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Kupu Taurangi Hauora o Aotearoa

Child and Youth Mortality Review Committee

Special Report:
Unintentional suffocation, foreign body inhalation and strangulation

March 2013

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- the 35 academics, medical professionals and injury prevention specialists from district health boards (DHBs), primary health organisations (PHOs), health-related non-governmental organisations (NGOs) and professional bodies who responded to the consultation process in October 2012.

The CYMRC would also like to acknowledge that a considerable amount of change has already been implemented as a result of the discussions that have occurred with different organisations regarding the contents and findings of this report as it has been developed. In particular, the Ministry of Health, the Consumer Affairs team at MBIE, Safekids New Zealand, Whakawhetu, TAHA and Change for Our Children have already begun to think about the recommendations and advice offered in this report, some of which have been implemented.

The CYMRC would like to extend its deepest sympathies to all of the families and whānau who have lost a child through unintentional suffocation, foreign body inhalation or strangulation. The CYMRC recognises that each death reviewed and analysed for this report represents a tragic loss of life, not just for the families and whānau of the deceased child or young person, but for all of New Zealand. We hope the recommendations and advice offered in this report will prevent future deaths of this nature.

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Foreword

The CYMRC continues to collect detailed information on mortality from all causes between the 28th day of life and the 25th birthday. High-level data from this collection system is updated annually and is available on the CYMRC section of the Health Quality & Safety Commission's website.[1] This information continues to show that those children growing up in disadvantaged circumstances are over-represented in mortality statistics.

This report demonstrates the value of collecting detailed information and provides a tragic reminder to our community of just how dangerous everyday objects like curtain cords, rope, pillows, mattresses and some foodstuffs can be. Death from traumatic asphyxia caused by suffocation is one of the three leading causes of unintentional injury deaths in New Zealand. Three main types of death are apparent: suffocation in place of sleep, inhalation of food or foreign bodies, and external pressure on the neck or face.

Over the last 20 years we have seen a dramatic reduction in death from sudden unexpected death in infants (SUDI), with the annual death toll reducing from 200 to 60 because of the 'Back to Sleep' campaign.[2] This represents 3000 people who are alive today who would otherwise have died. Sixty deaths, however, are still too many, and New Zealand is an unfavourable outlier compared with other developed countries. This report shows that suffocation in place of sleep must be recognised as an increasingly important cause of SUDI. There has been a tendency for families to consider the sudden death of infants as something that 'just happens' and so feel disempowered from prevention. We hope the information in this report can be used to empower families to help their infants survive with a strong focus on safe sleep every sleep.

Information about the deaths indicates how quickly tragedy can occur; normal activities like a birthday party, social gathering or adventurous play can quickly turn to tragedy. It is not uncommon for suffocation in place of sleep deaths and inhalation-related deaths to occur when there are breaks from normal routine, less supervision, busy activities in groups, unfamiliar surroundings, alcohol or distracted caregivers. This suggests that a focus on keeping good routines (like safe sleep or not running while eating) may be important in saving lives.

The recommendations in this report strongly support a number of current government initiatives, such as: improved support for vulnerable children; enhanced smoking cessation programmes; better systems to support engagement with health systems; systems to increase the availability of safe sleep spaces; and improved systems to support policies and staff training in DHBs. New methods to reduce hazards from consumer products, by improving systems and cross-sector linkages, are suggested in the recommendations.

Māori and Pacific infants are strikingly over-represented in the statistics. It is important to ensure that any interventions are most effective for Māori and Pacific infants, leading to a reduction in disparity with direction-setting and engagement being driven by Māori and Pacific peoples.

Information collected in this report has already been used to influence the new Ministry of Health choking guidelines,[3] and work is occurring to develop training resources and safe sleep programmes across New Zealand.

The community messages at the end of this report (pp30–31) and the list for assessing safe sleep spaces (p17) are important take-home messages for all families to improve child survival. It would be appropriate to use them for media releases, the development of injury prevention guidance and other information.

Nick Baker *Chair, Child and Youth Mortality Review Committee*

1 For CYMRC mortality data, please see http://www.hqsc.govt.nz/our-programmes/mrc/cymrc/publications-and-resources/publication/16/.

2 See chapter 1 of the CYMRC's *Fifth Report to the Minister of Health* (2009).

3 See http://www.health.govt.nz/publication/food-and-nutrition-guidelines-healthy-children-and-young-people-aged-2-18-years-background-paper.

Introduction

Suffocation, foreign body inhalation and strangulation are well-recognised causes of death in the paediatric age group. Data from the United States and United Kingdom show a significant burden of death due to unintentional suffocation, choking or strangulation (1, 2).

Prevention of these deaths is more likely to be achieved with a 'best practice' model (3). Best practice incorporates surveillance of New Zealand issues and uses a three-way approach: safe product design and use, effective legislation, and parent and professional education. Best practice also includes particular attention to those population groups where disparate outcomes are demonstrated.

In New Zealand, unintentional injury is the second leading cause of death in those aged between one month and 24 years (34.5 percent for 2002–08)(4). Previous CYMRC data have indicated that within the unintentional injury category, death from 'suffocation' is the third leading cause. The use of the term 'suffocation' within CYMRC data encompasses a heterogeneous collection of causes that end in death due to asphyxia. This includes unintentional strangulation from cords or ropes around the neck, foreign body inhalation leading to blockage of the airways, oro-nasal obstruction of the external airways (unintentional suffocation), chest compression, and head and neck entrapment (traumatic asphyxia). Previous CYMRC reports have not explored the contributions that various conditions make to the wider classification of death from 'suffocation' used by the CYMRC. For this reason, detailed knowledge of the New Zealand cases will be provided in this report, highlighting causal factors, trends and preventable factors.

Furthermore, unintentional suffocation[4] is increasingly being recognised as a significant contributing factor to SUDI in those aged less than one year. As more information becomes available from death scene investigations, it is becoming clear that a considerable proportion of deaths that might previously have been labelled as sudden infant death syndrome (SIDS) are attributable to unsafe sleeping situations.[5] Death by traumatic asphyxia occurs in these situations as suffocation occurs when an infant becomes wedged between bedding and a firm surface or is overlain by a co-sleeping partner (5, 6). A 10-year review of SUDI in Auckland found that 64 percent of deaths occurred in a bed-sharing situation (7). Analysis of such detailed scene data may explain, in part, the proportional increase of reported infant death due to unintentional suffocation in bed (8, 9), leading to diagnostic transfer. Location of infant sleep has also been shown to be an important contributor. A case control study over two decades showed an eight-fold increase in reported deaths in adult beds compared with deaths reported in cribs over the time studied. Concurrently, deaths in cribs decreased over this time period (9).

Other mechanisms of unintentional death by asphyxia include strangulation from cords or ropes and choking on food or other objects (1, 10). Children in the 1–5-year age range are more likely to become tangled in hanging cords, such as curtain cords, bibs or pacifier cords and be unable to extract themselves from these situations. Older children are at risk during dangerous or experimental play with ropes, such as climbing trees with ropes and rope swings (2, 10). Trachea size in children is smaller than adults, with trachea being of similar size to the size of the child's little finger. Furthermore, children younger than three years of age are more likely to put things in their mouth as part of normal development. Together, these factors increase the risk of young children choking on both food and non-food items. Hard, round foods, such as peanuts and beans, are the most likely causes of death due to choking, although items with elasticity and lubricity, such as hot dogs and balloons, also contribute to childhood choking deaths internationally (11–13). While this report focuses on mortality, mortality remains only a small proportion of the overall health burden associated with unintentional suffocation, foreign body inhalation and strangulation. For example, for every child that dies from foreign body inhalation another 10 are seen in hospital (12). This does not include those children who choke and are successfully treated at home.

4 From this point on in the report, the term 'unintentional suffocation' refers to death from deprivation of oxygen due to obstruction of the external air passages rather than the heterogeneous, and perhaps misleading, definition used in previous CYMRC data, which also included deaths from strangulation (external pressure to the neck), traumatic asphyxia and foreign body inhalation.

5 Please see the text box on page 19 entitled 'Preventing the unexpected – how does suffocation and strangulation in bed relate to SUDI and SIDS?'

In this special report we will provide information on the mechanisms and circumstances of death by suffocation, foreign body inhalation and strangulation in New Zealand children and young people aged less than 25 years, from the New Zealand Mortality Review Database. With this information we hope that effective prevention strategies can be put in place that are developmentally appropriate, culturally acceptable and provide effective information using health promotion principles.

Methods

Cause(s) of death and sample selection

A. Main underlying cause of death as assigned in the National Mortality Collection:[6] In the National Mortality Collection all deaths are assigned a single main underlying cause of death (ICD-10-AM), plus as many contributory causes (ICD-10-AM) as required. The initial analyses in this section include only cases with a main underlying cause of death in the range outlined below, in order to ensure that each individual is allocated a single cause, and so that the totals in tables and graphs are 100 percent.

The initial analysis thus includes all children and young people aged 0 days to less than 25 years who died in New Zealand between 1 January 2002 and 31 December 2009, and where the main underlying cause of death identified in the National Mortality Collection was in the following range:

- accidental suffocation and strangulation in bed (ICD-10-AM W75)
- other accidental suffocation, strangulation and threats to breathing (ICD-10-AM W76, W77, W83)
- inhalation of food or other objects causing obstruction of respiratory tract (ICD-10-AM W79–80).

Cases selected using these criteria were then used to explore the distribution of suffocation in children and young people by year, gender, age and ethnicity.

B. Cause(s) of death assigned after additional review of information from the New Zealand Mortality Review Database: The CYMRC and the PMMRC[7] store data in the New Zealand Mortality Review Database, which contains information from a variety of sources, many of which could be used to assign a cause or causes of death. On occasion, the New Zealand Mortality Review Database holds additional information not available to Ministry of Health coders when assigning official causes of death in the National Mortality Collection. Thus, in addition to using National Mortality Collection cause of death data, this section contains additional analyses where the main underlying cause of death has been assigned following individual case review of CYMRC and PMMRC data. Benefits of the detailed analysis include the provision of further information on the mechanisms of injury leading to unintentional death from suffocation, foreign body inhalation and strangulation, and information concerning the location in which these deaths occurred. Further, the possibility remained that a number of similar deaths had been coded to other causes (eg, SIDS), potentially masking the magnitude of the problem. The methodology used to assign cause(s) of death in this context is outlined below.

Search strategy for additional case review: A wide search of the New Zealand Mortality Review Database (using an additional eight ICD-10-AM codes, as well as those deaths awaiting ICD-10-AM coding which were considered to be due to suffocation, foreign body inhalation or strangulation by CYMRC and PMMRC data group staff) was conducted in order to find additional cases not identified by the search strategy above. The methodology used was intentionally broad in order to capture as many additional cases as possible. Detailed analysis of these cases was then undertaken in order to identify the mechanism and location of death.

Sample selection for detailed case review: The detailed case review included children and young people aged 0 days to less than 25 years who died in New Zealand between 1 January 2002 and 31 December 2009, and where the ICD-10-AM main underlying cause of death identified in the National Mortality Collection was in the following range:

- pneumonitis due to food and vomit (ICD-10-AM J690)
- asphyxia (ICD-10-AM R090)
- unattended death (ICD-10-AM R98)
- other ill-defined and unspecified causes of mortality (ICD-10-AM R99)

6 The National Mortality Collection is maintained by Ministry of Health coders, who classify the underlying cause of death for all deaths registered in New Zealand. More information can be found at: http://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/mortality-collection.

7 The CYMRC acknowledges collaboration with the Perinatal and Maternal Mortality Review Committee (PMMRC) to access information about infants under 28 days of age.

- accidental suffocation and strangulation in bed (ICD-10-AM W75)
- other accidental hanging and strangulation (ICD-10-AM W76)
- threat to breathing due to cave-in, falling earth and other substances (ICD-10-AM W77)
- inhalation of gastric contents (ICD-10-AM W78)
- inhalation and ingestion of food causing obstruction of respiratory tract (ICD-10-AM W79)
- inhalation and ingestion of other objects causing obstruction of respiratory tract (ICD-10-AM W80, W808)
- other specified threats to breathing (ICD-10-AM W83)
- unspecified threat to breathing (ICD-10-AM W84)
- hanging, strangulation and suffocation, undetermined intent (ICD-10-AM Y20)
- SIDS (ICD-10-AM R95).

Each case was then reviewed by a single reviewer and assigned to one of nine sub-groups: unintentional strangulation,[8] foreign body inhalation, death in a place of sleep with suffocation, suicide or purposeful strangulation with unclear intent to die, SUDI, medical cause, aspiration of vomit, suspicious death and unknown cause. Information used to support sub-group allocation included local Child and Youth Mortality Review Group review data, police reporting (POL47 and POL47A forms), and post mortem and coroner reports. If insufficient information was available from the New Zealand Mortality Review Database, Coronial Services provided further information where possible. The deaths assigned into the sub-group of death in a place of sleep with suffocation were further independently checked by two additional reviewers to confirm that the deaths fulfilled the inclusion criteria below. Discrepancies were resolved by consensus discussion.

Inclusion criteria: Cases were included in the analysis if they were clearly unintentional and were: 1) due to external compression of the neck leading to strangulation, 2) external compression of the chest leading to suffocation, 3) oro-nasal compression, or 4) blockage of the airway with an object other than vomit.

Exclusion criteria: Cases were excluded if it was unclear that they were unintentional. Cases with the ICD-10-AM code of 'Y20: Hanging, strangulation and suffocation, unclear intent' were excluded when there was clear intent to cause strangulation or suffocation, but no clear intent to die, or if there had been prior suicidal behaviour. Deaths classified as SUDI that had no clear evidence of accidental suffocation or entrapment were excluded. In some cases there was a strong suspicion that accidental suffocation due to overlay by a co-sleeping partner was the cause of death, but only those cases found in compromising situations (such as under a co-sleeping partner) were included. Deaths with post-mortem findings consistent with a cause other than suffocation, foreign body inhalation or strangulation, and deaths with evidence of vomit in the airway assigned as cause of death, were also excluded, as it was hypothesised that vomit in the airway may have been an agonal event rather than a terminal event. Suspicious cases and cases due to a medical cause, such as sepsis or asthma, were excluded. Cases with insufficient information to permit further classification were also excluded as unknown cause.

Demographic data, risk factors for SUDI, potential risk factors for unintentional overlay, potential risk factors for entrapment or wedging in bed and a narrative account surrounding the death were recorded for all cases. A descriptive analysis of the cases was also undertaken.

Notes on interpretation: The actual number of deaths from unintentional suffocation, overlay or wedging is probably underestimated in this analysis, as only cases where clear evidence that a suffocation event had occurred were included. Further, while the search terms were made as broad as possible so as to include any potential cause of suffocation, the possibility remains that some cases may have been overlooked. In addition, the CYMRC dataset was not complete for all cases, and in a number of cases, there was conflict between data from different sources. In such cases the reviewer took all findings into consideration when making a decision.

Ethnicity classifications were undertaken using a prioritised classification.[9]

8 The term 'unintentional strangulation' used in this report includes deaths due to ligatures, objects or hands leading to external pressure on the neck, and deaths due to heavy objects on the chest and/or neck, not in a place of sleep, leading to traumatic asphyxia. These deaths were combined in order to avoid identification of the few cases that occurred in the latter category and the recognition that the risk factors for these deaths were likely to share common factors.

9 The CYMRC ethnicity protocol can be found on the New Zealand Mortality Review Database website at: https://secure-www.otago.ac.nz/nzmrdg/reports.html.

A. Analysis of data from the National Mortality Collection

Main underlying cause of death

The following section uses the main underlying cause of death (ICD-10-AM), as assigned in the National Mortality Collection, to review deaths from unintentional suffocation, foreign body inhalation and strangulation in New Zealand children and young people aged 0 days to less than 25 years between 1 January 2002 and 31 December 2009.

Distribution by year

In New Zealand during 2002–09, on average, 24 children or young people per year died from unintentional suffocation, foreign body inhalation and strangulation, with this equating to a rate of 1.63 per 100,000. The largest sub-group was deaths due to accidental suffocation and strangulation in bed (78.4 percent of total deaths) (Table 1).

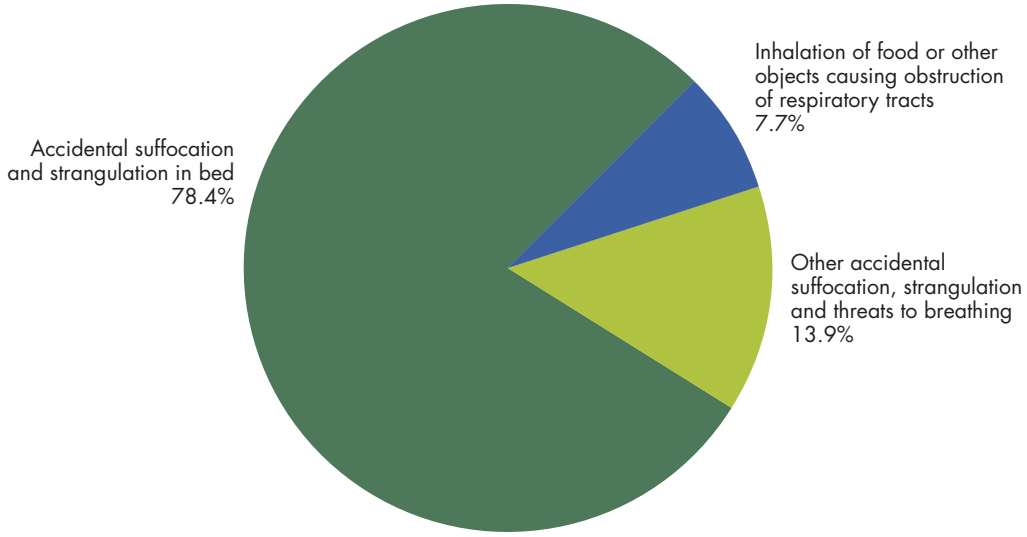
Table 1. Mortality from unintentional suffocation, foreign body inhalation and strangulation in children and young people aged 0 days to 24 years, New Zealand, 2002–09[10]

ICD-10-AM CAUSE OF DEATH	2002	2003	2004	2005	2006	2007	2008	2009	Total	Total (%)	2002–09 rate per 100,000
Accidental suffocation and strangulation in bed	13	13	18	13	23	27	29	16	152	78.4	1.28
Other accidental suffocation, strangulation and threats to breathing	1	4	4	3	1	6	6	2	27	13.9	0.23
Inhalation of food or other objects causing obstruction of respiratory tracts	2	2	-	2	-	6	3	-	15	7.7	0.13
Total	16	19	22	18	24	39	38	18	194	100.0	1.63

Source:
Numerator: CYMRC and PMMRC Cases by ICD-10-AM Main Underlying Cause of Death as assigned in the National Mortality Collection.
Denominator: Statistics New Zealand Estimated Resident Population.

10 The latest information on deaths over 28 days of age from these causes can be found within CYMRC mortality data. See: http://www.hqsc.govt.nz/our-programmes/mrc/cymrc/publications-and-resources/publication/16/.

Figure 1. Mortality from unintentional suffocation, foreign body inhalation and strangulation in children and young people aged 0 days to 24 years, New Zealand, 2002–09 (n=194)



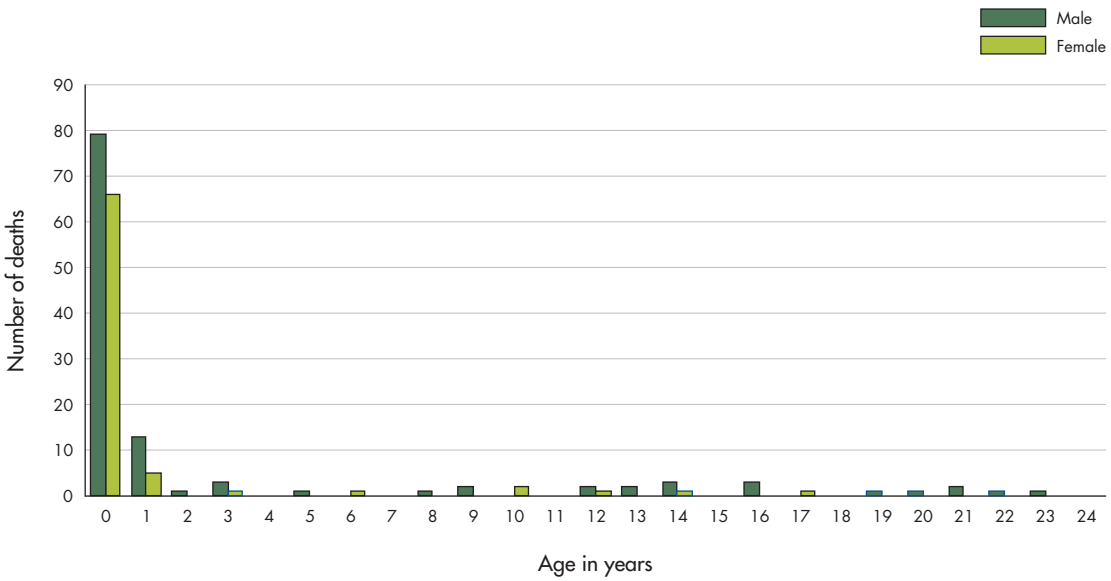
Source: CYMRC and PMMRC Cases by ICD-10-AM Underlying Cause of Death as assigned in the National Mortality Collection.

Distribution by age and cause

In New Zealand during 2002–09, deaths from suffocation and strangulation in bed were highest during the first year of life, with only one death occurring after 24 months of age. In contrast, deaths from other suffocation, strangulation or threats to breathing were more evenly distributed across the age range. Mortality from inhalation of food or other objects was highest in preschool-age children, with the highest rates being seen in those 12–24 months of age. Males were more likely to die from unintentional suffocation, foreign body inhalation and strangulation than females in each of the categories reviewed (Figures 2–5).[11]

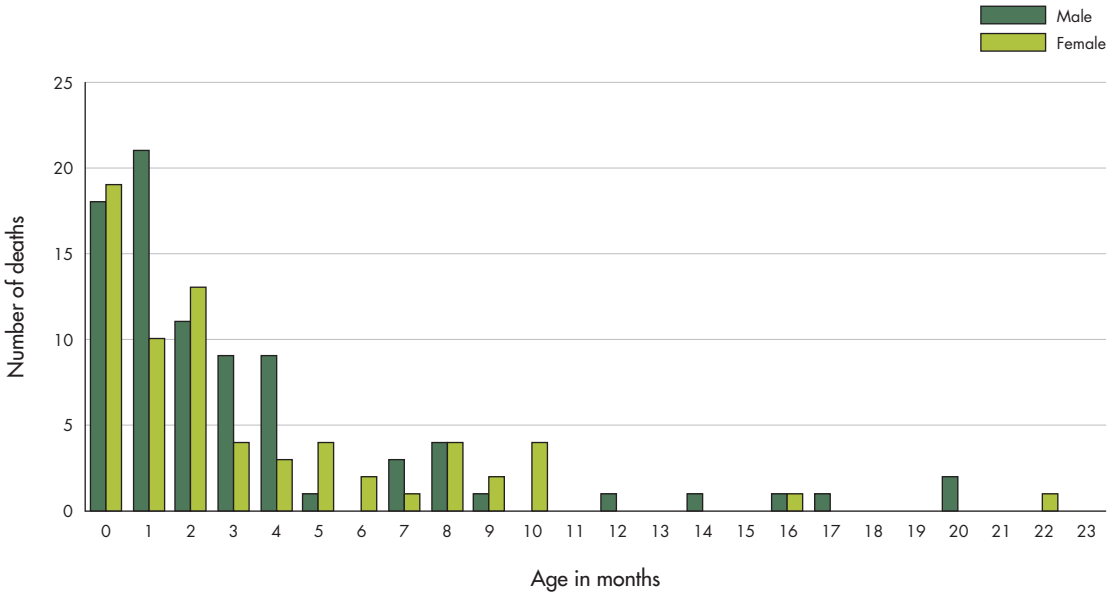
11 See page 11 and Appendix 1 for comparison to dataset based on ICD-10-AM codes.

Figure 2. Mortality from unintentional suffocation, foreign body inhalation and strangulation in children and young people aged 0 days to 24 years by age and gender, New Zealand, 2002–09 (n=194)



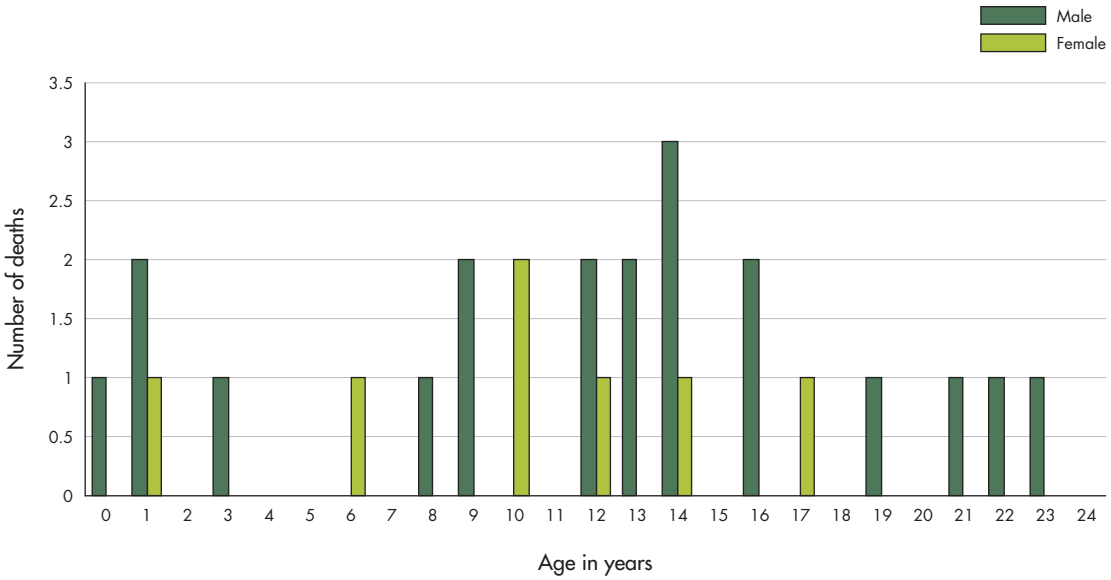
Source: CYMRC and PMMRC Cases by ICD-10-AM Underlying Cause of Death as assigned in the National Mortality Collection.

Figure 3. Mortality from accidental suffocation and strangulation in bed in children and young people aged 0 days to 23 months by age and gender, New Zealand, 2002–09 (n=152)



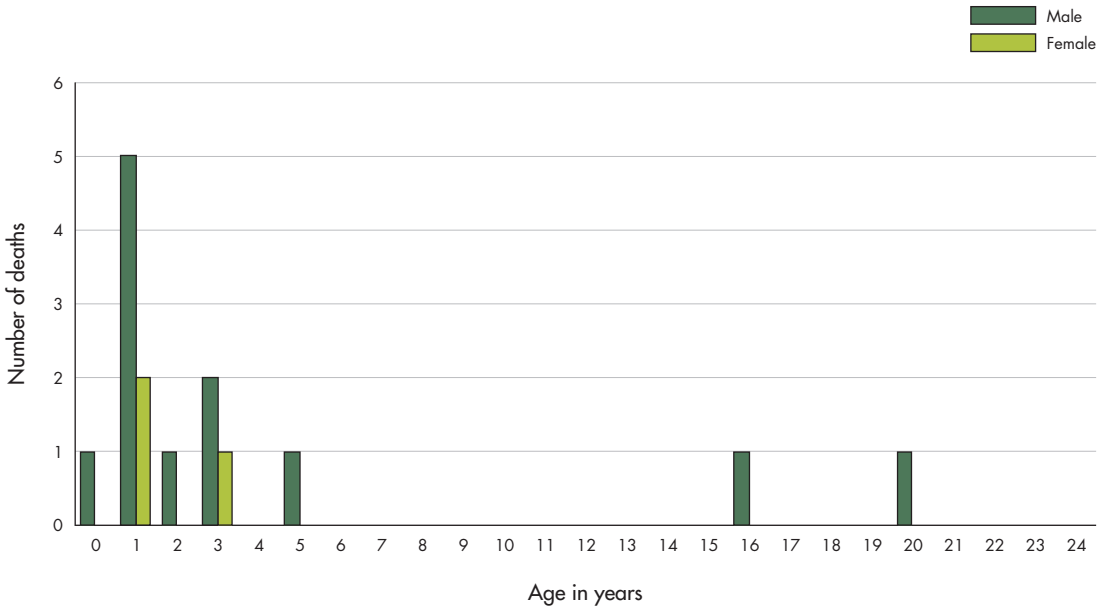
Source: CYMRC and PMMRC Cases by ICD-10-AM Underlying Cause of Death as assigned in the National Mortality Collection.

Figure 4. Mortality from other suffocation, strangulation or threats to breathing in children and young people aged 0 days to 24 years by age and gender, New Zealand, 2002–09 (n=27)



Source: CYMRC and PMMRC Cases by ICD-10-AM Underlying Cause of Death as assigned in the National Mortality Collection.

Figure 5. Mortality from inhalation of food or other objects in children and young people aged 0 days to 24 years by age and gender, New Zealand, 2002–09 (n=15)



Source: CYMRC and PMMRC Cases by ICD-10-AM Underlying Cause of Death as assigned in the National Mortality Collection.

Distribution by ethnicity

In New Zealand during 2002–09, using the Prioritised Ethnicity Classification, mortality from suffocation and strangulation in bed (W75) was significantly higher for Māori and Pacific children and young people (rate ratio Māori 9.71, 95 percent CI 6.35–14.84; rate ratio Pacific peoples 4.34, 95 percent CI 2.39–7.89) than for European children and young people (Table 2).

Due to the small number of deaths from inhalation of food or other objects (W79–80) and other suffocation, strangulation or threats to breathing (W76, W77, W83) these two categories were combined for review by ethnicity. There were no significant differences between Māori and European children and young people for these (combined) categories of death. The small numbers preclude a more meaningful analysis for children of other ethnic groups (Table 2).

Table 2. Mortality from unintentional suffocation, foreign body inhalation and strangulation in children and young people aged 0 days to 24 years by ethnicity, New Zealand, 2002–09

ETHNIC GROUP	2002	2003	2004	2005	2006	2007	2008	2009	Total	2002–09 rate per 100,000	Rate ratio	Rate ratio confidence interval (95%)
Accidental suffocation and strangulation in bed												
European	3	3	4	2	5	2	5	3	27	0.4	1	-
Māori	7	8	12	10	13	21	20	11	102	3.85	9.71	6.35–14.84
Pacific peoples	3	1	2	1	3	4	3	1	18	1.72	4.34	2.39–7.89
Asian	-	1	-	-	2	-	1	1	5	0.38	0.97	0.37–2.51
MELAA	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	13	13	18	13	23	27	29	16	152	1.27		
Inhalation of food or other objects and other suffocation, strangulation or threats to breathing												
European	1	3	2	2	1	8	5	2	24	0.35	1	-
Māori	2	2	2	2	-	2	3	-	13	0.49	1.39	0.71–2.73
Pacific peoples	-	-	-	1	-	1	1	-	3	0.29	0.81	0.25–2.70
Asian	-	1	-	-	-	-	-	-	1	0.08	0.22	0.03–1.61
MELAA	-	-	-	-	-	1	-	-	1	0.76	2.17	0.29–16.04
Subtotal	3	6	4	5	1	12	9	2	42	0.35		
Total	16	19	22	18	24	39	38	18	194	1.62		

Source:
Numerator: CYMRC and PMMRC Cases by ICD-10-AM Underlying Cause of Death as assigned in the National Mortality Collection.
Denominator: Statistics New Zealand Estimated Resident Population.

B. Analysis following additional review of information from the New Zealand Mortality Review Database

Introduction

Further to the 194 cases identified above, 427 extra cases were identified from a search of the eight additional ICD-10-AM codes. All 621 cases subsequently underwent a detailed case review of the information contained in the New Zealand Mortality Review Database to classify deaths as unintentional suffocation, foreign body inhalation and strangulation; or unrelated to unintentional suffocation, foreign body inhalation and strangulation, as detailed in the methods section. Cases classified as unintentional strangulation, foreign body inhalation and death in place of sleep with suffocation (n=79 cases) were then included in the following analysis, while the remaining cases (n=542 cases) were excluded (Table 3) (see Appendix 1).

Distribution of included cases by category of death

In New Zealand during 2002–09, 79 children and young people died from unintentional suffocation, foreign body inhalation and strangulation as determined by case review, with these deaths being broken into three categories: unintentional strangulation (13 deaths); foreign body inhalation (16 deaths); and death in a place of sleep with suffocation (50 deaths) (Table 3).

Table 3. Classification of unintentional suffocation, foreign body inhalation and strangulation deaths from additional analysis of the CYMRC and PMMRC datasets in children and young people from 0 days to 24 years, New Zealand, 2002–09

CAUSE OF DEATH	2002	2003	2004	2005	2006	2007	2008	2009	Total	Total (%)	2002–09 rate per 100,000
Unintentional strangulation	-	4	1	-	-	1	4	3	13	16.5	0.11
Foreign body inhalation	2	1	-	2	-	5	3	3	16	20.3	0.13
Death in place of sleep with suffocation	4	9	7	5	5	8	9	3	50	63.3	0.42
Total cases included as unintentional suffocation	6	14	8	7	5	14	16	9	79	100	0.66
Suicide/Purposeful strangulation intent to die unclear	3	1	5	4	4	5	12	21	55	10.1	0.46
SUDI	49	57	55	46	71	58	58	38	432	79.7	3.64
Medical causes	1	-	1	1	1	2	4	3	13	2.4	0.11
Aspiration of vomit	1	1	1	1	-	2	-	1	7	1.3	0.06
Suspicious death	2	2	1	-	-	-	-	-	5	0.9	0.04
Unknown cause	5	1	1	3	2	2	4	12	30	5.5	0.25
Total cases reviewed and excluded	61	62	64	55	78	69	78	75	542	100	4.56

Source: CYMRC and PMMRC Data Collections.
Numerator: Cause of Death assigned following individual case review of CYMRC and PMMRC data.
Denominator: Statistics New Zealand Estimated Resident Population.

Excluded cases by cause of death

Of the 542 cases that were excluded from further review, the majority 432 (79.7 percent) were classified as SUDI, with most, 292 cases (67.6 percent of those classified as SUDI), being coded as ICD-10-AM R95: SIDS. Fifty-five (10.1 percent) of the 542 excluded cases were classified as suicide or purposeful strangulation with unclear intent to die. Thirty (54.5 percent) of these 55 excluded cases had an ICD-10-AM Y20: Hanging, Strangulation and Suffocation, Undetermined Intent code. Thirty (5.5 percent) of the total 542 cases were excluded as there was insufficient information to assign them to an appropriate category. The majority of this latter group was from 2009, with a high proportion having coroner reports and local group reviews outstanding.

Unintentional strangulation

In New Zealand during 2002–09, 13 children and young people died from unintentional strangulation, equating to a rate of 0.11 per 100,000. There were eight male and five female deaths. The deaths fell into two broad categories, those in infants (six cases, range 7–24 months) and those in older children and young people (seven cases, range 6–24 years).

The deaths in infants younger than two years of age were due to strangulation with loose cords such as a curtain cord, mosquito net, evening bag strap and a commercially available product to ensure supine sleeping by securing an infant to the bed with a wide band across the abdomen. Infants in these situations did not have the developmental ability to extract themselves from a dangerous situation.

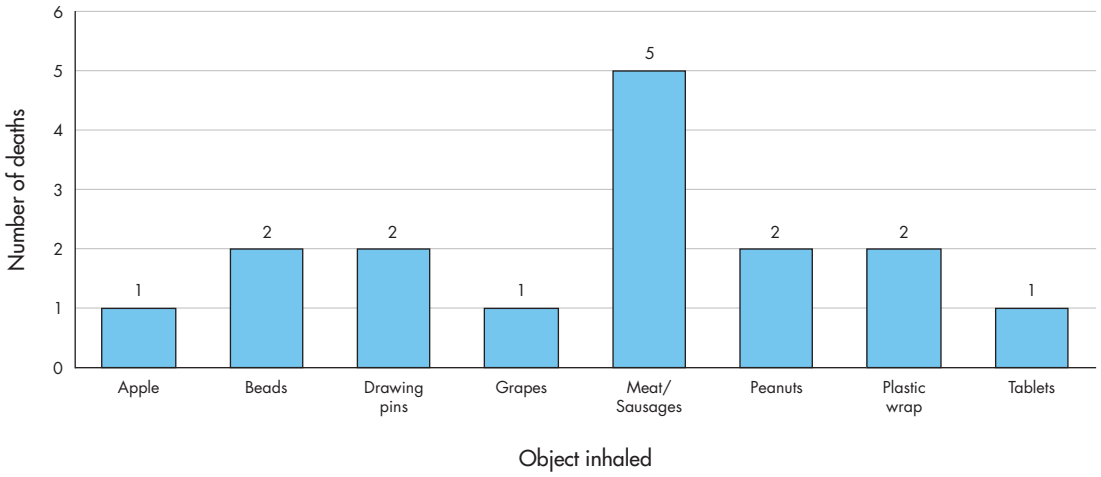
Deaths in the older children were due to collapse of sand or dirt (three cases) or due to dangerous play with ropes or cords such as a homemade flying fox, climbing with rope or cord, or riding a skateboard with a rope.

Foreign body inhalation

In New Zealand during 2002–09, 16 children and young people died from foreign body inhalation, equating to a rate of 0.13 per 100,000. There were 13 male and three female deaths. The median age of death was 4.9 years (range 1–20 years). Thirteen deaths were in children under six years of age, with the remaining three young people being over 15 years (with one case complicated by alcohol intoxication and the other two by severe developmental delay).

Deaths occurred as a result of the inhalation of food: meat/sausage n=5 (31.3 percent), peanuts n=2 (12.5 percent), apple n=1 (6.3 percent), grapes n=1 (6.3 percent); or other objects like drawing pins n=2 (12.5 percent), plastic food wrapping n=2 (12.5 percent), beads n=2 (12.5 percent) and tablets n=1 (6.3 percent) (Figure 6). Seven of the 16 deaths (43.8 percent) occurred away from the normal eating routine at home, eg, at a family or social event.

Figure 6. Mortality from foreign body inhalation in children and young people aged 0 days to 24 years, by type of object inhaled, New Zealand, 2002–09 (n=16)



Source: CYMRC and PMMRC Data Collections; Cause of Death assigned following individual case review of CYMRC and PMMRC data.

Death in place of sleep with suffocation

In New Zealand during 2002–09, 50 children or young people died from suffocation in a place of sleep, equating to a rate of 0.42 per 100,000.

Forty-eight (96 percent) of the deaths were in infants under 12 months of age, equating to a rate of 0.10 per 1000 live births. Amongst this group the average age of death was 3.4 months (range three days to 10 months, median three months) with the most common age at death being one month or under (n=21). Both children aged over 12 months had developmental delay.

Using prioritised ethnicity, mortality from death in a place of sleep with suffocation was significantly higher for Māori (rate ratio 8.22, 95 percent CI 4.04-16.73) and Pacific (rate ratio 4.56, 95 percent CI 1.74-11.98) children and young people than for European children and young people (Table 4).

Deaths were due to overlay (60 percent, n=30) or wedging (40 percent, n=20). Overlay consisted of overlay by mother while breastfeeding (16 percent, n=8), overlay by sibling in a co-sleeping[12] situation (8 percent, n=4) and overlay by mother or father in a co-sleeping situation (34 percent, n=17), with mechanism unknown in one case. Wedging deaths occurred due to entrapment between a hard sleeping surface and bedding, ie mattress and cot, bed or couch (20 percent, n=10), sleeping surface and wall (10 percent, n=5), and couch or cushions (10 percent, n=5) (Table 5).

In 13 cases (26 percent) death occurred in what could be considered the infant's routine sleeping situation. A quarter of deaths in place of sleep with suffocation (24 percent, n=12) occurred away from home, all in makeshift bedding arrangements. Other causes of break from routine included infants moved for breastfeeding or bottle-feeding, to help them settle, because of a party or social gathering, home renovations, household overcrowding or low environmental temperature.

12 The term 'co-sleeping' refers to the situation where another sleeping individual is sharing the same sleeping surface.

Table 4. Mortality from unintentional suffocation, foreign body inhalation and strangulation in children and young people aged 0 days to 24 years by ethnicity, New Zealand, 2002–09

ETHNIC GROUP	2002	2003	2004	2005	2006	2007	2008	2009	Total	2002–09 rate per 100,000	Rate ratio	Rate ratio confidence interval (95%)
Accidental suffocation and strangulation in bed												
European	2	4	1	1		1	1		10	0.15	1	-
Māori	2	3	6	4	3	6	7	1	32	1.21	8.22	4.04–16.73
Pacific peoples		1			2	1	1	2	7	0.67	4.56	1.74–11.98
Asian		1							1	0.08	0.52	0.07–4.07
MELAA									0	0	0	-
Subtotal	4	9	7	5	5	8	9	3	50	0.42		
Inhalation of food or other objects and other suffocation, strangulation or threats to breathing												
European	-	3	-	-	-	5	4	2	14	0.21	1	-
Māori	2	1	1	2	-	-	2	2	10	0.38	1.84	0.82–4.13
Pacific peoples	-	-	-	-	-	-	1	1	2	0.19	0.93	0.21–4.10
Asian	-	1	-	-	-	-	-	1	2	0.15	0.75	0.17–3.28
MELAA	-	-	-	-	-	1	-	-	1	0.76	3.72	0.49–28.29
Subtotal	2	5	1	2	-	6	7	6	29	0.24		
Total	6	14	8	7	5	14	16	9	79	0.66		

Source: CYMRC and PMMRC Data Collections.
Numerator: Cause of Death assigned following individual case review of CYMRC and PMMRC data.
Denominator: Statistics New Zealand Estimated Resident Population.

Information regarding co-sleeping was available in 46 of the 50 deaths (92 percent). All of the overlay deaths, and four (20 percent) of the 20 wedging deaths, were in a co-sleeping situation. Overall, 34 out of the 50 cases of suffocation in place of sleep (68 percent) occurred in a co-sleeping situation.

Information regarding where the children and young people were put to sleep was available in 48 of the 50 cases (96 percent). Seven were placed to sleep in a cot (17 percent), 32 in a bed (62.3 percent), and nine in a couch or chair (20.8 percent). Six of the seven deaths in cots were due to faulty cots, and there was insufficient information regarding the condition of the cot in the remaining death. Cots commonly had an inappropriate-sized mattress that could allow wedging between the mattress and the base of the cot. Alternatively, the sides of the cot were faulty and allowed infants to slip through and become trapped. Two of the infants were found under pillows, and eight died at the breast when their mother fell asleep while feeding, most of whom were less than one month old.

Unfortunately, information was not consistently available for known risk factors for SUDI (particularly absence of a risk factor). However, the CYMRC and PMMRC datasets indicate that at least two (4 percent) infants were placed to sleep prone, nine (18 percent) were exposed to a smoking environment, eight (16 percent) were noted to have an illness at the time of death (most commonly an upper respiratory tract infection), three (6 percent) were premature and in four (8 percent) cases alcohol use by caregivers was noted to be a significant contributing factor.[13] The CYMRC has previously recommended that processes to systematically collect information about the contribution of alcohol to all infant and child deaths should be improved (14). Currently robust systems only exist where deaths involve motor vehicles.

13 It is important to note that this CYMRC and PMMRC data relies on information gathered for coroners, usually by New Zealand Police. The information collected has not always been recorded consistently. The CYMRC has called for standardised investigations, particularly for SUDI deaths, for many years. A current Health Research Council research project, led by Dr Ed Mitchell, has employed a team of investigators throughout New Zealand to collect a standard set of data for SUDI cases from 1 March 2012 for three years.

Table 5. Death in place of sleep with suffocation in children and young people aged 0 days to 24 years, number and rate per 100,000 population, by location found, New Zealand, 2002–09

DEATH IN PLACE OF SLEEP WITH SUFFOCATION	Frequency	Percentage of category	Percentage of total	2002–09 rate per 1000 live births*
Wedging				
Trapped between sleep surface and bedding	10	50	20	0.02
Trapped between sleep surface and wall	5	25	10	0.01
Trapped between cushions and couch	5	25	10	0.01
Total	20	100	40	0.04
Overlay				
While feeding	8	26.7	16	0.02
By sibling co-sleeping	4	13.3	8	0.01
By parent co-sleeping	17	56.7	34	0.04
Unknown	1	3.3	2	s
Total	30	100	60	0.06
Grand total	50		100	0.1

* While the age range for this table is 0–24 years, 96 percent of the deaths occurred in those under one year of age, hence rates are calculated as per 1000 live births.

's' indicates rate suppressed due to small numbers.

Source: CYMRC and PMMRC Data Collections.
Numerator: Cause of Death assigned following individual case review of CYMRC and PMMRC data.
Denominator: New Zealand Health Information Service (NZHIS) live births 2002–09.

Wedging refers to an infant who was found with face, neck or chest trapped in a manner that would impede breathing and compromise the airway. Wedging had to occur between a sleeping surface or bedding and a firm surface such as a cot side or wall.

Overlay refers to the situation where a co-sleeping partner has caused suffocation.

Suffocation in place of sleep includes situations where the whole or part of a body, such as a limb or breast, can cover the face, flex the neck or apply pressure to the chest or abdomen of an infant making it harder to breath leading to asphyxia.[14]

14 Infants have few mechanisms to protect their own airway because of soft flexible tissues, so even slight pressure on the nose or face or neck flexing can create a risk of suffocation.

Issues and recommendations

Issues identified and recommendations made by guest authors[15]

We report the detailed case review of 79 deaths from unintentional suffocation, foreign body inhalation and strangulation during 2002–09, and the identified elements that contributed to these deaths. Official data, such as that provided by the National Mortality Collection and reported on in the first section of this report, is useful for understanding the distribution of suffocation, foreign body inhalation and strangulation in broad terms. However, detailed case reviews by the numerous local Child and Youth Mortality Review Groups across the country provide invaluable information specific to New Zealand communities, and it is these findings that are most relevant to identify future recommendations.

Death in place of sleep with suffocation

Fifty of the 79 deaths in this report arose from unintentional suffocation in bed, particularly among infants. The 50 deaths classified as death in a place of sleeping with suffocation differ from the 152 cases in the National Mortality Collection coded as 'ICD-10-AM W75: Accidental suffocation and strangulation in bed' as the main cause of death. One hundred and thirteen of these deaths were excluded from the detailed analysis as there was no clear evidence of death from suffocation, as described in the methods (see Appendix 1). Of the 113 cases excluded, 77 (68 percent) were co-sleeping and 22 (19.5 percent) infants were found prone. Furthermore, 54 (47.8 percent) out of the 113 cases had an additional risk factor for SIDS/SUDI. The tight definition for death in place of sleep with suffocation used in this report attempted to highlight mechanisms and location for such deaths in New Zealand beyond information that was already available from previous SIDS/SUDI data. In utilising such a tight definition, the report is likely to have underestimated the burden of death from suffocation or strangulation in bed.

The 50 deaths reinforce the importance of safe places to sleep. The message 'safe sleep, every sleep, every place' must be given correctly and consistently by all health professionals. It is concerning to see that the rate of death in Māori and Pacific infants is significantly higher than for European infants (rate ratio 8.22, 95 percent CI 4.04-16.73, rate ratio 4.56, 95 percent CI 1.74-11.98, respectively). We were not able to determine the cause of this marked difference, although differences in rates of smoking in pregnancy will be one factor. Infants who are exposed to smoke in pregnancy tend to be smaller and have reduced hypoxic arousal so are more prone to suffocation.

Tipene-Leach et al have previously demonstrated a high rate of co-sleeping in Māori infants (15), while Hutchinson et al have demonstrated a high rate of co-sleeping in Pacific infants (16). There has been debate regarding the safety of bed-sharing, and the most recent data suggests a decreasing prevalence (8 percent of Māori, 17 percent of Pacific, 4 percent of European and 16 percent of Asian infants sharing the parents' bed at six weeks of age)(17). The promotion of breastfeeding and infant–parent bonding is cited as a benefit of bed-sharing (18, 19). However, during bed-sharing an infant may spend a proportion of their sleep with their face covered (19). Infants exposed to smoke before birth are not able to respond appropriately to this stressor. In Hutchinson's study, 22 percent of both Māori and Pacific infants were also exposed to cigarette smoke (16), a considerable risk factor for SUDI and SIDS. This review has again highlighted unacceptable health inequalities for Māori and Pacific infants. Regardless of the underlying cause, the increased risk in these infants needs to be highlighted to the parents, whānau and professionals who care for them. Furthermore, there is a need for appropriate targeted and assessed interventions in these communities.

The data in this analysis is not adjusted for smoking. However, the airway and/or breathing compromise seen in these cases was apparently sufficient to kill any baby. An additional number of New Zealand infants die each year in co-sleeping situations or unsafe sleep spaces where compromise to airway or breathing contributes to death in situations where infants have vulnerability, eg, smoke-exposed or pre-term.

15 Once again, the CYMRC would like to thank guest authors Dr Rebecca Hayman and Dr Stuart Dalziel. The CYMRC would also like to thank reviewers who provided feedback early on in the report, including: Martin Rushton and Lou Parker from Consumer Affairs, MBIE; Dr Marewa Glover and Dr David Tipene-Leach from the Mortality Review Committees' Māori caucus; Stephanie Cowan from Change for Our Children; Anne Weaver and Moses Alatini from Safekids New Zealand; and Erin Beatson and Sue Campbell from Plunket.

Attributes of a safe sleep space

This report has highlighted that a substantial number of infants suffocate or are strangled during sleep every year. Much is known about what constitutes a dangerous sleep environment, often based on death scene review. It is much harder to specify the attributes of a safe sleep environment. It is suggested that the attributes below are used in assessing any sleeping arrangement from first principles to support families to implement safe sleep practices.

A safe sleep space should be:

1. **Free from other people who might overlay the infant** – sleep arrangements need to make sure that if someone else moves while sleeping, the infant will still be able to breathe easily with a clear airway.
2. **Free of gaps that could trap or wedge** – there should be no gaps that might trap an infant, wedge them and make breathing hard or impossible.
3. **Firm** – so the infant's neck does not flex[16] and compromise the airway, and the face cannot get buried in the surface if the infant rolls into the prone position.
4. **Flat** – so the infant does not suffer compromise to the airway or breathing by rolling over, tipping out, inversion of sleep space or becoming wedged.
5. **Free from objects that might cover the face or cause strangulation or neck flexing** – nothing should be put near that could cover the face during sleep or impair breathing. This could include pillows, bedding, sleep restraint apparatus or low-hanging mobiles.
6. **Free to breathe** – infant has no restriction of chest movement from pressure on the chest, tight wrapping or heavy bedding.
7. **Free from tobacco smoke** – babies should sleep in environments that are totally smokefree.

In safe sleep spaces, infants should be:

1. **Back to sleep** – infants should always be placed on their backs to sleep.
2. **Smokefree** – always allow babies to breathe air free of smoke.
3. **In parents' room** – babies are safest when sleeping in the same room that their parents sleep in for the first six months of life.
4. **At a comfortable temperature, avoiding overheating** – too many layers or too much heat from others can distress babies.
5. **Looked after by a sober caregiver** – someone who is ready and alert to meet their needs.

The above attributes could be incorporated into health messages that already exist. For example, the Ministry of Health's Safe Sleep Essentials campaign advises:

- **In every place, for every sleep, check that baby is safe:**
  - **Face up** – babies should be placed to sleep on their backs on a firm, flat surface.
  - **Face clear** – free from other people who might overlay baby, free of gaps that could trap or wedge, free of objects that might cover the face or cause strangulation.
  - **Smokefree** – babies should sleep in environments that are totally smokefree.

16 See the leaflet *Safe Sleep for Babies*, published by The University of Auckland's Faculty of Medical and Health Sciences. URL: http://www.changeforourchildren.co.nz/files/docs/safesleepforbabies.pdf.

Because all sleeps should be safe sleeps, parents need to be aware of the risks associated with makeshift bedding. Problems with makeshift sleeping arrangements may occur because people often think infants need to be 'snugly' in soft environments, or tightly wrapped or cocooned. However, situations such as a couch, beanbag or adult bed also increase the risk of suffocation or strangulation, as face covering, overheating, neck flexing or wedging can easily occur.

Beds designed for adults are often too soft, have spaces to wedge an infant or coverings that can cover the face. Infants all need a space designed for them to sleep safely. There is a risk of suffocation from overlaying if an adult or another child is in the same bed as an infant, as the other person may accidently move and compromise the ability of the infant to breathe.

This study has also highlighted that infants still die in unsafe bassinettes and cots. While New Zealand safety standards exist for cots and bassinettes (AS/NZS 2172:2003, AS/NZS 2195:2010, AS/NZS 2130:1998), all cots and bassinettes should be checked to make sure they are safe, especially those that are second-hand or makeshift. Cots that have been purchased second-hand, or passed down from generation to generation, are at risk of having ill-fitting mattresses or being broken. A practical solution provided by a local Child and Youth Mortality Review Group was to have a pop-up window on internet sites, such as Trade Me, providing recommendations for safe cot features at the point of sale for second-hand goods.

Recommendations about infants sleeping in cots must include the importance of a secure cot with a tightly fitting mattress that can't move during sleep. Furthermore, parents and caregivers need to be aware of the risks of reduced awareness associated with their own alcohol and drug use – all babies should have a sober carer at all times. These messages need to be disseminated widely to the community, and reinforced at all levels.

Because safe sleep is so important, much work is being done to find better ways to keep infants safe. The wahakura is a woven flax basket designed to meet points 1–5 in the first text box on page 17 (20). In addition, the wahakura can sit in the family sleeping place and provide the benefits of bed-sharing, such as ease of breastfeeding and bonding. Furthermore, the wahakura is a culturally appropriate solution and easily transportable, making it a potential solution to deaths occurring in makeshift bedding arrangements and in faulty cots.

Similarly, pepi-pods[17] are being provided in a number of centres throughout the country and are very well accepted by families. Various clip-on cots and 'side car' cots are also being trialled in New Zealand.

It is crucial that new solutions being considered comply with the above standards, and that any unforeseen consequences relating to their use or misuse are identified and addressed. As part of a current randomised controlled trial, mothers are given either a wahakura or a bassinet and then followed over time to determine the environmental and practical issues related to its safety and use, and therefore how families and whānau can be best supported to keep infants safe.

Safe sleep messages need to be given from before birth, and health care professionals, including midwives, Well Child providers and general practice (GP) practice nurses, have a responsibility to reinforce messages that are current, scientifically proven and consistent across all spheres. This early intervention is especially important as infants under two months represent the largest single group at risk of suffocation while in a place of sleeping.[18]

Messages regarding safe sleeping do change practice (16). Von Kohorn demonstrated that advice regarding safe sleep position given from multiple sources to high-risk mothers does make a difference to childcare practices (21). Mothers' beliefs regarding comfort and risk of choking in the supine position influence their decisions, and safe sleep messages should reassure mothers regarding these issues (21). All health practitioners need to ensure that the messages given are consistent and ensure best practice is implemented. Often, health practitioners might need to provide the same message repeatedly to support learning and implementation.

17 Contact http://www.changeforourchildren.co.nz/pepi-pod for more information on the pepi-pod.

18 The CYMRC notes that Child, Youth and Family also appreciates the importance of these safe sleep messages and the CYMRC appreciates the work Child, Youth and Family is undertaking to provide accurate and up-to-date information on safe sleeping practices to caregivers and foster care providers.

Preventing the unexpected – how does suffocation and strangulation in bed relate to SUDI and SIDS?

SUDI is an umbrella term that describes the death of an infant which was not anticipated as a significant possibility 24 hours before the death, or where there was a similarly unexpected collapse leading to or precipitating the events which led to the death. Deaths due to traumatic asphyxia caused by suffocation from overlaying and wedging are included as SUDI cases, yet deaths due to motor vehicle crashes or assaults are not. Within the group of deaths designated as SUDI, there is a spectrum of cases ranging from those that are unexplained following full investigation (SIDS) to cases which are fully explained (explained SUDI). Between these two ends of the spectrum are cases where a pathologist or coroner cannot be certain as to whether the death is explained or not; these are often labelled 'unascertained'. The unexpected nature of SUDI can lead to the acceptance that these deaths 'just happen' and cannot be prevented. In fact, a substantial proportion of SUDI are preventable.

Deaths that are categorised as SUDI are 'unexpected' from the point of view of parents or caregivers. Therefore, it is important to review the whole SUDI spectrum so preventive efforts can be aimed at all causes of SUDI. Unfortunately, coding of deaths and even the definitions used is not a precise science, and pathologists, coroners and researchers around the world and in New Zealand include and exclude different categories. For instance, some do not include cases of suffocation or strangulation in bed within SUDI; this means any international comparisons need to be viewed with extreme caution. Exclusion of any cases from the SUDI group may mask the importance of some preventive strategies.

A critical feature of the first year of life is that infants can die without warning signs or distress to alert parents or caregivers. Intrinsic vulnerabilities in some infants may make them more susceptible to sudden death without any apparent external factor or illness. There are also cases which are clearly attributable to external factors that on their own would be sufficient to cause death. These include suffocation and strangulation in bed or overwhelming infection. Between these two extremes a spectrum exists where the degree of contribution of infant factors and environmental factors varies. It appears that infant factors and external factors conspire together with risk accumulating. Where un-modifiable risk factors in the infant exist, it is especially important that environmental factors are as favourable as possible.

Infant vulnerabilities include:

- smoke exposure during pregnancy
- smoke exposure after birth
- prematurity
- small for gestational age
- illness or congenital/genetic conditions that may affect the ability to breathe.

The above vulnerabilities are inter-related. For example, smoke exposure during pregnancy (a modifiable risk factor) results in infants being born at a smaller birth weight and less able to rouse if short of oxygen. Smoke exposure after birth (again modifiable) results in an increased number of respiratory infections in infants.

The sleeping environment is crucial with regard to SUDI prevention (see the earlier text box describing the features of a safe sleep space). A key message from this report is that everyone needs to be aware of the circumstances that lead to infants suffocating or being strangled in bed so they can be avoided. Furthermore, there are common themes between SIDS prevention messages and the actions needed to prevent suffocation and strangulation in bed, so good uptake of prevention is likely to have benefits for the prevention of other parts of the SUDI spectrum as well.

Foreign body inhalation

Sixteen children died as a result of choking in New Zealand during 2002–09. Foreign body inhalation leading to death in children is well recognised internationally (1, 10). The majority of deaths that we report here occurred in children younger than two years of age. Sausage/Meat and peanuts were the cause of death in approximately half of the cases. Literature supports the finding that hard, round foods (such as peanuts and beans) are the most likely causes of death due to choking. Items with elasticity and lubricity, such as hot dogs and balloons, are also often cited as high risk (11–13).

Death from choking is just the tip of the iceberg. For every child who dies from foreign body inhalation, another 10 are seen in hospital (13). Tragically, almost half of the deaths in this series occurred at a gathering or communal place of eating and during a special event such as a party. While the reasons for the contribution that such environments make to mortality rates were not available from the CYMRC dataset, it is not unreasonable to suggest that during such gatherings special foods are more likely to be available (such as nuts, small, round lollies and small sausages), children are less likely to be supervised and children are more likely to be running around while eating and not following the normal eating routine of sitting still and focusing on eating alone. All of these factors may contribute to an increase in choking-related deaths at such events.

In 2010, the American Academy of Pediatrics (AAP) published a policy statement on prevention of choking that highlighted the risk of latex balloons (responsible for 29 percent of deaths in one case series) and hot dogs (responsible for 17 percent of deaths). The AAP recommended foods and toys to have mandatory choking hazard warnings and a call to redesign high-risk foods such as hot dogs (22).

The New Zealand Ministry of Health has recently developed guidelines on the prevention of choking by food in children (23). Increasing the awareness of the importance of supervised eating times is important, and a focus on one activity at a time should be emphasised. In addition, awareness of potential household choking risks, such as small objects and toys, should be encouraged. These need to be kept out of the reach of young children. Interestingly, there were no deaths from small toys or small parts incorporated into toys in the cases reviewed.

In New Zealand, children's toys must comply with a standard related to mechanical and physical properties, which is a common legal requirement in most developed jurisdictions around the world (24). This provision makes it a mandatory requirement that small parts that are choking hazards be illegal in toys for children under 36 months. The adoption of this provision may be reflected in our results. Furthermore, there has been a focus on providing health promotion messages over a number of years to highlight to parents the importance of age-appropriate toys and avoiding toys with small removable parts or small toys that may cause choking.

What to do with a choking child (25)

If a foreign body is easily visible in the mouth then remove it, but be careful not to push it further into the airway. Do not perform blind finger sweeps of the mouth.

Are they coughing? Encourage coughing, support and assess continuously.

Do they have severe airway obstruction or an ineffective cough? An ineffective cough is recognised by the child's inability to speak, cry or take breaths between coughs.

If they are conscious:

1. Send for help.
2. Five back blows – lying the child or infant with head down, deliver blows with the heel of your hand to the back of the child.
3. Five chest thrusts – turn the child over, still in head down position, and placing heel of hand on the lower third of the sternum deliver thrusts at a rate of one per second.
4. Assess the mouth for a foreign body and repeat if the foreign body has not been expelled.

If they are unconscious:

1. Send for help.
2. Open the airway – head tilt, chin lift and jaw thrust.
3. Give five rescue breaths.
4. Commence cardiopulmonary resuscitation (CPR).

Unintentional strangulation

Thirteen children died from unintentional strangulation in New Zealand during 2002–09. Six of them were under two years of age, and lacked the developmental ability to extract themselves from a dangerous situation. Altman in Victoria, Australia, reviewed 16 deaths in a 10-year period due to unintentional cord strangulation. Age and developmental ability of the child influenced the mechanism of death. Infants not yet mobile became tangled in cords on objects, as in a rattle on a string or a hanging necklace (10). Other studies have shown dummy cords and bibs to also pose risk in this age group (1, 5). As children become more mobile they encounter danger in the form of hanging cords or ropes such as curtain cords. The danger of curtain cord strangulation is widely recognised in the literature with 168 deaths reported in the United States over a 15-year period (26). Internationally, there has been advocacy and legislation created to prevent unintentional strangulation in this age group (27–30).

Older children are at risk from dangerous play with ropes or cords. Six children over the age of six years died in New Zealand from dangerous play with ropes. Homemade rope swings have caused deaths in Australia (10). Children need to be educated about safe play with ropes. This message should be reinforced by parents, teachers, caregivers and the media.

Unintentional suffocation

The prevention of unintentional suffocation requires consistent and clear messages, provided through education and professional advice and with media support. In addition, high-risk families could be targeted with an intensive home visiting programme aimed at increasing awareness of safety at home. Tertinger et al developed and tested a home accident prevention inventory package, which introduced and reinforced safety messages over multiple visits. At the end of the intervention, homes were safer from known risk factors leading to childhood injury (31). Although intensive, for families identified as high risk, such as those with Child, Youth and Family involvement, a package similar to this may be useful.

In Austria, a free home safety pack was provided to all families with children less than six years of age. Items included a smoke alarm, safety plugs and window barriers to prevent falls (3). The box was popular and most items had good uptake in terms of use in the house. However, it was an expensive project to run and EuroSafe recommended integration of the products into housing standards so that safety features are already part of the house that a family rents or buys. Currently some regional initiatives produce a home safety pack, 'Reach Me', and this model could be distributed to a wider community and have additional items such as curtain cord coverings or cleats, and a choking guide to the size and type of food objects suitable for varying age groups. Housing New Zealand could incorporate safety features recommended by this report into homes under its jurisdiction.

Limitations of analysis

Although the information within the CYMRC database on the 79 cases in this report is extensive and from sources including local Child and Youth Mortality Review Groups, police, post-mortem findings and coroner reports, the information is not reported by all these sources in a systematic format. This lack of a systematic format is likely to result in reporting bias; factors that are present and felt to have contributed to a single death are likely to be reported, while the absence of these factors in any single death are less likely to be reported. For example, data on smoking exposure or alcohol impairment of caregivers was not consistently reported in the cases of suffocation in the place of sleep. The report is further limited by the lack of detailed information regarding the prevalence of given exposures within the community and the small numbers included. However, it should be noted that the detailed information collected within the CYMRC database is not replicated in any other country, hence we have a unique data source to describe the circumstances surrounding the death of New Zealand's children and young people from which to make informed recommendations.

Issues and recommendations from local Mortality Review Groups

During 2002–09, a total of 62 cases (37 percent of the cases identified by an ICD-10-AM J690, R090, R98, R99, W75-79, W84, Y20 search) underwent local group review. The proportion undergoing review increased progressively as the number of local review groups operating around the country increased. Thus, in interpreting the issues and recommendations highlighted below, it should be remembered that these recommendations were made on the basis of a review of only a subset of the deaths that occurred during this period.

Local groups identified three consistent themes when reviewing suffocation, foreign body inhalation and strangulation cases: the need for after-death care pathways, the need for education and consistency of messages and the need for improved interagency communication.

After-death care pathways

Care after death can have a significant impact on the ongoing grief process for the family and whānau. Local Child and Youth Mortality Review Groups often note that families who suffer the death of an infant or child in the community receive fewer supports than when the death occurs in hospital. Local group recommendations included more support services that are culturally and linguistically appropriate. They also noted that people with disabilities need more support, and in some cases there is a lack of understanding of police and medical processes, and more support needs to be provided for communication with these services. Some local Child and Youth Mortality Review Groups have highlighted good practice with a follow-up medical appointment after the death to provide preventative messages for the remaining children, an opportunity to explain post-mortem findings, screen for abnormal grief response and ensure adequate support systems are in place. After-death care should support the grieving family and whānau, first and foremost. It should be a no-blame, culturally sensitive process, ensuring the family has adequate resources, support and information following the death.

Consistency of information given to caregivers

Some local Child and Youth Mortality Review Groups noted the inconsistency of information provided by neonatal intensive care units, lead maternity carers (LMCs) and Well Child providers. In some cases, the significance of risk factors appears not to have been recognised, or these risk factors were not communicated to families. Recommendations included further education of LMCs and Well Child providers on how to make consistent assessments of risk, provide appropriate referrals, provide correct and consistent safe sleep messages for prevention, screen parents and caregivers about their smokefree status, and offer referrals to smoking cessation services. In addition to education, an audit or regular review of practitioners' practice could be made to ensure ongoing best practice is developed and followed consistently. Leaflets or pop-up windows on internet sites such as Trade Me could be used to provide information regarding safe sleeping and safe cots. Immunisation was noted by some groups to be erroneously associated with SUDI by some families and whānau.[19] In other cases, there was a delay in calling emergency services and there was concern expressed that there was no credit on the phone to make the emergency call.

Need for improved interagency communication

Many of the cases that were reviewed were complex and had multi-agency involvement. In addition to multiple risk factors, there were also occasions of previous child or young person deaths in the same family and whānau. Often there was a breakdown in communication or a lack of suitably resourced care coordination. Local groups suggested more social work support in such cases was essential, as was the development of a service to coordinate care from health, education, child protection and police perspectives. There is some confusion regarding the privacy laws and what information could be shared between agencies, and this was seen as needing to be clarified and formalised into agreements between agencies. In addition, accidents involving products could be relayed to the Consumer Affairs team in MBIE to allow prevention initiatives. One group suggested that persistent follow-up of families and whānau refusing to engage with Well Child providers was critical to improve outcomes for children. They suggested that this could be the responsibility of a formally assigned care coordinator. However, the reasons why some family and whānau do not engage with such services are not fully known.

19 A number of studies have conclusively shown that SUDI is not caused by immunisation, including the New Zealand Cot Death Study, which found a lower rate of SUDI in immunised children (Mitchell EA, Stewart AW, Clements M. 1995. Immunisation and the sudden infant death syndrome: New Zealand Cot Death Study Group. *Archives of Disease in Childhood* 73: 498–501).

Issues and recommendations from the CYMRC

Smoking

Some populations in New Zealand have high rates of smoking. Smoking during pregnancy or around the baby will put the baby at increased risk of SUDI from all causes, including suffocation in sleep and SIDS. There is already considerable effort being undertaken in working with parents and families to achieve smokefree homes, and this effort must not be compromised. Regardless, all pregnant mothers, babies and children receiving health care ought to be screened for smoking in the home by asking parents about tobacco smoke exposure in the home where the pregnant mother, baby or child lives. Smoking cessation services must be offered when needed, especially in pregnancy. Developing more systems to reduce uptake of smoking by young Māori women prior to conception is potentially an important step to reduce smoking rates in pregnancy and improve infant health outcomes.

Injury prevention

The CYMRC observes that New Zealand has a high rate of death from injury, particularly unintentional injury, amongst its children and young people (4). A focus on childhood and adolescent injury should remain a priority to address this.

In the current classification of injury deaths in the first year of life, it is convention to include transport, drowning and suffocation deaths (where a clear external agent, such as a blind cord, applies force) in the category of unintentional injury. Such deaths only make up 2.4 percent of deaths in infants aged between 28 days and one year. The injury prevention sector works hard to highlight and prevent risky situations which may contribute to these classes of deaths. However, as highlighted by the above work, this is an under-representation of the risk of unintentional injury death in infants as deaths due to suffocation or strangulation in place of sleep are, in contrast, classified as SUDI deaths and not unintentional injury deaths. SUDI comprises 40.9 percent of deaths in infants aged between 28 days and one year.

The analysis in this report demonstrates that suffocation and strangulation in bed is, overwhelmingly, the most common cause of injury death in infants under one. The previous classification of suffocation and strangulation in place of sleep only within the SUDI group has tended to hide this condition. Preventive efforts from the injury prevention sector have not been prominent and the community as a whole has, at times, tended to accept these deaths as something that happens rather than something that can be prevented. As these deaths are largely preventable, the CYMRC would like to see preventive efforts in this area grow.

As deaths from suffocation or strangulation in the place of sleep are in fact injury deaths, successful preventive work will have much in common with other types of injury prevention work. In the past, identified unintentional injury related problems have often led to prevention interventions, such as the provision of car seats. The provision of safe sleeping devices (as in cots, pepi-pods or wahakura) could follow along these lines. The CYMRC recognises that a number of DHBs and NGOs have developed programmes to provide pepi-pods or wahakura to at-risk families. The value of the wahakura project, in particular, is that it is developed from a Māori-initiated, community response to SUDI.

The European Child Safety Alliance (3) has created a report card of policy interventions with evidence of positive effect for injury prevention strategies. European countries use this to benchmark their progress and to implement evidence-based strategies. New Zealand can use this as an evidence-based guide to effective prevention strategies for unintentional suffocation, foreign body inhalation and strangulation, and to assess progress toward the goal of decreasing deaths.

With respect to the European Child Safety Alliance report card for unintentional suffocation, foreign body inhalation and strangulation, positive features of the current New Zealand climate include responsible government departments, leadership and interagency networking in the area of child injury prevention, and surveillance in place to ensure strategies are valid within the New Zealand context (32). Furthermore, there are New Zealand laws to enable restriction and banning of unsafe products and to require warning labels on toys and foods that are a choking hazard. In addition, New Zealand has appropriate regulation regarding cot design and is able to monitor the impact of an intervention such as the wahakura.

However, areas that New Zealand could improve on include more explicit warning labels outlining actual risk of strangulation or choking. A warning label must explain what the risk is in order to be effective. Secondly, specific curtain cord legislation could be introduced to reinforce the production and importation of curtain cords that conform to international safety legislation and have appropriate safety labels to prevent strangulation. Thirdly, although no deaths were recorded from latex balloons or drawstrings on children's clothing, this is an area that has caused deaths overseas. More debate might need to occur in New Zealand before we can identify how to address this issue.

In many cases, infants who die of SUDI come from families where complex needs exist and vulnerability to a number of adverse outcomes can be recognised before death. Early identification of vulnerable infants and families provides an opportunity to implement cross-sector interventions and supports. Systems to assess their needs, from before birth, and provide additional supports and interventions are therefore recommended.

Finally, New Zealand could improve systems within the Well Child and social support systems around home injury prevention across multiple child development stages. This would include assessment and education regarding home safety and provision of consistent messages. Supportive home visits can be effective if information is provided at an age-appropriate time in the child's development and combined with the provision of free safety equipment, if needed (3). Tools and information resources could be created and key indicators recorded. These key indicators could be included in a checklist of quality indicators, including every infant being registered with a GP by four weeks of age.[20] These resources could be used to ensure consistent safe messages are being disseminated, and to identify high-need families and whānau who require more intensive intervention.

Preventing suffocation in place of sleep

The CYMRC notes that suffocation in place of sleep is the most common cause of death from unintentional injury in the first year of life in New Zealand and is largely preventable. Prevention should, therefore, be a high priority for all health and social service providers, including those who specialise in injury prevention.

Coroners frequently request that the health sector provide clear consistent advice about prevention. Such clear advice is becoming more important as additional sleep options become available to families. In the past, mixed and conflicting messages about the best safe sleep arrangements may have been a factor in the continuing death toll from SUDI. The CYMRC has, therefore, developed the following points to guide professionals, family and whānau.

1. Infants under three months of age (and especially in the first month of life) are most vulnerable to suffocation in place of sleep.
2. Risk of death, although not identified in this report, is apparent in the first few hours following birth.[21]
3. Interventions to prevent circumstances that may compromise the airway or breathing of an infant will reduce the risks of suffocation in place of sleep and have a significant impact on the incidence of SUDI in New Zealand.
4. Smokefree pregnancies and families will reduce vulnerability in infants. Babies exposed to smoke during pregnancy and after birth are more vulnerable and have increased risks of suffocation in sleep.
5. All places where infants sleep should be carefully assessed from first principles (see page 17) to minimise risks of suffocation.
6. Parents and caregivers should be informed that a significant number of infants die every year because of suffocation[22] in the situation of sharing a sleep surface with an adult or child.

20 The CYMRC is very pleased to note recent work to improve continuity of GP and Well Child care with newborn enrolment.

21 Suffocation has been identified as a contributing factor to sudden and unexpected postnatal collapse (SUPC) in infants in the first 12 hours of life (Becher J-C, Bhushan SS, Lyon AJ, et al. 2011. Unexpected collapse in apparently healthy newborns – a prospective national study of a missing cohort of neonatal deaths and near-death events. *Archives of Disease in Childhood Fetal Neonatal Edition*. doi: 10.1136/F2 of 5 adc.2010.208736).

22 Suffocation in place of sleep includes all situations where the whole or part of a body, such as a limb or breast, can cover the face, flex the neck or apply pressure to the chest or abdomen of an infant making it harder to breath. Infants have few mechanisms to protect their own airway because of soft flexible tissues so even slight pressure on the nose or face or neck flexing can lead to suffocation.

7. Current evidence suggests that the safest place to sleep for ALL infants is in their own cot or bassinette designed for infant sleep, close to parents or caregivers and in the same room as parents or caregivers at night.
8. Some families share a bed or other sleep surface with their baby routinely, occasionally or do so when away from home. In these situations there are some new solutions (such as wahakura or pepi-pods) which may provide the baby with some protection.
9. When the only available sleep spaces are hazardous,[23] providers of health and social services should all work to support families in providing sleep spaces for infants. Families should obtain a cot compliant with the mandatory safety standard AS/NZS 2172:2003 or a safe bassinette. Where this is impractical or impossible, a wahakura, pepi-pod or other arrangement that minimises the risk of suffocation should be considered.
10. Where infants have additional factors leading to vulnerability, such as in-utero smoke exposure, prematurity, low birth weight or medical conditions, additional efforts should be made to reduce the risks of suffocation.
11. Every baby needs a sober caregiver. Caregivers who are under the influence of drugs or alcohol should never share a bed with the baby.

23 Hazardous spaces would include couch, mattress or bed not designed for infant sleep (even if nobody is sharing the space), bean bags, cushions or other makeshift arrangements.

National policy and practice recommendations

1. The CYMRC will report mortality data in ways that demonstrate that a large proportion of SUDI are due to unintentional injury through suffocation, in order to highlight appropriate prevention strategies.

2. The CYMRC recommends that safe sleep for every New Zealand infant should be a high priority of government departments and agencies, DHBs, health providers and families and whānau. Multipronged interventions to increase the prevalence of safe sleep should include the following:
   a) **The provision of safe places to sleep:** The CYMRC would like to see the provision of safe sleep environments (in the form of cots, wahakura or pepi-pods) to families that meet an agreed threshold of need. Health and social service providers need to be aware of the different programmes available (either nationally or within their local area) that provide safe sleep devices for families in need.
   b) **Increasing community awareness and education:** This can be achieved through health promotion and social marketing about the risks and circumstances in which suffocation in place of sleep occurs and how these situations can be avoided. Appropriate Māori and Pacific community leaders are seen as key influencers to support families in establishing safe sleeping routines from birth. The Health Promotion Agency might have the connections and expertise to support such a campaign.
   c) **A clear national strategy headed by appropriate Māori and Pacific community leaders:** The strategy needs to highlight the risks that can arise when an infant shares a sleep surface with another person who is asleep, while also emphasising the benefits of breastfeeding and skin-to-skin contact while awake.

3. The CYMRC recommends that at every point of contact with health care professionals for young women, pregnant women, babies and children, questions are asked about smoking, information about the increased risks to baby's health from smoke exposure is provided, and assistance offered to become smokefree, including referral to smoking cessation services. Efforts to reduce uptake of smoking by young Māori women are also especially important.

4. The CYMRC will convene a meeting of senior key stakeholders in infant product safety – including the Ministry of Social Development, MBIE, ACC, and the Ministry of Health – to discuss current prevention efforts and to identify leadership. The CYMRC will seek to have the following ideas, strategies and approaches considered:
   a) The development of a memorandum of understanding to improve information sharing between the Ministry of Health, Ministry of Social Development, MBIE and ACC to allow information regarding deaths and injury associated with products to be monitored and acted on appropriately.
   b) The Commerce Commission to enforce mandatory standards **AS/NZS 2172:2003, AS/NZS 2195:2010, AS/NZS 2130:1998** for cots and bassinettes.
   c) Information on safe cots be available to all purchasers at the point of sale, even when sales are online.
   d) The 'Keeping Kids Safe' checklist about cot safety be used by health care providers and welfare agencies, before and after birth, as well as by families, whānau and sellers of used cots.[24]
   e) Retailers supported to have the potential to positively influence families by being a greater source of information about safe sleeping through having literature available in their stores, and making sure that all displays demonstrate good safe sleep practice by displaying cots with correctly sized mattresses, no pillows and safe bedding.
   f) Increased consumer and retailer awareness and education regarding the hazards of curtain and blind cords and the availability of solutions to reduce risks.
   g) Visits to homes by service providers to be used as opportunities to highlight and address risks and provide information.

24 For more information, see http://www.consumeraffairs.govt.nz/for-consumers/goods/product-safety/keeping-kids-safe/cots.

h) More informative and explicit hazard labels, outlining actual risk of strangulation or choking for products, eg, curtains and blind cords.

i) The Ministry of Social Development continuing to provide, and more actively promoting, the support available to eligible families to obtain a safe sleep space through the use of special needs grants.

5. The CYMRC recommends government departments and agencies continue to fund and support unintentional suffocation research, particularly into the efficacy and safety of the pepi-pod and wahakura.

6. The CYMRC recommends government departments and agencies, DHBs and health providers develop recommendations around systems that identify needs before birth and ensure continuity of care after birth, with high levels of engagement with GP[25] and Well Child services.[26]

7. The CYMRC recommends government departments and agencies, DHBs and health providers clarify who has the primary duty of care for newborn infants under one month of age. While early enrolment with GPs and Well Child services is important, LMCs and midwives play a key role in supporting engagement with health care as well, and there needs to be a strong focus on the baby's health, well-being and injury prevention.

8. The CYMRC will meet with the Ministry of Social Development to discuss the Ministry's role in the prevention of suffocation and strangulation as the lead agency for cross-sector injury prevention work for infants and children (as specified within the New Zealand Injury Prevention Strategy).

   A well-targeted, multi-sector, strategic approach to the prevention of suffocation and strangulation is required, with an emphasis on ensuring community-based local ownership of interventions, and alignment with SUDI prevention work.

9. The CYMRC encourages a centralised approach to the development and dissemination of safe sleep resources. Anecdotal evidence suggests that many well-meaning agencies and groups develop resources that are not consistent, which further complicates the need to provide simple, direct, evidence-based safe sleep messages.

10. The CYMRC recommends that the Ministry of Education, with input from the Ministry of Health, reinforce key messages regarding suffocation in bed, choking and strangulation in its National Administration Guidelines provided to early childhood education providers and schools.

25 The CYMRC is very pleased to acknowledge recent work that supports the enrolment of newborn babies with general practices.

26 The recently published *Solutions to Child Poverty in New Zealand* from the Children's Commissioner's Expert Advisory Group makes a number of similar recommendations (33).

Best practice for DHBs, PHOs and NGOs

The CYMRC recommends the following as best practice for preventing unintentional suffocation, foreign body inhalation and strangulation to DHBs, PHOs and NGOs:

1. All DHBs should have a safe infant sleeping policy, incorporated into Ministry of Health requirements for DHBs, that adheres to CYMRC guidelines and is agreed by antenatal, neonatal, postnatal and paediatric services,[27] which aims to ensure:
   a) staff who support families caring for infants (including GPs, PHOs, NGOs, LMCs, midwives and neonatal and paediatric nurses) receive training and updates about prevention of SUDI and ways of communicating risks to families as part of their core training
   b) parents readily see and observe safe sleeping practices for all infants[28] within DHB facilities so they better understand how to practise safe sleep after they are discharged home
   c) safe sleeping arrangements are available for all infants after they are discharged home – meaning that DHBs or other agencies should provide safe sleep devices for at-risk families if they are unable to obtain one; in addition, health care providers need to plan ways to undertake home visits to assess the quality of the baby's sleep space, especially for infants with the greatest vulnerability
   d) families are provided with education and supports, including use of te reo and Pasifika languages, tailored to their level of need about the hazards that arise in some sleeping situations
   e) all parents and caregivers are supported to be smokefree, especially during pregnancy, and DHBs have a focused smokefree policy to ensure that all parents and caregivers are screened about smoking (particularly in regards to the exposure of newborns to tobacco smoke), receive advice about the increased health risks caused by tobacco smoke, supported to become smokefree and offered referrals to smoking cessation services
   f) advice on safe strategies for night feeds and settling infants is provided to parents
   g) the advice received by parents regarding safe sleep practices is consistent across health care professionals
   h) safe infant sleep practices are monitored as a quality indicator for maternity and child health facilities, ensuring meaningful outcomes are measured (such as what parents are doing, rather than recording that safe sleep was discussed).

2. All DHBs should have a safe sleep coordinator and a safe sleep action group, consisting of midwives, GPs, Healthy Populations, Well Child providers, paediatric and neonatal staff and Māori health providers, that meets regularly. The safe sleep action group will support the safe sleep coordinator to coordinate and deliver up-to-date education, policies and resources for safe sleep while also auditing and evaluating DHB practices.

3. All DHBs should have systems in place that ensure early identification of vulnerable infants (before birth) and ensure high quality, inter-sectoral interventions and supports are in place for those vulnerable infants, including those needed to support safe sleep. This means developing individual care plans that name the services to be involved with each individual, family and whānau; are culturally appropriate; and include all members of the health care teams, including midwives. To be effective, the family and whānau must 'own' the plan. Details of the plan need to be recorded and implementation needs to be monitored and evaluated.

4. All DHBs should ensure that Well Child providers deliver messages to caregivers regarding safe sleep and strangulation and choking prevention. Where possible, these messages should be supported by providing caregivers with resources and safety equipment, such as curtain cord cleats.

27 For a sample of a DHB safe sleep policy, see the CYMRC section of the Health Quality & Safety Commission's website: http://www.hqsc.govt.nz/our-programmes/mrc/cymrc/publications-and-resources/sudi/.

28 It is important to ensure this work extends beyond maternity services to include paediatric medical and surgical services and other services where infants may be admitted with a parent, such as adult medical, surgical and mental health services.

5. Health care providers should be assessing needs and planning with families to enable safe sleep through interventions and supports that make safe sleep options easy to understand and practise. These actions should start before birth and be reviewed at birth and again in the postnatal period (34). Rather than develop new agencies and programmes, it is important to consider existing programmes that might do such work, such as the Hutt Valley DHB Regional Public Health 'Healthy Housing Project' or existing Well Child providers.

6. Appropriate instructions for use, followed by monitoring and evaluation, need to be in place where pepi-pods and wahakura are used.

7. Antenatal courses should discuss how to prevent unintentional suffocation and strangulation, and emergency treatment, in addition to SUDI and safe sleep practices. Parents should be encouraged to take CPR and choking first aid courses.

8. After-death care and support should be offered to families and whānau where an infant or child dies in hospital or the community. A number of DHBs and NGOs are working to improve the quality of culturally appropriate and timely after-death care and support.

Best practice in community messaging

The CYMRC recommends the following as best practice community messaging for preventing unintentional suffocation, foreign body inhalation and strangulation:

To prevent death in place of sleep by suffocation:

1. Safe sleep for babies should be everyone's priority.
2. In the first year of life, always place baby to sleep on their back.
3. In the first year of life, baby should sleep on a firm, flat and level surface with no pillow.
4. In the first year of life, baby should have their own sleeping space.
5. In the first six months of life, baby is safest when sleeping in the same room that their parents sleep in.
6. Parents should be informed of the risks from bed-sharing, particularly parents who smoke.
7. Eliminate smoking, drugs and alcohol.
8. Never allow anyone to smoke in the baby's bedroom or in the car with the baby.
9. Every baby needs a sober caregiver. Do not share a bed with your baby if you have consumed alcohol.
10. Do not share a bed with your baby if you have taken any drugs.
11. Baby should never sleep on a sofa, alone or with an adult or child.
12. Parents of young infants are often tired. Therefore, be careful where you lie with your baby in case you accidentally fall asleep with baby in an unsafe sleeping space.
13. Baby should not be left to sleep in car seats or capsules, except during car travel.
14. Broken cots are dangerous cots.
15. Ensure that the mattress in the cot is the appropriate size and fits the cot without gaps that could trap or wedge a baby.
16. Ensure that bedding cannot cover the infant's face.
17. Ensure the cot is away from walls and windows and is free-standing in the room.
18. Safe sleep routines are important, especially if away from home or at a social gathering.[29]
19. Some infants have died from the use of products that restrain the infant's movements during sleep. These products must be used with caution as they have been associated with deaths.
20. Encourage breastfeeding.
21. Assess the safety of sleep spaces from first principles using the list on page 17.

29 Safe sleep solutions such as wahakura or pepi-pods are recommended to reduce the risks of suffocation at social gatherings where multiple people sleep in a shared space. We encourage hosts to keep some on hand, in case people do not bring their own.

Foreign body inhalation:

1. Toddlers should be supervised at all meal times and encouraged to concentrate on the activity of eating only. This must be in all places, including large social gatherings where people can easily be distracted and there are lots of children.
    - *If toddlers are excited and running around, they might choke.*

2. When children are eating, they shouldn't be doing anything else.
    - *If children are playing or running while they eat, they might choke.*

3. Be cautious when feeding toddlers small, round, hard or elastic foods like sausage, grapes or apple.
    - *These foods need to be sliced or grated to make choking unlikely because they are more likely to cause choking and death.*

4. Be on the lookout for choking hazards in the home. Vacuum and sweep the floors regularly, check the baby's sleep space for loose or broken parts, and keep items that could be choking hazards out of baby's reach.

Unintentional strangulation and suffocation:

1. Be aware of loose cords around the home and the risk of strangulation. This includes parts of the baby's clothing, such as bibs or pacifier ties.
    - *Cords that can fit around your child's head could become entangled and cause suffocation.*

2. Curtain cords should have a safety device to cover them or to keep the cords together so that they do not form a noose, or they should be kept out of the reach of children. Cots should be placed at least 10cm away from the windows and other hazards. Curtains with an open weave, in which a baby can be caught, should be avoided.
    - *Hanging curtain cords and loose fabrics have caused deaths by strangulation.*

3. If children are playing with ropes or cords, make sure they never put a rope around their own neck or chest or someone else's neck or chest.
    - *Dangerous play with ropes or cords, such as homemade flying foxes or climbing with rope or cord, can lead to unintentional strangulation.*

4. It is also important to be cautious when digging in sand or dirt.
    - *Children or young people can become trapped in unsupported dirt or sand holes, particularly while digging in sand dunes or cliffs.*

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Appendix

Appendix 1: Flow of data for the analysis undertaken in this report

A: Analysis of data from the National Mortality Collection

Accidental suffocation and strangulation in bed (ICD-10-AM W75) n=152

Other accidental suffocation and threats to breathing (ICD-10-AM W76, W77, W83) n=27

Inhalation of food or other objects causing obstruction of respiratory tract (ICD-10-AM W79-80) n=15

B: Analysis following additional review of information from the New Zealand Mortality Review Database

Eight additional ICD-AM codes reviewed: n=427

Pneumonitis due to food and vomit (ICD-10-AM J690)

Asphyxia (ICD-10-AM R98)

Other ill defined and unspecified causes of mortality (ICD-10-AM R99)

Inhalation of gastric contents (ICD-10-AM W78)

Other specified threats to breathing (ICD-10-AM W83)

Unspecified threat to breathing (ICD-10-AM W84)

Hanging, strangulation and suffocation, undetermined intent (ICD-10-AM Y20)

Sudden infant death syndrome (SIDS) (ICD-10-AM R95)

Total cases reviewed: n=621

Unintentional strangulation: n=13

From other accidental suffocation, strangulation and threats to breathing (ICD-10-AM W76, W77, W83) n=9

From remaining ICD-10-AM codes reviewed n=4

Foreign body inhalation: n=16

From inhalation of food or other objects causing obstruction of respiratory tract (ICD-10-AM W79-80) n=13

From remaining ICD-10-AM codes reviewed n=3

Death in place of sleep with suffocation: n=50

From accidental suffocation and strangulation in bed (ICD-10-AM W75) n=49

From remaining ICD-10-AM codes reviewed n=11

Excluded from additional detailed analysis: n=542

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