ExternalData Release 2018

Reference and Process User Guide

Contents

1 Purpose of document

This document provides a reference guide for researchers interested in utilising the anonymised *Growing Up in New Zealand* (*GUiNZ*) data. This includes data collected from before the cohort children were born to when they were four years old. This document provides an overview of the *Growing Up in New Zealand* study, information about the available datasets, and how to apply for access to become a user of the datasets. Research data available for release have been anonymised to protect participant privacy and to comply with participant consents. These are termed the External Research Datasets (see Section 3 for further information on the available datasets and anonymisation process).

1.1 Background to the study

Growing Up in New Zealand is a child-focused longitudinal study that provides an up-to-date, population-relevant picture of what it is like to be a child *Growing Up in New Zealand* in the 21st century. Approximately 7,000 children and their families are taking part in this study. The study aims to provide a complete picture of the pathways that lead to successful and equitable child development, thereby providing evidence to improve wellbeing for all children.

Growing Up in New Zealand is explicitly designed to follow children from before birth until they are young adults to understand "what works" for children and families and to consider pathways of development across multiple domains of influence. This will allow for a better understanding of the complex interplay of all the factors that lead to child outcomes including growth, health, behaviours and cognitive development. For further information on study design and sample collection see our cohort profile, recruitment and retention paper and also our calibration protocol technical paper (all available at www.growingup.co.nz).

1.2 Data Collection Waves

Each data collection wave (DCW) of *Growing Up in New Zealand* seeks information across six inter-connected domains (see our cohort profile for more detail). Each cross-sectional DCW is planned according to a balance of age-appropriate information from all the inter-connected domains, in the context of the overarching longitudinal research objectives, whilst aiming to be policy relevant. Attention is also given to ensuring that the methods utilised to collect domain-specific evidence acknowledges the unique New Zealand population and environmental context.

Timelines
The study was commissioned by the New Zealand government in 2004 and commenced in 2008 with the recruitment of 6822 pregnant mothers who had an expected due date between March 2009 and May 2010. A cohort of 6846 children were born into the study. Study data has been collected from participating families at several time points and from multiple sources (mother, partner, child proxy and child observation data) and via different collection methods including: face to face interviews, telephone interviews, and data linkage.

Face-to-face interviews
Computer Assisted Personal Interviews (CAPI) were undertaken by trained interviewers, most often in the child's home, at several time points including:
- The antenatal DCW0 with the pregnant mother (most often in the last trimester of her pregnancy) and with her partner (almost always the stated biological father);
- The nine month DCW1 with the child's mother and her partner;
- The two year DCW2 with the child's mother and her partner, which also involved direct observations, developmental and anthropometric assessments of the children at two years of age; and
- The four year (pre-school) DCW5 with the child's mother, which included direct observations,

developmental and anthropometric assessments and biological samples from the children at four years of age.

Telephone interviews
Brief Computer Assisted Telephone Interviews (CATI) were undertaken by trained staff with the child's mother (or equivalent) to allow for age-appropriate developmental information to be collected and to assist with cohort retention. These phone calls occurred at several time points including when the children were:

- 6 weeks old
- 35 weeks old
- 16 months old
- 23 months old
- 31 months old
- 45 months old

Online questionnaires
The 'Starting school' information was collected from mothers in the study when their children were approximately six years of age. This data collection wave was the first to use a self-complete online questionnaire, rather than via computer-assisted personal (CAPI) and telephone (CATI) interviews.

- 72 months old

Data linkage
Data linkage provides access to health-related data from the antenatal period up to the pre-school DCW5. This is accessed only after gaining parental consent to do so. Selected derived variables are added to the GUiNZ external datasets from these sources.

Data access
Since the study's inception, it has been envisaged that the longitudinal resource would inform both policy and research relating to children and their families in New Zealand. After consent has been given by the participants, and with oversight from the Data Access Committee, in line with our Data Access Protocol, access to the data from each DCW has been externally released. The *Growing Up in New Zealand* datasets contain mostly raw data – however, where appropriate, standardised information that adds analytical utility to the dataset will also be released, for example, ethnicity classifications. The following external data releases are available from *Growing Up in New Zealand* to date, as summarised in Table 1.

Table 1: Summary of *Growing Up in New Zealand* external data releases to date

Data Collection Wave	Contact Point	Mother information	Partner information	Child information
DCW0	Antenatal	✓	✓	
DCW1	Perinatal			✓ *
	6 weeks	✓		✓
	35 weeks	✓		✓
	9 months	✓	✓	✓ **
DCW2	16 months	✓		✓
	23 months	✓		✓
	2 years	✓	✓	✓
DCW3	31 months	✓		✓
DCW4	45 months	✓		✓
DCW5	54 months	✓		✓
DCW6	72 months	✓		

* Linkage to perinatal health records.
** Includes linkage to heath records in first year of life. See Appendix A for technical documentation on linkage to National Immunisation Register and National Minimum Dataset.

1.3   Background publications

It is expected that all researchers interested in using the *Growing Up in New Zealand* datasets will be familiar with the key background documents describing the study in more detail (available at www.growingup.co.nz).

In particular:

- **Report 1: Before we are born**

This is the first report released and focuses solely on the antenatal data as well as describing the cohort and research objectives of the study.

> Morton, S. M. B., Atatoa Carr, P. E., Bandara, D. K., Grant, C. C., Ivory, V. C., Kingi, T. R., Liang, R., Perese, L. M., Peterson, E., Pryor, J. E., Reese, E., Robinson, E. M., Schmidt, J. M., Waldie, K. E. (2010). *Growing Up in New Zealand: A longitudinal study of New Zealand children and their families. Report 1: Before We Are Born*. Auckland, *Growing Up in New Zealand*. ISBN: 978-0-473-17889-5 (electronic), ISBN: 978-0-473-17974-8 (print).

- **Report 2: Now we are born**

Now we are born describes the cross sectional data from the first nine months of our cohort children's lives and the longitudinal changes from antenatal to nine months.

> Morton, S. M. B., Atatoa Carr, P., Grant, C. C., Lee, A., Bandara, D. K., Mohal, J., Kinloch, J., Schmidt, J., Hedges, M., Ivory, V., Kingi, T. K., Liang, R., Perese, L., Peterson, E., Pryor, J., Reese, E., Robinson, E., Waldie, K., Wall, C. (2012). *Growing Up in New Zealand: A longitudinal study of New Zealand children and their families. Report 2: Now We Are Born*. Auckland, University of Auckland. ISSN: 2253-2501 (Print)

- **Cohort profile**

This journal article describes in detail the cohort design and set up of the study. It is the foundational document for referencing the study.

> Morton, S. M. B., Atatoa Carr, P., Grant, C. C., Robinson, E. M., Bandara, D. K., Bird, A., Ivory, V. C., Kingi, T. K., Liang, R., Marks, E. J., Perese, L. M., Peterson, E. R., Pryor, J. E., Reese, E., Schmidt, J. M., Waldie, K. E., Wall, C. (2012). *Cohort Profile: Growing Up in New Zealand*. International Journal of Epidemiology 42(1): 65-75. DOI: 10.1093/ije/dyr206

- **Recruitment and retention**

This paper lays out the methods and techniques used to recruit the largest cohort of participants in a longitudinal study ever undertaken in New Zealand. It also discusses the retention methods used in the study and our success rates over time.

> Morton, S. M. B., Atatoa Carr, P., Grant, C. C., Robinson, E. R., Bird, A. and Waayer, D. (2012). *How do you recruit and retain a pre-birth cohort? Lessons learnt from Growing Up in New Zealand*. Evaluation and the Health Professions. DOI: 10.1177/0163278712462717.

- **Generalisability**

The comparability of *Growing Up in New Zealand* births to all the births across New Zealand has also been compared and contrasted.

> Morton, S. M. B., Ramke, J., Kinloch, J., Grant, C. C., Atatoa Carr, P., Leeson, H., Lee, A. C. and Robinson, E. (2014). G*rowing Up in New Zealand cohort alignment with all New Zealand births*. Australian and New Zealand Journal of Public Health. DOI: 10.1111/1753-6405.12220

- **Report 3: Now We Are Two**

This report provides insight into the physical health and development, emotional and behavioural well-being, and cognitive development of New Zealand two-year-olds. The report also depicts changes in the children's home environment, childcare arrangements and socioeconomic situation over the first two years of their lives.

> Morton, S.M.B., Atatoa Carr, P.E., Grant, C.C., Berry, S.D., Bandara, D.K., Mohal, J., Tricker, P. J., Ivory, V.C., Kingi, T.R., Liang, R., Perese, L.M., Peterson, E., Pryor, J.E., Reese, E., Waldie, K.E.,and Wall, C.R. (2014). *Growing Up in New Zealand: A longitudinal study of New Zealand children and their families. Now we are Two: Describing our first 1000 days.* Auckland: Growing Up in New Zealand. ISSN: 2253-251X (Online), ISSN: 2253-2501 (Print)

- **Report 4: Now We Are Four**

This report provides insight into the physical health and development, emotional and behavioural well-being, and cognitive development of New Zealand four-year-olds. The report also depicts changes in the children's home environment, childcare arrangements and socioeconomic situation between two and four and highlights the school readiness of the children. This report also looks at the biological samples taken from the children with regards to their health.

> Morton, S.M.B, Grant, C.C., Berry, S.D., Walker, C.G., Bandara, D.K., Mohal, J., Bird, A., Underwood, L., Fa'alili-Fidow, J. (2017). *Growing Up in New Zealand: A longitudinal study of New Zealand children and their families. Now we are four. Auckland: Growing Up in New Zealand.*

Further *Growing Up in New Zealand* publications relating to various aspects of the study are available online (www.growingup.co.nz), in particular our Child Vulnerability Reports 1 and 2 and Residential Mobility reports are suggested background reading. Our model of data release and documents provided are in line with similar contemporary longitudinal studies overseas (such as Growing Up in Ireland - www.growingup.ie, Growing Up in Australia - www.growingupinaustralia.gov.au, Millennium Cohort Study (UK) - www.cls.ioe.ac.uk, and Growing Up in Scotland - http://growingupinscotland.org.uk).

2 Up to 72M Data Collection Wave Instruments

From DCW0 to the 54M DCW (DCW5) we have used several tools and scales taken or adapted from other studies for mother (M), partner (P) and in DCW2 and DCW5 directly from the study child (C). Table 2 outlines the dataset name, including where the tool can be found in the questionnaire (and in brackets the variable code name), the measurements taken, the domain and construct being addressed, how it was measured and the pertinent reference used to justify the tool/ method applied. Additional information is included in the 'Notes' if the tool has been adapted or modified, or if the user requires added technical information for the data to be analysed appropriately (see Appendix A) or where our team has published using a particular scale or tool (see numbered references in Appendix B) . For further guidance or to provide feedback on specific tools/scales please contact dataaccess@growingup.co.nz.

Table 2: Up to 54M DCW tools, scales and references

Data set	Question/ variable number	Tool or scale	Domain/construct	How applied/used	Key reference	Notes
DCW0 M/P	ACT1A-7	The International Physical Activity Questionnaire	Health and Wellbeing – activity and exercise	Mother and Partner administered questionnaire	Craig, C. L., Marshall, A. L., et al. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine & Science in Sports & Exercise, 35*(8), 1381-1395.	11, 19
DCW0 M/P	GH1	Perceived General Health	Health and Wellbeing – health status	Mother and Partner administered questionnaire	Ware, J. E., Kosinski, M., & Keller, S. K. (1994). *SF-36 physical and mental health summary scales: A user's manual*. Boston, MA: The Health Institute.	16, 18
DCW0 M	NUT9-15	Food Frequency Questionnaire	Health and Wellbeing – diet and nutrition	Mother administered questionnaire	Subar AF (2006) The food propensity questionnaire: concept, development, and validation for use as a covariate in a model to estimate usual food intake. Journal American Diet Association 106(10), 1556-1563.	8, 9, 19
DCW0 M	ALC1GP-ALC3GP_AM	Adapted questions from the National Nutrition Survey	Health and Wellbeing – pre- and during pregnancy alcohol consumption	Mother administered questionnaire	Russell D. G., Parnell W. R., Wilson N. C. (1999) *NZ Food: NZ People. Key Results of the 1997 National Nutrition Survey*. Wellington: Ministry of Health.	2, 19
DCW0 M/P	EDI1-10	Edinburgh Postnatal Depression Scale	Psychosocial and Cognitive Development – mental health	Mother and Partner administered questionnaire	Cox, J. L., Holden, J. M., Sagovsky, R. (1987). Detection of postnatal depression. Development of the 10-item Edinburgh postnatal depression scale. *The British Journal of Psychiatry, 150*,782-786.	1, 6, 10, 15, 16, 17, 18, 19
DCW0 M/P	PSS1-10	Perceived Stress Scale	Psychosocial and Cognitive Development –parental stress	Mother and Partner administered	Cohen, S., Karmack, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*, 385-	1, 6, 10, 15, 16, 17, 18

Data set	Question/ variable number	Tool or scale	Domain/construct	How applied/used	Key reference	Notes
				questionnaire	396.	
DCW0 P	BFI1-44	Big Five Inventory – Adolescent Version	Psychosocial and Cognitive Development –temperament and personality	Partner administered questionnaire	John OP & Srivastava S (1999) The Big Five Trait Taxonomy: History, measurement, and theoretical perspectives. In LA Pervin & OP John (Eds.) Handbook of Personality: Theory and Research (2nd ed, 102-138) New York: Guilford Press.	Adolescent version used due to simplified text. Three minor modifications were made to items 8, 12, and 14 to help further clarify items, and two liking items, which are not used in the calculation of the big five but are included in the adolescent BFI, were not used.
DCW0 M/P	COH1-9	Family Adaptation and Cohesion Scales	Family and Whānau – family cohesion	Mother and Partner administered questionnaire	Olson, D. H. (1985). FACES III (Family Adaptation and Cohesion Scales). St. Paul, MN: University of Minnesota.	The 9-item Family Cohesion scale was specifically developed for *Growing Up in New Zealand* with good reliability and validity (Cronbach's alpha for mothers α=.84 and fathers α=.83). It is based on items from the Family Adaptation and Cohesion Scales (FACES III; Olson, 1985), developed with Māori concepts of whānau to more appropriately reflect the New Zealand context (see Waldie, Peterson, D'Souza, Underwood, Pryor, Atatoa Carr, Grant, Morton SMB, 2015, p. 68). 15, 18
DCW0 M/P	SPE1-6 & SPF1-6	Parenting Social Support Scale	Family and Whānau – parenting support	Mother and Partner administered questionnaire	Dunst, C. J., Jenkins, V., & Trivette, C. M. (1984). Family Support Scale: Reliability and validity. Journal of Individual, Family and Community Wellness, 1, 45-52.	5, 6, 15, 16, 17
DCW0 M/P	WH1-9 &	Warmth and Hostility Scale (from Iowa Family Interaction Rating Scale)	Family and Whānau – interparental relationship and conflict	Mother and Partner administered questionnaire	Melby JN et al. (1989-1993). The Iowa family interaction rating scales (editions 1-4). Unpublished coding manual. Iowa State University, Institute for Social and Behavioral Research, Ames.	15, 16, 17
DCW0 M/P	CFL1-6	Items from Resilience in Stepfamilies Study	Family and Whānau – interparental relationship and conflict	Mother and Partner administered questionnaire	Pryor, J. (2004). Stepfamilies and resilience. Final report. Prepared for Centre for Social Research and Evaluation/ Te Pokapū Rangahau Arotaki Hapori. Wellington: Roy McKenzie Centre for the Study of Families, Victoria University of Wellington.	6, 15
DCW0 M/P	CT1-6	Interparental Relationship – Commitment	Family and Whānau – interparental	Mother and Partner	Johnson, M. P., Caughlin, J. P., & Huston, T. L. (1999). The tripartite nature of marital	6, 15

Data set	Question/ variable number	Tool or scale	Domain/construct	How applied/used	Key reference	Notes
			relationship/commitment	administered questionnaire	commitment: personal, moral, and structural reasons to stay married. Journal of Marriage and the Family, 61, 160-177.	
DCW0 M/P	IDQ6-10	Modified version of the Hawaiian Lifestyle Questionnaire	Culture and Identity – cultural knowledge, participation and values	Mother and Partner administered questionnaire	Kaholokula, J. K., Nacapoy, A. H., Grandinetti, A. & Chang, H. K, (2008). Association between acculturation modes and type 2 diabetes among Native Hawaiians. *Diabetes Care, 31* (4), 698-700.	Modified with permission to reflect parental participation in New Zealand cultural practices.
DCW0 M/P	FIN6,10 & OCC1-34A	Socioeconomic Status (SES) Income and Occupation	Societal Content and Neighbourhood Environment	Mother and Partner administered questionnaire	Statistics New Zealand (2008) General Social Survey - Statistics New Zealand, Wellington, Social Conditions Business Unit, Statistics New Zealand. 30 January 2009, http://www.stats.govt.nz/developments/general-social-survey.htm.	5, 17, 18
DCW0 M/P	NE5-14	Neighbourhood Integration Scale	Societal Context and Neighbourhood Environment – neighbourhood integration, isolation and safety	Mother and Partner administered questionnaire	Turrell, G., Kavanagh, A., & Subramanian, S. V. (2006). Area variation in mortality in Tasmania (Australia): The contributions of socioeconomic disadvantage, social capital and geographic remoteness. *Health and Place*, 12, 291-305.	6, 15, 16, 17, 18
DCW1M /P	M28-38 (EL1-11)	Extract from the Pridham Scale	Psychosocial and Cognitive Development – Social and Emotional Adjustment & Maternal Attachment	Mother and Partner administered questionnaire	Pridham, K. F., & Chang, A. S. (1989). What being the parent of a new baby is like: Revision of an instrument. *Research in Nursing & Health, 12*, 323-329.	Items from the original Pridham scale, plus further two items: one asking about overall parenting confidence; and the other about mother-child closeness. Also included: two items on satisfaction with support from partner and family. 12
DCW1M	M94-101 (AX1-8)	GAD-7	Psychosocial and Cognitive Development –anxiety	Mother administered questionnaire	Spitzer, R. L., Kroenke, K., Williams, J. B. (2006). A brief measure for assessing generalised anxiety disorder: the GAD-7. Archives of Internal Medicine. 166:1092-1097.	5
DCW1M	M83-93 (EDI1-10)	Edinburgh Postnatal Depression Scale	Psychosocial and Cognitive Development – mental health	Mother administered questionnaire	Cox, J. L., Holden, J. M., Sagovsky, R. (1987). Detection of postnatal depression. Development of the 10-item Edinburgh postnatal depression scale. *The British Journal of Psychiatry, 150*,782-786.	1, 5, 7, 10, 12, 16, 17
DCW1P	P65-73 (PH1-10)	Patient Health Questionnaire-9	Psychosocial and Cognitive Development – mental health	Partner administered	Kroenke, K., & Spitzer, R. L. (2002). The PHQ–9: A new depression diagnostic and	12, 17

Data set	Question/ variable number	Tool or scale	Domain/construct	How applied/used	Key reference	Notes
				questionnaire	severity measure. Psychiatric Annals, 32, 509–515. doi:10.3928/0048-5713-20020901-06	
DCW1M /P	M110-121 & P92-103 (SPE1-6 & SPF1-6)	Parenting Social Support Scale	Family and Whānau – parenting support	Mother and Partner administered questionnaire	Dunst, C. J., Jenkins, V., & Trivette, C. M. (1984). Family Support Scale: Reliability and validity. *Journal of Individual, Family and Community Wellness, 1,* 45-52.	10, 12, 17
DCW1M /P	M220-225 & P170-175 (BL1-6)	PISA Sense of Belonging and Participation 2000	Culture and Identity – sense of belonging	Mother and Partner administered questionnaire	Willms, J. D. (2003). Student engagement at school: A sense of belonging and participation. Results from PISA 2000. Paris: OECD. http://www.oecd.org/dataoecd/42/35/33689437.pdf	Questions were modified to tap individuals' sense of belonging to community, and two of the eight questions that related more specifically to school belonging were dropped.
DCW1M /P	M122-127 & P104-109 (PCT/RCT/ SCT)	Interparental Relationship – Commitment	Family and Whānau – interparental relationship/commitment	Mother and Partner administered questionnaire	Johnson, M. P., Caughlin, J. P., & Huston, T. L. (1999). The tripartite nature of marital commitment: personal, moral, and structural reasons to stay married. Journal of Marriage and the Family, 61, 160-177.	Items were developed for this study that reflect the three dimensions of commitment identified by Johnson et al. 10
DCW1M /P	M137-146 & P119-124 (PCFL)	Items from Resilience in Stepfamilies Study	Family and Whānau – interparental relationship/conflict	Mother and Partner administered questionnaire	Pryor, J. (2004). Stepfamilies and resilience. Final report. Prepared for Centre for Social Research and Evaluation/ Te Pokapū Rangahau Arotaki Hapori. Wellington: Roy McKenzie Centre for the Study of Families, Victoria University of Wellington.	10, 17
DCW1M /P	M128-136 & P110-118 (WH1-9)	Warmth and Hostility Scale (from Iowa Family Interaction Rating Scale)	Family and Whānau – interparental relationship/warmth and hostility	Mother and Partner administered questionnaire	Melby JN et al. (1989-1993). The Iowa family interaction rating scales (editions 1-4). Unpublished coding manual. Iowa State University, Institute for Social and Behavioral Research, Ames.	6, 17
DCW1M /P	M143-146 & P125-128 (PCFL/ VCFL)	Women's Abuse Screening Tool (WAST)	Family and Whānau – interparental relationship/violence	Mother and Partner administered questionnaire	Brown, J. B., Lent, B., Brett, P., Sas, G., Pederson, L. (1996). Development of the woman abuse screening tool for use in family practice. *Family Medicine, 28,* 422–428.	Only the first 4 items of the WAST were included as these were less confrontational at this stage of the longitudinal study.
DCW1C	C103-C114, C150-C162, C166-C177	Very Short Form of IBQ-R	Psychosocial and Cognitive Development – temperament	Child proxy administered questionnaire	Rothbart & Bates, (2006). Temperament. In W. Damon, R. Lerner, & N.Eisenberg (Eds.), *Handbook of child psychology*: Vol. 3. Social, emotional, and personality development (6th ed) (pp. 99–166). New York: Wiley.	Note: we have identified and validated a NEW FIVE factor structure that discriminates well across Europeans, Maori, Pacifika and Asian children - see references below for details on this and

Data set	Question/ variable number	Tool or scale	Domain/construct	How applied/used	Key reference	Notes
	(IB4-34)					how IBQ-R have been analysed: Peterson et al. (2017a). Peterson et al. (2017b).
DCW1C	C132-139, C141-144 (MC1-12)	MacArthur CDI: Words and Gestures	Psychosocial and Cognitive Development – language and communication	Child proxy administered questionnaire	CDI Advisory Board (1992/1993). *The MacArthur Communicative Development Inventory: Words and Gestures*. Paul H. Brookes Publishing Co.	The 12 items of the First Communicative Gestures scale were included as a measure of non-verbal communication. 13
DCW1C	C119, 120, 123-131 (SB1-11)	The Communication and Symbolic Behavior Scales (CSBS)	Psychosocial and Cognitive Development – expressive language	Child proxy administered questionnaire	Wetherby & Prizant (2001). *Communication and Symbolic Behavior Scales (CSBS)*. Paul H. Brookes Publishing Co.	Eleven items were used tapping three subscales: emotion and use of eye gaze; use of communication; and use of sounds. 12
DCW2 C	C246-248 (SLP1-3)	Brief Infant Sleep Questionnaire	Health and Wellbeing - sleep	Child proxy administered questionnaire	Sadeh A. (2004) A brief screening questionnaire for infant sleep problems: validation and findings for an internet sample. Pediatrics 113(6) e570-757.	
DCW2 C	O27-45 (HW1-16)	Anthropometry – height and weight	Health and Wellbeing - growth	Stadiometer – height Scales - weight	Pietilainen KH et al. (2001) Tracking of body size from birth to adolescence: Contributions of birth length, birth weight, duration of gestation, parents' body size, and twinship. American Journal of Epidemiology 154, 21-29.	A laser measuring device was introduced to replace the standard portable stadiometer. The laser device has also been used in the Growing Up in Australia study. Technical document in Appendices. Contact dataaccess@growingup.co.nz for further guidance.
DCW2 C	C250-314 (FFQ1-101)	Food Frequency Questionnaire	Health and Wellbeing – diet and nutrition	Child proxy administered questionnaire	Subar AF (2006) The food propensity questionnaire: concept, development, and validation for use as a covariate in a model to estimate usual food intake. Journal American Diet Association 106(10), 1556-1563.	9
DCW2 C	C17-41 (SDQ1-25)	Strength and Difficulties Questionnaire (SDQ)	Psychosocial and Cognitive Development – conduct and behaviour	Child proxy mother and partner administered questionnaire	Goodman R (1997) The strength and difficulties questionnaire: a research note. Journal of Child Psychology and Psychiatry 38, 581-586.	3, 4, 6, 10
DCW2 C	O2-17 (ST16-32)	Stack and Topple interaction task	Psychosocial and Cognitive Development – social	Child interaction	Ross HS (1982) Establishment of social games among toddlers. Developmental	Technical document in Appendices. Contact dataaccess@growingup.co.nz

Data set	Question/ variable number	Tool or scale	Domain/construct	How applied/used	Key reference	Notes
			competence, inhibitory control, motor control and play behaviour	with interviewer	Psychology 18(4), 509-518.	for further guidance.
DCW2 M	M86-129 (BFI1-44)	Big Five Inventory (BFI) – Adolescent version	Psychosocial and Cognitive Development - personality	Mother administered questionnaire	John OP & Srivastava S (1999) The Big Five Trait Taxonomy: History, measurement, and theoretical perspectives. In LA Pervin & OP John (Eds.) Handbook of Personality: Theory and Research (2nd ed, 102-138) New York: Guilford Press.	Adolescent version used due to simplified text. Three minor modifications were made to items 8, 12, and 14 to help further clarify items, and two liking items, which are not used in the calculation of the big five but are included in the adolescent BFI, were not used.
DCW2 C	C43-80 (SC1-38)	Self-concept	Psychosocial and Cognitive Development – self-concept	Child proxy administered questionnaire	DesRosiers FS (1996) The assessment of self-concept in toddlers. Infant Behavior and Development 19, 422.	
DCW2 C	C334-434 (LD2-9)	MacArthur CDI-II short form A	Psychosocial and Cognitive Development – verbal communication	Child proxy administered questionnaire	Fenson L et al. (2000) Short-form versions of the MacArthur Communicative Development Inventories. Applied Psycholinguistics 21, 95-116.

Reese, E., & Read, S. (2000). Predictive validity of the New Zealand MacArthur Communicative Development Inventory: Words and Sentences. *Journal of Child Language, 27*, 255-266. | Permission granted by Philip Dale (100 items plus one question about word combinations). Note that we adapted the CDI-II Short Form A for New Zealand English (as per Reese & Read, 2000) and for Maori (direct translation by Peter Keegan), Samoan, Tongan (adapted by Elaine Ballard and Mele Taumoepeau) and Chinese (adapted by Elaine Ballard from the Chinese version of the CDI). |
DCW2 M/P	M3-14 (TS1-12)	Time Spent with Child Scale	Family and Whanau – parent-child relationship - affiliation	Mother and Partner administered questionnaire	Davies PT et al. (2002). Child emotional security and interparental conflict. Monographs of the Society for Research on Child Development. Serial No. 270, 67(3).	
DCW2 M/P	M140-148 (WH1-9)	Warmth and Hostility Scale	Family and Whanau – interparental relationship	Mother and Partner administered questionnaire	Melby JN et al. (1989-1993). The Iowa family interaction rating scales (editions 1-4). Unpublished coding manual. Iowa State University, Institute for Social and Behavioral Research, Ames.	10
DCW2 M/P	M34, 36, 38 (PID5,7,9)	Enjoyment of Parenting Scale	Culture and Identity – parental identity	Mother and Partner administered questionnaire	Martin, A. J. (2003). The relationship between parents' enjoyment of parenting and children's school motivation. *Australian Journal of Guidance and Counselling, 13*(2), 115-132.	
DCW2	O19-25	Parent-child interaction	Education Domain – quality of	Observation	Taumoepeau M & Ruffman T (2006) Mother	Tool was adapted from Taumoepeau &

Data set	Question/ variable number	Tool or scale	Domain/construct	How applied/used	Key reference	Notes
C/M	(PCI1-17) & M16-18 (PC0-5)		interactions	of Mother and child & Mother and Partner questionnaire	and infant talk about mental states relates to desire language and emotion understanding. Child Development 77, 465-481.	Ruffman (2006) to tap into dimensions of the quality of the mother-child interaction: maternal warmth; open-ended questions; maternal talk about emotions; children's emotional expressions (empathy); maternal linking to child's own experience; and maternal discipline. Permission granted by Mele Taumoepeau. 14
DCW2 P	M152-162 (CFL7-17)	Women's Abuse Screening Tool (WAST)	Family and Whanau – interparental relationship - violence	Partner administered questionnaire	Brown JB et al (1996). Development of the woman abuse screening tool for use in family practice. Family Medicine, 28, 422–428.	Only the first 4 items of the WAST were included as these were less confrontational at this stage of the longitudinal study. Only collected from partners that this time point.
DCW2 M/P	M173-183 (OC14-52) & M185-186 (FIN6,10)	Socioeconomic Status (SES) Income and Occupation	Societal Content and Neighbourhood Environment	Mother and Partner administered questionnaire	Statistics New Zealand (2008) General Social Survey - Statistics New Zealand, Wellington, Social Conditions Business Unit, Statistics New Zealand. 30 January 2009, http://www.stats.govt.nz/developments/general-social-survey.htm.	17
DCW5-C	CO HW20-31 (OBS Q1.1-1.18)	Anthropometry – height, weight and waist	Health and Wellbeing - growth	Stadiometer – height Scales – weight Tape - waist	Pietilainen KH et al. (2001) Tracking of body size from birth to adolescence: Contributions of birth length, birth weight, duration of gestation, parents' body size, and twinship. American Journal of Epidemiology 154, 21-29 McCarthy, H. D. (2014). Measuring growth and obesity across childhood and adolescence. Proceedings of the Nutrition Society, 73, 210-217.	In order to further investigate early weight issues, trunk fat mass and obesity at the pre-school phase we have also collected waist circumference. Technical document in Appendices. Contact dataaccess@growingup.co.nz for further guidance.
DCW5-C	CM FFQ (Q2.1-2.60)	Food Frequency Questionnaire	Health and Wellbeing – diet and nutrition	Child proxy administered questionnaire	Subar AF (2006) The food propensity questionnaire: concept, development, and validation for use as a covariate in a model to estimate usual food intake. Journal American Diet Association 106(10), 1556-1563.	The same questions were used as the 2-yr questionnaire except for the following changes: Vegetable food group - Avocado was added as a variable. Milk, Cheese and Yoghurt food group – Infant formula/toddler milk was removed as a variable and breast milk

Data set	Question/ variable number	Tool or scale	Domain/construct	How applied/used	Key reference	Notes
						was removed as an option under other milk.
DCW5-C	CM CBQ1-36 (Q7.1-7.36)	Child Behaviour Questionnaire –Very Short Form (CBQ-VSF)	Psychosocial and Cognitive Development –temperament	Child proxy administered questionnaire	Putnam, S. P., & Rothbart, M. K. (2006). Development of Short and Very Short forms of the Children's Behavior Questionnaire. Journal of Personality Assessment, 87 (1), 103-113.	We used the Infant Behavior Questionnaire-Very Short form (IBQ-VSF) at 9 months. The CBQ-VSF is an age-appropriate continuation of the IBQ-VSF measuring the same temperament factors. Tech document in Appendices which further explains the factor structure in our data. Contact dataaccess@growingup.co.nz for further guidance.
DCW5-C	CM SDQ1-24 (Q8.1-8.24)	Strength and Difficulties Questionnaire (SDQ)	Psychosocial and Cognitive Development – conduct and behaviour	Child proxy mother administered questionnaire	Goodman R (1997) The strength and difficulties questionnaire: a research note. Journal of Child Psychology and Psychiatry 38, 581-586.	Tech document in Appendices Contact dataaccess@growingup.co.nz for further guidance.
DCW5-C	O OB 4-8, 40-41, 43-45, 49 (OBS Q10.1-10.15)	Assessor report from the Preschool Self-Regulation Assessment (PSRA)	Psychosocial and Cognitive Development - conduct and behaviour	Interviewer observation of child	Smith-Donald, R., Raver, C. C., Hayes, T., & Richardson, B. (2007). Preliminary construct and concurrent validity of the Preschool Self-Regulation Assessment (PSRA) for field-based research. Early Childhood Research Quarterly, 22, 173-187.	Items A1, B5, C3, E6 and three items on aggression from the PSRA were chosen to provide two functions: 1) an indication of issues that may have affected the child's performance on the observation tasks and 2) easily observable behaviours that can be matched to parent reported behaviour and temperament.
DCW5-M	M PH1-10 (Q17.1-17.10)	Patient Health Questionnaire-9	Psychosocial and Cognitive Development – mental health	Mother administered questionnaire	K., & Spitzer, R. L. (2002). The PHQ–9: A new depression diagnostic and severity measure. Psychiatric Annals, 32, 509–515. doi:10.3928/0048-5713-20020901-06	Maternal depression was measured before birth and at 9 months using the Edinburg Post-Natal Depression Scale which would no longer be appropriate. The PHQ-9 was used in partners at 9-months.
DCW5-C	CO GWT1-4 (OBS Q8.1-8.4)	Gift Wrap Task	Psychosocial and Cognitive Development - inhibitory emotion control (hot cognition)	Child observation	Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. Developmental Psychology, 36, 220–232.	Tech document in Appendices Contact dataaccess@growingup.co.nz for further guidance.
DCW5-C	CO AKT1-8 (OBS Q3.1-3.8)	Affective Knowledge Task (AKT) – modified version of the Expressive/Receptive Task sub tasks	Psychosocial and Cognitive Development - emotion recognition & understanding	Child observation	Denham, S. A. (1986). Social cognition, social behavior, and emotion in pre-schoolers: Contextual validation. Child Development, 57, 194-201.	Slight changes were made to the scared face by removing the eyebrows to make it less feminine. We added the emotions (surprised and disgust) in

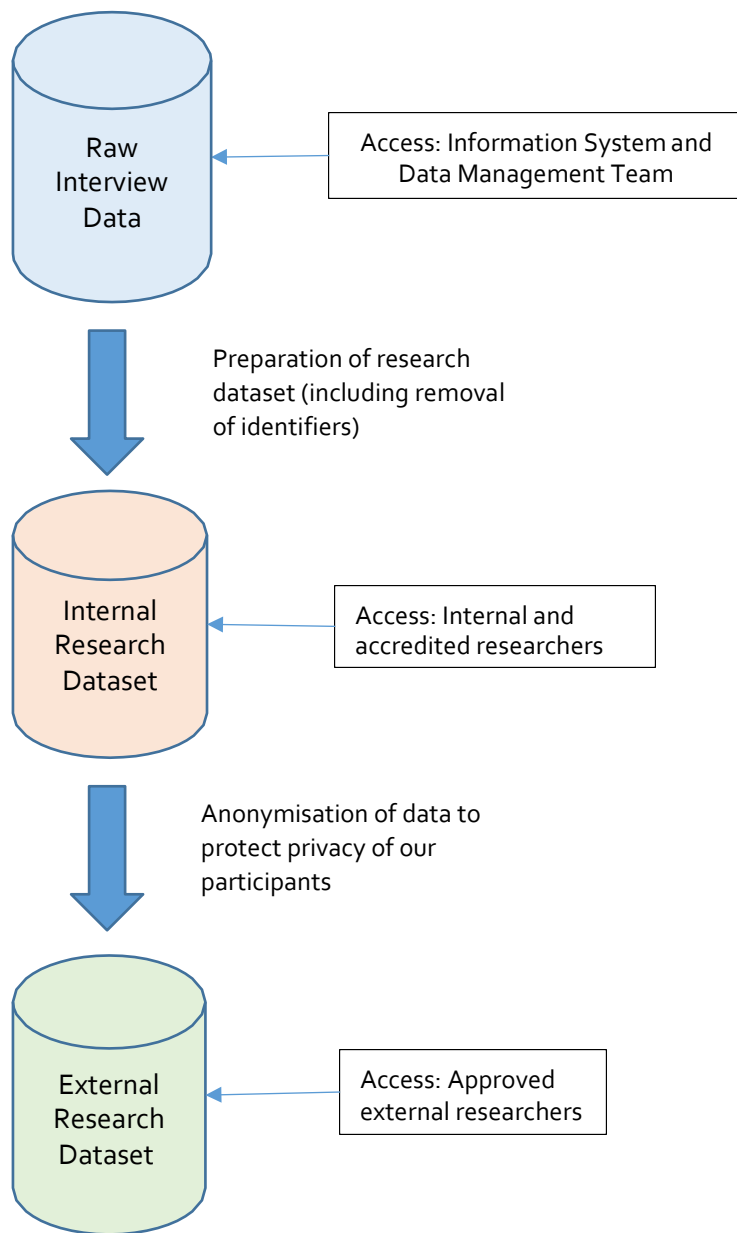| Data set	Question/ variable number	Tool or scale	Domain/construct	How applied/used	Key reference	Notes
						order to try and avoid potential ceiling effects with the original four emotions. Tech document in Appendices Contact dataaccess@growingup.co.nz for further guidance.
DCW5-C	CM PAR7-27 (Q13.7-13.27)	Parenting Practices Questionnaire	Psychosocial and Cognitive Development - parenting style	Mother administered questionnaire	Robinson, C. C., et al. (1995). Authoritative, Authoritarian, And Permissive Parenting Practices: Development Of A New Measure. Psychological Reports 77(3): 819-830.	A subset of 21 items were chose from the original 62-item scale to reflect each of the three parenting styles (authoritarian, authoritative, and permissive).
DCW5-C	CO DIB1-2, 42 (OBS Q4.1-4.3)	DIBELS – letter naming fluency (Grade K/Benchmark 1)	Psychosocial and Cognitive Development - phonological awareness/reading	Child observation	Good, R.H., & Kaminski, R. A. (Eds.) (2002). Dynamic Indicators of Basic Early Literacy Skills (6th ed.). Eugene, OR: Institute for the Development of Educational Achievement. Available: http://dibels.uoregon.edu/	Tech document in Appendices Contact dataaccess@growingup.co.nz for further guidance.
DCW5-C	CO PPVT0-44 CO PPVTset1 errorS (OBS Q5.0-5.44)	Adapted Peabody Picture Vocabulary Test (PPVT) version three	Psychosocial and Cognitive Development - verbal communication & comprehension	Child observation	Dunn, L. M., Dunn, L. M., & Williams, K. T. (1997). Peabody Picture Vocabulary Test–III. Circle Pines, MN: American Guidance Service. Rothman, S. (2005). Report on Adapted PPVT-III and Who Am I? Growing Up in Australia: The Longitudinal Study of Australian Children	Shortened version of the PPVT used, which is a test of receptive vocabulary used as a screening test of verbal ability. Adaptation based on work done in the United States for the Head Start Impact Study, with a number of changes for use in Australia (Rothman 2005). Tech document in Appendices Contact dataaccess@growingup.co.nz for further guidance.
DCW5-C	CO NN1-5 (OBS Q6.1-6.5)	Name and Numbers task from the Who Am I?	Psychosocial and Cognitive Development - writing, numeracy & symbols	Child observation	de Lemos, M. and Doig, B. (1999). Who Am I? Developmental Assessment: Melbourne. ACER	Tech document in Appendices Contact dataaccess@growingup.co.nz for further guidance.
DCW5-C	CO PTT1-20 (OBS Q2.1-2.20)	Hand clap (adapted version of the pencil tap task from the Preschool Self-Regulation Assessment (PSRA)	Psychosocial and Cognitive Development - executive functioning	Child observation	Golden, C., J., Hammeke, T. A., & Purisch, A. D. (1979) The Standardized Luria-Nebraska Neuropsychological Battery: A manual for clinical and experimental use. Lincoln, Nebraska: University of Nebraska Press.	Tech document in Appendices Contact dataaccess@growingup.co.nz for further guidance.
DCW5-C	CO PCI20-25 (OBS	Party invitation	Education – parent child interaction	Child observation	Aram, D., & Levin, I. (2001). Mother-child joint writing in low SES: Sociocultural	Tech document in Appendices Contact dataaccess@growingup.co.nz for further guidance.

Data set	Question/ variable number	Tool or scale	Domain/construct	How applied/used	Key reference	Notes
	Q7.1-7.6)				factors, maternal mediation, and emergent literacy. Cognitive Development, 16, 831-852	
DCW5-M	M CFL20-22 (Q20.5-20.7)	Verbal Conflict Scale (3 items from a scale developed for Resilience in Stepfamilies Study)	Family and Whānau – interparental relationship (verbal conflict)	Mother administered questionnaire	Pryor, J. (2004). Stepfamilies and resilience. Final report. Prepared for Centre for Social Research and Evaluation/ Te Pokapū Rangahau Arotaki Hapori. Wellington: Roy McKenzie Centre for the Study of Families, Victoria University of Wellington.	Only verbal conflict items were include at 54 months as physical conflict is covered by the other scales on violence (i.e. WAST).
DCW5-M	M CFL 18-19, 23-32 (Q20.8-20.19)	WHO Violence questionnaire (6 items), WOMEN'S ABUSE SCREENING TOOL (WAST) – three items	Family and Whānau – interparental relationship (violence)	Mother administered questionnaire	Brown, J.B., Lent, B., Brett, P., Sas, G., Pederson, L. (1996). Development of the woman abuse screening tool for use in family practice. Family Medicine, 28, 422–428	The World Health Organisation (WHO) violence questionnaire provides items on physical and psychological abuse. The WAST (Brown et al., 1996) is a widely used reliable screening tool for violence in relationships.
DCW5-M	M WL01-08 (Q19.12-19.19)	Work-life balance scale from Growing Up in Australia: Longitudinal Study of Australian Children (LSAC)	Family and Whānau – work life balance	Mother administered questionnaire	Growing Up in Australia: Longitudinal Study of Australian Children (LSAC). http://www.aifs.gov.au/growingup/studyqns/index.html	This series of questions was asked of the partners at 9 months (DCW1-P) and now has been asked of mothers.
DCW5-M	M ETHID1-12 (Q18.1-18.12)	Modified Multigroup Ethnic Identity Measure(MEIM)	Culture and Identity - ethnic identity, pride & belonging	Mother administered questionnaire	Phinney, J. (1992). The multigroup ethnic identity measure: A new scale for use with diverse groups. Journal of Adolescent Research, 7 (156), 156 – 176.	The 12-items were all used but slightly modified by addition of the word "culture" rather than just "ethnicity".
DCW5-M	CM NZID14 (Q18.13-18.16)	Modified version of the Lifestyle Attitude Questionnaire	Culture and Identity - national identity	Mother administered questionnaire	Kaholokula et al. (2008). Association between acculturation modes and Type 2 diabetes among native Hawaiians. Diabetes Care, 31(4), 698-700.	Direct consultation with creator of the Lifestyle Attitude questionnaire, Dr Kaholokula, was undertaken prior to use and permission received to modify the tool for the New Zealand context.

Only questions related to acculturation assessment used at this DCW. |
| DCW5-C | CM LD33-37 (Q10.12-10.16) | PROLL (Parent Rating of Oral Language & Literacy) – modified version of TROLL tool for teachers | Culture and Identity - child's pragmatic language | Child proxy administered questionnaire | Dickinson, McCabe, & Sprague. (2001). Teacher Rating of Oral Language and Literacy (TROLL): A research-based tool. Ciera Report #3-016. Michigan, US: Centre for the Improvement of Early Reading Achievement (CIERA), University of Michigan. Accessed 11 December 2014, from | Special permission was received from creator of TROLL, David Dickinson, to modify a few relevant questions, but not the entire instrument. |

Data set	Question/ variable number	Tool or scale	Domain/construct	How applied/used	Key reference	Notes
					http://www.ciera.org/library/reports/inquiry-3/3-016/3-016.pdf	
DCW5-M	CM OC100 (19.4) CM OC102-OC103 (19.2, 19.1) CM OC104-OC105 (19.3, 19.5) OCC4 (19.6) OCC5 (19.7) OCC6 (19.8) OCC7-OCC8 (19.9-19.10) OC48 (19.11)	Household SES - employment/work, hours of work and reasons for working status	Societal Content and Neighbourhood Environment	Mother administered questionnaire	Statistics New Zealand (2008). General Social Survey - Statistics New Zealand, Wellington, Social Conditions Business Unit, Statistics New Zealand. 30 January 2009, http://www.stats.govt.nz/developments/general-social-survey.htm. Statistics New Zealand (2008). 2006 Census Questionnaires, Christchurch, Information Centre, Statistics New Zealand (SNZ). http://www.stats.govt.nz/census/about-2006-census/2006-questionnaires.htm.	Labour force questions were derived from the NZ Census of Population and Dwellings (2006). These are validated within the NZ population and allow for comparability with official statistics. The hours of work question came from the General Social Survey (GSS, 2008, WORT1Q02). Other questions related to weekend work and work schedule came from the Household, Income & Labour Dynamics in Australia (HILDA) survey. 'Reasons for not working' were taken from LSAC wave 1.

3 About the datasets

Once the field data collection is complete the raw questionnaire and observational data are extracted, data is cleaned and collated, and operational data is removed. The research data are initially formatted as an internal working dataset. External research datasets are anonymised to protect participant privacy and to comply with participant consents. See definitions of both working datasets below and Figure 1 which demonstrates the data release infrastructure.

☐ **Internal Research Datasets** are available to accredited researchers working within *Growing Up in New Zealand* or researchers working in direct collaboration with the internal research team. Researchers wishing to discuss collaborations should contact the *Growing Up in New Zealand* Data Access Coordinator to arrange a meeting with the ResearchDirector (dataaccess@growingup.co.nz).

☐ **External Research Datasets** are publically available datasets that do not contain identifying information. Identifying Information is defined as personal information (see the Privacy Act 1993) and includes data collected about a person from which the identity of that person or a member of his or her family could reasonably be ascertained. The data have been anonymised without compromising the value of the information. In order to protect the anonymity of our participants a small proportion of the data have had to be re-coded or re-classified or minimally removed from the research dataset.

Raw Interview Data → Access: Information System and Data Management Team

Preparation of research dataset (including removal of identifiers)

Internal Research Dataset → Access: Internal and accredited researchers

Anonymisation of data to protect privacy of our participants

External Research Dataset → Access: Approved external researchers

Figure 1: Data release infrastructure

3.1　Data anonymisation

This section provides a summary of the processes that have been applied to generate the anonymised External Working Datasets. The datasets have been anonymised in accordance with the agreed principles outlined in the "Preparation of *GUiNZ* data for the University remote access facility" appendix of the 2016 contract between Auckland UniServices and Superu (Schedule 6). *GUiNZ* adopts and completes the anonymisation process in the context of international best practice. *GUiNZ* does not use any perturbative techniques that reduce and distort original data structures and the distribution of data values.

External Working Datasets are defined by the *GUiNZ* Data Access Protocol as anonymised datasets drawn from the internal working datasets which contain sensitive and identifying information. The anonymisation process removes all direct identifiers and other identifying information that is determined to be highly disclosive (highly sensitive) and with a very high likelihood of breaching the confidentiality and/or privacy of individual participants. Some sensitive or identifiable items are retained where variables are deemed to be useful or important for analysis and where sensitivity risk and identification risk are judged to be low.

Data was removed or transformed/treated if they met the following criteria:
1. Direct participant identifiers;
2. Highly disclosive content; and
3. Categories with cell counts less than five cases of the entire dataset.

The treatment applied to anonymise the variables is presented in the External Working Datasets and classified as derived, categorised, or re-classified variables. Each type of variable transformation is defined as follows:

- **Derived variables**: A new variable that has been generated from one or more raw pieces of information collected, using a numerical computation or mathematical formula or composite score.

- **Categorised variables**: Highly sensitive raw variables with categories containing low cell counts (<5) have been collapsed into the most proximal category (either top or bottom-coding).

- **Re-classified variables**: Variables resulting from multiple response questions exhibiting low cell counts (<5) or mapping low level raw data information to the high level classification and external standards such as ethnicity or language classifications from Statistics New Zealand.

Note: When we have used the term derived in reference to variables please note that this definition of derivation is interchangeable, depending on the context. Some of the variables from DCW0 have been both derived and subsequently top/bottom coded due to extremely low cell counts. For example, a variable for the length of living in the current home was defined as 'derived and categorised' in DCWoP.

Furthermore, the following data items have also been incorporated into the External Working Datasets having been derived from information collected and stored separately from the research data along with the participant nominal information:

- Geolocation information: Such as New Zealand Deprivation, District Health Board of domicile and Urban-rural location.

- Country of residence: *Growing Up in New Zealand* engages with families and children who move overseas and collects country of residence to conduct interviews. Where a child and/ or their mother are living outside New Zealand the specific country information is collapsed into "Other country" to protect anonymity.

The guiding principles that have been adopted to create the External Working Datasets are summarised in Table 3:

Table 3: Dataanonymisation principles used in up to DCW5 external data release

Variable Type	Principle applied
Highly sensitive raw information	Data are presented as derived, categorised or re-classified. These transformed variables still provide the necessary information to undertake analyses
Categorical variables with low cell counts	Low cell count categories have been categorised
Continuous variables with low frequencies at the lower or the upper extremes	Low frequency extremes distributions have been categorised
Multiple-response variables with low frequencies	Responses with low frequencies (≤5) have been combined to create a new response variable
Date-specific variables	Dates have been converted to day, month or year
Free text variables	Free text is not released in a raw form, but has instead been classified and categorised
Study unique identifiers (ID)	Data are replaced by pseudo identifiers for external datasets to enable linkages with other currently available *GUiNZ* external datasets

3.2 Further considerations when analysing the data

Every effort is made to ensure the quality and accuracy of the *Growing Up in New Zealand* datasets and related documentation. It is however important to acknowledge the evolving complexity of the datasets available, which will increase over time, and the iterative nature of longitudinal datasets. Consequently, before carrying out any analyses it is essential that researchers familiarise themselves with some key issues. These can be broadly described as two types of issue: data preparation and exploratory data analysis.

Data preparation

Coding
- Reverse coding – before creating composite scores from the sum or mean of individual variables, check the wording of the item in the questionnaire and it's 'polarity' in comparison with other variables in the composite[#]

- ☐ Re-coding - are the values of the variables coded appropriately for your needs?[*]
- Up-coding - The majority of our questions are closed in format thus much of our coding and data checking is done during the interview. However, where there are open ended questions the data have to be reviewed and where relevant coded into separate categorical variables after the interview. Other questions had pre-defined coding frames but "Other – please specify" options were available to the participant which also required post interview up-coding. The newly coded responses for both additional codes and variables appear in the dataset, but all text from the original responses have been removed to protect the respondent's identity.

'Missing data' – data may be 'missing' for a number of reasons
- Genuine missing data – participant did not answer the question, in this case the cell in the dataset will be blank.
- Refused/ Don't know – participant refused to answer or gave "Don't know" as a response. Usually these responses are coded 98 or 99 (or in some cases 9). Statistical packages will not automatically recognise that these values indicate missing data.
- Skipped data – these data are missing by design because not all participants are asked to answer all items in a questionnaire. That is, participants might 'skip' items depending on their previous responses. In these cases the cell in the dataset will be blank.

Exploratory data analysis

Here are some areas to consider before analysis:

- Missing data – are there any patterns to the missing data? This includes bias (genuine missing data and Refused/ Don't know data).
- Checking for normality (continuous/scale variables) – can scale data be analysed using parametric tests, and what it the distribution of that data?
- Transforming scale variables into categorical variables – are there known cut-offs that can be used to transform scale data into categories or does the distribution of scores suggest that this would be appropriate?
- Checking the distribution (nominal and ordinal/ categorical variables) – is there such uneven distribution across responses that the variable cannot be meaningfully included in statistical analyses?
- Collapsing categorical variables – would it make sense to collapse nominal or scale data into fewer categories (based on the literature or based on the distribution of responses)?

Reverse and recoding example

- ☐ # In the 9 month Mother dataset, items 1 and 10 of the Edinburgh Postnatal Depression Scale are worded positively while the rest of the items are worded negatively (as is standard for the tool). Values for these variables will need to be reversed before adding the 10 scale items.
- ☐ * In the 9 month Mother dataset, the Edinburgh Postnatal Depression Scale items (EDI1_m9M to EDI10_m9M) are coded 1 to 4. However, the original scale is coded 0 to 3. Failure to recode the values would lead to inflated scores.

Additional information and data issues still to be resolved

1. The Peabody Picture Vocabulary Test (PPVT) data from the 54M DCW will be released at a later date. Please contact dataaccess@growingup.co.nz for further information.

2. Summary of contact with agencies related information (DCW5M): The DCW5 mother dataset collected information relating to service agencies for children, including the name of service agency and the age of the child when the mother had initial contact with the agency. The original text responses from these questions are not available in the external data due to identifying nature of the detailed information. These free-form text data are coded into pre-defined coding frames and subsequently each responses is classified into a broader category. All the contact with agencies related information has been made available in external datasets.

3.3 Data use disclaimer

While all care and diligence has been used in processing, analysing, and extracting our data and data dictionaries, we give no warranty it is error free. We recommend that users exercise their own skill and care with respect to their use of the data/ information and carefully evaluate the accuracy, currency, completeness, and relevance of the data for their purposes.

All scales and tools have been used/ adapted or developed according to the following published literature (see Section2; Table 2 and technical documentation in Appendix A and references in Appendix B). For proper usage of these tool/ scales please refer to the pertinent documentation within this guide. Note that improper use of these tools will result in erroneous/ incorrect output.

For further guidance or to provide feedback on specific issues please contact dataaccess@growingup.co.nz.

4 Structure and content of the datasets

The *Growing Up in New Zealand* external working datasets includes all cohort children from singleton and twin pregnancies from antenatal mothers. Families with triplets have been removed from the externally released datasets as privacy could not be safeguarded. Data for these families are available in the internal working datasets via direct collaboration with the *Growing Up in New Zealand* team.

At each DCW all attempts were be made to gather information from all cohort children. However numbers completed vary across waves and it should not be assumed that denominators are constant or that skips are always the same individuals. Failure to complete may be due to death, opt-out or skips at any wave. Skipped refers to when a participant does not complete a particular data collection point but remains in the study and can be re-contacted and/ or re-engage at a later DCW.

Study informant 'Mother' in antenatal wave is the child's biological mother. However mother can and does change between waves for some children (may be the primary guardian of the child and not the child's biological mother). This will be reflected in a change in the mother ID between waves. Similarly information was also collected from the study informant 'partner', partners of the pregnant mothers. Partners can also change between waves. At two year DCW (DCW2) and 54M DCW (DCW5), the interviewer was also an informant to gather observational data.

For each DCW (excluding the antenatal DCW), there are separate external working datasets for the cohort child (data from child observation and measurements by the interviewer and questions asked about the child to the child proxy), the mother and the partner. These separate files within a wave also combine data collected at different time points. The list below provides the content within each DCW.

4.1 Antenatal Data Collection Wave (DCW0): includes information collected during the antenatal period from the mothers of the cohort children (DCW0M: antenatal mother dataset), as well as information collected from the partners of the pregnant mothers (DCW0P: antenatal partner dataset). This information was collected during the first *Growing Up in New Zealand* antenatal DCW in 2009 and 2010.

The antenatal DCW served three key purposes:
1. It collected baseline information about the parents, the family, the pregnancy and the wider environment from before the time of the child's birth.
2. It described the foundations for the future longitudinal data collections planned for the *Growing Up in New Zealand* cohort.
3. It was a critical part of the engagement of the parents of the cohort children to allow their child's development to be followed from before birth to their early adult life.

4.2 Data Collection Wave – The First Year (DCW1): Includes information collected from before birth and through the first nine months of the cohort children's development, and focuses on the children themselves as the key participants in the longitudinal study. It contains multidisciplinary information about the children from their birth until they are nine months old, as well as information from the children's mothers and their partners collected at the same time. Data collection took place at several times during this period including:

- Perinatal data linkage – linkage to routine pregnancy, delivery and neonatal records to provide birth specific information
- Six-week telephone interview which collected specific information about birth and the first few weeks of development
- 35-week telephone interview which updated contact and household details for the children

- 9-month face-to-face interviews with mothers and partners independently. This data collection was largely undertaken when the cohort children were within one month of being nine months old.

4.3 Data Collection Wave – The Second Year (DCW2): includes information collected through the second year of the cohort children's lives. These have been collected at multiple data collection points and have been collated in multiple datasets:

- 16-month telephone interview collected information about last 14 weeks of pregnancy, birth and the first few weeks of development
- 23-month telephone interview focused specifically on child's eating habits, household and transportation
- 2 year face-to-face interviews with mothers and partners independently. These comprehensive interviews collected parental and child information that is significant in the second year of a child. The interviewer also gathered observational information on the cohort child such as child's interactions through play, parent-child interaction, child's weight/ height measurements and information on the household/ dwelling.

These datasets from the DCW2 were combined to create the mother, child and partner datasets.

4.4 Data Collection Wave – 31M (DCW3): includes information from a telephone interview.

- 31-month telephone interview collected information about the study child including information on household internet access, use of early child education, child health including breastfeeding and also language development. Included in this call was also an update of the household information in order to determine aspects of crowding.

4.5 Data Collection Wave – 45M (DCW4): includes information from a telephone interview.

- 45-month telephone interview collected information about the study child including an update on internet access, use of early child education and breastfeeding status. Also included was information pertaining to child's media use, food behaviours and allergies, oral hygiene, sleep and toilet training, languages spoken and language development. Mother's income and employment status were also updated as was the household information.

4.6 Data Collection Wave – 54M (DCW5): includes information from a face-to-face interview with mother and study child/children.

- These comprehensive interviews collected mother and child information that is significant for the pre-school period of life. The interviewer also gathered observational information on the cohort household/ dwelling and study child. Study child information included observation of child's interactions through play, parent-child interaction, and child's weight/ height and waist measurements.

For more detail see the questionnaires available on the website (www.growingup.co.nz).

4.7 Data Collection Wave – 72M (DCW6): includes information from mothers in the study when their children were approximately six years of age. It was aimed at learning more about parents' and children's experiences with the move from early childhood education into primary schooling. The DCW6 dataset contains a range of information about transition to school, including age of starting school, type of school, reasons for deciding to choose school and how the study's mothers and their

children feel about school. It also includes some household data such as residential mobility since the child was 4.5 years old. DCW6 was the first to use a self-complete online questionnaire. It should be noted that the number of mothers that completed this questionnaire were less than the previous data collection waves. There is a potential for bias present due to the mothers that did not respond to the online questionnaire, and all users will need to take this into consideration in any cross—sectional or longitudinal analyses. There is a possibility and expectation that some missing data from DCW6 will be able to be filled in or imputed post completion of the face-to face 8 years DCW (in field 2017-2018). In the DCW6 dataset child ID is included to facilitate merging with other datasets. Please note that where twins are present in the dataset, the data for mothers will be [row] replicated. For more information on the 72M DCW please see the Transition to School Report.

4.8   Datasets:

List of datasets available from DCW0 – DCW6

- DCW0M: Antenatal mother dataset
- DCW0P: Antenatal partner dataset
- DCW1C: 9-month child dataset (includes 6 week data & perinatal data)
- DCW1M: 9-month mother dataset
- DCW1P: 9-month partner dataset
- DCW2C: 2 year child dataset (includes 16 month and 23 month data)
- DCW2M: 2 year mother dataset (includes 16 month and 23 month data)
- DCW2P: 2 year partner dataset
- DCW3C: 31-month child dataset (included a small amount of information from Mother)
- DCW4C: 45-month child dataset
- DCW4M: 45-month mother dataset
- DCW5C: 54-month child dataset
- DCW5M: 54-month mother dataset
- DCW6M: 72-month mother dataset

DCW1C, DCW2M and DCW2C datasets have multiple data collection points within the DCW. Participants who skipped a data collection point in these dataset will have missing information. The *Growing up in New Zealand* variable naming convention that these datasets follow is presented in Table 4.

Table 4. *Growing up in New Zealand* **dataset naming convention**

Data collection wave	Full dataset name	Short name for the dataset	Variable suffix	Reference for variable suffix
DCW0	Antenatal Mother	DCW0M	_AM	Antenatal mother
	Antenatal Partner	DCW0P	_AP	Antenatal partner
DCW1	9-month child dataset	DCW1C	_W6	Six week call
			_PDL	Perinatal
			_M9CM	Nine month child
			_NIR1	National immunisation register
			_NMDS1	National minimum dataset
	9-month mother dataset	DCW1M	_M9M	Nine month mother
	9-month partner dataset	DCW1P	_M9P	Nine month partner
DCW2	2 year child dataset	DCW2C	_M16CM	Sixteen month child
			_M23CM	Twenty three month child
			_Y2CM	Two year child
	2 year mother dataset	DCW2M	_M16M	Sixteen month mother
			_M23M	Twenty three month mother
			_Y2M	Two year mother
	2 year partner dataset	DCW2P	_Y2P	Two year partner
DCW3	31-month child & mother dataset	DCW3C	_M31CM	31 month child
			_M31M	31 month mother
DCW4	45-month child dataset	DCW4C	_M45CM	45 month child
	45-month mother dataset	DCW4M	_M45M	45 month mother
DCW5	54-month child dataset	DCW5C	_M54CM	54 mother child
	54-month mother dataset	DCW5M	_M54M	54 month mother
DCW6*	72-month mother dataset	DCW6M	_M72M	72 month mother
	72-month child ID	DCW6C	_M72CM	72 month child

* Child information was collected but not by child proxy

4.9   Identification (ID) structure

For external dataset release, seven digit alphanumeric pseudo identification keys have been developed to protect the identity of all the informants (including the child, mother and partner).

5 Merging datasets

As with any relational datasets, a detailed understanding of the research question and data needed is required in order to integrate and extract the information of interest. The *Growing Up in New Zealand* datasets have been designed to enable the user to merge information from multiple datasets, using the most straight-forward data linking principles. The way in which data are merged will depend on the research question and planned analyses.

Merging allows the user to integrate information from multiple datasets. In this context, you can create cross sectional (within a DCW) or longitudinal (between DCWs) data suitable for analysis. Figure 2 depicts how the *Growing Up in New Zealand* datasets within and between waves are able be merged using the identification keys.

Identification keys provide the relationships between the datasets (see Figure 2):

- **Child to Child relationships:** This is either a one to zero or one to one relationship, which means that a particular IDN_CHILD in (for example) DCW2C would correspond to one (the same child) or no child (if the child did not complete that particular DCW) in DCW1C. It should be noted here that DCW0_IDN is an identification table created retrospectively in DCW0 so that antenatal mother and partner information can be merged.
- **Child to Mother/Partner relationships:** Child datasets contain multiple births, in which case parental data may be repeated if a child-focused merge is undertaken (one mother/partner to many children relationship).
- **Mother to Partner relationships:** Mother and partner identification keys for all data collection points within a wave are provided in each of the child datasets allowing a cross sectional merge. Then longitudinal (between DCWs) data can be merged using IDN_CHILD.

As the child is the focus of the study, IDN_CHILD is the primary merging key; remaining constant over time while mothers and partners, and their corresponding keys, may change between DCWs or even within them (as mothers and partners may change over time).

There is a dataset available, DCW0_IDN, which contains child ID (IDN_CHILD), mother ID (IDN_AM), and partner ID (IDN_AP). This will enable the smooth linking of antenatal datasets with other datasets.

Please not that the DCW6 dataset contains mother only information. To facilitate merging with other datasets the child ID (IDN_CHILD) has been included as well (see Figure 2).

The resulting dataset after merging two or more datasets will always depend on the involved datasets and their relationships. As a result, the number of cases (among other characteristics) in a merged dataset will need careful checking and may not necessarily line up with the number of cases in the original datasets.
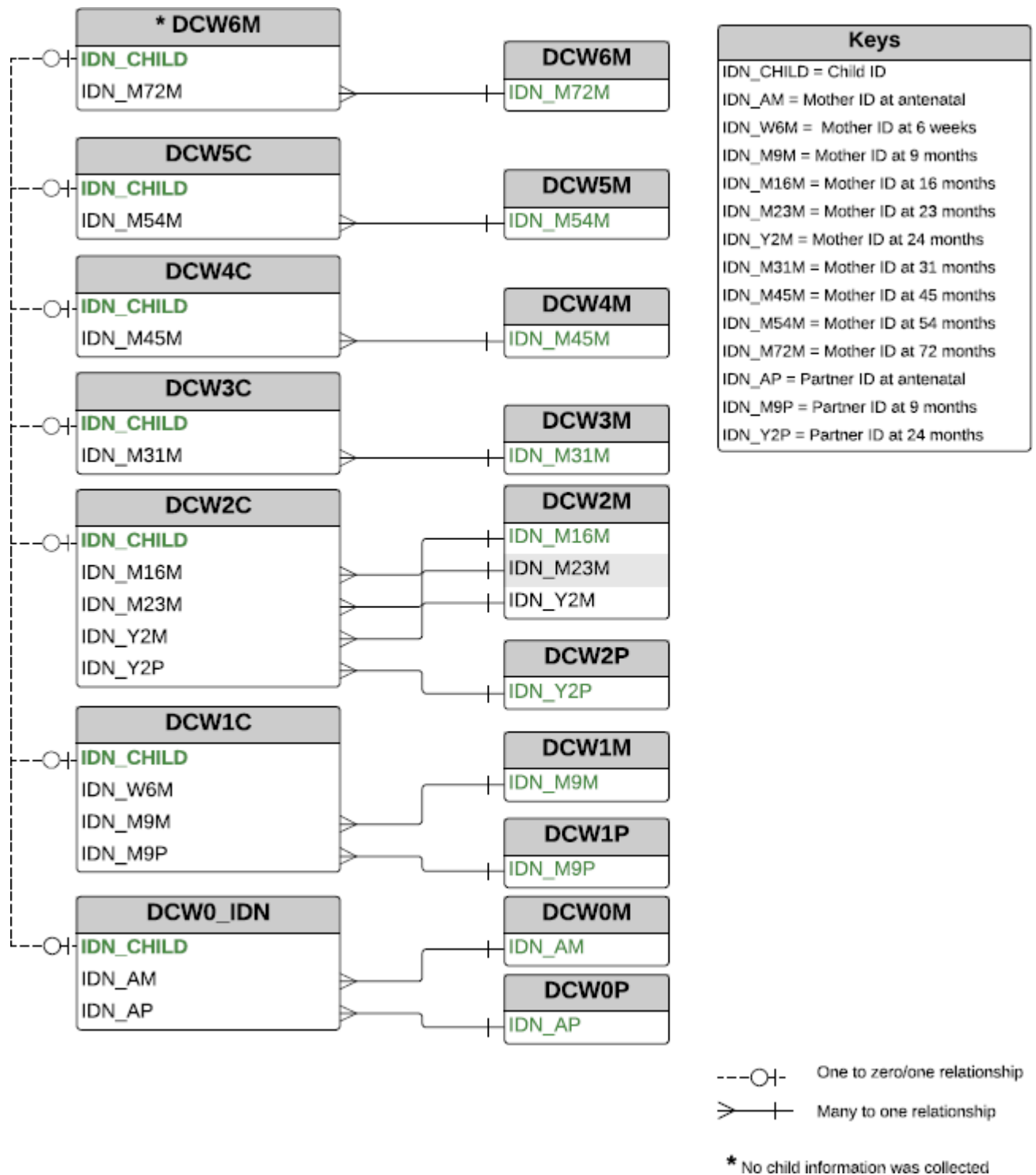
Figure 2: *Growing Up in New Zealand* **relational datasets**

6 Keeping the study data anonymous

6.1 Study principles and participant consent

One of the most important principles of the *Growing Up in New Zealand* study is that the data made available are anonymised. This protects the privacy of participants and enables the collection of sensitive data because confidentiality is assured.

The consent form for participants stated:

> *"I understand that the research team will keep my involvement in this study confidential, and that no material that could identify me will be used in any reports on this study."*

The Participant Information Sheet that accompanied this Consent Form stated:

> *"The information about your child and family is completely confidential. No information that could identify you or your child will be used in any reports on this study."*

In all processes, *Growing Up in New Zealand* must therefore ensure that all researchers adhere to these statements and keeping data anonymous must be balanced with providing data for robust, contemporary, population relevant analyses. For this reason, the use of all external datasets must ensure that:

- Involvement in the study is kept confidential and individual participants cannot be identified;
- All access to the *Growing Up in New Zealand* data is driven by the requirements set out in the *Growing Up in New Zealand* Data Access Protocol; and
- All access to the *Growing Up in New Zealand* data is overseen by the Data Access Committee.

6.2 The Data Access Protocol

The Data Access Protocol is a key document that sets out how the data from *Growing Up in New Zealand* can be accessed. All researchers using the *Growing Up in New Zealand* external datasets must be familiar with the Data Access Protocol.

The Data Access Protocol includes:

- The principles that govern data access
- The process by which researchers may apply for data access
- The provisions that are used to safeguard the privacy of study participants and their families
- The provisions that are used to ensure the long-term sustainability of the study
- The role and function of the Data Access Committee that will oversee the operation of the protocol
- The provisions that are used to guide authorship decisions and publication of papers produced under the protocol. All publications that utilise the data must be approved by the Data Access Committee prior to being submitted for publication. This is to ensure that the publication is in keeping with the principles of confidentiality and sustainability laid out in the Data Access Protocol.

As part of this Data Access Protocol, applications to use the external working datasets must include a brief dissemination plan. Further information about how to apply for the external working datasets is provided in Section 8.

6.3 The Data Access Committee

The role of the *Growing Up in New Zealand* Data Access Committee (DAC) is to facilitate the provision of appropriate access to data collected in the study by approved researchers under the terms and conditions of the Data Access Protocol.

As such, external working datasets cannot be used without the prior approval of the Data Access Committee and adherence to the Data Access Protocol.

6.4 Data security requirements

The Researcher will not, directly or indirectly, disclose or permit to be disclosed to any person the Dataset and/ or any results obtained from use of the Dataset except in accordance with the Dissemination Plan.

The Researcher will have and maintain security arrangements to safeguard the Dataset from unauthorised access that adhere to industry-accepted "best practices" for information of the same level of sensitivity. The Researcher will ensure that access to the Dataset is limited to them under this Agreement to access the Dataset. Only the Researcher listed in this agreement is permitted to access the Dataset.

7 Data documents

7.1 Questionnaires

The *Growing Up in New Zealand* questionnaires used during the DCWs are available *(*from www.growingup.co.nz) when data collection is completed in the field.

7.2 Data dictionaries

The *Growing Up in New Zealand* data dictionaries are designed to provide researchers with a comprehensive understanding of the external datasets. These should be read alongside the relevant questionnaires. Each record describes a single variable and the fields are shown in the order in which they appear (left to right) across the top row of the data dictionaries:

- No: Row number in data dictionary.
- Research Domain/ Subdomain: Name of relevant research area.
- Questionnaire Number: The questionnaire number for the variable.
- Question: The question text or a shortened version of the question text.
- Variable Name: Name of the variables as they appear in the external dataset. This field will be empty, where a variable is unavailable.
- Formatted Data Values: Lists levels or categories within a variable, where a description is required.
- Value Labels: Description of formatted data values.
- Variable Type: Describes how different variables in the external working datasets have been presented.

    These are:
    - Raw Variables: Data values that have maintained their original form and structure from the raw dataset with no subsequent transformations.
    - Categorised Variables: Variable categories were combined from the raw form.
    - Re-classified Variables: Variables resulting from multiple response question/s exhibiting low cell counts were combined. In other cases, variables were mapped to standard classifications such as Languages/Ethnicity/ICD classification/Religion etc.
    - Derived Variables: A new variable that has been constructed from one or more raw variables.
    - Derived and Categorised Variables: A new variable that has been both derived first and subsequently categorised.

- Notes: The notes column provides additional information relevant to the named variable.

7.3 Other documents

The *Growing Up in New Zealand* website (www.growingup.co.nz) provides a series of documents for the external data user including:

- Detailed information about our Data Collection Waves with links to questionnaires
- Overarching and specific research questions of *GUiNZ*
- Conceptual research framework
- *GUiNZ* research publications
- Current research with *GUiNZ* data

8 Applying for access to the external working datasets

8.1 Who can apply

The intention of *Growing Up in New Zealand* is to ensure that the robust and contemporary information collected about New Zealand children within the longitudinal datasets will be well utilised to inform policy and research. To comply with the *Growing Up in New Zealand* Data Access Protocol, external data access applicants must be a researcher within a university, crown agency, research institute or other equivalent organisation in New Zealand or overseas, as described in Table 5.

Table 5: Applying for access to the external research datasets

	Who can apply to access the External Research Dataset	How to apply for access to the External Research Dataset
Research (or equivalent) located in New Zealand	Researcher located in New Zealand at a university or other equivalent organisation. This includes the following research categories: Academics Researchers Research assistant Enrolled masters or PhD students	Researcher applies to access the data according to the process summarised in Section 6.2. The forms also require approval by the chief executive, or equivalent, of that organisation or institution. Where a research assistant or student is the applicant, the forms also require approval by the senior researcher managing the research assistant or the student's supervisor.
	Researcher (or equivalent) located in New Zealand at a crown agency	
	Researcher (or equivalent) located in New Zealand at an organisation where the primary business is research	
	Researcher (or equivalent) located in New Zealand at a district health board, council or other statutory body	
	Researcher (or equivalent) located in New Zealand at a non-government organisation that focuses on children, families and/or communities.	
	Researchers located in New Zealand at any other organisation (including commercial organisations, private companies, lobby groups)	Will be considered on a case by case basis. Please contact the External Working Dataset Data Access Coordinator in the first instance.
Research (or equivalent) located outside New Zealand	Researcher located outside New Zealand at a university or other equivalent organisation. This includes the following research categories: Academics Researchers Research assistant Enrolled masters or PhD students	Researcher applies to access the data according to the process summarised in Section 6.2. The forms also require approval by the chief executive, or equivalent, of that organisation or institution. Where a research assistant or student is the applicant, the forms also require approval by the senior researcher managing the research assistant or the student's supervisor.
	Researchers located outside New Zealand at any other organisation	Will be considered on a case by case basis. Please contact the External Working Dataset Data Access Coordinator in the first instance.

8.2 Process for applying for access to the external working datasets

The following steps describe how to apply for access to the external working datasets:

1. Attend a Data Access Workshop or provide confirmation that the materials covered in the workshops have been reviewed (available at www.growingup.co.nz/workshops)
2. Completed the Application Form available on www.growingup.co.nz/data. Applications will be reviewed by the *Growing Up in New Zealand* Data Access Committee (DAC) which meets regularly. The DAC will endeavour to review applications at the next available meeting, although this will depend on when the application is received and the number of applications to be reviewed. Dates for scheduled DAC meetings can be found at www.growingup.co.nz/data
3. Sent the signed form to dataaccess@growingup.co.nz

When the application is received:

1. The application will be reviewed before the DAC meeting for completeness and to assess whether the requirements have been met.
2. The DAC will formally review the application and make a final decision on the application.
3. The Data Access Coordinator will inform applicants of the outcomes of their application
4. Where applications have been approved, the Data Access Coordinator will facilitate the provision of the external working datasets to the applicant.

Questions regarding data access and applications to use the data are welcomed. For more information please contact the External Data Access Coordinator via dataaccess@growingup.co.nz.

When the end date of the research application is reached:

At the end date of the research, the applicant's access to the external dataset system will automatically expire.

When you are ready to publish and before the output is distributed:

1. Complete the Application to Publish form. This can be found at www.growingup.co.nz/data.
2. Send the signed form along with the draft publication to dataaccess@growingup.co.nz.
3. The DAC will review the application to publish (with respect to their review of privacy and confidentiality principles) and make a final decision on the application to publish.
4. The Data Access Coordinator will inform applicants of the outcomes of their application to publish within 10 working days of the application being reviewed by the DAC.

9 Appendix A – Technical documentation

9.1 Immunisation information – DCW1

1.   Purpose

The purpose of this technical document is to explain the steps undertaken to create immunisation timeliness and completeness information using exact linkage of the *Growing Up in New Zealand* data to routinely collected data from the Ministry of Health National Immunisation Register (NIR). The resulting derived variables are available in DCW1C external dataset.

2.   Methodology

National Immunisation Register data was retrieved for *GUiNZ* children whose caregivers had consented to *GUiNZ* researchers accessing their health records when they undertook the antenatal interview. Exact data linkage was used based on the National Health Index (NHI) numbers of the cohort children (also available in the NIR) to link information about immunisations contained in the NIR with DCW1C information. Children who could not be linked to any immunisation records were assumed not to be immunised.

3.   Schedule and type of immunisation doses the child received

All New Zealand-born children are scheduled for immunisation doses at 6 weeks, 3 months and 5 months of age. At each of these times, children receive:

*   1 dose of Diphtheria/ Tetanus/ Pertussis/ Polio/ Hepatitis B/ *Haemophilus influenza* type b vaccine; and
*   1 dose of Pneumococcal Conjugate Vaccine

Complete immunisation was defined as having received all six of these immunisation doses by one year (the age at which the NIR data was linked). Timely immunisation was defined as receiving all six vaccines (scheduled at 6 weeks, 3 months and 5 months) within 30 days of their due date.

4.   Development process

A total of 6,847 children from the *GUiNZ* main cohort are included in the external datasets (triplets are excluded because of ease of identifying individuals). Caregiver consent for linkage to routine health records, including the NIR, was given for 6,676 of the children (97.5%). Caregivers of 171 children did not consent to NIR linkage. No NIR linkage was made for 8 children. In total 6,668 children were linked to NIR records (see figure below).

The figure below illustrates this process and provides the number of children for whom completion (VAC_ALL6_NUM_SL) and timeliness (VAC_ALL6_ONTIME_SL) are available.

```
┌─────────────────────────────────────────────────────────┐
│      Eligible children in the *GUiNZ* external dataset    │
│                      (n = 6,847)                          │
└─────────────────────────────────────────────────────────┘
                    │
                    │          ┌──────────────────────────────────────┐
                    ├─────────▶│ Did not consent to NIR linkage (n = 171) │
                    │          └──────────────────────────────────────┘
                    ▼
┌─────────────────────────────────────────────────────────┐
│               Consented to NIR linkage                    │
│                      (n = 6,676)                          │
└─────────────────────────────────────────────────────────┘
                    │
                    │          ┌──────────────────────────────────────┐
                    ├─────────▶│   NIR linkage not established (n = 8)    │
                    │          └──────────────────────────────────────┘
                    ▼
┌─────────────────────────────────────────────────────────┐
│  NIR linkage established (i.e. infant's NHI identified in NIR) │
│                      (n = 6,668)                          │
└─────────────────────────────────────────────────────────┘
```
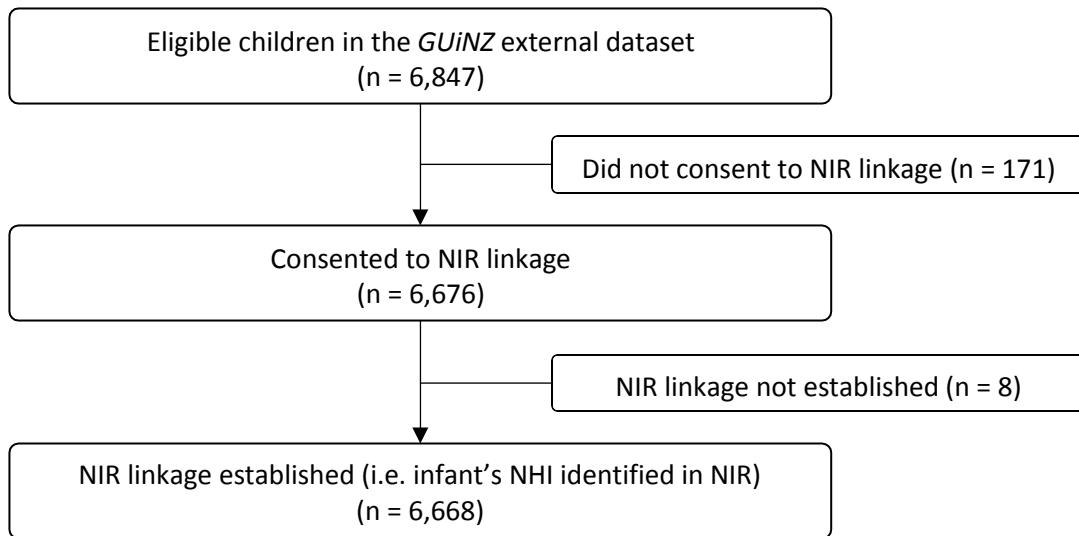
5.   Derived variables created – definitions and variable names

Two new derived variables from the NIR have been added to the DCW1C dataset as a result of this linkage.

Completion: VAC_ALL6_NUM_SL: The child has received all immunisation doses up to one year.
Timeliness: VAC_ALL6_ONTIME_SL: All vaccine doses were given on time.

9.2 Respiratory hospitalisation and admission information – DCW1

1.   Purpose

The purpose of this technical document is to explain the steps undertaken to create derived variables for admission to hospital for respiratory conditions in the first 12 months of life using deterministic linkage of the *Growing Up in New Zealand* (*GUiNZ*) data to routinely collected data from the Ministry of Health National Minimum Dataset (NMDS). This resulting derived variables are available in DCW1C external dataset.

2.   Background

The NMDS is New Zealand's national collection of hospital discharge information for inpatients and day patients. In New Zealand, the NMDS captures data on all acute hospital admissions in public hospitals or publicly funded private hospitals. The NMDS data up to age 1 year were available for the cohort children for whom consent for data linkage was obtained. 6,853 children were enrolled into the *Growing Up in New Zealand* cohort. Consent for linkage of the National Minimum dataset in the first year of life was obtained for 93% (n=6,376) of the cohort children (Figure 1).

This document describes the process for derivation of three respiratory admission variables from the NMDS. These derived variables are: (1) admissions for respiratory tract infections (RES_ADM), (2) length of hospital stay for respiratory tract infections (RES_LOS), and (3) recurrent admissions for respiratory tract infections (RES_RECURRENT). These derived variables are available in the DCW1C external dataset.

3.   Methodology

The NMDS was provided by Ministry of Health in an excel format for all *Growing Up in New Zealand* children for whom consent to collect routine health data for the first year of life was obtained. Linkage to *Growing Up in New Zealand* data was performed using the child's NHI. The dataset was cleaned and this process has been documented in the "Data Cleaning and Access Plan Document" dated 31st August 2013 and also in a PhD thesis (1). Variables such as child ID, mother ID and family ID had to be added into the NMDS from the linked perinatal dataset as a reference source. Addition of these variables allowed for deterministic linkage of the NMDS with other *Growing Up in New Zealand* datasets.

Screening for Respiratory tract infections

ICD-10 diagnostic codes were used to identify whether each hospital admission was for a respiratory tract infection. Respiratory infections are described by codes contained in 5 of the 20 ICD-10 chapters. The relevant codes from Chapters X, VII, VIII, I and XVI can be included (Table 1). Disease codes for the eye (Chapter VII) and ear (Chapter VIII) can be included as these sense organs can potentially be involved during an acute respiratory infection (ARI). The codes within each chapter that were considered during the screening process are:

•   Chapter X. Diseases of the Respiratory System: Acute upper respiratory infections (J00-J06); Influenza and pneumonia (J10-J18); Other acute lower respiratory infections (J20-J22); Other diseases of the upper respiratory tract (J30-39); Chronic lower respiratory tract diseases (J40-J47); Suppurative and necrotic conditions of the lower respiratory tract (J85, J86); Other diseases of pleura (J90-J93) and Other diseases of the respiratory system (J95-J99).

•   Chapter VII. Diseases of the Eye and Adnexa: Disorders of the eyelid, lacrimal system and orbit (H00, H01, H04); Disorders of conjunctiva (H10).

•   Chapter VIII. Diseases of the Ear and Mastoid Process: Diseases of the external ear (H60); Diseases of the middle ear and mastoid (H65-67, H70-75, H83).

•   Chapter I. Certain Infections and Parasitic Infections: Tuberculosis (A15, A16, A19); other bacterial diseases (A36-A37); other diseases caused by chlamydia (A71, A74); other viral diseases (B26, B27, B30).

•   Chapter XVI. Certain Conditions Originating in the Perinatal Period (Respiratory and cardiovascular disorders specific to the perinatal period (P23); Infections specific to the perinatal period (P36, P39).

Data was also extracted for length of hospital stay (LOS) for each respiratory admission as another measure of respiratory disease burden during infancy. The NMDS in long format (multiple lines of data per child corresponding to the number of hospital events) was used to describe the hospital admissions of those children with more than one respiratory admission (recurrent respiratory infection).

Table 1: Listing of International Classification of Diseases diagnostic codes for respiratory tract infections

Upper respiratory tract infection		Upper and Lower respiratory infection		Type	Lower respiratory tract infection	
Code	Description		Description		Code	Description
A36	Diphtheria	J06	Acute upper respiratory	URTI*	A15	Respiratory tuberculosis, confirmed
A37	Whooping cough	J09	Influenza due to certain identified influenza virus	URTI	A16	Respiratory tuberculosis, not confirmed
A71	Trachoma	J10	Influenza due to, virus not identified	URTI	A19	Miliary tuberculosis
B26	Mumps	J30	Vasomotor and allergic rhinitis	URTI	J11	Influenza with pneumonia, virus not identified
B30	Viral conjunctivitis	J31	Chronic rhinitis, nasopharyngitis and pharyngitis	URTI	J12	Viral pneumonia, NC
H00	Hordeolum and chalazion	J32	Chronic sinusitis	URTI	J13	Pneumonia due to *streptococcus pneumoniae*
H01	Other inflammation of eyelid	J33	Nasal polyp	URTI	J14	Pneumonia due to *Haemophilus influenzae*
H04	Disorders of lacrimal system	J34	Other disorders of nose and nasal sinus	URTI	J15	Bacterial pneumonia, NC
H10	Conjunctivitis	J35	Chronic diseases of tonsils and adenoids	URTI	J16	Pneumonia due to other infectious organisms
H60	Otitis externa, not specified	J36	Peritonsillar abscess	URTI	J17	Pneumonia in diseases, CE
H65	Nonsuppurative otitis media	J37	Chronic laryngitis and laryngotracheitis	URTI	J18	Pneumonia, organism unspecified
H66	Suppurative and unspecified Otitis Media	J38	Diseases of vocal cords and larynx,, NC‡	URTI	J20	Acute bronchitis
H67	Otitis media	J39	Other diseases of upper respiratory tract	URTI	J21	Acute bronchiolitis
H70	Mastoiditis and related conditions	J93	Pneumothorax	LRTI†	J22	Unspecified acute lower respiratory infection
H71	Cholesteatoma of middle ear	J95	Post procedural respiratory disorders, NC	LRTI	J40	Bronchitis, not specified as acute or chronic
H72	Central perforation of tympanic membrane	J96	Respiratory failure, Non-classified	LRTI	J41	Simple and mucopurulent chronic bronchitis
H73	Other disorders of tympanic membrane	J98	Other respiratory disorders	LRTI	J42	Unspecified chronic bronchitis
H74	Other disorders of middle ear and mastoid	J99	Respiratory disorders in diseases, CE§	LRTI	J43	Emphysema
H75	Other disorders of middle ear and mastoid				J44	Other chronic obstructive pulmonary disease
H83	Other diseases of inner ear				J45	Asthma
J00	Acute nasopharyngitis (common cold)		*URTI Upper respiratory tract infections		J46	Status Asthmaticus
J01	Acute sinusitis		†LRTI Lower respiratory tract infections		J47	Bronchiectasis
J02	Acute pharyngitis		‡ NC Non-classified		J86	Pyothorax
J03	Acute tonsillitis		§ CE Classified elsewhere		J90	Pleural effusion, Non-classified
J04	Acute laryngitis				J91	Pleural effusion, in conditions CE
J05	Acute laryngitis [croup] & epiglottis				J92	Pleural plaque

4.   Development process

6,853 children were enrolled into the *Growing Up in New Zealand* cohort and consent for linkage of the National Minimum dataset was provided for 93% of the cohort children (n=6,376). Consent for linkage was not obtained for 172 children (Figure 1).
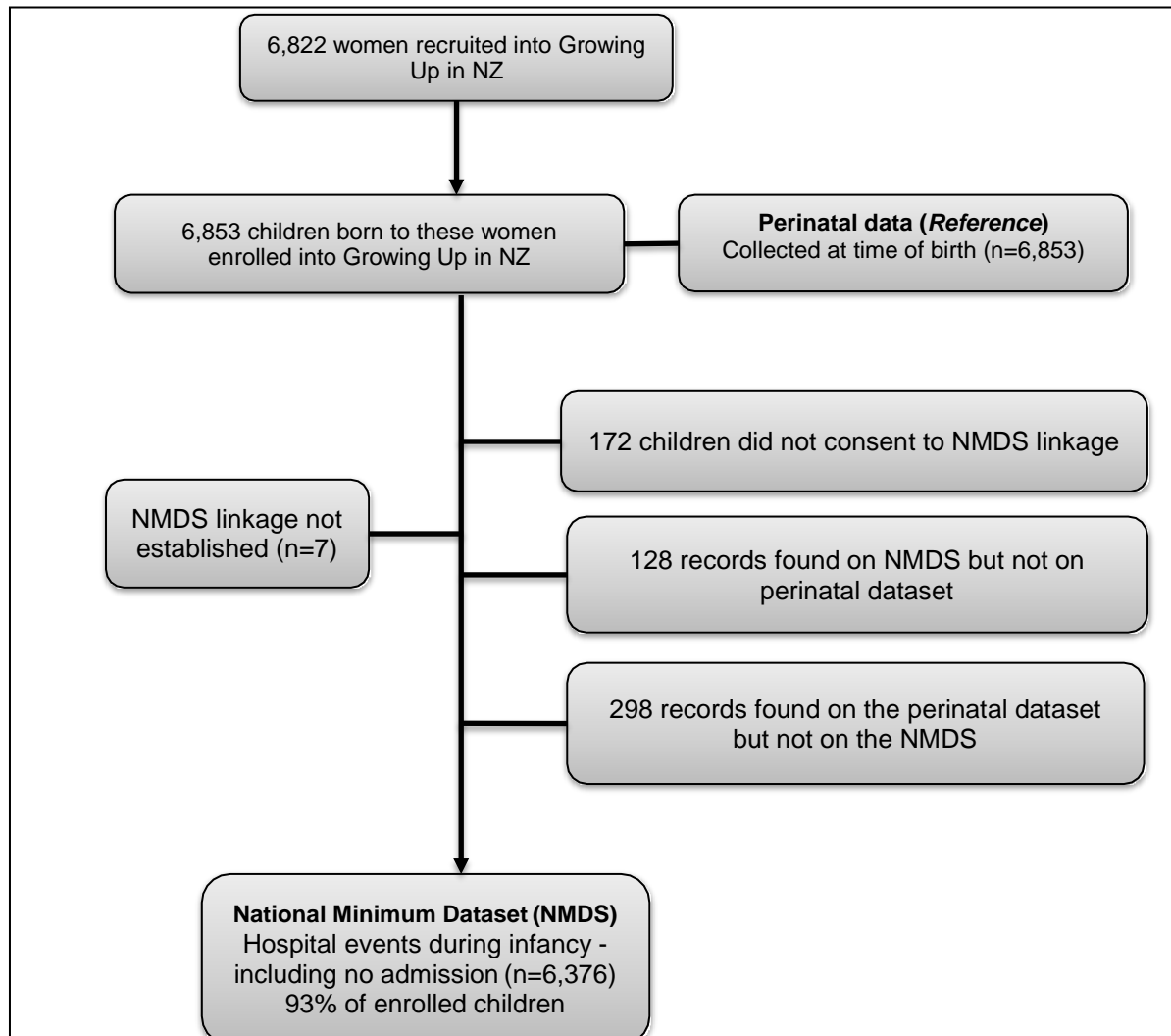
Figure 1: Summary of the linkage process and number of children for whom the RES_ADM, RES_LOS, and RES_RECURRENT data is available in DCW1C

There were 128 records on the NMDS that did not match with the perinatal datasets. These records were removed. There were 298 records on the perinatal dataset but not on the NMDS. These children were not followed further but numbers seemed consistent with the findings reported in the *Growing Up in New Zealand* "Now we are born" report that approximately 5% of the cohort were either born at home or born overseas or elsewhere (outside of areas defined by Waikato, Counties Manukau and Auckland). NMDS linkage was not able to be established with 7 children in the next step. Therefore NMDS information was available for 6,376 of the *Growing Up in New Zealand* cohort children and derived variables describing the respiratory admissions have been integrated into DCW1C dataset for data users.

5.   Definition of respiratory admission variables

The definitions for the derived variables with the labels and code frames are provided in Table 2. The RES_ADM data label "98" was applied for children who were seen at the hospital for a respiratory infection but not admitted for further care.

Table 2: Variable Name, definition and code frame for the three derived variables

Variable Name	Label	Code frame
RES_ADM_NMDS1	Whether child admitted to hospital due to a respiratory infection	0= No 1= Yes 98= seen at hospital for respiratory infection but not admitted
RES_LOS_NMDS1	Total length of stay in hospital for all respiratory infections in first year of life	1 to 9 and more= Number of days admitted in hospital
RES_RECUR_NMDS1	Number of times the child was admitted due to respiratory infection	1= 1 times 2= 2 times ... 5+= 5 and more times

6.   Summary

Three derived variables from the NMDS are provided in the DCW1C child dataset. Deterministic data linkage established respiratory admission information for children whose parents consented to health data linkage in the first year of the cohort child's life.

7.   Notes

The linkage to NMDS was undertaken by Rajneeta Saraf and Mark Hobbs as part of their PhD projects under the supervision and guidance of Dinusha Bandara (Biostatistician) and Cameron Grant (Associate Director-*Growing Up in New Zealand* and PhD supervisor). Saraf's project was funded by CureKids and Hobbs' project by the Auckland Medical Research Foundation.

The *Growing Up in New Zealand* team and PhD students should be acknowledged as per the External Data Access process, along with the additional funding sources, when the derived respiratory variables are used by external researchers.

Key references:

Saraf, R. (Submitted). Acute Respiratory Tract Infections and Vitamin D. Neonatal vitamin D levels and acute respiratory tract infections in the first year of life. (Doctoral thesis).

World Health Organization. ICD-10 International statistical classification of diseases and related health problems. 10th revision. Geneva: World Health Organization.

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Hobbs, M. R., Morton, S. M., Atatoa-Carr, P., Ritchie, S. R., Thomas, M. G., Saraf, R., Chelimo, C., Harnden, A., Camargo, C. A. and Grant, C. C. (2016),Ethnic disparities in infectious disease hospitalisations in the first year of life in New Zealand.J Paediatr Child Health.doi: 10.1111/jpc.13377

9.3 Anthropometry – DCW2 & DCW5

1.   Why we chose this tool - background

Anthropometric measures in early life provide important longitudinal measures to understand growth trajectories, which may be used as a marker of nutritional status. Classic anthropometric measures of weight and height in early life (i.e. birth, infancy, childhood and adolescence) are also associated with the likelihood of later health and wellbeing (e.g. obesity and other chronic diseases). In order to further characterise early growth and investigate the early determinants of later obesity and chronic diseases in the *GUiNZ* cohort (McCarthy 2014; Taylor et al. 2008), waist circumference measurements were collected in addition to standard height and weight at the pre-school phase (DCW5).

2.   Why other tools were excluded

A laser stadiometer was chosen, rather than a classic portable stadiometer, in order to reduce the weight and volume of the equipment that the interviewers had to carry. To take height measurements, the laser stadiometer was attached to a metal bracket, specifically designed for this study. The laser device for measuring height in children has previously been used successfully by the Growing Up in Australia Study (LSAC) and has being validated for taking height measurements among children 2-12 years old (Garcia-Turner 2015). Caregiver's anthropometric measurements were not taken in both DCWs because of time constraints and sensitivity around consent for measurements.

3.   How the tool was used and if specifically adapted for our use

At 2 Years & 54 months, anthropometric measurements were collected by trained interviewers during face-to-face interviews. Measurements of weight (kilograms) and height (centimeters) were taken in duplicate. If differences between two measurements were higher than 0.5 kg or 1 cm, a third measurement of weight and height, respectively, was performed. The protocol for measuring weight and height has been prescribed by the World Health Organization (WHO 1995). In earlier DCWs where it was not possible to measure anthropometry for logistical reasons, measurements were instead collected from the most recent records of weight and height recorded in the Well child Tamariki Ora book (www.wellchild.org.nz), or alternatively from other health records or from parental report (note these alternate measures also included age at measurement).

At the 54 months DCW waist circumference (centimeters) was added to the anthropometric measures. Measurements were made at the midpoint between the lower margin of the least palpable rib (bottom of rib cage/10th rib) and the top of the iliac crest (hip bone), with the child using light clothing (WHO 2008). Measurements were taken in duplicate. If differences between the two measurements were greater than 1 cm, a third measurement was performed. Weight was measured using the Tanita Digital bathroom scale (Model HD-351) ®, with capacity of 200kg and precision of 0.1kg. Height was measured using the laser stadiometer Precaster CA 600®, with capacity of 50 meters and precision of 0.2 cm. Waist circumference was taken using a measuring tape, with capacity of 2 meters and precision of 0.1cm.

4.   How we have created the outcome variables/ any up-coding/ collation of variables etc.

All raw anthropometry data that relates to height, weight and waist circumference were recorded by interviewers and multiple measures were recorded as above. We have subsequently undertaken data integration to provide the single most accurate measurement value for researchers. We have

additionally provided the variables "Notes on quality" for each of the measurements at 2 year and 54 months (weight, height and waist circumference). Those variables describe the quality of the anthropometric measurements taken for each child at the different time points.

5.   Additional information

Anthropometry data has been collected explicitly with a view to the longitudinal growth of the children rather than for cross-sectional analysis. In cross-sectional analysis caution should be taken when looking only at short time frame analyses. Additional data cleaning and harmonisation of *Growing Up in New Zealand* anthropometric data is being undertaken, in order to improve accuracy of the measurements and to check biological plausibility of extremes values of weight, height and waist circumference within the cohort.

Notes

The *Growing Up in New Zealand* team should be acknowledged as per the External Data Access process, along with the additional funding sources, when the anthropometric variables are used by external researchers.

Key references:

Garcia-Turner VM (2015). Validation study of a laser as a new tool for height measurement. Abstract published on Anais of AAAS2015 Annual Meeting-Innovations, information and imaging. February 2015, San Jose, California, USA (on-line).

McCarthy H.D. (2014). Measuring growth and obesity across childhood and adolescence. Proceedings of the Nutrition Society, 73, 210-217.

Pietilainen K. H. Kaprio J. Rasanen M. Winter T. Rissanen A. & Rose R. J. (2001). Tracking of body size from birth to late adolescence: Contributions of birth length, birth weight, duration of gestation, parents' body size, and twinship. American Journal of Epidemiology, 154, 21-29.

Taylor R. W. Williams S. M. Grant A. M. Ferguson E. Taylor B. J. & Goulding A. (2008). Waist circumference as a measure of trunk fat mass in children aged 3 to 5 years. International Journal of Pediatric Obesity, 3, 226-233.

World Health Organization. Physical status: the use and interpretation of anthropometry. Geneva: World Health Organization; 1995 (Technical Report Series, 854).

World Health Organization Waist circumference and waist–hip ratio: report of a WHO expert consultation, Geneva, 8–11 December 2008.

9.4 Stack and Topple – DCW2

1.   Why we chose this tool - background

We choose the stack and topple task (Ross, 1982) for several reasons. Firstly, it has been used experimentally with toddlers. It is a structured and interactive play task that can be used with an unfamiliar person such as the interviewer. Secondly, it best represents four main characteristics of social games: mutual involvement; turn taking; repetition of a sequence; and nonliterality. Finally and importantly, we were able to easily modify previous procedures of this task to measure key aspects of the child's:
- Attention (orienting, sustained, joint);
- Inhibitory control (self-control);
- Motor control; and
- Social engagement.

2.   Why other tools were excluded

There is currently not a systematic repertoire of infant or toddler game-playing behaviours in the literature and nor are there any interactive, short standardised tools that quickly measure the subskills we sought to measure. We did consider other structured games such as "peek a boo" and others, but none were as age appropriate, met our criteria or were appropriate to be played with a stranger.

3.   How the tool was used and if specifically adapted for our use

We modified the stack-and-topple activity by introducing three phases: Demonstration, Individual Pay, and Cooperative Play. In the demonstration phase, we measured the child's attention orienting and joint attention, as well as the ability to inhibit their impulses to reach for the blocks. The Individual Play phase allowed us to measure motor ability (and by proxy sustained attention). The Cooperative Play phase allowed us to measure social engagement, sustained and joint attention, and inhibitory control.

4.   How we have created the outcome variables/ any up-coding/ collation of variables etc.

- The stack and topple task was a brief child-interviewer interaction activity designed to assess six key measures of early social and cognitive functioning: attention orienting, sustained attention, joint attention, motor ability, inhibitory control and sociability.

- As such, the protocol that interviewers completed for each participant (see 2 year observation booklet) addressed these constructs. After preliminary analyses, some of the data were collapsed due to the following reasons:
  - Low response rates (when response rates were <=1% of the sample) in certain categories (see below).
  - When the child was interviewed by an interviewer who did not achieve greater than 75% reliability on the particular measure during training.
  - For additional information: Refer to Henderson, Waldie, Peterson, Underwood and Morton (in prep). Or contact Dr Annette Henderson, a.henderson@auckland.ac.nz.
- It is important to note the following two processes for ensuring that data analysis is being carried out on the appropriate sample.

  - For all analyses, select only participants who were <36 months old at data collection **AND**

o For each of the variables, "select if" the child was interviewed by an interviewer who achieved sufficient reliability. That is, the child has a "1" for each reliability measure (see Table 1).

Table 1: Process for analysing Stack and Topple variables

Measure	Variable (s)	Step 1	Step 2	Consider
Attention orienting	ST17_Y2CO	Select only participants <36m	"select if" AO_Reliability_Y2CO = 1	nST32_1_Y2CO
Joint attention/ demonstration task	ST18_Y2CO	Select only participants <36m	"select if" JA_Reliability_Y2CO = 1	nST32_1_Y2CO
Joint attention/ co-operative task	ST24_Y2CO	Select only participants <36m	"select if" JA_Reliability_Y2CO = 1	nST32_3_Y2CO nST32_4_Y2CO
Motor Skills	ST23_Y2CO	Select only participants <36m	"select if" MS_Reliability_Y2CO = 1	nST32_2_Y2CO
Inhibitory control/ demonstration task	ST20_Y2CO	Select only participants <36m	"select if" IC_Reliability_Y2CO = 1	nST32_1_Y2CO
Inhibitory control/ co-operative task	ST25_Y2CO	Select only participants <36m	"select if" IC_Reliability_Y2CO = 1	nST32_3_Y2CO nST32_4_Y2CO
Sustained attention	ST26_Y2CO	Select only participants <36m	"select if" SA_Reliability_Y2CO = 1	nST32_3_Y2CO nST32_4_Y2CO
Social engagement	ST27_Y2CO	Select only participants <36m	"select if" SE_Reliability_Y2CO = 1	nST32_3_Y2CO nST32_4_Y2CO

5. Additional information

Researchers may also want to explore the impact of the four variables that indicate which Stack and Topple tasks the child attempted [nST32_1_Y2CO; nST32_2_Y2CO; nST32_3_Y2CO; nST32_4_Y2CO]. Further details on the data collected and suggested recoding are provided below.

Attention Orienting [ST17_Y2CO]
- *Task Question: At the start of the task, did the child pay attention before you started demonstrating the stacking?*
- This variable indicates toddlers' ability to orient their attention from one activity towards the interviewer at the beginning of the task. Due to very few responses in the "No" and "Yes, after 2 prompts" categories, it is suggested that these are combined to form one category resulting in the following response categories for attention orienting: "Not at all or after 2 prompts"; "After 1 prompt"; or "Yes, immediately".

Joint Attention [ST18_Y2CO; ST24_Y2CO]
- *Task Question: Did the child maintain joint attention (look at the interviewer and the blocks) during both demonstrations/cooperative task?*
- For analyses, it is suggested that both joint attention variables (Demonstration: ST18_Y2CO; Cooperative Task: ST24_Y2CO) are dichotomised as follows (because few children looked primarily at the interviewer): "Child looked mostly at blocks or mostly at interviewer"; or "Child looked actively at both blocks and interviewer".

Motor Skills [ST23_Y2CO]
- *Task Question: During the individual task, what was the highest number of blocks stacked?*

Inhibitory control (IC) [ST20_Y2CO; ST25_Y2CO]

- *Task Question: During the second [demonstration: ST20_Y2CO/cooperative task: ST25_Y2CO (where the child goes first)], did the child wait his/her turn?*
- Due to low response rates in the "Hardly ever" or "A little" categories for both tasks, it is suggested that these categories are combined to make two categories for this measure: "Under-controlled and inconsistent"; or "Controlled".

Sustained attention [ST26_Y2CO]

- *Task Question: During the cooperative tasks, did the child stay focused on the task?*
- Due to very few responses in the "Hardly ever" and "A little" categories, it is suggested that these categories are combined to make two categories for this measure: "Low sustained attention" (Child stayed focused on the task hardly ever, or a little; or "High sustained attention" (Child stayed focused on task most of the time).

Social engagement [ST27_Y2CO]

- *Task Question: During the cooperative tasks, was the child socially engaged (e.g. smiling, talking, enjoying the task)?*
- Due to low response rates in the "Hardly ever" category, it is suggested that these categories are combined with "Showed some signs" to make two categories for this measure: (Child hardly ever showed signs of being socially engaged during task OR Child showed some signs of being socially engaged during task); or "Child showed signs of being socially engaged during most of the task".

Key reference:

Ross, H.S. (1982) Establishment of social games among toddlers. Developmental Psychology, 18(4), 509-518.

9.5 Child Behaviour Questionnaire (VSF) - DCW5

1.   Why we chose this tool – background

A number of instruments have been developed to measure temperament (Rothbart 2011), but those associated with the work of Mary Rothbart are among the most popular for use in research and in practice (Peterson et al. *in press a*).

Growing Up in New Zealand used the Infant Behavior Questionnaire-Very Short form (IBQ-VSF) at 9 months. The CBQ-VSF (Putnam & Rothbart 2006) is an age-appropriate continuation of the IBQ-VSF (Putnam et al. 2015) measuring the same temperament factors.

2.   How the tool was used and if specifically adapted for our use

The CBQ-VSF questionnaire was designed to measures three broad scales of a child's temperament: Negative Affect (NA), Surgency (S) and Effortful Control (EC). However, our research (described below) has suggested that a six factor structure *Negative Affect, Effortful Control, Surgency, Hardiness, Boldness and Attention)* is a better fit for the data and has predictive validity (Stubbing et al. under review).

There original CBQ-VSF has 36 questions in total, 12 for each broad factor. Each question is a statement to which the mother responds whether the statement is a true or untrue description of their child's behaviour over the past six months. The items are rated on a scale from 1 to 7 (1 = Extremely untrue, 2 = Quite untrue, 3 = Slightly untrue, 4 = Neither true nor untrue, 5 = Slightly true, 6 = Quite true, 7 = Extremely true). Mothers can also respond that they didn't know or that the question was not applicable if they had never seen the child in a certain situation. These responses are treated as missing data. The internal consistency (Chronbach's alpha) for the three CBQ – VSF broad scales were: NA α = .71; S α = .72; EC α = .70

However, a confirmatory factor analysis (CFA) on the CBQ-VSF three factor model using all children whose mother responded to all the CBQ-VSF items (N=5836) and Maximum Likelihood Estimation was poor (x^2= 19736.559; df = 591; x^2/df = 33.395, p < .001; RMSEA = .075, CFI = .514; Gamma Hat = .84; SRMR = .0809). The model had low fit on several key fit indexes including SRMR and Gamma Hat, suggesting that the model was not the best representation of the data. Previous researchers have also suggested that the 3 factor structure may not be the most parsimonious (e.g. Sleddens et al. 2011and Allan et al. 2013).

3.   How we have created the outcome variables/any up-coding/collation of variables etc.

Six factor structure of temperament using the CBQ-VSF
Exploratory Factor analysis (EFA) identified a 6 Factor model (*Negative Affect, Effortful Control, Surgency, Hardiness, Boldness and Attention)*. These 6 factors explained 41.048% of the variance and had five eigenvalues above 1.5 (see Table 1 below).

In accordance with Tabchnick and Fidell (2001) the Cronbach alpha reliabilities of five of the six factors (*Negative Affect, Effortful Control, Boldness, Surgency, and Attention*), were found to be acceptable (range .609- .716) and are shown in Table 2 along with the correlation matrix of the five factors. The Chronbach alpha reliability for Hardiness was just below the acceptable range at .578. The correlations were all below .4 and were in the expected direction. The highest correlations were between the three new factors and the factors from which they were derived.

Confirmatory factor analysis: Six Factor model
We conducted a CFA on our proposed 6 Factor model using the full sample of all children whose mother completed all items on the CBQ-VSF (N= 5836). We found acceptable fit ($x2 = 11670.911$; df = 545; $x2/df = 21.415$, p <.001; RMSEA = .059; CFI = .710; gamma hat = .90; SRMR = .0683). Factor correlations and Reliabilities of the Proposed CBQ-VSF Six Factor Structure are shown in Table 2.

Table 1: Exploratory Factor Analysis of the CBQ - VSF Proposed Six Factor Structure Using Maximum Likelihood and Varimax Rotation

CBQ-VSF			Factor Loadings of the New 6 Temperament Factors					
Original Factor	No.	Item	NA	EC	Boldness	Surg	Attention	Hardiness
NA	14	When angry about something, s/he tends to stay upset for ten minutes or longer.	.572					
NA	32	Gets angry when s/he can't find something s/he wants to play with.	.538					
NA	23	Is very difficult to sooth when s/he has become upset.	.533					
NA	8	Tends to become sad if the family's plans don't work out.	.518					
NA	17	Seems to feel depressed when unable to accomplish some task.	.504					
NA	2	Gets quite frustrated when prevented from doing something s/he wants to do.	.413		.244			
S	1	Seems always in a big hurry to get from one place to another.	.376		.319			
NA	35	Becomes upset when loved relatives or friends are getting ready to leave following a visit.	.368					
NA	11	Is afraid of burglars or the "boogie man".	.310					
EC	18	Is good at following instructions.		.472				
EC	3	When drawing or colouring in a book, shows strong concentration.		.459				
EC	27	Sometimes becomes absorbed in a picture book and looks at it for a long time.		.452				
EC	15	When building or putting something together, becomes very involved in what s/he is doing, and works for long periods.		.448				
EC	21	Likes the sound of words, as in nursery rhymes.		.441				
EC	6	Prepares for trips and outings by planning things s/he will need.		.345		.222		
EC	9	Likes being sung to.		.337				
EC	33	Enjoys gentle rhythmic activities, such as rocking or swaying.		.322				
EC	30	Approaches places s/he has been told are dangerous slowly and cautiously.		.226				
S	34*	Sometimes turns away shyly from new acquaintances.			.667			
S	10	Seems to be at ease with almost any person.			.640			
S	22*	Is sometimes shy even around people s/he has known a long time.	-.257		.608			
S	19*	Takes a long time in approaching new situations.	-.259		.540			
S	7	Often rushes into new situations.	.390		.448	.273		
S	28	Likes rough and rowdy games.				.597		
S	4	Likes going down high slides or other adventurous activities.				.563		
S	16	Likes to go high and fast when pushed on a swing.				.461		

S	13*	Prefers quiet activities to active games.		-.338	.459	
S	25	Is full of energy, even in the evening.	.203		.426	
S	31*	Is slow and unhurried in deciding what to do next.			.240	
EC	36	Comments when a parent has changed his/her appearance.				.770
EC	12	Notices it when parents are wearing new clothing.			.222	.712
EC	24	Is quickly aware of some new item in the living room.			.223	.452
NA	29*	Is not very upset at minor cuts or bruises.				.917
NA	5	Is quite upset by a little cut or bruise.		.337		**.625**
NA	20*	Hardly ever complains when ill with a cold.				.304
NA	26*	Is not afraid of the dark.				.216

Note: Items loading less than .2 are not shown; NA = Negative Affect, Surg = Surgency, EC = Effortful Control. * designates reverse coded item. Where there are cross loads >.2 the strongest loading item is in bold.

Table 2: Factor Correlations and Reliabilities of the Proposed CBQ-VSF Six Factor Structure

Correlation Matrix		1	2	3	4	5	α
NA (9 items)	Mean = 4.38	-.048**	-.103**	.083**	.106**	.260**	.707
EC (9 items)	Mean = 5.34		-.049**	-.058**	.350**	-.045*	.623
B (5 items)	Mean = 3.91			.292**	-.006	-.125**	.716
S (6 items)	Mean = 5.20				.004	-.144**	.609
A (3 items)	Mean = 5.70					.043*	.712
H (4 items)	Mean = 3.95						.578

Note: NA = Negative Affect, S = Surgency, EC = Effortful Control, A = Attention, H = Hardiness; * = correlation significant at the p<.05 level; ** = correlation significant at the p<.001 level; α = Chronbach's Alpha.

Predictive Validity of the 6 factor structure
Regression models were then run and the 6 temperament factors were found to be differentially related to observer reported child engagement, patience, child task focus, attention, and aggression (Stubbing et al. under review).

4.   Additional information

Table 1 identifies the items that make up our proposed 6 factor structure of temperament at 4.5 years using the CBQ-VSF. Note some items are reversed scored (see * items in Table 1). Please email e.peterson@auckland.ac.nz if you wish to added to a mailing list to receive a copy of the paper on the 6 factor structure once it has been accepted for publication.

Key references:

Allan, N. P., Lonigan, C. J., & Wilson, S. B. (2013). Psychometric evaluation of the Children's Behaviour Questionnaire – Very Short Form in preschool children using parent teacher report. Early Childhood Research Quarterly, 28(2), 302-313. Retrieved from http://dx.doi.org/10.1016/j.ecresq.2012.07.009

Peterson E.R., Waldie K.E., Mohal J, Reese E, Atatoa-Carr P.E, Grant C.C, Morton S.M.B. (*in pressa*). Infant Behavior Questionnaire-Revised Very Short Form: A new factor structures' associations with parenting perceptions and child language outcomes. Journal of Personality Assessment.

Peterson E.R., Mohal J, Waldie K.E., Reese E, Atatoa-Carr P.E., Grant C.C, Morton S.M.B. (*in press b*). A cross-cultural analysis of the infant behavior questionnaire very short form: An Item response theory analysis of infant temperament in New Zealand. Journal of Personality Assessment*.*

Putnam, S. P., & Rothbart, M. K. (2006). Development of Short and Very Short Forms of the Children's Behaviour Questionnaire. *Journal of Personality Assessment, 87*(1), 102-112.

Putnam, S. P., Helbig, A. L., Gartstein, M. A., Rothbart, M. K., & Leerkes, E. (2014). Development and assessment of short and very short forms of the infant behavior Questionnaire–Revised. Journal of Personality Assessment, 96(4), 445-458. doi:10.1080/00223891.2013.841171

Rothbart, M. K. (2001). *Becoming who we are: Temperament and personality in development.* New York, NY: Guilford Press.

Sleddens, E. F. C., Kremers, S. P. J., Candel M. J. J. M., De Vries, N. N . K., & Thijs, C. (2011). Validating the Children's Behaviour Questionnaire in Dutch children: Psychometric properties and a cross-cultural comparison of factor structure. Psychological Assessment, 23(2), 417-426. doi: 10.1037/a0022111

Stubbing, J., Peterson E.R., Waldie K.E., Morton S.M.B. (under review). Child Behaviour Questionnaire-Revised Very Short Form: A new six factor structure.

9.6 Strengths and Difficulties Questionnaire – DCW5

1. Why we chose this tool – background

The Strengths and Difficulties Questionnaire (SDQ) is a parent-rated 25-item scale that measures five aspects of child behaviour (see Table 1: child behaviours measured by the SDQ

1) to 2) added together to generate an 'internalising problems' score (based on 10 items)	1) emotional symptoms (5 items)	1) to 4) added together to generate a total difficulties score (based on 20 items)
	2) peer relationship problems (5 items)	
3) to 4) added together to generate an 'externalising problems' score (based on 10 items)	3) hyperactivity/inattention (5 items)	
	4) conduct problems (5 items)	
	5) prosocial behaviour (5 items)	

For each of the 5 subscales, the score can range from 0 to 10, the externalising/ internalising scores can range from 0 to 20 and the total difficulties score can range from 0 to 40. The SDQ is used widely and internationally; it is argued to have the advantages of being reliable, brief, comprehensive and simple to administer. It assesses positive and negative behaviours, it can be used across a wide range of ages and it has self, parent and teacher report versions.
The SDQ can screen for behavioural difficulties typically identified in longer questionnaires such as the Child Behaviour Checklist. It has norms for use in multiple countries including Australia, United Kingdom and the USA (see www.sdqinfo.com). It is also used in the New Zealand Before School Check (B4SC).

2. Why other tools were not chosen

Other questionnaire-based scales considered included:
- Child Behaviour Checklist (CBCL)
  o This was identified as being too long and the items were too negative.
- Brief Infant Toddler Socio Emotional Assessment (BITSEA)
  o This scale was too expensive to administer.
- Ages and Stages Questionnaire
  o The socio-emotional items were too long.

) (Goodman, 1987).

Table 1: child behaviours measured by the SDQ

1) to 2) added together to generate an 'internalising problems' score (based on 10 items)	1) emotional symptoms (5 items)	1) to 4) added together to generate a total difficulties score (based on 20 items)
	2) peer relationship problems (5 items)	
3) to 4) added together to generate an 'externalising problems' score (based on 10 items)	3) hyperactivity/inattention (5 items)	
	4) conduct problems (5 items)	
	5) prosocial behaviour (5 items)	

For each of the 5 subscales, the score can range from 0 to 10, the externalising/ internalising scores can range from 0 to 20 and the total difficulties score can range from 0 to 40. The SDQ is used widely and internationally; it is argued to have the advantages of being reliable, brief, comprehensive and simple to administer. It assesses positive and negative behaviours, it can be

used across a wide range of ages and it has self, parent and teacher report versions.

The SDQ can screen for behavioural difficulties typically identified in longer questionnaires such as the Child Behaviour Checklist. It has norms for use in multiple countries including Australia, United Kingdom and the USA (see www.sdqinfo.com). It is also used in the New Zealand Before School Check (B4SC).

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Other questionnaire-based scales considered included:
- Child Behaviour Checklist (CBCL)
  - This was identified as being too long and the items were too negative.
- Brief Infant Toddler Socio Emotional Assessment (BITSEA)
  - This scale was too expensive to administer.
- Ages and Stages Questionnaire
  - The socio-emotional items were too long.

4. How the tool was used and if specifically adapted for our use

At the 2Y DCW, the "early-years" SDQ (for ages 2-4) was included in the mother (n=6242) and partner (n=3804) questionnaires[1]. Confirmatory factor analysis was used to evaluate the SDQ's factor structure/test for measurement invariance, normative New Zealand scores/banding have been described and mother/partner scores compared with the following results:
- We found support for a modified five-factor model, in which the prosocial factor was extended into a positive construal factor[2].
- For mothers, full measurement invariance of the modified model was found across child gender and socioeconomic status, partial invariance was found across mother's ethnicity[1].
- Full measurement invariance of the modified model was found across mothers and fathers[3].
- Parents showed moderate agreement in their SDQ ratings[3].

At the 54m DCW, the "standard" SDQ (for ages 4-17) was included in the child proxy questionnaire. In the process of processing the data it was discovered that one item had been omitted from the 54m Child Proxy Questionnaire. The missing SDQ item was:
"*Often fights with other children or bullies them*".
This item contributes to the following scores:
- conduct problems;
- externalising problems; and
- total difficulties.

The missing item also affects the ability to determine whether a child meets the criteria for normal, borderline or abnormal behaviour on these scales.

This technical document includes information to help external users account for the missing item in their analyses (see Section 5).

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[1] Morton, S.M.B., Atatoa Carr, P.E., Grant, et al., (2014). Growing Up in New Zealand: A longitudinal study of New Zealand children and their families. Now we are Two: Describing our first 1000 days. Auckland: Growing Up in New Zealand.

[2] D'Souza, S., Waldie, K.E., Peterson, E.R. et al. (2017a). Psychometric Properties and Normative Data for the Preschool Strengths and Difficulties Questionnaire in Two-Year-Old Children. J Abnorm Child Psychol 45: 345. doi:10.1007/s10802-016-0176-2

[3] D'Souza, S., Waldie, K.E., Peterson, E.R. et al. (2017b). The Strengths and Difficulties Questionnaire: Factor structure and parent agreement in two year old children. *Assessment.*

5. How we have created the outcome variables/ any up-coding/ collation of variables etc.

The external dataset includes raw data for 24 SDQ items and derived subscale data for: Emotional problems; Peer problems; Hyperactivity-Inattention; Prosocial behaviour. Detailed information on scoring the SDQ can be found on the youthinmind website: http://www.sdqinfo.org/py/sdqinfo/co.py

Table 2 shows the variable names for each of the SDQ items that belong to these subscales.
Note: variables with an asterisk should be reverse coded before they are used for analysis.
Also note that in the 54M external dataset, all SDQ items are coded as follows:
1= Not true; 2= Somewhat true; 3= Certainly true; 99= Don't know or 98 =Refused. Individual items for use in subscale scores were recoded as 0= Not true; 1= Somewhat true; 2= Certainly true.

Table 2: SDQ variables for each subscale

Subscale	Items
Emotional problems	SDQ3_m54Cm; SDQ8_m54Cm; SDQ13_m54Cm; SDQ16_m54Cm; SDQ24_m54Cm
Peer problems	SDQ6_m54Cm; SDQ11_m45Cm*; SDQ14_m54Cm*; SDQ19_m54Cm; SDQ23_m54Cm
Hyperactivity-Inattention	SDQ2_m54Cm; SDQ10_m54Cm; SDQ15_m54Cm; SDQ29_m54Cm**; SDQ31_m54Cm**
Prosocial behaviour (positively worded items)	SDQ1_m54Cm; SDQ4_m54Cm; SDQ9_m54Cm; SDQ17_m54Cm; SDQ20_m54Cm

*one missing item as described above

6. Dealing with the missing SDQ item

Growing Up in New Zealand has carried out a review to:
- identify information available to potentially contribute to resolving the issue of the missing SDQ item;
- identify methods that could be used to deal with the missing SDQ item; and
- evaluate each of these methods.

Useful information available to external users are described in Table 3.

Table 3: *Growing Up in New Zealand* SDQ data available

Information
Scores of 25 items (and all derived subscale scores) from mothers & partners at 2Y
Scores of 24 items (and subset of derived subscale scores) from mothers at 54M
Scores of 25 items (and all derived subscale scores) from mothers & teachers at 8Y*

* available from 2018

We explored the following methods of dealing with the missing SDQ item.
- multiple and simple imputation
- using the SDQ scoring method for missing values

For each of these methods, we provide: a brief description of the method and how it could be applied to the data; how the method was evaluated and what the findings were.

Imputation
This work explored whether the missing values could be imputed. A literature search on the application of imputation was carried out and expert views were sought on whether this method could be used when an entire item was missing.

Imputation is the practice of substituting missing values with 'reasonable guesses' and there are various statistical approaches available for achieving this. In single imputation procedures, the missing data is imputed once (for instance, by imputation of the mean, last value carried forward, regression modelling), and then the analysis continues as normal. Multiple imputation is a more statistically principled technique than single imputation but creates multiple versions of the dataset.

In principle, multiple imputation should be undertaken in a bespoke way depending on specific research questions. Due to these reasons, multiple imputation was not felt to be appropriate.

Single imputation of an item with missing values relies on having observed values for that item upon which to base the imputation of the missing values. Given that an entire item was missing (i.e. there were no observed values) different ways of creating these observed values were reviewed.

We considered using the 2Y SDQ item data carried forward as the basis (observed values) for imputation. In this approach, each child's SDQ data for the missing item from the 2Y interview would be carried forward and used to replace the missing values for a random subsection of the cohort – this data would form the basis of the observed values upon which to impute the remaining missing values for the cohort. This method assumes that children's scores on individual SDQ items do not change significantly over time. However, as Table 4 shows, this does not appear to be the case. At 54M, scores among the cohort have generally 'improved' compared with scores at 2Y.

Table 4: 2Y responses to the SDQ conduct items [with corresponding 54M data]

Response	Temper	Obedient*	Fights	Argues	Spiteful	[Lies]	[Steals]
Not true	22% [39%]	33% [47%]	62%	51%	69%	[68%]	[87%]
Somewhat true	53% [48%]	62% [49%]	31%	40%	28%	[30%]	[11%]
Certainly true	25% [13%]	5% [3.5%]	7.5%	9%	3.5%	[2%]	[2%]

* scores reversed; missing item in grey column

More complex methods of imputation could make use of other available data, in the form of *Growing Up in New Zealand* SDQ data from both the 2Y and 54M. For these methods, these data would be included in the imputation model to help predict the imputed values with better accuracy than simply carrying forward the missing item 2Y scores. Further data for imputation will be available when the SDQ is re-administered to the cohort at the 8Y DCW; parent-reported and teacher-reported data will be collected.

SDQ scoring method for missing values
Where there are SDQ missing data, a scoring method can be applied whereby item scores are scaled up pro-rata (if at least 3 items have been completed) (see http://www.sdqinfo.org/py/sdqinfo/co.py). For example a score of 4 based on 3 completed items is scaled up to a score of 7 (6.67 rounded up) for 5 items (4 divided 3 multiplied by 5). The easiest way of calculating pro-rata subscale scores is to multiply the mean of individual item scores by 5 (provided there are at least 3 subscale scores available). Using this method, the subscale scores, externalising/ internalising scores and total difficulties score have the same ranges as described

previously.

To evaluate this method, the missing SDQ item was removed from the 2Y dataset and the impact on the results of original (25 item) analyses was explored. In addition, confirmatory factor analysis of the 2Y data was rerun as if the SDQ item had been missing (see D'Souza et al. 2017, for a full description of the methods used). The findings of this work are shown in Table 5.

Table 5: comparison of 2y SDQ data with and without missing item

	25 items (N=6242)	24 items (N=6237)	Differences in scores/%
Mean (SD) scores:			
Conduct problems	3.13 (1.97)	3.47 (2.04)*	Significant, p<.01
Externalising problems	7.48 (3.46)	7.82 (3.51)	Significant, p<.01
Total difficulties	11.53 (5.16)	11.87 (5.17)	Significant, p<.01
Conduct problems			
Normal	76.1% (n=4752)	70.3% (n=4384)	Significant, X2=
Borderline	11.5% (n=719)	16.1% (n=1005)	6262.42, p<.01
Abnormal	12.4% (n=771)	13.6% (n=848)	
Total difficulties			
Normal	78.2% (n=4874)	76.5% (n=4764)	Significant, X2=
Borderline	11.7% (n=729)	12.7% (n=794)	9170.94, p<.01
Abnormal	10.1% (n=630)	10.8% (n=671)	
Confirmatory factor analysis (modified model$)	CFI = 0.905; X2 = 3361.02;	CFI = 0.908; X2 = 2945.66;	

* conduct problem scores for 24 items calculated using four items and scaled up to range of 0-10
$ see D'Souza et al., 2017.

The original 25 item and the revised 24 item datasets both had full measurement invariance across child's gender and deprivation, and partial but satisfactory invariance across mother's ethnicity. Confirmative factor analysis showed that both methods had good model fit. However, the SDQ results for the revised 24 item dataset were significantly different than those for the original 25 item dataset. Thus, dealing with the missing SDQ item in this way may significantly impact the result of any analysis carried out.

This method may result in inflated conduct subscale scores thus leading to inflated externalising and total difficulties scores. An explanation for this is found in Table 4; with the exception of the 'spiteful' item, the cohorts' scores on the missing item (fighting with or bullying other children) at 2Y were significantly lower than most of the other conduct item scores (ps<0.001). Currently, we cannot ascertain whether this pattern of low scoring relative to other items persists or how it changes as the cohort children get older. As Table 5 shows there are changes in the pattern of responses to each of the other SDQ conduct items at 54M. Further information on these patterns will be available when the 8Y external dataset becomes available.

This method of rescoring the conduct problems subscale may be appropriate for specific research questions. In particular, the total difficulties score and bandings appear to be less impacted than the conduct problems and externalising subscales.

7. Additional information

Accompanying variables for the SDQ are as follows:

SDQ32_m54Cm [Overall, do you think that {NAME} has difficulties in one or more of the following areas: emotions, concentration, behaviour or being able to get on with other people?]

If the response to this item was "Yes", the following items were administered:
- SDQ33_m54Cm [How long have these difficulties been present?]
- SDQ34_m54Cm [Do the difficulties upset or distress your child?]
- SDQ35_m54Cm; SDQ36_m54Cm; SDQ37_m54Cm; SDQ38_m54Cm [Do the difficulties interfere with your child's everyday life in the following areas? Home life; Friendships; Learning; Leisure activities]
- SDQ39_m54Cm [Do the difficulties put a burden on you or the family as a whole?]

Key reference:

Goodman R (1997) The Strengths and Difficulties Questionnaire: A Research Note. Journal of Child Psychology and Psychiatry, 38, 581-586.

9.7   Gift Wrap Task – DCW5

1.   Why we chose this tool – background

This measure was selected to get an observational measure of the ability to control emotionally arousing behaviour prior to entering school. The task selected is a brief observational measure of delayed gratification and is argued to be a measure of hot cognition (Metcalf & Mischel 1989).

The ability to delayed gratification has been found to be predictive of multiple life outcomes including, prevention of developmental and mental health problems, and increase in resilience, fewer conduct disorders and addictive and antisocial behaviours and greater scholastic achievement (Mishcel 1974 and Mischel et al. 1989).

More recently, Caspi et al. (2011) found that high levels of self-control identified in three year olds was associated with adults reporting fewer health problems, less substance dependence fewer criminal convictions, reduced chance of having children raised in single parent homes and less likely to have annual income of less than $NZ 20,000.

The tool is used widely in the research literature and in several longitudinal studies. For example it was used in the Chicago Neighbourhoods study (N= 6000) as part of the Preschool Self-Regulation scale.

2.   Why other tools were excluded

The original delayed gratification task more commonly known as the Marshmallow task (Mischel and Ebbeson 1970) was excluded due to difficulties around using food as an incentive and due to inability to film the child's behaviour.

3.   How the tool was used and if specifically adapted for our use

The child was told "Now I have a surprise to show you, but I don't want you to see it. I want to wrap it first. Please turn around so you won't see it. Please don't look or peek while I wrap it. I'll tell you when I'm done".

A timer is set for 1 minute. The interviewer takes out wrapping materials and pre-wrapped gift (being careful not to let the child see that gift is already wrapped). The interviewer noisily pretends to wrap while watching child's behaviour. After 1 minute they say "Ok, I'm all done, you can turn around now".

The interviewer records the time of the child's first peek. They also record each time the child turns around or peeks and they say "Remember, no peeking. I'll tell you when I'm done". The interviewer also codes how many times the child peeked.

4.   How we have created the outcome variables/ any up-coding/ collation of variables etc.

The outcome variables are: time to first peek and how many times the child peeked. Four response options were possible.

1. Child peeked once
2. Child peeked more than once
3. Child peeked once or more and then remained peeking for the remainder of the timing
4. Child peeked (one or more times) and touched the gift

Key references:

Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. Developmental Psychology, 36, 220–232.

Metcalf, J., & Mischel,W (1999). A Hot/Cool-System Analysis of Delay of Gratification: Dynamics of Willpower. Psychological Review, 106, 1, 3-19.

Mischel, W., Ebbesen, E.B. (1970). "Attention in delay of gratification". Journal of Personality and Social Psychology **16** (2): 329–337. DOI:10.1037/h0029815.

Mischel, W. (1974). Processes in delay of gratification. Academic Press.

Mischel, W., Shoda, Y., & Rodriguez, M. L. (1989, May). Delay of gratification in children. Science, 244, 933-938.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H. L etc. Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. Proceedings of the National Academy of Sciences, 108, 7, 2693-2698.

9.8 Modified version of the Expressive/Receptive Task of the Affective Knowledge Task (AKT) – DCW5

1.   Why we chose this tool – background

Denham's (1986) Affective Knowledge Task is one of the most widely used emotion knowledge tests (Morgan et al. 2009). It has good internal consistency and 1 year stability (Denham et al. 2012). Early child socio-emotional learning is increasingly being seen as vital component with respect to school readiness, school adjustment, social competence and academic achievement (e.g. Denham et al. 2003; Denham et al. 2012). This is because a pre-schooler who has attained age-appropriate socio-emotional learning skills is more able to pay more attention to tasks, plan more, and devote more resources to learning and this enables them to work better with their teachers and peers to share resources and maximise learning opportunities (Denham et al. 2012).

We were not able to use the full AKT due to time constraints. Instead we used the Expressive/ Receptive Task of the AKT and in conjunction with the test author we modified the task slightly. Rather than using puppets with stick on faces we used cards with simple cartoon faces. We used the original four faces for happy, sad, scared and angry (although slight changes were made to the scared face by removing the eyebrows to make it less feminine, We also added the emotions (surprised and disgust) in order to try and avoid potential ceiling effects with the original four emotions (Denham et al. 2012).

2.   Why other tools were excluded

We also considered using the Pearlman Emotional Knowledge Task and the Test of Emotion Comprehension (Pons et al. 2004), the Emotion Matching Task (Morgan et al. 2009) and the Kusche Affective Interview (Kusche 1984). These measures had various limitations such as they were too long, had less evidence for reliability and validity, required extensive interview training , required recording equipment, involved listening to American voices which may be confusing to some New Zealand children, or used actual faces that were from one particular ethnic group.

3.   How the tool was used and if specifically adapted for our use

The tool was scored in the same way that the original AKT task was scored. In keeping with the AKT manual, interviewers were trained on the administration of this task to ensure consistency in delivery.

Children were presented with six face cards presented in a random order. The interviewer pointed to the first card and ask the child in a neutral tone, "How does [HE/ SHE] feel?"

If the child uses a descriptive word such as "crying", or "smiling" they prompted the child again by saying "yes, very good, but how does [HE/ SHE] feel?"

- 2 points were given for the correct emotion or acceptable synonym (e.g. "mad" for angry, "shocked" for surprised, etc.)
- 1 point was given for an incorrect emotion that is within the same emotional valence (e.g. "afraid" for sad, "upset" for angry, etc.)
- 0 points were given for an incorrect emotion with the opposite emotional valence (e.g. "happy" for sad etc.) or for a word that is not an emotion (e.g. "crying" for sad, or "smiling" for happy etc.)

A child score on the Modified Expressive AKT task is obtained by calculating a total score from the six presented cards.

4.　　　　How we have created the outcome variables/ any up-coding/ collation of variables etc.

Following this task the interviewer was asked to code whether the child stayed focused on this task. Consideration should be given as to whether to only use the data from those children who were identified as concentrating on the task "Most" or "All of the time".

A paper is being prepared by the *GUiNZ* team which describes how this this tool was modified and how the cohort performed on the task at the 54 month interview.

Key References:

Denham, S. A. (1986). Social cognition, social behavior, and emotion in pre-schoolers: Contextual validation. Child Development, 57, 194-201.

Denham, S. A., Blair, K. A., DeMulder, E., Levitas, J., Sawyer, K., Auerbach–Major, S., & Queenan, P. (2003). Preschool emotional competence: Pathway to social competence? Child development, 74(1), 238-256.

Denham, Hamada Bassett, Way, Mincic, Zinsser & Graling (2012): Pre-schoolers' emotion knowledge: Self-regulatory foundations, and predictions of early school success Cognition and Emotion, 26(4): 667–679.

Kusché, C. A. (1984). *The understanding of emotional concepts by deaf children: An assessment of an affective curriculum*. Unpublished dissertation, University of Washington.

Morgan,J. K., Izard, C.E., King, K.A. (2009) Construct Validity of the Emotion Matching Task: Preliminary Evidence for Convergent and Criterion Validity of a New Emotion Knowledge Measure for Young Children. Soc Dev. 2009 January 21; 19(1): 52–70 doi:10.1111/j.1467-9507.2008.00529.x.

Pons, F., Harris, O.L., deRosnay, M. (2004). Emotion comprehension between 3 and 11 years: developmental period and hierarchical organization. European Journal of Developmental Psychology, 1(2), 127-152

9.9 DIBELS Letter Naming Fluency – DCW5

1. Why we chose this tool – background

We chose the Dynamic Indicators of Basic Early Literacy Skills subtest of Letter Naming Fluency (**DIBELS LNF**) from the DIBELS NEXT battery as our early literacy task because children's letter knowledge is a key indicator of their later success in reading (Adams 1990). DIBELS LNF offers an efficient and valid way to assess children's letter knowledge. The LNF assesses children's knowledge of letters, their ability to say the letters, and their naming speed or fluency. We used the Grade K/ Benchmark 1 version with a list of randomly ordered lower-case and upper-case letters.

2. Why other tools were excluded

The DIBELS LNF is free and it is the most efficient measure of children's letter knowledge available. It has been validated with New Zealand children (Schaughency & Suggate 2008). We explored assessing the children's phonological awareness using the DIBELS First Sound Fluency task as another key indicator of children's oral language and early literacy, but that measure was cut due to time constraints.

3. How the tool was used and if specifically adapted for our use

We followed the instructions from the DIBELS NEXT manual in administering and scoring the DIBELS LNF (see https://dibels.org/dibelsnext.html).

4. How we have created the outcome variables/ any up-coding/ collation of variables etc.

The number of letters correctly named in the 1-minute time limit is the outcome variable. The lowercase "l" was counted as correct if called either "L" or "I". If the child self-corrected a response within 3 seconds, the letter was counted as correct. We used a discontinue rule if the child did not correctly name any letters in the first row. Children were not penalised for differences in pronunciation due to dialect, articulation delays or impairments, or speaking a first language other than English.

5. Additional information

If standard scores are desired, we recommend calculating z-scores or percentiles/ quartiles. We do not recommend using the US benchmarks for DIBELS LNF because the *Growing Up in New Zealand* children differ from typical US samples in age, school experience, and dialect.

Key references:

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print.* Cambridge MA: The MIT Press.

Kaminski, R. A., Baker, S. K., Chard, D., Clarke, B., & Smith, S. (2006). *Final report: Reliability, validity, and sensitivity of Houghton Mifflin Early Growth Indicators (Tech. Rep.).* Eugene, OR: Dynamic Measurement Group and Pacific Institutes for Research.

Schaughency, E., & Suggate, S. (2008). Measuring basic early literacy skills amongst year 1 students in New Zealand. New Zealand Journal of Educational Studies, 43(1), 85-106.

9.10 Luria 'hand clap' task – DCW5

1.   Why we chose this tool – background

The Hand Clap Task measures: inhibitory control/ response inhibition (cold cognition) - the ability to stop doing something that is almost a natural response. In the case of hand clapping it is the ability not to copy the interviewer, but do the opposite. It also allows a measure of attention - the ability to stay focused on the number of claps, and the executive component of memory - the ability to remember what was clapped and do the opposite.

The Luria pencil tap task is a measure of children's inhibitory control that is part of the well-known and widely-used Luria-Nebraska Neuropsychological Battery (Golden et al. 1979). The task requires children to perform the opposite action of what an assessor does (e.g. tap once when an assessor taps twice and tap twice when an assessor taps once) across 16 trials.

The Luria pencil tap task has been used by the Head Start for Faces 2009 cohort study of 3,500 children, the Universal Preschool Child Outcomes longitudinal study (N=1000) and is part of the Pre School Self-Regulation Assessment (PSRA; Smith-Donald et al. 2007) which is used in the Chicago School Readiness Project.

2.   Why other tools were excluded

Other inhibitory tasks that were part of the PSRA were considered (e.g. balance beam and toy sorting task) but these required more equipment and were longer in duration.

3.   How the tool was used and if specifically adapted for our use

The task was modified to a hand clap to reduce potential bias/ confounds with fine motor skills with the possibility that some children may have had less exposure to holding pens and pencils than others. The task was administered as follows:

Interviewer: [Showing hands and clapping] "Now for this game, when I clap one time, you clap two times. And when I clap two times, you clap one time, ok? Let's try."

Teaching trials:
1. Clap once [child should clap twice]
2. Clap twice [child should clap once]
3. Clap twice [child should clap once]

Up to six teaching trials were completed. The interviewer stopped the teaching trials and moved on to the testing trials when the child responded correctly on three trials in a row. Of these three trials, at least one must have required the child to clap once as the correct response, and at least one of these trials must have required the child to clap twice as the correct response. The first three teaching trials are shown above. If further teaching trials were required then the interviewer repeated the three listed above.

The interviewer recorded the number of teaching trials completed (maximum of six) and recorded whether or not the child got the last teaching trial correct. Once the teaching trials were completed the task moved on to the test trials.

Test trials:
The administration and response recording are detailed in the table (Table 1).

Table 1: Administration of the Luria hand clap task

Number of interviewer claps			0. Child did not clap	1. Child clapped once	2. Child clapped twice	3. Child clapped more than twice	4. Unclear how many times
1.	2 claps	*PTT4_M54C0*	○	○ (shaded)	○	○	○
2.	1 clap	*PTT5_M54C0*	○	○	○ (shaded)	○	○
3.	1 clap	*PTT6_M54C0*	○	○	○ (shaded)	○	○
4.	2 claps	*PTT7_M54C0*	○	○ (shaded)	○	○	○
5.	1 clap	*PTT8_M54C0*	○	○	○ (shaded)	○	○
6.	2 claps	*PTT9_M54C0*	○	○ (shaded)	○	○	○
7.	1 clap	*PTT10_M54C0*	○	○	○ (shaded)	○	○
8.	2 claps	*PTT11_M54C0*	○	○ (shaded)	○	○	○
9.	2 claps	*PTT12_M54C0*	○	○ (shaded)	○	○	○
10.	1 clap	*PTT13_M54C0*	○	○	○ (shaded)	○	○
11.	2 claps	*PTT14_M54C0*	○	○ (shaded)	○	○	○
12.	1 clap	*PTT15_M54C0*	○	○	○ (shaded)	○	○
13.	1 clap	*PTT16_M54C0*	○	○	○ (shaded)	○	○
14.	2 claps	*PTT17_M54C0*	○	○ (shaded)	○	○	○
15.	2 claps	*PTT18_M54C0*	○	○ (shaded)	○	○	○
16.	1 clap	*PTT19_M54C0*	○	○	○ (shaded)	○	○

4.   How we have created the outcome variables/ any up-coding/ collation of variables etc.

The external variable [NAME] provides the number of correct responses across the 16 test trials. As such, [NAME] is a scale variable with minimum score 0 and maximum score 16.

This is a standardised scoring technique for the task, see: Bialystok et al. (2010).

5.   Additional information

Accompanying variables for this task are as follows:
[NAME]: whether the child was able to engage in the hand clap task at all.
[NAME]: whether the child stayed focussed on the hand clap task.

Key references:

Golden CJ, Hammeke TA & Purisch AD. (1979). The Standardized Luria-Nebraska Neuropsychological Battery: A manual for clinical and experimental use. Lincoln, Nebraska: University of Nebraska Press.

Bialystok E, Barac R, Blaye A & Poulin-Dubois D (2010). Word Mapping and Executive Functioning in Young Monolingual and Bilingual Children, Journal of Cognition & Development, 11:4, 485-508.

Smith-Donald R, Raver CC, Hayes T, Richardson B. (2007). Preliminary construct and concurrent validity of the Preschool Self-regulation Assessment (PSRA) for field-based research. Early Childhood Research Quarterly, 22(2), 173-187.

9.11 Name and Numbers task – DCW5

1.   Why we chose this tool – background

The 'Who am I?' Developmental Assessment is an indicator of school readiness designed for pre-school and the first two years of school. The test includes a series of writing and copying tasks designed to assess children's understanding and use of conventional symbols.

'Who Am I?' has been used by the Longitudinal Study of Australian Children (LSAC) at and numerous other longitudinal studies. It has also been used across cultures. It is quick to administer and has a standardised scoring procedure. Two numbers tasks were added: counting up to 10 and counting down from 10.

2.   Why other tools were excluded

No other writing or numeracy measures were considered.

3.   How the tool was used and if specifically adapted for our use

The 'Who Am I?' Developmental Assessment includes 11 tasks in which children are asked to write their name, copy shapes, and write numbers, letters and words. For the *Growing Up in New Zealand* Leading Light observations, Questions 1 to 7 (name writing, copying five shapes, number writing) of the assessment were used under licence from The Australian Council for Educational Research Ltd. Only the name and numbers tasks were administered to the main cohort plus two counting tasks.

The tasks were administered as follows:
The children were provided with an A4 Name and Numbers Worksheet, and a pencil/ pen. The sheet had two large spaces on it for writing.

Interviewer:
[Pointing to the space provided]. "Write your name here."
Any response, even if only a scribble was praised.
[Pointing to the space provided]. "On this page I want you to write some numbers"
Interviewer could prompt to ensure that children understood but avoided instructing specifically which numbers to write. Children could be encouraged to respond further ("Can you write some more numbers?"). Children who wrote larger numbers (> 20) were asked if they could write some bigger numbers.
Worksheet was collected back from the child.
Interviewer: "Please can you count up from 1 to 10?"
Interviewer wrote down the child's responses.
Interviewer: "Please can you count down from 10 to 1?"
Interviewer wrote down the child's responses.

4.   How we have created the outcome variables/ any up-coding/ collation of variables etc.

Coding for the name and numbers task was carried out by trained researchers according to a scoring protocol. All scores were double checked by a second researcher.

Responses for the 'Who am I?' items were coded according to the standard scoring manual whereby each responses is assessed on a four-point scale relating to the skill required for the task[4] (Table).

Table 1: Who am I? scoring

Task	Score				
	0	1	2	3	4
My name is	No response	Scribble, or no recognisable letters from the name	Criteria: Some recognisable letters from the name. Permitted: letters formed poorly; an incomplete name	Criteria: Recognisable name. Permitted: letters formed poorly; name written in reverse (mirror writing)	Criteria: Recognisable name; letters generally clear. Permitted: some letters reversed
I can write numbers	No response	Scribble, or no recognisable numbers	Criteria: At least 1 recognisable number. Permitted: numbers mixed with letters; difficulty in distinguishing between numbers & letters	Criteria: Numbers only; more than 1 number written; reasonable well-formed numbers. Permitted: reversals; in sequence or not	Criteria: Numbers only; several numbers written; numbers clearly formed and separated. Permitted: few if any reversals; in sequence or not

The counting tasks were coded according to the number of correct numbers in the longest number sequence given by the child (the inclusion of other words (i.e. not numbers) or interruptions in the sequence was permitted).

The external variables for the name and number are as follows.
NN6_m54Co: ' 'My name is' score (range 0-4)
NN7_m54Co: ' 'I can write numbers' score (range 0-4)
NN3s_m54Co: 'Count up from 1 to 10' score (range 0-10)
NN4s_m54Co: 'Count down from 10 to 1' score (range 0-10)

5.   Additional information

Accompanying variables for this task are as follows: [NN1_m54Co]: whether the child was able to engage in the name and numbers at all; [NN2_m54Co]: which hand the child used to write their name or numbers; [NN5_m54Co]: whether the child stayed focused on the name and numbers task.

Key References:

de Lemos M. & Doig B. (1999). Who Am I?: Developmental Assessment: Melbourne. ACER.

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[4] Rothman, S. (2005). Report on Adapted PPVT-III and Who Am I? Growing Up in Australia: The Longitudinal Study of Australian Children

9.12 Parent-Child Interaction task (party invitation) – DCW5

1.   Why we chose this tool – background

We chose this tool because it offers a way to directly observe mother-child teaching and learning interactions in a context that is age-appropriate and applicable across a broad range of cultures: creating a birthday party invitation together (Aram & Levin 2001). Writing a birthday party invitation is flexible enough to elicit a range of responses from parents and children, yet challenging enough that 4-year-olds would not be able to complete the task without help. The tool has been used extensively with parents and preschool children from diverse cultures and socioeconomic backgrounds and with children with special needs (Aram, Most & Mayafit 2006). This research shows that maternal writing mediation with preschoolers predicts children's literacy levels in primary school, even after controlling for children's preschool literacy skills and sociodemographic factors (Aram & Levin 2004). The tool also allowed us to sample a broad range of dimensions: mothers' specific help with writing; mothers' support in the form of open-ended questions; mothers' warmth during the interaction, defined as instances of praise and encouragement; mothers' sensitivity in providing just enough help but not taking over the interaction from the child.

2.   Why other tools were excluded

There were not any readily available tools for assessing mother-child interactions in large samples. Other possibilities for adaptation that we considered and rejected included book-reading interactions and conversational interactions. We selected the writing interaction as offering the best way of observing mother-child teaching interactions in early childhood across a diverse range of cultures. Moreover, the tool can be administered and scored in any language, as long as the interviewer was fluent in that language.

3.   How the tool was used and if specifically adapted for our use

We adapted the tool for the *Growing Up in New Zealand* sample in the following ways:

--In the original task, the child was asked to imagine having a birthday party and to write a list of guests to be invited to the party. We adapted those instructions with the following: "For the next activity, we will be asking you to help your child with some writing, so it would be best if you could sit near a table or other hard surface. I'm going to give you some paper and a felt. Please help your child to create a party invitation. You will have about 5 minutes to work on it together".

--Previous administrations of the birthday party task with small samples employed videotaping and then fine-grained coding of maternal assistance with various aspects of writing. We instead trained interviewers to become reliable with a master coder prior to going out into the field, where they coded the interactions live on four different dimensions.

--We timed the interactions with a stopwatch to aid in coding of the different dimensions, with interviewers rating only one of the dimensions at a time in 30-second blocks to aid reliability.

--We added the dimensions of open-ended questions, maternal warmth and maternal sensitivity to link to our earlier observations of mothers and children at age 2 and to tap into a more global interaction style that goes beyond writing help.

4.   How we have created the outcome variables/ any up-coding/ collation of variables etc.

The four outcome variables are: mothers' print talk; mothers' open-ended questions; mothers' praise/ encouragement; and overall quality of the interaction.

Key references:

Aram, D., & Levin, I. (2001). Mother-child joint writing in low SES: Sociocultural factors, maternal mediation, and emergent literacy. *Cognitive Development, 16, 831*-852.

Aram, D., & Levin, I. (2004). The role of maternal mediation of writing to kindergartners in promoting literacy in school: A longitudinal perspective. Reading and Writing, 17(4), 387-409.

Aram, D., Most, T., & Mayafit, H. (2006). Contributions of mother–child storybook telling and joint writing to literacy development in kindergartners with hearing loss. Language, Speech, and Hearing Services in Schools, 37(3), 209-223.

10 Appendix B – Our publications that have utilised established tools and scales

Below is a list of publications that have used *Growing Up in New Zealand* data and the specific tools and scales detailed in Appendix A and also noted in Section 2 Table 2.

1. Bécares L & Atatoa Carr P. (2016). The association between maternal and partner experienced racial discrimination and prenatal perceived stress, prenatal and postnatal depression: findings from the *Growing Up in New Zealand* cohort study. *International Journal for Equity in Health.* 15(1): 1-12. doi:10.1186/s12939-016-0443-4

2. Bird A L, Grant C C, Bandara D K, Mohal J, Atatoa Carr P E, Wise M R, Inskip H, Miyhara M, Morton S M B. (2016). Maternal health in pregnancy and associations with adverse birth outcomes: Evidence from *Growing Up in New Zealand*. *Australian and New Zealand Journal of Obstetrics and Gynaecology*. doi: 10.1111/jpc.13377

3. D'Souza S, Waldie K E, Peterson E R, Underwood L, Morton S M B. (2016). Psychometric properties and normative data for the preschool Strengths and Difficulties Questionnaire in two-year-old children. *J Abnorm Child Psychol*. doi:10.1007/s10802-016-0176-2

4. D'Souza S, Waldie K E, Peterson E R, Underwood L & Morton S M. (2017). The Strengths and Difficulties Questionnaire: Factor structure of the father-report and parent agreement in 2-year-old children. *Assessment.* doi: 10.1177/1073191117698757

5. Morton S M B, Atatoa Carr P E, Grant C C (for GUiNZ team). (2012) *Growing Up in New Zealand*: A longitudinal study of New Zealand children and their families. Report 2: Now we are born. University of Auckland, Auckland. ISSN: 2253-2501 (Print)

6. Morton S M B, Atatoa Carr P E, Berry S D, Grant C C, Bandara D K, Mohal J, Tricker P J. (2014). *Growing Up in New Zealand*: A longitudinal study of New Zealand children and their families. Residential Mobility Report 1: Moving house in the first 1000 days. Auckland: *Growing Up in New Zealand*

7. Morton S M B, Atatoa Carr P E, Grant C C, Berry S D, Marks E J, Chen X M-H, Lee A C. (2014). *Growing Up in New Zealand*: A longitudinal study of New Zealand children and their families. Vulnerability Report 1: Exploring the Definition of Vulnerability for Children in their First 1000 Days. Auckland: *Growing Up in New Zealand*

8. Morton S M B, Grant C C, Wall C R, Atatoa Carr P E, Bandara D K, Schmidt J M, Ivory V, Inskip H M, Camargo Jr C A. (2014). Adherence to nutritional guidelines in pregnancy: Evidence from the *Growing Up in New Zealand* birth cohort study. *Public Health Nutrition*, *FirstView Article*. 1-11. doi:10.1017/S1368980014000482

9. Morton S M B, Saraf R, Bandara D K, et al. (2014). Maternal and perinatal predictors of newborn iron status. *New Zealand Medical Journal*. 127(1402): 62-77. Article online (subscription only)

10. Morton S M B, Atatoa Carr P E, Grant C C, Berry S D, Mohal J, Pillai A. (2015). *Growing Up in New Zealand*: A longitudinal study of New Zealand children and their families. Vulnerability

Report 2: Transitions in exposure to vulnerability in the first 1000 days of life. Auckland: *Growing Up in New Zealand*

11. Nichani V, Dirks K, Burns B, Bird A, Morton S M B, Grant C C. (2016). Green space and physical activity in pregnant women: Evidence from the *Growing Up in New Zealand* study. *Journal of Physical Activity and Health*. Online article doi: 10.1123/jpah.2016-0013

12. Peterson E R, Waldie K E, Mohal J, Reese E, Atatoa Carr P E, Grant C C, Morton S M B. (2017). Infant Behavior Questionnaire-Revised Very Short Form: A new factor structures' associations with parenting perceptions and child language outcomes. *Journal of Personality Assessment.* 1-13. doi: 10.1080/00223891.2017.1287709

13. Reese E, Ballard E, Taumoepeau M, Taumoefolau M, Morton S M B, Grant C C, Atatoa Carr P, McNaughton S, Schmidt J, Mohal J, Perese L. (2015). Estimating language skills in Samoan- and Tongan-speaking children growing up in New Zealand *First Language.* 35(4-5): 407-427. doi: 10.1177/0142723715596099

14. Reese E, Bird A L, Taumoepea M, Schmidt J, Mohal J, Grant C C, Carr P E A, Morton S M B. (2016). "You are our eyes and ears": A new tool for observing parent-child interactions in large samples. *Longitudinal and Life Course Studies.* 7(4):386-408. doi:10.14301/llcs.v7i4.381

15. Reese E, Peterson E, Waldie K, Schmidt J, Bandara D, Carr P, . . . Morton S. (2016). High Hopes? Educational, socioeconomic, and ethnic differences in parents' aspirations for their unborn children. *Journal of Child and Family Studies.* 25(12): 3657-3674. doi:10.1007/s10826-016-0521-7

16. Underwood L, Waldie K E, D'Souza S, Peterson E R, Morton S M B. (2016). A longitudinal study of pre-pregnancy and pregnancy risk factors associated with antenatal and postnatal symptoms of depression: Evidence from *Growing Up in New Zealand. Maternal and Child Health Journal.* 1-17. doi: 10.1007/s10995-016-2191-x

17. Underwood L, Waldie K E, Peterson E, D'Souza S, Verbiest M, McDaid F, Morton S. (2017). Paternal depression symptoms during pregnancy and after childbirth among participants in the *Growing Up in New Zealand* study. *JAMA Psychiatry.* 74(4): 1-10. doi: 10.1001/jamapsychiatry.2016.4234

18. Waldie K E, Peterson E R, D'Souza S, Underwood L, Pryor J E, Atatoa Carr P E, Grant C C, Morton S M B. (2015). Depression symptoms during pregnancy: Evidence from *Growing Up in New Zealand. Journal of Affective Disorders*. 186: 66–73. doi:10.1016/j.jad.2015.06.009

19. Wall C R, Gammon C S, Bandara D K, Grant C C, Atatoa Carr P E, Morton S M B. (2016). Dietary patterns in pregnancy in New Zealand-influence of maternal socio-demographic, health and lifestyle factors. *Nutrients*. 8(5): 1-16. doi: 10.3390/nu8050300