THE CONSEQUENCES OF OBESITY

Introduction

Childhood obesity has both short and long term consequences. The short term consequences that affect children's quality of life are largely limited to severely obese children. They include sleep problems, asthma, type 2 diabetes, orthopaedic disorders (including slipped upper femoral epiphysis) and psychological and social distress [1]. In addition, a number of early markers for coronary artery disease are measureable in obese children including elevated blood pressure and cholesterol [2]. The long term consequences are mainly related to the fact that obese children have a high probability of becoming obese adults, with the consequent increased risks of metabolic syndrome, type 2 diabetes and cardiovascular disease [3].

There is no routinely collected information on the consequences of obesity in children and young people. However, a small number of children and young people do come into contact with the hospital system for obesity related conditions including those hospitalised for type 2 diabetes, slipped upper femoral epiphysis and bariatric surgery. The following section reviews the data available for each of these conditions.

TYPE 2 DIABETES

Introduction

Type 2 diabetes is one of the most serious complications of childhood obesity [4]. Most overweight children have significant metabolic abnormalities due to insulin resistance, even if they have no evidence of type 2 diabetes [5]. In Auckland, the incidence of type 2 diabetes in children 0–14 years increased five-fold between 1995 and 2007, from 0.5 per 100,000 to 2.5 per 100,000 (representing about 10% of all new cases of diabetes among children and adolescents in the Auckland region) [6]. The average annual incidence over the period was 1.3 per 100,000, with rates being 0.1 per 100,000 for European children and 3.4 per 100,000 for Māori and Pacific children [6]. Unlike type 1 diabetes, type 2 diabetes is often asymptomatic and therefore diagnosis requires laboratory testing.

The following section reviews hospital admissions in children and young people aged 0–24 years with type 2 diabetes mentioned in any of their first 15 diagnoses.

Data Source and Methods

Definition

1. *Hospital admissions for children and young people aged 0–24 years with type 2 diabetes listed in any of their first 15 diagnoses*
2. *Mortality for children and young people aged 0–24 years with type 2 diabetes listed as the main underlying cause of death or as a contributory cause*

Data Source

1. National Minimum Dataset

Numerator: Hospital admissions for children and young people aged 0–24 years with type 2 diabetes (ICD-10-AM E11) listed in any of the first 15 diagnoses.

2. National Mortality Collection

Numerator: Mortality in children and young people aged 0–24 years with type 2 diabetes (ICD-10-AM E11) listed as the main underlying cause of death, or as a contributory cause.

Denominator: Statistics New Zealand Estimated Resident Population (projected from 2007).

Notes on Interpretation

Note 1: This analysis focuses on hospital admissions and mortality for children and young people with type 2 diabetes listed in any of the first 15 diagnoses, or as the main underlying, or a contributory cause of death. The rationale for looking beyond the primary diagnosis was the need to highlight the spectrum of health issues experienced by those with type 2 diabetes, and their consequent requirement for health services.

Note 2: As the majority of those with type 2 diabetes are managed in the outpatient or primary care setting, it is likely that this analysis significantly underestimates the number of children and young with type 2 diabetes. This is supported by the finding that during 2008–2012, over three-quarter of hospitalisations for children and young people with type 2 diabetes were for reasons other than their diabetes. Thus if they had not been admitted for another reason, their type 2 diabetes would have gone unrecorded in the hospital admission dataset. The rationale for the methodology used however, was the absence of other more reliable sources of information on the number of children and young people with type 2 diabetes in the community.

Note 2: The admission rates presented here differ to those presented previously due to a change between ICD-10-AM Version 3 and 6 which tightened up the way diabetes was assigned as an additional diagnosis. With the introduction of Version 6 in July 2008, new criteria were introduced for coding diabetes as a secondary diagnosis in the presence of another condition. In this analysis, this resulted in the loss of a number of cases where the primary diagnosis was cystic fibrosis, but type 2 diabetes was recorded as a secondary code. While these changes have been taken into account in back mapping (which is why overall rates are lower in trend analysis than previously), it is likely that the changes were also responsible for the drop off in type 2 diabetes admissions which occurred in 2008–09, immediately after the introduction of ICD-10-AM V6.

Note 3: The terminology used to describe diabetic complications differs to that used previously due to changes in the way ICD-10-AM Version 6 deals with coma and ketoacidosis. Previous ICD-10-AM versions included two sub-categories: diabetes with coma and diabetes with ketoacidosis without coma. In ICD-10-AM Version 6 ketoacidosis and lactic acidosis are grouped together, with additional digit extensions being used to identify the presence or absence of coma. Thus earlier reports grouped admissions into type 2 diabetes with coma and type 2 diabetes with ketoacidosis, whereas in this report, these have been combined into the category *Type 2 Diabetes with Ketoacidosis/Lactic Acidosis +/− Coma*.

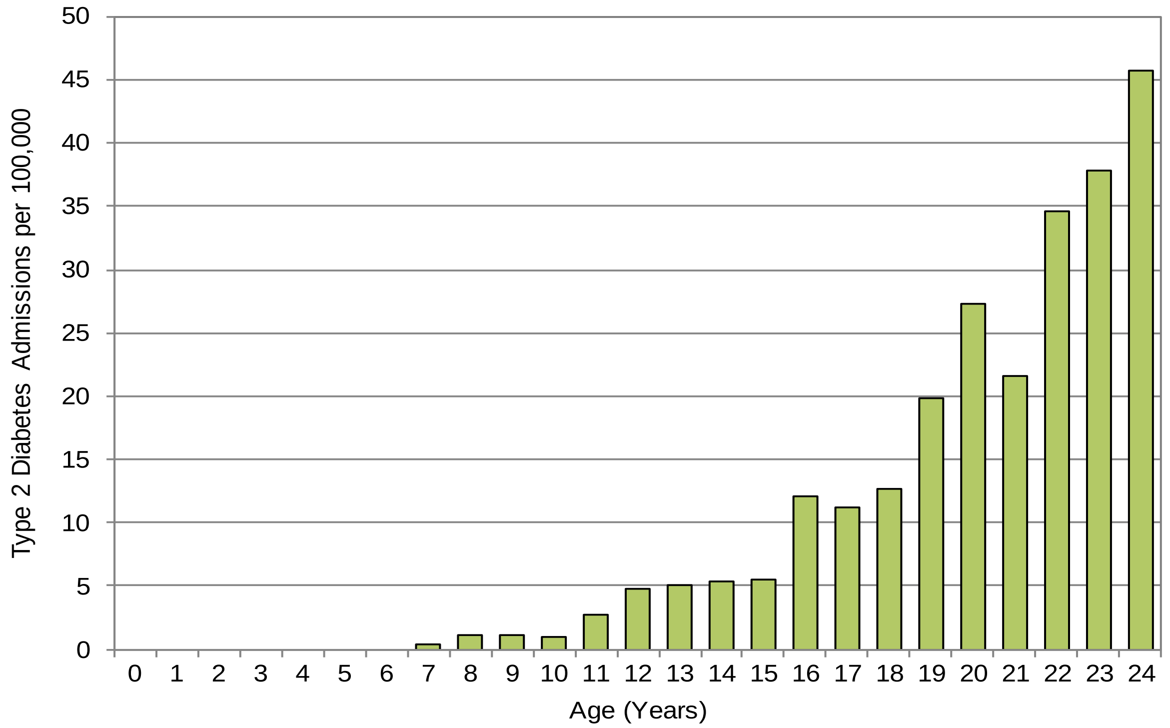
Note 4: If no mention of type 2 diabetes was made in any of the first 15 diagnoses, these cases were not included, even if the patient had been assigned a diabetes related code on a previous admission.

New Zealand Distribution and Trends

Distribution by Age

In New Zealand during 2008–2012, hospitalisations for children and young people with type 2 diabetes were infrequent during childhood, but increased thereafter, with the highest rates being seen in those in their early twenties (**Figure 1**). During 2006–2010, four young people had type 2 diabetes listed as the main underlying cause of death, or as a contributory cause, with all deaths being in young people over 15 years of age.

Figure 1. Hospital Admissions for Children and Young People with Type 2 Diabetes by Age, New Zealand 2008–2012



Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with type 2 diabetes listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007)

Table 1. Hospital Admissions in Children and Young People Aged 0–24 Years with Type 2 Diabetes by Primary Diagnosis, New Zealand 2008–2012

Primary Diagnosis	Number of Admissions: Total 2008−2012	Number of Admissions: Annual Average	Rate per 100,000 Population	% of Admissions in those with Type 2 Diabetes
Type 2 Diabetes				
Diagnoses other than Type 2 Diabetes*	616	123.2	8.07	78.8
Type 2 Diabetes without Complications	32	6.4	0.42	4.1
Type 2 Diabetes with Multiple Complications	29	5.8	0.38	3.7
Type 2 Diabetes with Ketoacidosis/Lactic Acidosis +/− Coma	16	3.2	0.21	2.0
Type 2 Diabetes with Renal Complications	6	1.2	0.08	0.8
Type 2 Diabetes with Ophthalmic Complications	6	1.2	0.08	0.8
Type 2 Diabetes with Unspecified Complications	3	0.6	0.04	0.4
Type 2 Diabetes with Other Specified Complications	74	14.8	0.97	9.5
Total Type 2 Diabetes Admissions	782	156.4	10.24	100.0
*Conditions Contributing to Diagnoses other than Type 2 Diabetes				
Pregnancy Childbirth Post-Partum	134	26.8	1.75	17.1
Skin Infections	54	10.8	0.71	6.9
Diseases of the Respiratory System	50	10.0	0.65	6.4
Injury and Poisoning	36	7.2	0.47	4.6
Schizophrenia	23	4.6	0.30	2.9
Other Mental Health Issues	25	5.0	0.33	3.2
Cardiovascular Diseases	24	4.8	0.31	3.1
Abdominal and Pelvic Pain	21	4.2	0.28	2.7
Gastroenteritis	20	4.0	0.26	2.6
Other Infectious Diseases	18	3.6	0.24	2.3
Complications Medical Surgical Care	17	3.4	0.22	2.2
All Other Diagnoses	194	38.8	2.54	24.8
Total Other Diagnoses	616	123.2	8.07	78.8

Source: Numerator: National Minimum Dataset, hospital admissions by primary diagnosis for children and young people with type 2 diabetes listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007)

Distribution by Primary Diagnosis

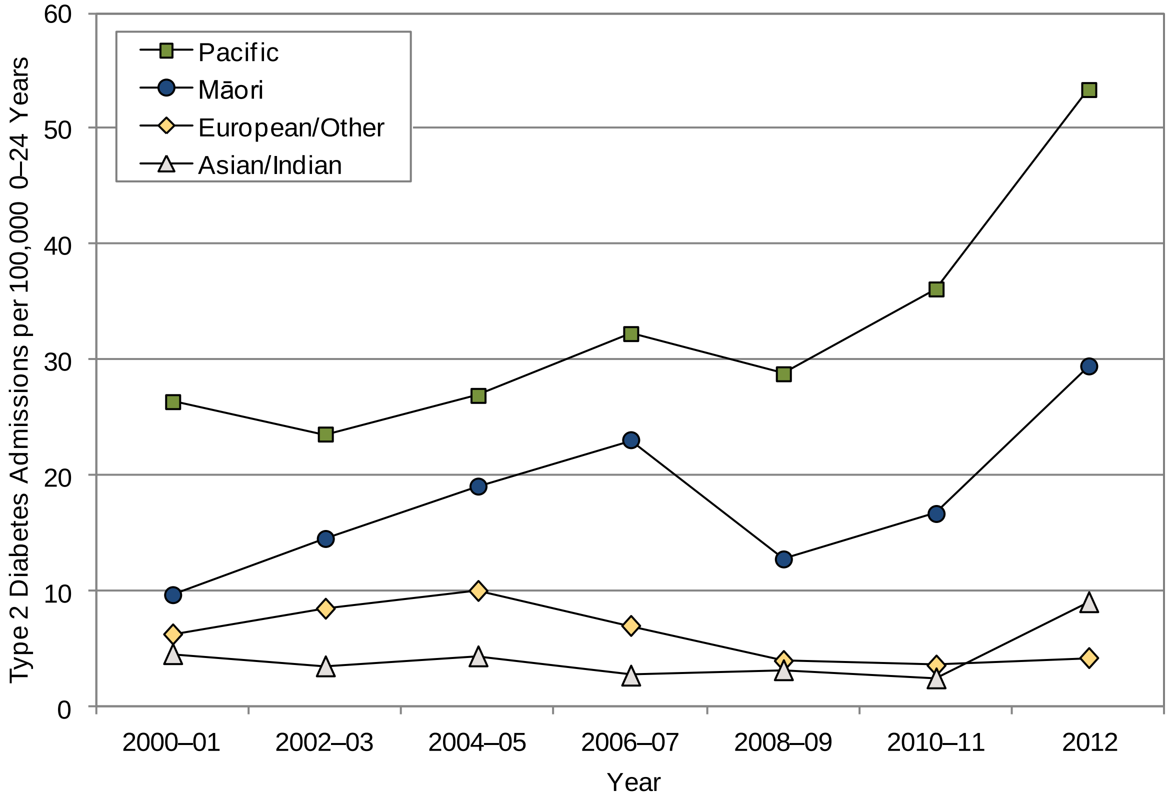
In New Zealand during 2008–2012, 21.2% of hospital admissions for children and young people with type 2 diabetes in any of their first 15 diagnoses had a diabetes related code listed as their primary diagnosis. The remaining 78.8% of admissions had non-diabetes related primary diagnoses, with pregnancy and childbirth (17.1%), skin infections (6.9%) and diseases of the respiratory system (6.4%) being the leading non-diabetes related reasons for admission (**Table 1**).

Table 2. Hospital Admissions for Children and Young People Aged 0–24 Years with Type 2 Diabetes by Ethnicity and Gender, New Zealand 2008–2012

Variable	Rate	Rate Ratio	95% CI	Variable	Rate	Rate Ratio	95% CI
Type 2 Diabetes							
Asian/Indian	4.16	1.07	0.75–1.53	Female	14.51	1.00	
European/Other	3.89	1.00		Male	6.18	0.43	0.37–0.50
Māori	17.76	4.56	3.78–5.51				
Pacific	36.83	9.46	7.79–11.49				

Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with type 2 diabetes listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007); Note: Ethnicity is Level 1 Prioritised; Rate is per 100,000 population

Figure 2. Hospital Admissions for Children and Young People Aged 0–24 Years with Type 2 Diabetes by Ethnicity, New Zealand 2000–2012



Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with type 2 diabetes listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007); Note: Ethnicity is Level 1 Prioritised; Note: See Note 2 in Methods box regarding cautions in interpreting time series information as a result of a change in the way diabetes codes were assigned in 2008.

Distribution by Ethnicity and Gender

In New Zealand during 2008–2012, hospital admissions for those with type 2 diabetes were *significantly* higher for females and for Pacific > Māori > Asian/Indian and European/Other children and young people (**Table 2**). Similar ethnic differences were seen during 2000–2012, with admission rates increasing for Pacific and Māori children and young people during this period (**Figure 2**).

South Island DHBs Distribution and Trends

South Island Distribution

In the South Island during 2008–2012, 3 Nelson Marlborough, 3 South Canterbury, 27 Canterbury, <3 West Coast, 7 Otago and 7 Southland children and young people were hospitalised with a diagnosis of type 2 diabetes. Admission rates per 100,000 in Nelson Marlborough, Canterbury, Otago and Southland were *significantly* lower than the New Zealand rate, while in South Canterbury, while lower, rates were not *significantly* different from the New Zealand rate. In the West Coast small numbers prevented a valid comparison (**Table 3**).

South Island Trends

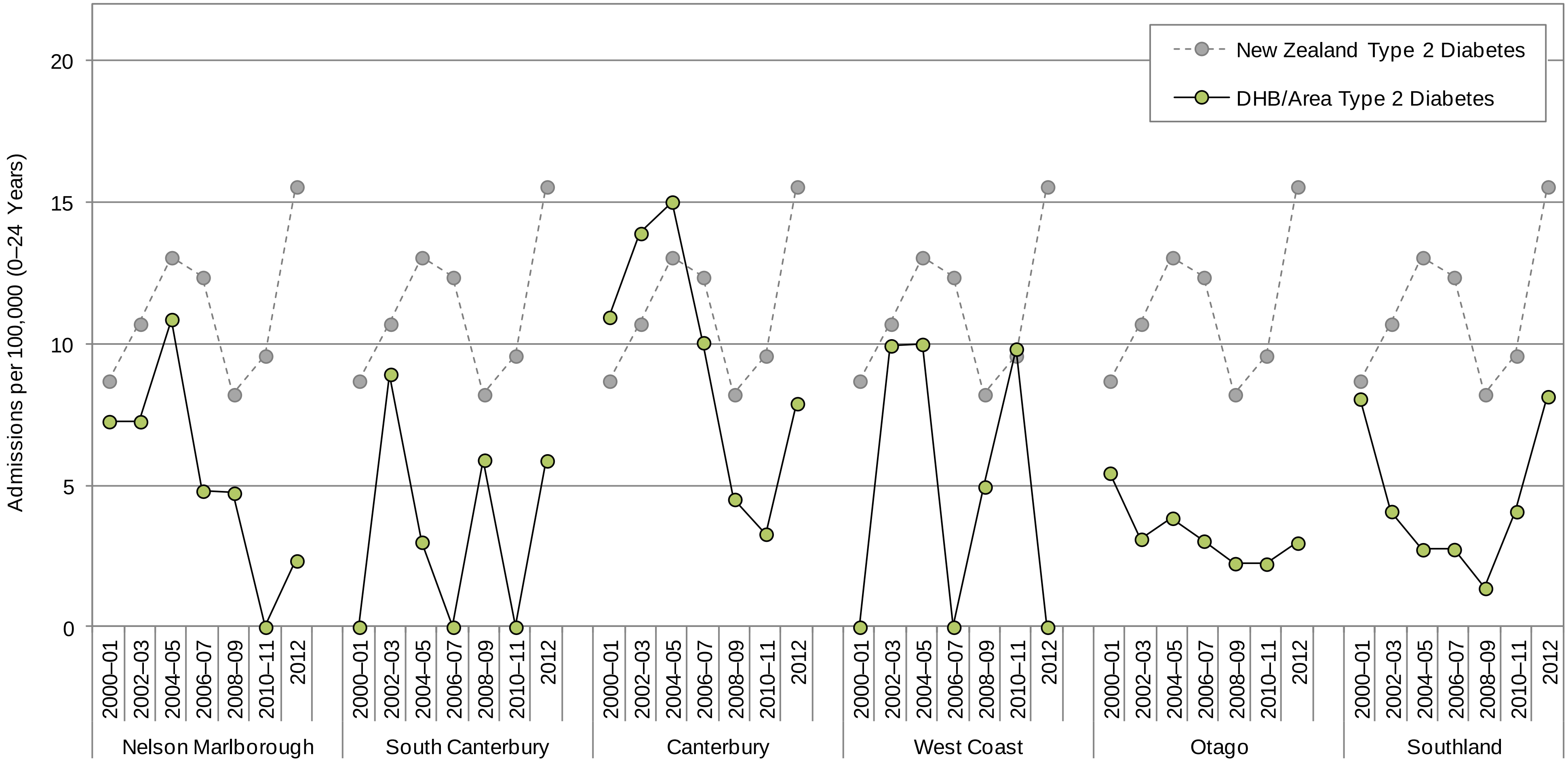
In the South Island DHBs during 2000–2012, large year to year variations (likely as a result of small numbers) made individual DHB's trends in admission rates difficult to interpret. However, rates in Nelson Marlborough, South Canterbury, the West Coast and Otago and Southland were lower than the New Zealand rate throughout this period (**Figure 3**).

Table 3. Hospital Admissions for Children and Young People Aged 0–24 Years with Type 2 Diabetes, South Island DHBs vs. New Zealand 2008–2012

DHB/Area	Total Number of Individuals 2008−2012		Total Number of Admissions 2008−2012	Average Number of Admissions per Individual per Year	Admission Rate per 100,000 Population	Rate Ratio	95% CI
	A*	B*					
Type 2 Diabetes							
Nelson Marlborough	3	3	5	0.33	2.35	0.23	0.10–0.55
South Canterbury	3	3	3	0.20	3.52	0.34	0.11–1.07
Canterbury	26	27	39	0.29	4.69	0.46	0.33–0.63
West Coast	<3	<3	s	s	s	s	s
Otago	7	7	8	0.23	2.38	0.23	0.12–0.47
Southland	5	6	7	0.23	3.82	0.37	0.18–0.78
New Zealand	439		782	0.36	10.24	1.00	

Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with type 2 diabetes listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007); Note: A*: Each individual only counted once in DHB in which they first reside (DHB total = NZ total); B*: Each individual counted once in each DHB in which they reside (sum of DHB totals exceeds NZ total). Rate Ratios are compared to NZ rate and have not been adjusted for population demographics; s: suppressed due to small numbers

Figure 3. Hospital Admissions for Children and Young People Aged 0–24 Years with Type 2 Diabetes, South Island DHBs vs. New Zealand 2000–2012



Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with type 2 diabetes listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007); Note: See Note 2 in Methods box regarding cautions in interpreting time series information as a result of a change in the way diabetes codes were assigned in 2008

Slipped Upper Femoral Epiphysis

Introduction

The long bones in children's arms and legs grow from areas of cartilage near the ends of the bones, known as the growth plates or physes (singular physis). The upper femoral epiphysis is the rounded upper end of the thigh bone that forms part of the hip joint. There is a growth plate between the upper femoral epiphysis and the femoral shaft (the long part of the bone, known as the diaphysis). A slipped upper femoral epiphysis (SUFE), occurs when the femoral head is displaced from the shaft at the growth plate to a variable degree [7]. The term SUFE is a little misleading since the head of the femur remains in its normal position in the acetabulum (socket) of the pelvis while the rest of the femur has moved upwards, forwards and laterally from its normal position.

SUFE is one of the most common hip disorders in adolescents and it affects 10–60 per 100,000 children and adolescents per year [8,9]. The peak age of incidence is around 13 years for boys and 11 years for girls, and rates are higher in boys. It is more common in the left hip than the right, although in 20–40% of cases both hips are affected. A study of 211 children admitted to Starship Children's Hospital with SUFEs between 1988 and 2000 estimated that, compared to European children, Māori children had admission rates 4.2 times higher and Pacific children 5.6 times higher [10].

The causes of SUFE are unclear but obesity is a significant risk factor, especially for bilateral SUFEs [11]. One study done in New York found that 81.1% of 106 children with a SUFE on x-ray had a BMI above the 95th percentile, compared to 41.1% of the 46 children who had a hip x-ray for hip pain but did not have a SUFE [12].

SUFE usually develops gradually with no apparent precipitating injury but it may follow a fall or sports injury or occur acutely with severe pain [8]. The signs and symptoms include pain in the hip, groin or knee, altered gait and limping. "Stable" SUFEs (>90% of all SUFEs) permit the patient to walk with or without crutches but a patient with an "unstable" SUFE cannot walk at all [13].

Treatment involves orthopaedic surgery to ensure stability across the growth plate by fixing the epiphysis in situ with pins or a screw [13]. The most severe complication of SUFE treatment, which is mostly associated with unstable SUFEs, is avascular necrosis of the femoral head (death of part of the bone as a result of interruption to its blood supply) which leads to early development of severe osteoarthritis of the hip, ultimately necessitating hip replacement. Treatment may also be associated with damage to the articular cartilage (chondrolysis) in the hip joint. The incidence of this complication has reportedly decreased with improvements in surgical techniques.

The following section reviews hospital admissions in children and young people aged 0–24 years with a slipped upper femoral epiphysis mentioned in any of their first 15 diagnoses.

Data Source and Methods

Definition

1. *Hospital admissions for children and young people aged 0–24 years with a slipped upper femoral epiphysis (SUFE) listed in any of their first 15 diagnoses*

Data Source

1. National Minimum Dataset

Numerator: Hospital admissions for children and young people aged 0–24 years with a slipped upper femoral epiphysis (non-traumatic) (ICD-10-AM M93.0) listed in any of the first 15 diagnoses.

Denominator: Statistics New Zealand Estimated Resident Population (projected from 2007).

New Zealand Distribution and Trends

Distribution by Primary Diagnosis and Procedure

In New Zealand during 2008–2012, 96.3% of hospitalisations for children and young people aged 0–24 years with a slipped upper femoral epiphysis listed in any of their first 15 diagnoses, had SUFE listed as the primary reason for admission.

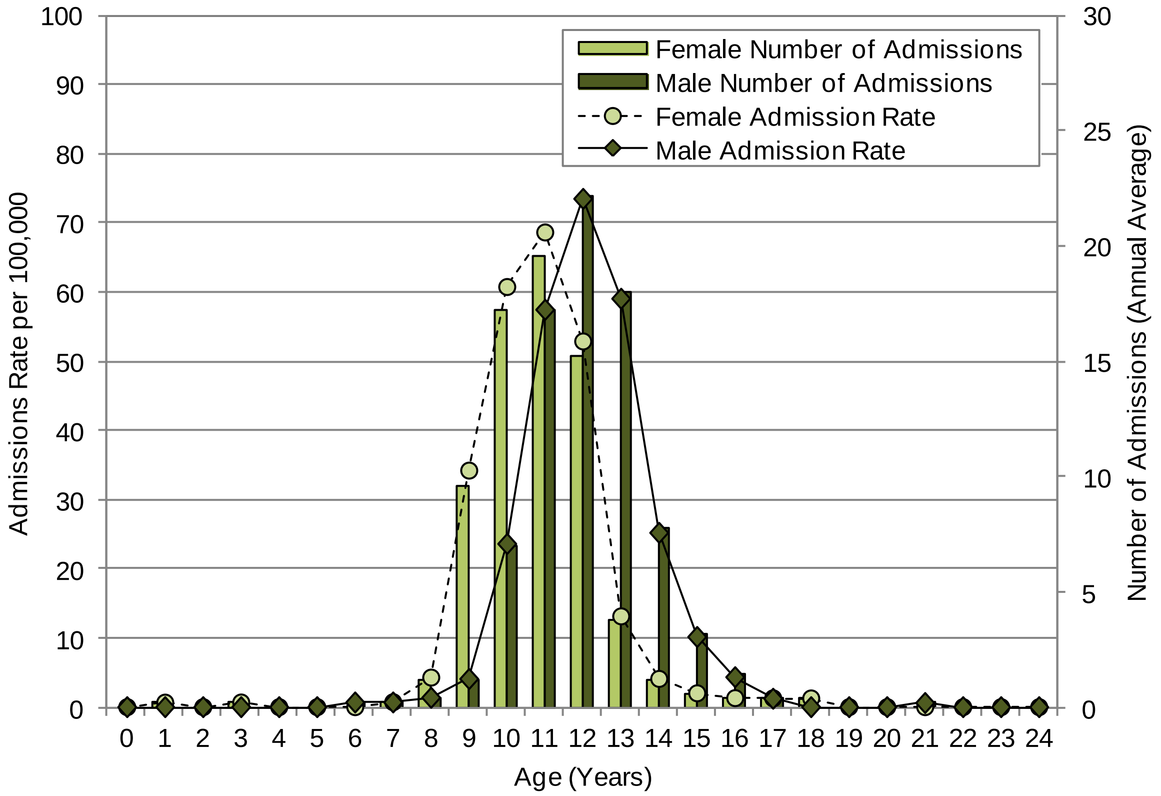
Of the 748 hospitalisations during 2008–2012 where SUFE was listed in any of the first 15 diagnoses, 705 (94.3%) were acute (same day) or arranged (within seven days of referral) admissions, while 43 (5.7%) were drawn from the waiting list.

During 2008–2012, 95.9% of hospitalisations in children and young people with SUFE listed in any of the first 15 diagnoses, also had a primary procedure recorded, with closed reductions of a slipped capital femoral epiphyses (47.6%) and epiphysiodesis of the femur (21.5%) being the most frequently listed primary procedures (**Table 4**).

Distribution by Age

In New Zealand during 2008–2012, hospitalisations for children and young people with SUFE were infrequent during early childhood, but increased rapidly after eight years of age. Admissions reached a peak at 11 years in females and 12 years in males, before declining again during the early-mid teens. During this period, the rapid increases seen in late childhood, the peak in early adolescence, and the subsequent decline in the early-mid teens, occurred on average, one year earlier in females than in males (**Figure 4**).

Figure 4. Hospital Admissions for Children and Young People with a Slipped Upper Femoral Epiphysis by Age and Gender, New Zealand 2008–2012



Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with SUFE listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007)

Table 4. Hospital Admissions in Children and Young People Aged 0–24 Years with a Slipped Upper Femoral Epiphysis by Primary Procedure, New Zealand 2008–2012

Primary Procedure	Number: Total 2008−2012	Number: Annual Average	Admission Rate per 100,000 Population	% of Admissions in those with SUFE
Slipped Upper Femoral Epiphysis				
Closed Reduction of Slipped Capital Femoral Epiphysis	356	71.2	4.66	47.6
Epiphysiodesis of Femur	161	32.2	2.11	21.5
Open Reduction of Slipped Capital Femoral Epiphysis	108	21.6	1.41	14.4
Insertion of Internal Fixation Device, Not Elsewhere Classified	31	6.2	0.41	4.1
Osteotomy of Proximal Femur with Internal Fixation	15	3.0	0.20	2.0
CT and MRI Scans	7	1.4	0.09	0.9
Open Reduction of Fracture of Femur with Internal Fixation	6	1.2	0.08	0.8
Arthrodesis of Hip	5	1.0	0.07	0.7
Ostectomy of Proximal Femur with Internal Fixation	4	0.8	0.05	0.5
Forage of Neck and/or Head of Femur	3	0.6	0.04	0.4
Other Procedures	21	4.2	0.28	2.8
No Listed Procedure	31	6.2	0.41	4.1
Total Admissions	748	149.6	9.80	100.0

Source: Numerator: National Minimum Dataset, hospital admissions by primary procedure for children and young people with SUFE listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007)

Distribution by Ethnicity and Gender

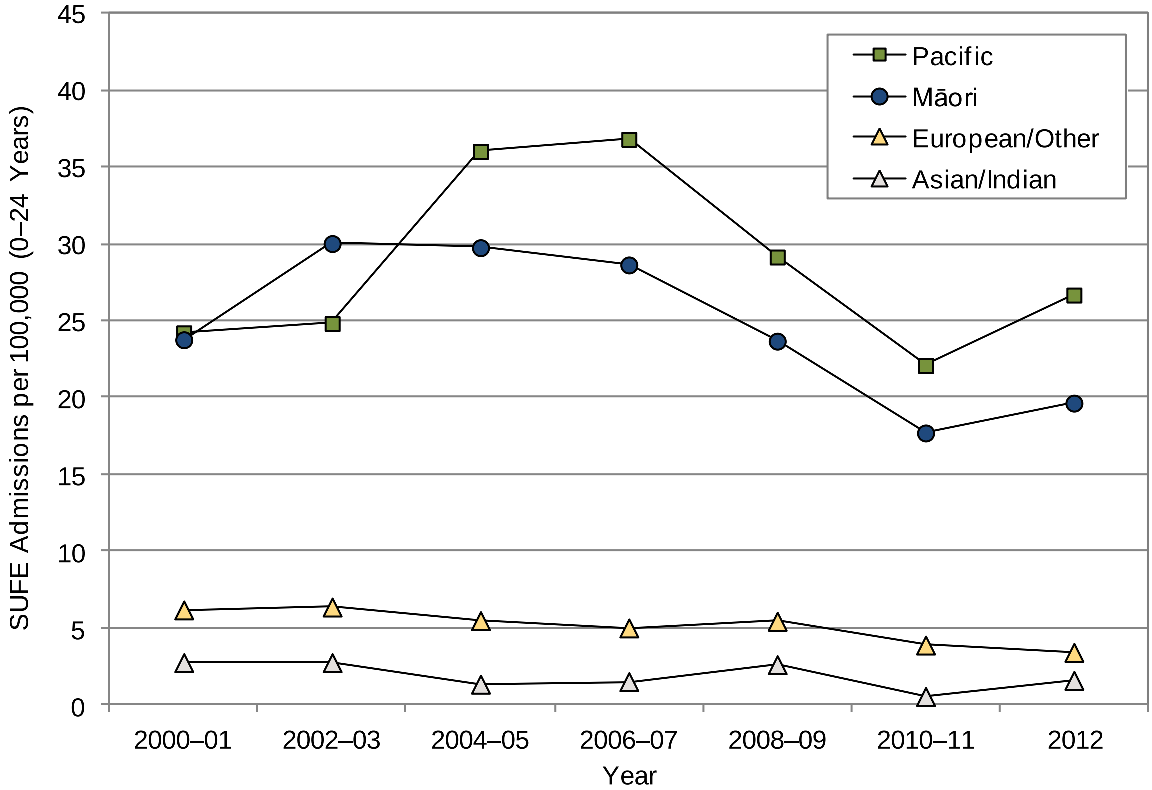
In New Zealand during 2008–2012, there were no *significant* gender differences in hospital admissions for SUFE, although rates were *significantly* higher for Pacific and Māori > European/Other > Asian/Indian children and young people (**Table 5**). Similar ethnic differences were seen during 2000–2012, with SUFE rates for Pacific children and young people also being higher than for Māori children and young people for the majority of this period (**Figure 5**).

Table 5. Hospital Admissions for Children and Young People Aged 0–24 Years with a Slipped Upper Femoral Epiphysis by Ethnicity and Gender, New Zealand 2008–2012

Variable	Rate	Rate Ratio	95% CI	Variable	Rate	Rate Ratio	95% CI
Slipped Upper Femoral Epiphysis							
Asian/Indian	1.57	0.36	0.21–0.61	Female	9.43	1.00	
European/Other	4.43	1.00		Male	10.14	1.08	0.93–1.24
Māori	20.44	4.62	3.87–5.50				
Pacific	25.78	5.82	4.75–7.13				

Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with SUFE listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007); Note: Ethnicity is Level 1 Prioritised; Rate is per 100,000 population

Figure 5. Hospital Admissions for Children and Young People Aged 0–24 Years with a Slipped Upper Femoral Epiphysis by Ethnicity, New Zealand 2000–2012



Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with SUFE listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007); Note: Ethnicity is Level 1 Prioritised

South Island DHBs Distribution and Trends

South Island Distribution

In the South Island during 2008–2012, 10 Nelson Marlborough, 6 South Canterbury, 46 Canterbury, 12 Otago and 16 Southland children and young people were hospitalised with a sipped upper femoral epiphysis. Admission rates per 100,000 in Nelson Marlborough, Canterbury and Otago were *significantly* lower than the New Zealand rate, while in South Canterbury and Southland rates were not *significantly* different. There were no admissions for SUFE in the West Coast during this period (**Table 6**).

South Island Trends

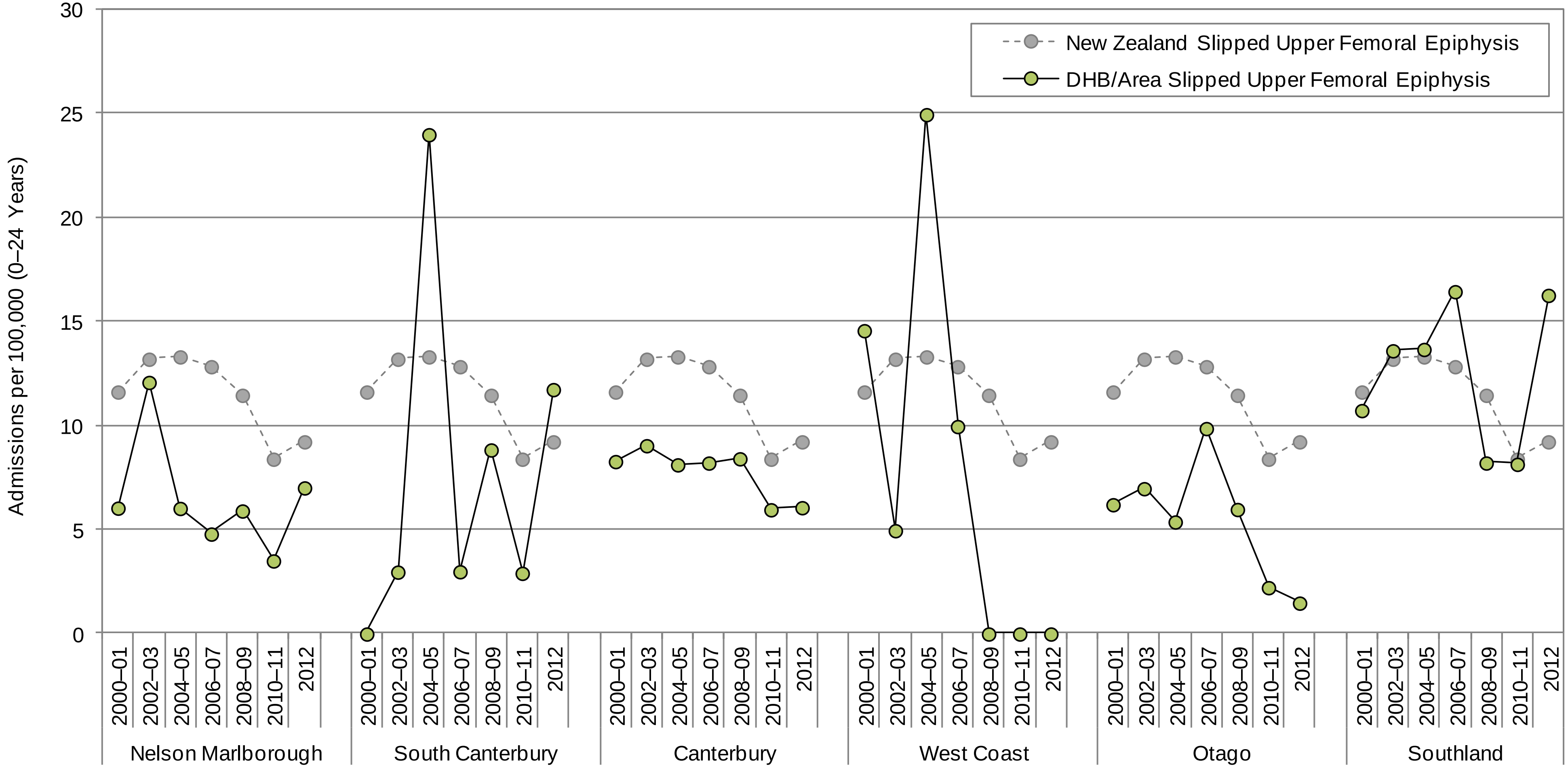
In the South Island DHBs during 2000–2012, large year to year variations (likely as a result of small numbers) made individual DHB's trends in admission rates difficult to interpret. However, rates in Nelson Marlborough, Canterbury and Otago were lower than the New Zealand rate throughout this period (**Figure 6**).

Table 6. Hospital Admissions for Children and Young People Aged 0–24 Years with a Slipped Upper Femoral Epiphysis, South Island DHBs vs. New Zealand 2008–2012

DHB/Area	Total Number of Individuals 2008−2012		Total Number of Admissions 2008−2012	Average Number of Admissions per Individual per Year	Admission Rate per 100,000 Population	Rate Ratio	95% CI
	A*	B*					
Slipped Upper Femoral Epiphysis							
Nelson Marlborough	10	10	11	0.22	5.17	0.53	0.29–0.96
South Canterbury	6	6	6	0.20	7.05	0.72	0.32–1.61
Canterbury	45	46	58	0.25	6.97	0.71	0.55–0.93
West Coast	0	0	0	0.00	–	–	–
Otago	12	12	12	0.20	3.58	0.37	0.21–0.65
Southland	16	16	18	0.23	9.82	1.00	0.63–1.60
New Zealand	617		748	0.24	9.80	1.00	

Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with SUFE listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007); Note: A*: Each individual only counted once in DHB in which they first reside (i.e. DHB total = NZ total); B*: Each individual counted once in each DHB in which they reside (i.e. the sum of DHB totals exceeds New Zealand total); Rate Ratios are compared to New Zealand rates and have not been adjusted for population demographics

Figure 6. Hospital Admissions for Children and Young People Aged 0–24 Years with a Slipped Upper Femoral Epiphysis, South Island DHBs vs. New Zealand 2000–2012



Source: Numerator: National Minimum Dataset, hospital admissions for children and young people with SUFE listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population (projected from 2007)

Bariatric Surgery

Introduction

While surgery for obesity is not generally recommended for obese children and young people, it has increasingly been used for the treatment of those with extreme obesity and obesity-related comorbidities, when more conservative treatment methods have failed [213]. In this context, guidelines from Australia's NHMRC [14] suggest that a post-pubertal adolescent with a BMI of >40 kg/m^2, or >35 kg/m^2 plus significant severe comorbidities such as type 2 diabetes or obstructive sleep apnoea, may be considered for bariatric surgery, if other interventions have been unsuccessful.

There are a number of different surgical procedures used, all of which are usually done laparoscopically. They include the Roux-en-Y gastric bypass, the adjustable gastric band, biliopancreatic diversion and the sleeve gastrectomy [15]. The best-studied procedure in adolescents is the Roux-en-Y gastric bypass. In this procedure, the stomach is stapled to exclude almost all of the stomach volume and create a small pouch at the top of the stomach. This is separated from the main body of the stomach and attached to the small intestine. Weight loss ensues from restriction of food intake and malabsorption [16]. Adverse effects that may follow the procedure include anastomotic leak, small bowel obstruction, dumping syndrome (symptoms that may include nausea, vomiting, bloating, cramps, diarrhoea and/or other symptoms), protein-calorie malnutrition, and micronutrient deficiency related to malabsorption [17].

The following section reviews hospital admission for bariatric surgery in young people aged 15–24 years using data from the National Minimum Dataset.

Data Source and Methods

Definition

1. *Hospital admissions for young people aged 15–24 years with bariatric surgery listed in any of their first 15 procedures*

Data Source

1. National Minimum Dataset

Numerator: Hospital admissions for young people aged 15–24 years with bariatric surgery listed in any of their first 15 procedures

Specific procedures (ACHI codes) included: Gastric reduction (3051100), Laparoscopic gastric reduction (3051101), Gastric bypass (3051200), Laparoscopic biliopancreatic diversion (3051201), Biliopancreatic diversion (3051202), Surgical reversal of procedure for morbid obesity (3051400), Insertion of gastric bubble (balloon) (9095000), Adjustment of gastric band (9095300), Revision of gastric band (1421500).

Denominator: Statistics New Zealand Estimated Resident Population (projected from 2007)

Notes on Interpretation

As only one procedure occurred in a young person less than 15 years of age, the analysis in this section has been restricted to young people aged 15–24 years.

New Zealand Distribution and Trends

Distribution by Primary Diagnosis and Procedure

Primary Diagnosis: In New Zealand during 2008–2012, obesity was the most frequent primary diagnosis in young people aged 15–24 years admitted for bariatric surgery, accounting for 65.9% of admissions. Type 2 diabetes and mechanical complications of gastrointestinal prosthetic devices made a smaller contribution (**Table 7**).

Primary Procedure: During the same period, laparoscopic gastric reductions (41.5%) were the most frequent primary procedure listed in young people admitted for bariatric surgery, followed by gastric bypasses for morbid obesity (29.3%) (**Table 8**).

Table 7. Hospital Admissions for Bariatric Surgery by Primary Diagnosis in Young People Aged 15–24 Years, New Zealand 2008–2012

Primary Diagnosis	Number: 2008−2012	Percent of Admissions (%)
Bariatric Surgery		
Obesity	27	65.9
Type 2 Diabetes	4	9.8
Mechanical Complications Gastrointestinal Prosthetic Devices	4	9.8
Other Diagnoses	6	14.6
Total	41	100.0

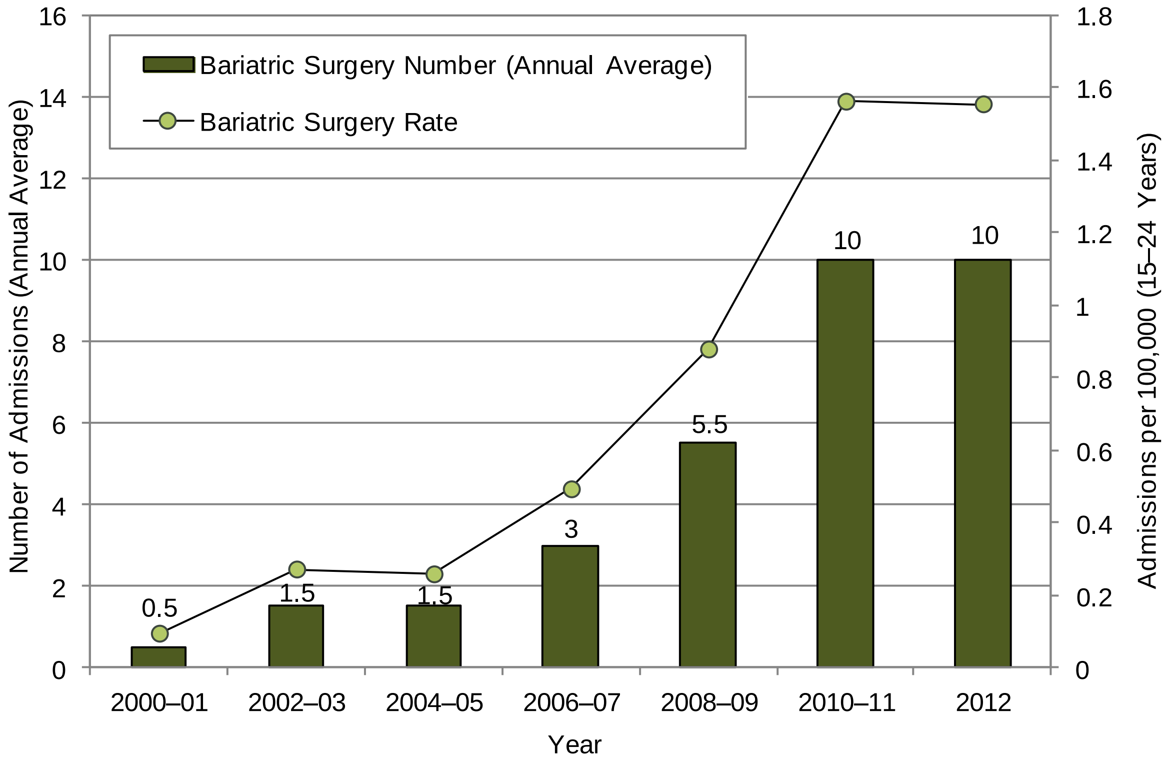
Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population (projected from 2007)

Table 8. Hospital Admissions for Bariatric Surgery by Primary Procedure in Young People Aged 15–24 Years, New Zealand 2008–2012

Primary Procedure	Number: 2008−2012	Percent of Admissions (%)
Bariatric Surgery		
Laparoscopic Gastric Reduction	17	41.5
Gastric Bypass for Morbid Obesity	12	29.3
Revision of Gastric Band	4	9.8
Biliopancreatic Diversion	3	7.3
Other Procedures	5	12.2
Total	41	100.0

Source: Numerator: National Minimum Dataset; Denominator: Statistics New Zealand Estimated Resident Population (projected from 2007)

Figure 7. Hospital Admissions for Bariatric Surgery in Young People Aged 15–24 Years, New Zealand 2000–2012



Source: Numerator: National Minimum Dataset; Denominator: Statistics New Zealand Estimated Resident Population (projected from 2007)

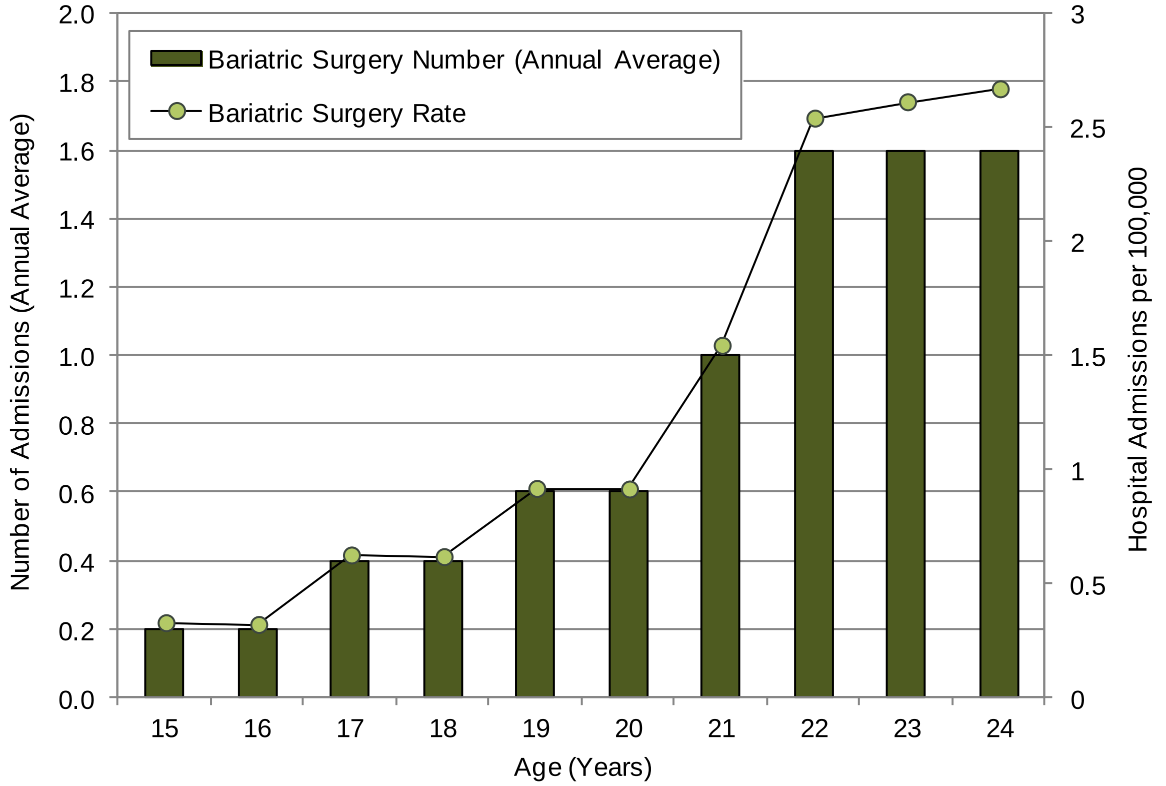
New Zealand Trends

In New Zealand, bariatric surgery admissions in young people aged 15–24 years increased from on average 0.5 admissions per year in 2000–01, to 10 per year during 2010–2012 (**Figure 7**).

Distribution by Age

In New Zealand during 2008–2012, bariatric surgery admissions were infrequent during the early teens, but increased thereafter, with the highest rates being seen amongst those in their early twenties (**Figure 8**).

Figure 8. Hospital Admissions for Bariatric Surgery in Young People Aged 15–24 Years by Age, New Zealand 2008–2012



Source: Numerator: National Minimum Dataset; Denominator: Statistics New Zealand Estimated Resident Population (projected from 2007)

Table 9. Hospital Admissions for Young People Aged 15–24 Years for Bariatric Surgery by Ethnicity and Gender, New Zealand 2008–2012

Variable	Number: Total 2008–2012	Rate	Rate Ratio	95% CI
Bariatric Surgery				
Prioritised Ethnicity				
Asian/Indian	<3	s	s	s
European/Other	28	1.52	1.00	
Māori	4	0.64	0.42	0.15–1.20
Pacific	6	2.29	1.51	0.62–3.64
Gender				
Female	34	2.20	1.00	
Male	7	0.43	0.20	0.09–0.44

Source: Numerator: National Minimum Dataset; Denominator: Statistics New Zealand Estimated Resident Population (projected from 2007); Note: Rate is per 100,000 15–24 years; Ethnicity is Level 1 Prioritised; s: suppressed due to small numbers

Distribution by Ethnicity and Gender

In New Zealand during 2008–2012, while bariatric surgery admissions were higher for Pacific > European/Other > Māori young people, these differences did not reach statistical significance. Admission rates however, were *significantly* higher for females than for males (**Table 9**).

South Island DHBs Distribution

In the South Island during 2008–2012, there were 11 admissions (South Canterbury <3; Canterbury 3; Otago <3; Southland 4) for bariatric surgery in young people aged 15–24 years.

Local Policy Documents and Evidence-Based Reviews Relevant to the Consequences of Obesity in Children and Young People

Obesity significantly increases the risk of developing type 2 diabetes, or a slipped upper femoral epiphysis. Interventions aimed at obesity prevention and management may therefore reduce the risk of these conditions and the need for bariatric surgery.

In New Zealand, a number of policy documents and reviews consider the prevention and management of obesity. These are briefly summarised in Table 109 (Local Policy Documents and Evidence-Based Reviews Relevant to Overweight and Obesity in Children and Young People) on Page 320, along with a range of guidelines and reviews which consider these issues in the overseas context.

In addition there are two in-depth topics related to Overweight and Obesity:
The Determinants and Consequences of Overweight and Obesity, and
The Treatment of Obesity in Children and Adolescents.

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