Improving rates of obesity in New Zealand 4 year old children.

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National SCIENCE Challenges

A BETTER START

E Tipu e Rea

National Science Challenges

There are 11 National Science Challenges

These represent the biggest science-based issues and opportunities facing New Zealand

A better start aims to improve the potential for young New Zealanders to have healthy and successful lives

A Better Start is funded by the Ministry of Business, Innovation and Employment

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BIG DATA

OBESITY

MENTAL HEALTH

LITERACY

National Science Challenges

- Big Data Theme:

Nichola Shackleton, Barry Milne, Rick Audas, Tong Zhu, **Barry Taylor**

- Obesity Theme:

José Derraik, Rachael Taylor, Susan Morton, Marewa Glover, **Wayne Cutfield**

BIG DATA

OBESITY

MENTAL HEALTH

LITERACY

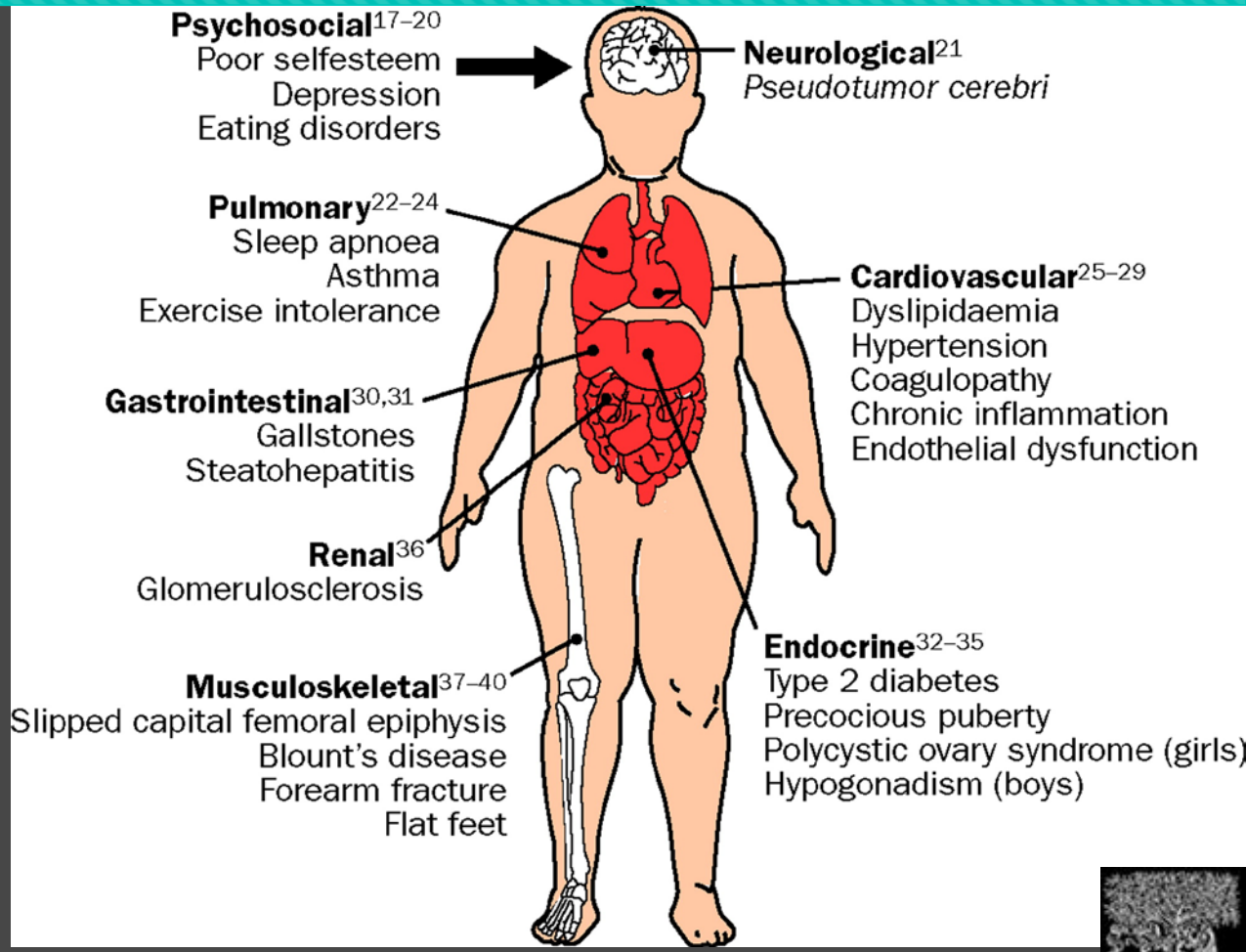
Background
What we know from international literature

1. Evidence from Europe, the USA and Australia suggest stabilising/decreasing prevalence in younger children.
2. Obesity rates continue to increase for children of lower socioeconomic groups, whereas they are stable or decreasing among children of higher socioeconomic status
   (NCMP: White et al (2016) HSE: Stamatakis et al (2010) NHANES & NSCH: Frederick et al (2014))
3. There has been an increasing focus on preventing obesity in early life (during preschool years)
4. Parents of young children frequently underestimate their children's overweight or obese status

Childhood obesity: public-health crisis, common sense cure

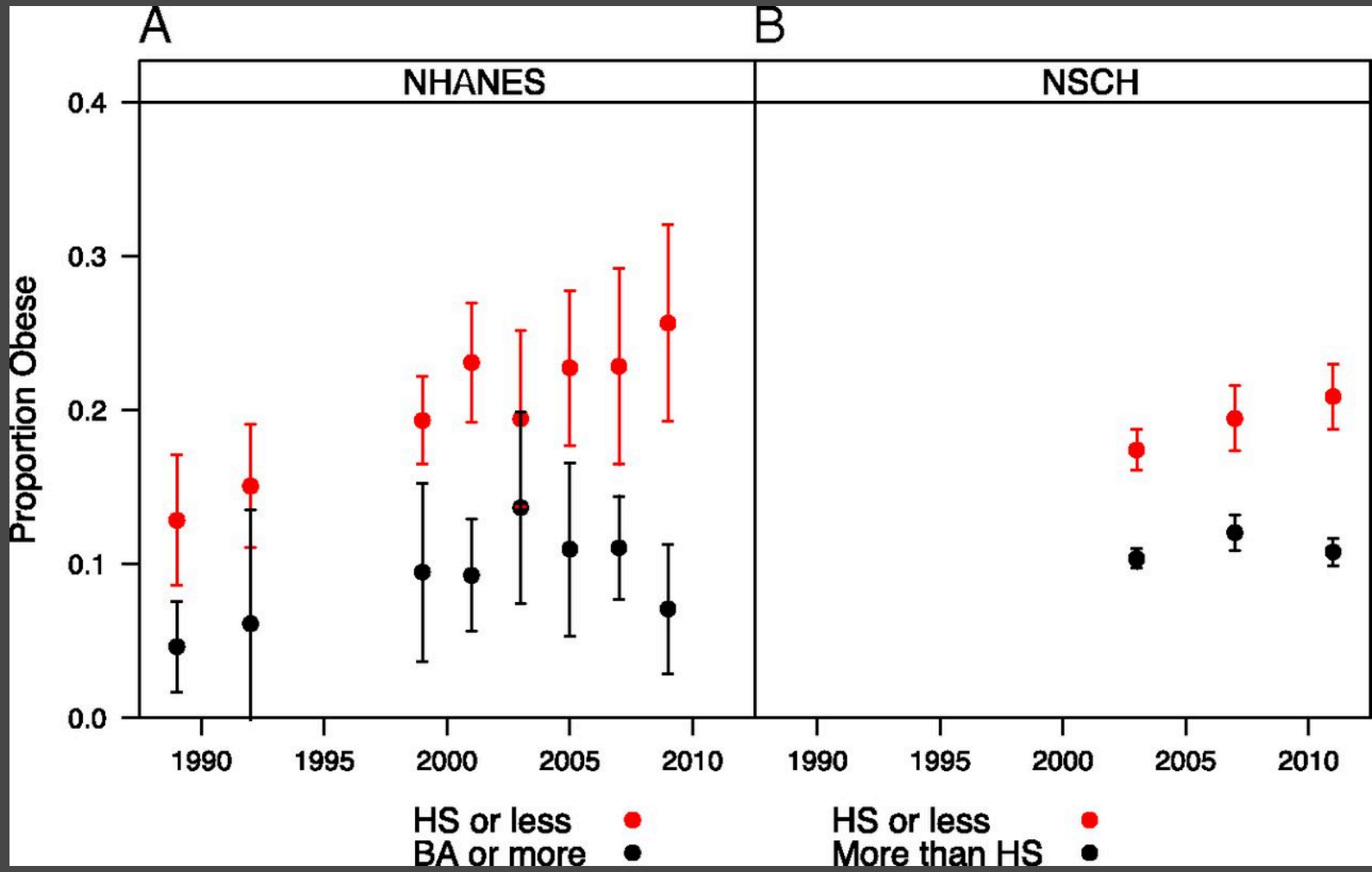
Cara B Ebbeling, PhD, Dorota B Pawlak, PhD, Dr David S Ludwig, MD

The Lancet Volume 360, Issue 9331, Pages 473-482 (August 2002)
DOI: 10.1016/S0140-6736(02)09678-2



Background
What we know from international literature

Trends in obesity among adolescents aged 12–17 y by parental education in the NHANES III (1999–2010) (A) and the NSCH (2003, 2007, and 2011).



Carl B. Frederick et al. PNAS 2014;111:1338-1342

PNAS

Background
What we know from international literature

1. Evidence from Europe, the USA and Australia suggest stabilising/decreasing prevalence in younger children.
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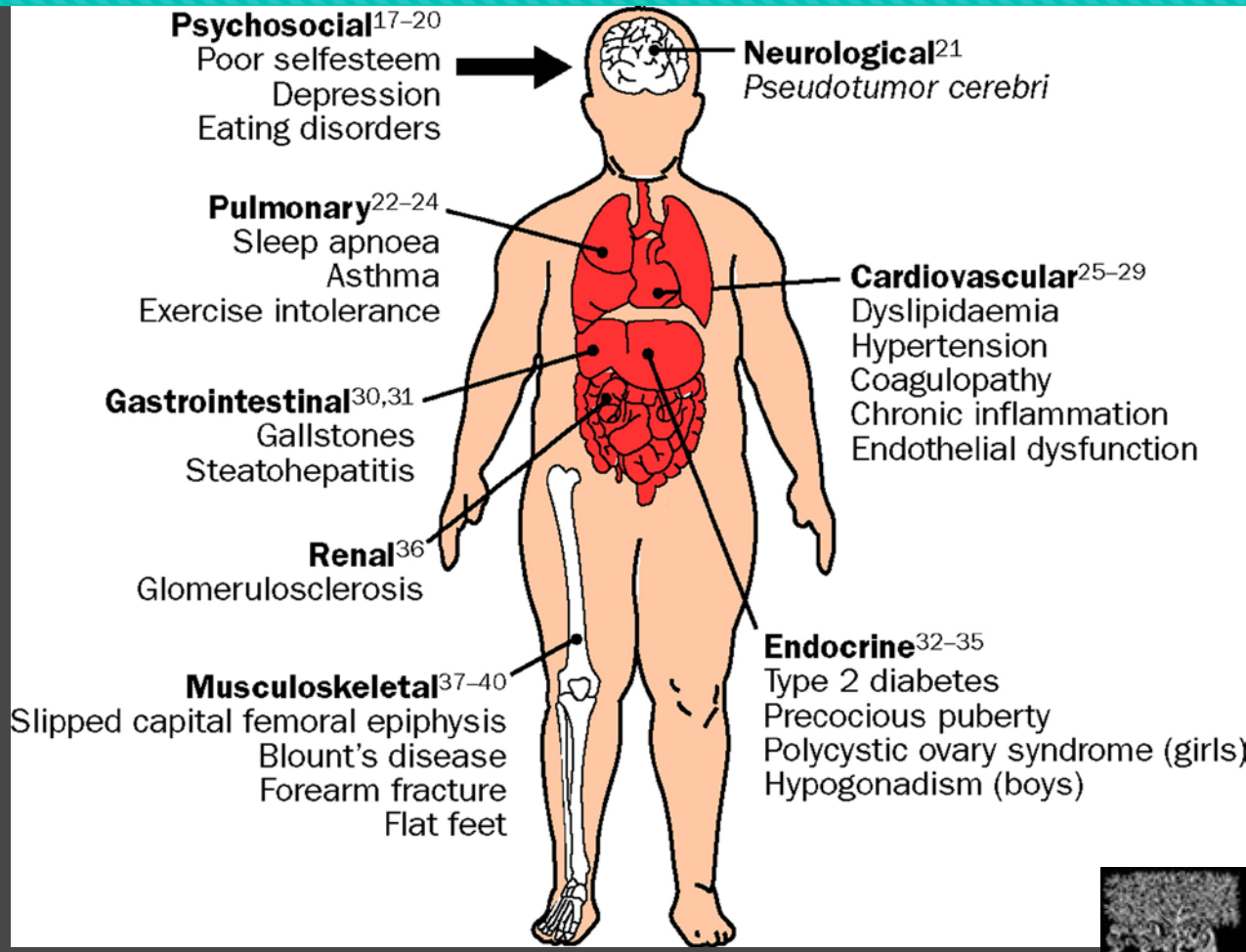
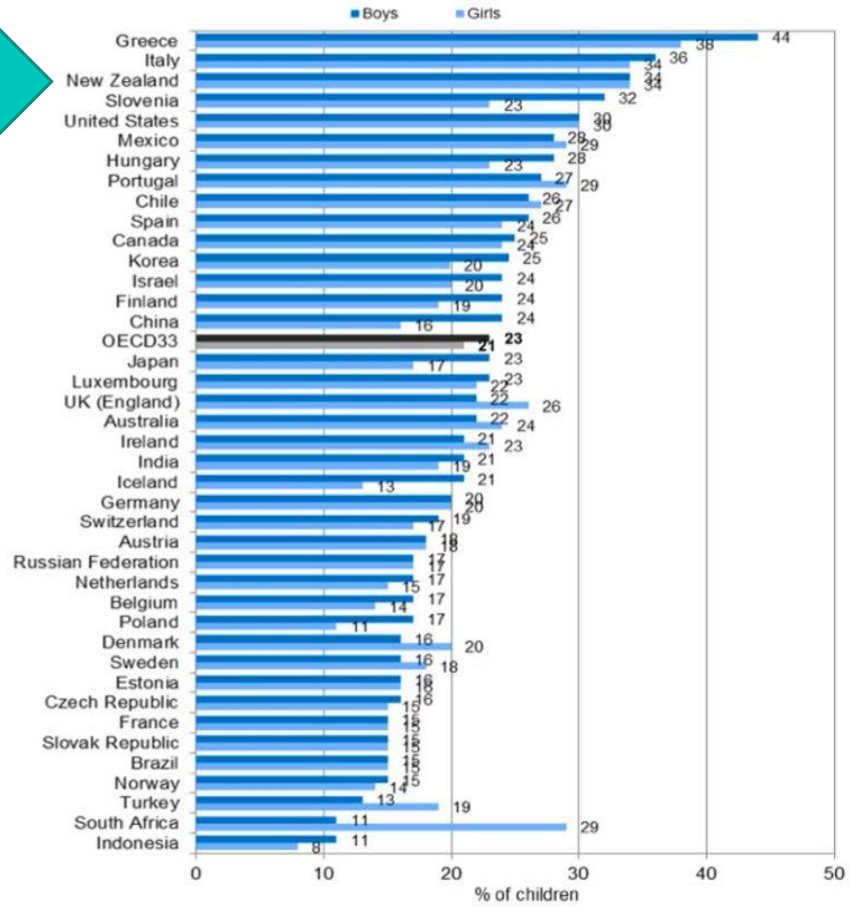


Background
What we know about NZ

1. The prevalence rates of childhood overweight and obesity in New Zealand are amongst the highest in the world.
2. National Health Survey data estimate that 22% of children aged 2-14 years are classified as overweight, and a further 11% are classified as obese
3. Rates of obesity in New Zealand are particularly high amongst those living in the most deprived areas, Pacific children, and Māori children.
4. However, these data were obtained on relatively small cohorts of children and adolescents, and we know little about trends in obesity amongst younger children in New Zealand.

Number 3

Figure 4. Measured overweight (including obesity) among children aged 5-17, 2010 or nearest year



Source: International Association for the Study of Obesity, 2013; Bös et al. (2004).

Background
What we can add

The B4 School Check data is integrated into the IDI

- Established September 2008 (we use 2010/2011 to 2015/2016)
- Eligible children are those who are enrolled with a PHO on their 4th birthday- target is 90% of eligible children
- coverage between 72-92%
- We can link to better quality ethnicity information (census/DIA)
- We have the numbers to look at ethnic subgroups

B4 School Check

The B4 School Check is a nationwide programme offering a free health and development check for 4-year-olds.

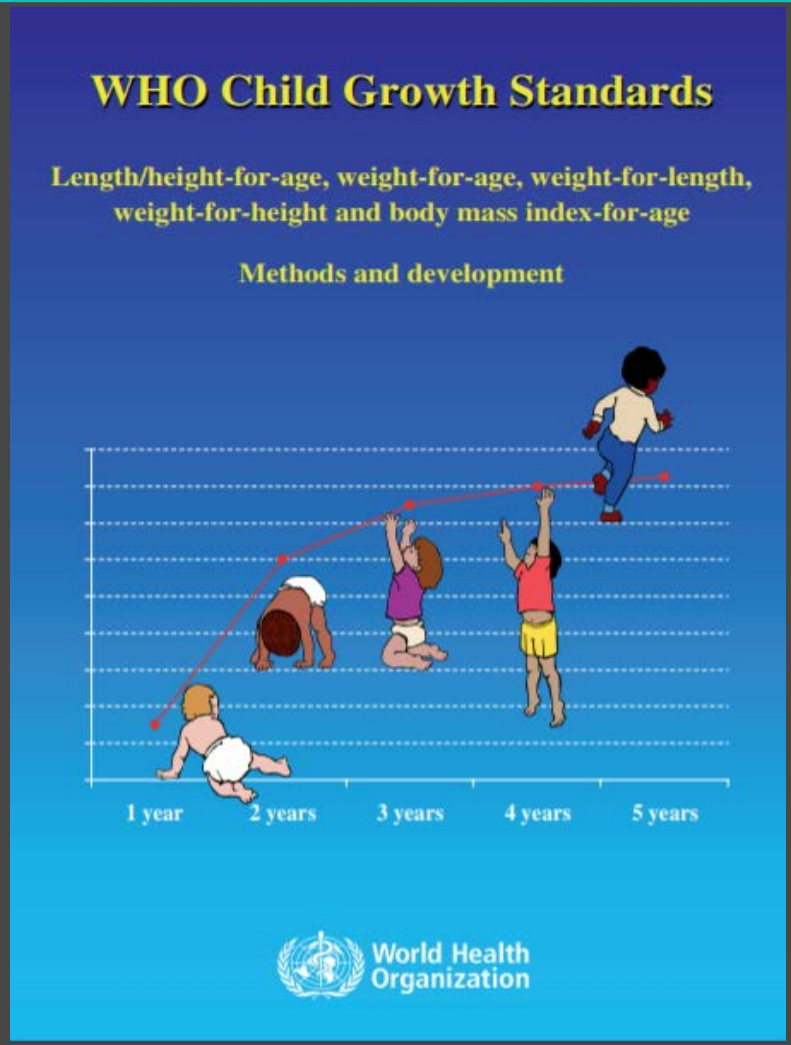
The B4 School Check aims to identify and address any health, behavioural, social, or developmental concerns which could affect a child's ability to get the most benefit from school, such as a hearing problem or communication difficulty.

It is the 12th core contact of the Well Child Tamariki Ora Schedule of services.

http://www.health.govt.nz/our-work/life-stages/child-health/b4-school-check

Data Preparation & measures

- Restricted data to:
  - those ages 48-60 months
  - Fiscal years 2010/2011 – 2015/2016
- Sample:
  - Height and weight for 319,101 children
    - measured in light clothing, shoes removed, equipment on stable levelled hard surface to the nearest 0.1 cm and 0.1 kg
  - 84% of the 379 080 Estimated Resident Population of 4-year-olds
  - 1 803 individuals (0.6% of the sample) were excluded due to extreme BMI (<-5 SDS,>5 SDS)
  - analytic sample of **317 298** children
- Linked to other data
  - Census, source_ranked_ethnicity table, Address notification
- WHO Anthro package used to calculate ZBMI
  - Overweight: ≥ 85th percentile
  - Obesity: ≥ 95th percentile
  - Extreme Obesity ≥ 99.7th percentile



Disclaimer

- Access to the data used in this study was provided by Statistics New Zealand under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the authors, not Statistics NZ.

Describing the sample

	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
n[a]	45285	50469	50331	58029	56643	56541
MoH coverage rate (%)	72	79	80	91	92	92
Gender (%)						
Male	50.8	51.3	51.6	51.4	51.1	51.2
Female	49.2	48.7	48.4	48.6	48.9	48.8
Ethnicity (%)						
European	74.0	72.2	72.5	71.2	69.8	69.1
Māori	27.0	25.9	26.0	25.9	26.1	25.8
Pacific overall	12.5	13.4	13.2	13.9	14.3	14.1
-Samoan	6.0	6.7	6.4	6.7	6.7	6.4
-Tongan	2.7	3.0	3.1	3.4	3.3	3.4
-Cook Island Māori	3.0	3.0	3.1	3.1	3.3	3.2
Asian overall	9.8	11.8	12.2	13.1	14.7	15.9
-Indian	3.6	4.2	4.3	4.4	4.6	4.5
-Chinese	2.7	3.6	3.8	4.0	4.7	5.1

[a] *randomly rounded to a base of 3, as per the confidentiality rules of Statistics New Zealand.*

[b] *Ethnic groups are not mutually exclusive, a child can be classified as belonging to multiple ethnicities.*

Describing the sample

	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Deprivation (NZDep) (%)						
quintile 1 (least deprived)	18.3	18.9	19.0	19.3	18.8	19.6
quintile 2	17.4	18.0	18.3	18.0	18.7	18.5
quintile 3	18.2	17.9	18.2	18.6	18.2	18.3
quintile 4	19.0	18.7	19.4	19.3	19.5	19.0
quintile 5 (most deprived)	25.0	24.7	24.1	24.5	24.6	24.2
Area (%)						
Urban	85.2	86.2	86.2	87.2	87.1	87.4
Rural	14.8	13.8	13.8	12.8	12.9	12.6

Results: Overall Prevalence rates

- prevalence rates for overweight decreased by 2.2 percentage points [1.8-2.5], from 35 to 32.8%
- Prevalence rates for obesity decreased by 2.0 percentage points [1.8-2.2], from 16.9 to 14.9%
- extreme obesity decreased by 0.6 [0.4-0.6] percentage points, from 3.5 to 2.9%
- evidence for a decreasing linear trend for overweight (slope=-0.38), obesity (slope=-0.35) and extreme obesity (slope=-0.12)

	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	Trend (RR)
Overweight	35.0	34.3	33.5	33.3	33.6	32.8	0.989
	(34.8, 35.2)	(34.1, 34.5)	(33.3, 33.7)	(33.2, 33.4)	(33.5, 33.7)	(32.7, 33.0)	(0.988, 0.990)
Obesity	16.9	16.1	15.6	15.3	15.5	14.9	0.979
	(16.7, 17.0)	(15.9, 16.2)	(15.4, 15.7)	(15.2, 15.4)	(15.4, 15.6)	(14.8, 14.9)	(0.977, 0.980)
Extreme obesity	3.5	3.4	3.2	3.2	3.0	2.9	0.966
	(3.4, 3.5)	(3.4, 3.5)	(3.2, 3.3)	(3.2, 3.3)	(3.0, 3.1)	(2.9, 3.0)	(0.962, 0.970)

Results: Gender

		2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	Trend (RR)
Overweight	Male	39.1	38.1	37.2	36.7	36.9	36.2	0.986
		(38.8, 39.4)	(37.8, 38.4)	(36.9, 37.4)	(36.5, 36.8)	(36.7, 37.0)	(36.1, 36.4)	(0.985, 0.988)
	Female	30.8	30.3	29.5	29.7	30.3	29.3	0.993
		(30.5, 31.1)	(30.1, 30.6)	(29.3, 29.8)	(29.5, 29.8)	(30.1, 30.4)	(29.2, 29.5)	(0.991, 0.995)
Obesity	Male	19.6	18.5	17.9	17.4	17.6	17.1	0.976
		(19.3, 19.8)	(18.2, 18.7)	(17.7, 18.1)	(17.3, 17.5)	(17.5, 17.8)	(16.9, 17.2)	(0.974, 0.978)
	Female	14.1	13.5	13.1	13.0	13.2	12.5	0.982
		(13.9, 14.3)	(13.3, 13.7)	(12.9, 13.3)	(12.9, 13.1)	(13.1, 13.3)	(12.4, 12.7)	(0.979, 0.985)
Extreme Obesity	Male	4.0	4.0	3.7	3.7	3.4	3.2	0.957
		(3.9, 4.1)	(3.9, 4.1)	(3.6, 3.8)	(3.7, 3.8)	(3.4, 3.5)	(3.2, 3.3)	(0.952, 0.962)
	Female	2.9	2.8	2.7	2.7	2.6	2.6	0.978
		(2.8, 3.0)	(2.7, 2.9)	(2.6, 2.8)	(2.6, 2.7)	(2.6, 2.7)	(2.5, 2.6)	(0.972, 0.984)

Results: Major Ethnic Groups - Overweight

	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	Trend (RR)
European	32.2	31.7	30.8	30.4	31.3	30.8	0.993
	(32.0, 32.5)	(31.5, 31.9)	(30.5, 31.0)	(30.3, 30.6)	(31.2, 31.5)	(30.7, 31.0)	(0.991,0.994)
Māori	42.2	42.0	41.6	41.4	41.9	41.1	0.996
	(41.8, 42.6)	(41.6, 42.4)	(41.2, 42.0)	(41.1, 41.6)	(41.6, 42.1)	(40.9, 41.3)	(0.994,0.998)
Pacific	55.4	54.0	54.6	54.8	53.4	52.4	0.991
	(54.7, 56.0)	(53.5, 54.5)	(54.1, 55.1)	(54.5, 55.2)	(53.1, 53.7)	(52.1, 52.7)	(0.989,0.993)
Asian	22.8	23.0	21.0	21.4	20.8	20.4	0.977
	(22.2, 23.4)	(22.5, 23.5)	(20.5, 21.4)	(21.1, 21.7)	(20.6, 21.1)	(20.2, 20.6)	(0.973,0.981)
overall	35.0	34.3	33.5	33.3	33.6	32.8	0.989
	(34.8, 35.2)	(34.1, 34.5)	(33.3, 33.7)	(33.2, 33.4)	(33.5, 33.7)	(32.7, 33.0)	(0.988,0.990)

Decreasing trends in overweight for all ethnic groups. Relative to the initial prevalence, Asian children experienced the largest decrease in prevalence

COMPARE TO TOTAL POPULATION

Results: Major Ethnic Groups - Obese

Largest relative decrease for Asian children. Changes in obesity prevalence largest for Pacific (3.3 [2.4-4.2] percentage points) and Asian (2.8 [2.1-3.5] percentage points) children, compared to the overall population.

	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	Trend (RR)
European	14.2	13.5	12.8	12.5	13.2	12.7	0.983
	(14.0, 14.3)	(13.3, 13.6)	(12.6, 13.0)	(12.4, 12.6)	(13.1, 13.3)	(12.6, 12.8)	(0.981,0.985)
Māori	22.2	20.9	21.0	20.4	20.9	20.0	0.985
	(21.8, 22.6)	(20.6, 21.2)	(20.6, 21.3)	(20.3, 20.6)	(20.7, 21.1)	(19.8, 20.2)	(0.982,0.988)
Pacific	33.5	31.8	32.9	31.8	30.1	30.2	0.980
	(32.8, 34.1)	(31.3, 32.3)	(32.4, 33.4)	(31.5, 32.1)	(29.9, 30.4)	(29.9, 30.5)	(0.977,0.983)
Asian	10.9	10.8	10.3	9.3	8.8	8.1	0.938
	(10.4, 11.3)	(10.5, 11.2)	(9.9, 10.6)	(9.1, 9.5)	(8.7, 9.0)	(7.9, 8.3)	(0.932,0.944)
overall	16.9	16.1	15.6	15.3	15.5	14.9	0.979
	(16.7, 17.0)	(15.9, 16.2)	(15.4, 15.7)	(15.2, 15.4)	(15.4, 15.6)	(14.8, 14.9)	(0.977,0.980)

Results: Major Ethnic Groups – Extreme obesity

	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	Trend (RR)
European	2.3	2.2	2.1	2.1	2.0	2.0	0.976
	(2.2, 2.3)	(2.1, 2.3)	(2.0, 2.2)	(2.1, 2.2)	(2.0, 2.0)	(2.0, 2.1)	(0.97,0.982)
Māori	5.0	4.7	4.6	4.3	4.5	4.2	0.970
	(4.8, 5.1)	(4.5, 4.9)	(4.5, 4.8)	(4.2, 4.4)	(4.4, 4.6)	(4.1, 4.3)	(0.963,0.976)
Pacific	10.0	9.7	9.7	8.8	8.2	7.9	0.949
	(9.6, 10.4)	(9.4, 10.1)	(9.4, 10.0)	(8.6, 9.0)	(8.0, 8.3)	(7.7, 8.0)	(0.943,0.956)
Asian	2.7	2.5	2.5	2.4	2.0	1.8	0.920
	(2.5, 2.9)	(2.3, 2.7)	(2.3, 2.7)	(2.3, 2.5)	(1.9, 2.1)	(1.7, 1.8)	(0.908,0.932)
overall	3.5	3.4	3.2	3.2	3.0	2.9	0.966
	(3.4, 3.5)	(3.4, 3.5)	(3.2, 3.3)	(3.2, 3.3)	(3.0, 3.1)	(2.9, 3.0)	(0.962,0.970)

Results: Ethnic sub groups

Trends Over time	Overweight	Obese	Extreme Obesity
- Samoan	0.996	0.990	0.969
	(0.993,0.999)	(0.986,0.994)	(0.96,0.978)
- Tongan	0.985	0.966	0.927
	(0.982,0.989)	(0.96,0.971)	(0.917, 0.938)
- Cook Island Māori	0.985	0.982	0.963
	(0.981,0.990)	(0.975,0.988)	(0.948,0.978)
- Indian	0.991	0.961	0.948
	(0.983,0.999)	(0.951,0.972)	(0.928,0.968)
- Chinese	0.984	0.912	0.919
	(0.976,0.991)	(0.901,0.923)	(0.892,0.948)

In the pacific subgroups: Tongan children experienced the largest relative and absolute decrease in the prevalence of obesity and extreme obesity, despite having the highest prevalence rates: Decrease in obesity and extreme obesity of 7.6 and 5.3 percentage points respectively

Results: Ethnic sub groups - Obesity

	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	Trend (RR)
Pacific overall	33.5	31.8	32.9	31.8	30.1	30.2	0.980
	(32.8, 34.1)	(31.3, 32.3)	(32.4, 33.4)	(31.5, 32.1)	(29.9, 30.4)	(29.9, 30.5)	(0.977,0.983)
- Samoan	34.5	33.3	33.8	32.8	31.7	33.2	0.990
	(33.6, 35.4)	(32.6, 34.1)	(33.0, 34.5)	(32.4, 33.3)	(31.2, 32.1)	(32.8, 33.7)	(0.986,0.994)
- Tongan	42.6	37.2	40.0	38.6	34.7	35.0	0.966
	(41.2, 44.0)	(36.1, 38.3)	(38.9, 41.1)	(38.0, 39.3)	(34.1, 35.3)	(34.4, 35.6)	(0.96,0.971)
- Cook Island Māori	29.8	28.3	27.4	27.4	26.7	26.9	0.982
	(28.6, 31.1)	(27.2, 29.3)	(26.4, 28.4)	(26.8, 28.0)	(26.1, 27.3)	(26.4, 27.5)	(0.975,0.988)
Asian overall	10.9	10.8	10.3	9.3	8.8	8.1	0.938
	(10.4, 11.3)	(10.5, 11.2)	(9.9, 10.6)	(9.1, 9.5)	(8.7, 9.0)	(7.9, 8.3)	(0.932,0.944)
- Indian	10.7	10.9	10.7	9.7	8.9	9.2	0.961
	(9.9, 11.4)	(10.2, 11.5)	(10.1, 11.3)	(9.4, 10.1)	(8.6, 9.2)	(8.9, 9.5)	(0.951,0.972)
- Chinese	11.5	10.1	8.4	7.6	8.6	6.6	0.912
	(10.7, 12.4)	(9.5, 10.7)	(7.8, 8.9)	(7.2, 7.9)	(8.3, 8.9)	(6.4, 6.9)	(0.901,0.923)

Results: Deprivation

Children residing in the least deprived areas (quintile 1) experienced greater relative decreases in overweight and obesity than those residing in the most deprived areas

Trends Over time	Overweight	Obese	Extreme Obesity
Quintile 1 (least deprived)	0.988	0.976	0.956
	(0.985,0.991)	(0.97,0.981)	(0.942,0.970)
Quintile 2	0.986	0.969	0.968
	(0.983,0.988)	(0.964,0.974)	(0.956,0.981)
Quintile 3	0.986	0.976	0.975
	(0.983,0.988)	(0.971,0.980)	(0.965,0.986)
Quintile 4	0.991	0.985	0.960
	(0.989,0.994)	(0.981,0.989)	(0.951,0.968)
Quintile 5 (most deprived)	0.995	0.984	0.973
	(0.993,0.996)	(0.982,0.987)	(0.967,0.979)

Results: Deprivation - obesity

	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	Trend (RR)
Quintile 1 (least deprived)	10.8	10.6	9.8	9.6	9.6	9.7	0.976
	(10.5, 11.2)	(10.3, 10.9)	(9.6, 10.1)	(9.4, 9.8)	(9.5, 9.8)	(9.5, 9.9)	(0.97,0.981)
Quintile 2	13.1	12.5	11.7	11.2	11.8	10.9	0.969
	(12.8, 13.5)	(12.1, 12.8)	(11.4, 12.0)	(11.0, 11.3)	(11.7, 12.0)	(10.7, 11.1)	(0.964,0.974)
Quintile 3	15.5	13.4	13.8	13.0	13.7	12.9	0.976
	(15.1, 15.8)	(13.1, 13.8)	(13.5, 14.1)	(12.8, 13.2)	(13.5, 13.9)	(12.7, 13.1)	(0.971,0.980)
Quintile 4	17.9	17.0	16.4	16.8	16.6	16.2	0.985
	(17.5, 18.3)	(16.6, 17.3)	(16.1, 16.7)	(16.6, 17.0)	(16.4, 16.8)	(16.0, 16.4)	(0.981,0.989)
Quintile 5 (most deprived)	24.3	24.1	23.8	23.3	23.3	22.4	0.984
	(23.9, 24.7)	(23.8, 24.5)	(23.4, 24.1)	(23.0, 23.5)	(23.1, 23.5)	(22.2, 22.6)	(0.982,0.987)

Results

- Are downward trends fully explained by changing composition of sample/population?
  - Linear time trends were adjusted for sex, ethnicity, deprivation and area. Overweight RR=0.992[0.990-0.994]; Obesity RR=0.980[0.977-0.983]; extreme obesity RR=0.963[0.956-0.969])
- Was using WHO protocols of (≥-5SD to ≤ 5SD) too restrictive for a NZ population?
  - We found no systematic differences by ethnicity, deprivation, gender or fiscal year for those between +5SDS and +7SDS. including those up to +7SD did not change the overall prevalence to the nearest 1 decimal place, and estimated prevalence by ethnicity and deprivation were within the estimated confidence intervals presented.
- Attendance is not 100%. What if those who do not attend had higher obesity rates?
  - We conducted a sensitivity check considering what would happen to the overall trends if those who did not attend had a 50% higher obesity rate than those who did attend. As attendance rates were lower in the earlier years, this exaggerates the observed downward trend with obesity decreasing from 19.3% in 2010/2011 to 15.5% in 2015/2016.
  - We also considered what would happen with a 50% lower obesity rate among non-attendees. This resulted in stable prevalence estimates across time from 14.5% in 2010/2011 to 14.3% in 2015/2016.

Limitations

- we are unsure of the extent to which protocols for measuring children's height and weight were adhered to for all children
- Māori and Pacific children may have different body compositions for a given BMI compared to other ethnic groups in New Zealand. Our figures may over-estimate obesity in these populations. **BUT** any misclassification of BMI for Māori or Pacific should affect data from all years similarly, so should not affect the overall downward trend.
- In the 2010/2011 fiscal year, the MoH reports very low (35%) uptake of the B4 School Check in Auckland. The rate increased to 65% in 2011/2012 and climbed to 95% in 2015/2016. Based on the characteristics we measured (ethnicity, deprivation, gender), the composition of the 2010/2011 sample appears to be very similar to later years.
- We only captured six years' worth of data, and longer follow-up will provide more confidence in the estimates of change over time

Conclusions

- Our findings support international reports of decreasing child obesity prevalence from developed countries such as the USA, Singapore, some parts of Europe and UK.
- Overweight and obesity rates appear to be on a downward trend among 4-year-old children in New Zealand, and this trend is consistent across socioeconomic and demographic groups.
- This research was only descriptive. Future research will concentrate on unpacking and explaining differentials in prevalence rates across demographic groups and communities, as this is a key issue requiring thorough investigation to better inform future strategies to reduce inequity.

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