

REGULAR ARTICLE

The recent fall in postperinatal mortality in New Zealand and the Safe Sleep programme

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ABSTRACT

Aim: Postneonatal mortality rates changed very little from 2000 until recently. There has been a decrease in mortality in New Zealand from 2009 to 2015. This study describes an infant Safe Sleep programme and postulates it is the cause for the recent decrease in deaths.

Methods: The Safe Sleep programme involved as follows: a focus on preventing accidental suffocation, a 'blitz' approach to SUDI education, the targeted provision of portable infant Safe Sleep devices (ISSD) and the development of Safe Sleep policy across all district health boards (DHBs).

Results: Participation in the education 'blitz' by health professionals exceeded one in 23 live births, distribution of Safe Sleep leaflets exceeded two for every live birth, and over 16 500 ISSDs have been distributed to vulnerable infants. Postperinatal mortality fell 29% from 2009 to 2015 (2.8 to 2.0/1000 live births). The fall has been greatest for Māori and in regions with the most intensive programmes.

Conclusion: The recent fall in postperinatal mortality has not happened by chance. It is likely that the components of end-stage prevention strategy, a focus on preventing accidental suffocation, the education 'blitz', the targeted supply of ISSDs and strengthened health policy, have all contributed to varying degrees.

INTRODUCTION

In the late 1980s, the importance of infant sleeping position as a risk factor for sudden infant death syndrome (SIDS) was recognised (1). Many countries advised parents to avoid placing babies prone to sleep and this was followed by a sharp decline in SIDS and in postneonatal mortality (28 days through to the first birthday) (2). In the 1990s, there was a more gradual fall in SIDS and postneonatal mortality, which has been attributed to the change from side to back sleeping position (3). In addition, part of the decrease may have been due to a decrease in smoking in pregnancy (4). Since then mortality rates have plateaued, which has led to calls for further campaigns, an expansion of the risks that should be targeted and different ways of intervening on risk factors, particularly those in the infant sleeping environment (5).

Studying trends in mortality is difficult, as certification of the cause of death may vary with time and between different jurisdictions. In New Zealand, there has been a decline in

SIDS, but 'accidental suffocation in bed' has increased and the incidence has become greater than deaths from SIDS (6). In New Zealand, the term sudden unexpected death in infancy (SUDI) is used, which is a broader term encompassing R95 (Sudden infant death syndrome), R96 (Other sudden death, cause unknown), R98 (Unattended death), R99 (Other ill-defined and unspecified causes of mortality), W75 (Accidental suffocation and strangulation in bed), W78 (Inhalation of gastric contents) and W79 (Inhalation and ingestion of food causing obstruction of respiratory tract) (7).

Key Notes

- The decline in postneonatal mortality plateaued in the 2000s. Recognition that over 50% of sudden unexpected deaths in infancy are associated with unsafe sleeping, especially bed sharing, has led to various 'Safe Sleep' initiatives.
- Postperinatal mortality in New Zealand has decreased by 29% from 2009 to 2015.
- The focus on preventing accidental suffocation, the education 'blitz' and the targeted supply of infant Safe Sleep devices have all contributed to varying degrees.

Abbreviations

DHB, District health board; ISSD, Infant Safe Sleep device; NZ, New Zealand; SIDS, Sudden infant death syndrome; SUDI, Sudden unexpected death in infancy.

There is recognition that many deaths are associated with 'bed sharing', where infants were sleeping in the parental bed, or on the same sleep surface if not a bed. A recent meta-analysis of 11 studies showed a clear association of bed sharing with SIDS (odds ratio (OR) = 2.9). In infants of mothers who smoked, the OR was 6.3 (8). Another recent study combining individual level data from five SIDS case-control studies showed that bed sharing was a risk even in families that were otherwise following all the recommendations, although this increased risk was small by comparison (9). The study confirmed that the greatest risk was due to the interaction of smoking with bed sharing. The addition of parental alcohol consumption on the night of the death increases the risk further. The combined risk is even greater in the younger infant. The risk from bed sharing has been controversial due, in part, to differences in how bed sharing is defined, understood, practiced, valued and whether or not the evidence of risk has been translated into population or targeted interventions.

SIDS and postneonatal mortality rates are higher in Māori than non-Māori, and although rates have decreased in both populations, the mortality rates remain higher in Māori (10). A survey of SIDS knowledge and infant care practice in Auckland reported that significantly more Māori had smoked in pregnancy (53% Māori, 8% non-Māori) and had reported 'some bed sharing' last night (65% Māori, 27% non-Māori) (11). Twenty-one percent of Māori mothers versus 1% of non-Māori mothers did both and this provides an explanation for the higher rates in Māori.

Change is often easier to achieve when there are local data to support it. A review of all infant deaths referred to the coroner in the Auckland region (including Police records) from 2000–2009 has been reported (12). Of 188 SUDI deaths, 121 (64%) occurred while bed sharing. Furthermore, bed sharing was observed in more than 90% of deaths in infants less than one month of age.

The aim of this study was to describe recent changes in mortality for infants aged 1–52 weeks (postperinatal mortality) in New Zealand and to describe the interventions that make up the Safe Sleep programme that we postulate have contributed to this decrease.

METHOD

Infant mortality categories

Statistics New Zealand publishes births and deaths statistics quarterly and provides customised reports on request (13). Data provided as a customised report licensed for re-use under the Creative Commons Attribution 3.0 New Zealand license were used to review trends in postperinatal mortality.

Total infant mortality describes all deaths of infants, from all causes both preventable and unpreventable, in the first year of life. There are three age categories: early neonatal (less than one week), late neonatal (1–4 weeks) and postneonatal (4–52 weeks). The latter two combine as the 'postperinatal' category. Approximately half of total infant deaths in New Zealand occur in the first week of life, largely

due to birth defects, preterm related and other less easily preventable causes. Deaths of infants aged 1–13 weeks comprise more than 50% of remaining deaths, making protection of younger infants a priority. Most potentially preventable deaths, however, they may be classified, occur in the postperinatal period.

This is an ecological study, and the analysis describes the trends. Due to small numbers, the rates may vary considerably from year to year. The variables supplied by Statistics New Zealand gave number of postperinatal deaths by ethnicity (Māori and non-Māori), age (<13 and 13 + weeks) and district health board (amalgamated into regions: Northern, Midland, Central and Southern).

The development of the Safe Sleep programme

From 1994, the New Zealand Ministry of Health has funded dedicated SUDI prevention services. Taking a tripartite approach, the Māori, Pacifica and mainstream providers have been responsible for leading SUDI prevention, within their contractual spheres of influence. Despite everyone's best efforts, declining SUDI mortality stalled in the years between 2000 and 2010, requiring an intervention rethink.

As early as 2006, efforts began to address the stalled rate of change in SUDI mortality for Māori infants (14). Māori interventionists, agencies and communities laid the foundations for what was to follow. Central to this work was the wahakura, a bassinet-like portable infant Safe Sleeping device (ISSD), hand-woven from native flax that was designed to increase safety in the bed sharing environment (Fig. 1). Being traditionally woven, it was hoped that the device would be a culturally acceptable way to overcome the risk associated with 'direct' bed sharing. Weaving workshops were held in Māori communities nationwide to spread Safe Sleep awareness and to teach the making of wahakura. Māori midwives issued wahakura to families, together with 'wahakura rules' for promoting safe use. Midwives valued the wahakura as a focus for promoting a wider range of antenatal advice such as breastfeeding, smoking cessation and immunisation.



Figure 1 The wahakura.

Despite its acceptability to Māori, the wahakura has been difficult to construct in bulk. The limited supply of wahakura has prevented a large-scale national intervention and hampered the potential impact on Māori infant death rates. However, this pivotal early work raised safe sleep awareness in Māori communities, introduced the notion of 'safer bed sharing' and established the ISSD approach as a potential solution to SUDI.

Since 2009, five intervention strands to promoting safe infant sleep have been introduced at different times. Together with the earlier Māori initiatives, they make up the Safe Sleep programme described in this study. The five strands are:

- An *end-stage strategy* to break the impasse on mortality changes
- A '*blitz*' approach to SUDI education to achieve alignment, consistency and scale
- An *intervention focus* on preventing accidental suffocation
- The *targeted supply of ISSDs* and Safe Sleep education
- The development of *Safe Sleep policies* by District Health Boards (DHBs)

End-stage strategy

In 2009, a three-pronged prevention strategy was designed to meet the complex challenges of ending SUDI (15). Based on diffusion of innovations theory (16) the interlocking prongs were as follows: align with evidence, build networks of influence and develop approaches of value. This strategy was underpinned by a shared vision of 'Safe Sleep for every baby, every sleep' for building alignment across regions and groups. The strategy provided the framework for pursuing a strong basis in evidence, high levels of participation in spreading Safe Sleep awareness and the development of enabling approaches for priority groups.

'Blitz' approach to SUDI education

In late 2009, a simple e-tool was developed as 'essential education' for understanding SUDI (17). The aim was to enable easy access to, and broad participation in, SUDI education, extending the reach of the traditional workshop mode of delivery. Called '*Baby Essentials*' the course was designed primarily to resolve professional controversy about bed sharing, and align people with evidence on areas of strong agreement. Participation was certificated, tracked and reported (18). A national network of 'Safe Sleep champions' was formed to implement this and other approaches at local level, and report on their peer education sessions. Champions were supported in this work with simple materials that included PowerPoint® presentations, information leaflets and 'talk cards' for facilitating a range of key conversations with families. Culturally specific workshops and resources, which were provided as part of Māori and Pasifika SUDI Prevention services, strengthened mainstream education.

Intervention focus

During 2010, a more intense focus on preventing accidental suffocation was initiated, to move away from the confusing terms associated with sudden infant deaths. It was thought that understanding infant breathing, and how it can be compromised, might increase confidence and trust in Safe Sleep advice. Called 'Through the Tubes' (19) the approach was delivered through the national Safe Sleep champion network, and materials included short lengths of plastic tubing to demonstrate four ways that oxygen can be slowed, or stopped, from passing 'through the tubes' (airways of infants); a covered face, a pinched nose, a 'chin-to-chest' position of the neck, and pressure on or against the chest. This novel approach aimed to facilitate engagement and understanding and be something worth talking about to others.

The targeted supply of ISSDs

In 2010, the wahakura programme was boosted by the discovery of a suitable companion device for enabling larger scale supply of ISSDs. This general purpose wahakura-sized container made from polypropylene was fitted with mattress and bedding, given the name Pēpi-Pod, where 'pēpi' means 'baby' in Māori, and introduced for concept testing with families (Fig. 2). A massive earthquake in Christchurch in February 2011 saw the device commissioned as an emergency response to unsafe infant sleeping in the aftermath of the disaster, and an infant health education programme developed around it. A national network of sewing groups rallied to make bedding, and 1000 ISSDs were distributed to earthquake families along with education on infant safety (20).

Like the wahakura before it, the Pēpi-Pod spread quickly to become a valued part of the infant health landscape. From two DHBs in 2011, demand increased to nineteen of twenty DHBs providing ISSDs (mostly Pēpi-Pods, but also wahakura) to vulnerable infants by 2015. This unexpected demand required a coordinated approach to supply and distribution of the Pēpi-Pod programme. A lead agency developed the required relationships, processes, content,



Figure 2 The Pēpi-Pod®.

and standards for supply and distribution. A purpose-built Pēpi-Pod was introduced during 2014 and these USSDs are now supplied on a cost-recovery basis for a unit price of NZD100 (GBD46.81, EUR59.26). This includes ISSD, mattress, bedding, education materials and coordination. Programme reports from monitoring data and user feedback describe the Pēpi-Pod Programme and its evolution from earthquake times through the first years of implementation (21).

ISSDs are now an established norm in New Zealand. Ministry of Health leaflets on safe infant sleep advise parents to use a wahakura or Pēpi-Pod if babies are to share the adult bed (22). Education is built into ISSD distribution, including 'rules' for infant protection (Table 1) and an invitation to recipients to help spread Safe Sleep awareness to others.

Safe Sleep policy

Health leaders were urged to make the prevention of SUDI a priority, in a joint letter sent out in June 2012 from the Health Quality and Safety Commission and Child and Youth Mortality Review Committee. The development of DHB-wide Safe Sleep policies, with the vision of 'every sleep a safe sleep' for babies, was a focal point for health action during 2013.

RESULTS

Infant mortality

Postperinatal mortality has decreased by 29% in the six years since 2009, and reached 2.0 deaths per 1000 live births in 2015, down from 2.8/1000 in 2009. This reduction has been most marked in Māori (Fig. 3) and in regions with the best supply of ISSDs (Table 2). For infants younger than 13 weeks (Fig. 4), the pattern is more confusing with an apparent decrease in mortality in <13-week age group in 2012–2013, and then a decrease in the 13 + age group in 2014–2015. As the number of deaths is relatively small, the mortality rates fluctuate from year to year, especially in subgroup analyses. Two infants died while using an ISSD, but in neither case was the cause of death thought to be associated with its use.

Table 1 Rules for using infant Safe Sleeping devices

Wahakura rules	Pēpi-Pod 'rules of protection'
Smoke-free environment	On the back, clear face; only baby in this space.
Face up, face clear	
Flat surface, no pillows, no loose blankets, no toys	Breastfed, smoke-free; sober carer close by me.
Put baby back into the wahakura after feeding	Own space, gentle care; drugs and drinking nowhere near.
No intoxicated adults	
Take the wahakura everywhere for every sleep	

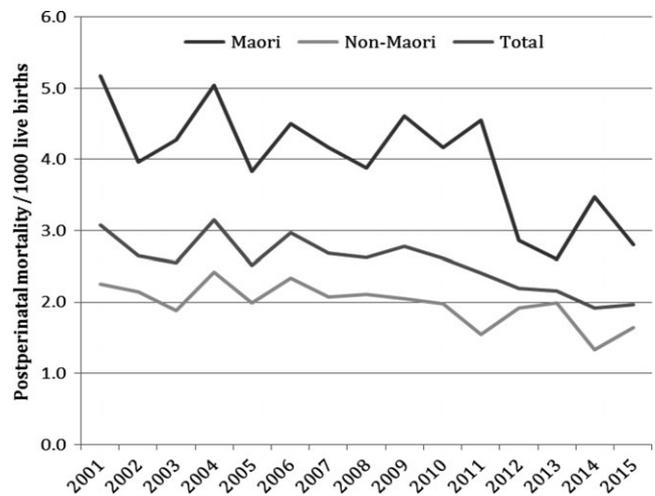


Figure 3 Trends in postperinatal mortality by ethnic group, 2001–2015.

Safe Sleep programme

Over 2600 health and community professionals each year for four years have participated in the SUDI education courses. For comparison with other countries, this equates to one participant per 23 live births. The distribution of Safe Sleep information leaflets to families is more than twice the number of babies born each year, and the number of Safe Sleep information cards designed for placement in hospital cots is approximately the number of babies born each year.

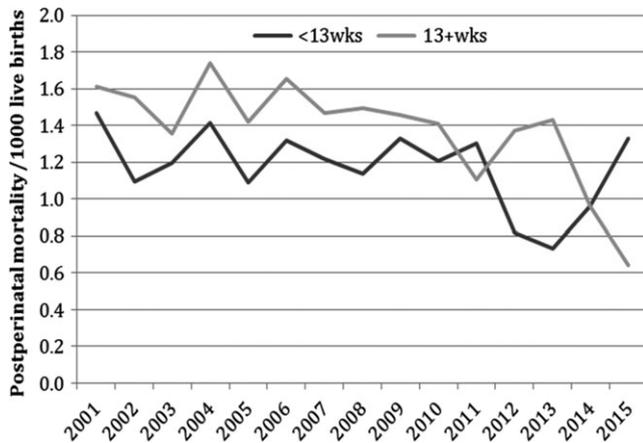
A comparison of data from two postal surveys (in 2005 and 2013) (23,24) in lower risk communities show increased awareness of advice to avoid bed sharing (46.0% and 62.8% respectively) and to sleep babies in the same room as the parent (1.4% and 23.3%), and increased reported receipt of Safe Sleep-related pamphlets (71% and 89%). In addition, parental-reported infant care practices changed during the interval. There were increases in back sleeping (64.8–72.7%) and sleeping in own bed, but in the parents' bedroom (9.9–61.3%), and a decrease in sleeping in parental beds 'last night' (10.5–4.7%).

More than 16 500 ISSDs have been supplied to vulnerable infants since 2010. Of these, 15 000 were Pēpi-Pods and an estimated 1500 wahakura. The Pēpi-Pod programme methods and results have been described in full in a report on the first three years of implementation (2012–2014) entitled 'Their first 500 sleeps' (21). It was compiled from an analysis of programme records for 3961 ISSDs issued, 2915 families contacted after an initial period of use when, for 90%, their babies were aged less than eight weeks, and user feedback from 701 families when, for 53%, their babies were aged less than 16 weeks. Main findings were that:

- the programme was applied consistently and appropriately by distributors where SUDI risk was high. ISSPs were issued to mother-infant dyads with documented SUDI risks: Māori or Pacific (82.2%), exposed to smoking in pregnancy (74.1%), maternal age <25 years

Table 2 Regional variations in reduced postperinatal mortality between 2009–2011 and 2012–2015 and supply of ISSD

Region	All births		Māori births in 2012–2015 N (%)	Number of deaths		Postperinatal mortality rate		Decrease in postperinatal mortality	Number of ISSD supplied	Number of ISSD supplied per 1000 births
	2009–2011	2012–2015		2009–2011	2012–2015	2009–2011	2012–2015			
Northern	75 960	98 073	22 692 (23.1)	192	198	2.5	2.0	0.5	2574	26.2
Midland	36 933	47 187	20 424 (43.3)	126	120	3.4	2.5	0.9	9520	201.8
Central	36 195	44 700	14 580 (32.6)	96	87	2.7	1.9	0.8	3943	88.2
Southern	38 583	48 180	9189 (19.1)	69	93	1.8	1.9	−0.1	462	9.6

**Figure 4** Trends in postperinatal mortality by age of infant at death, 2001–2015.

(50.7%), born before 37 weeks gestation (25.2%) and to infants with no other type of infant bed (28.1%).

- ISSDs were acceptable to and used appropriately by recipient families, and safety advice was reflected in snap shots of infant care. After an initial period of use, most (92%) of 2915 recipients wanted to keep their ISSD and 80% had discussed ‘infant Safe Sleep’ with others, engaging a recorded 14 451 people into Safe Sleep conversations. Parents reported that most infants were ‘always or usually’ placed for sleep on the back (96.1%), in the same room as the main carer at night (92.3%), in an ISSD when sleeping in risk locations, such as adult beds or sofas (88.1%) and breastfed (58.7% exclusively or fully and 19.5% partially).
- most of the 701 families who completed a user feedback survey reported that they received their ISSDs before their babies were four weeks old (83.3%), and that ‘same bed’ co-sleeping at some stage as receiving an ISSD was common (72.8%), with babies ‘always or usually’ also in an ISSD (75.7%). Duration of use fell between 8 and 12 weeks of age, from 82.7% to 57.3%, with 30% of infants still using their ISSD from 16 weeks. At the time of this survey, most infants were breastfed, 42.7% exclusively or fully and 30.8% partially.
- surveyed families reported a high value for the ISSD (93.6% rated it 7–9 out of 9) which was reflected in

comments about how it has supported them (examples below).

It has meant that she has somewhere safe to sleep no matter where we are.

You get a good night’s sleep having baby sleep close to you.

I don’t think I would have breastfed him if he wasn’t right next to me.

I love how she can see out the sides, how it feels like she’s in bed with you, but safe.

The Pēpi-Pod was good to have close by so I could touch him.

Great for when away from home so baby stays settled in his own bed.

I told all the new mums at church about it and I look forward to passing it on.

My sister is having a baby and she wants the Pēpi-Pod.

I’ve got plenty of people who want it when I’m finished with it.

All twenty DHBs had signed Safe Sleep policies by March 2014 with accountability to the New Zealand Ministry of Health built into planning and reporting schedules.

DISCUSSION

We report six years of reducing postperinatal mortality in New Zealand after a decade of little change, and describe a package of intentional activities that have likely contributed. These activities have been applied in real world conditions intending to improve mortality outcomes rather than prove causality. We present them as the back story to the mortality changes and put the case for them as contributing causes.

The Safe Sleep programme is a multimethod public health intervention, encompassing complexity, diversity, scale and an unpredictable time course, all of which pose challenges for meaningful evaluation (25). The most robust of research methods such as a randomised controlled study, are not always available, appropriate or

Table 3 Safe Sleep Programme Reverse Logic Model (2009–2015) charting the intervention course back from the goal of reduced mortality and inequalities for high-risk infants

Evidence To what did we respond?	Actions What did we do?	Output How did we know?	Outcomes How were these achieved?
Stalled mortality decline	Designed an 'end-stage' prevention vision and strategy	'Every sleep a safe sleep' is now the public health mantra	Alignment of health purpose
Rise in suffocation deaths	Spread 'Through the tubes' approach to focus on airways	268 sessions delivered to 2248 participants over 172 hours	Competence to discuss how to protect infant airways
Smoking + bed sharing risk	Supplied infant safe sleeping devices to high-risk infants	16500 ISSDs supplied in 4 years (2012-2015) and highly valued	More vulnerable infants safer when bed sharing
Low safe sleep awareness in priority groups	Promoted roles for priority group peer communication	Safe Sleep discussed with > 6.2 others per ISSD recipient	High Safe Sleep awareness in priority communities
Need for intervention scale	Introduced e-tools and a 'blitz' approach to scale education	Education participation rates by professionals of 1/23 live births	Frequent and consistent Safe Sleep discussions with families
No supportive infant Safe Sleep health policy	Required DHBs to develop infant Safe Sleep policies	All 20 DHBs had active Safe Sleep policies by Mar 2014	Systematic health action on infant Safe Sleep
Persisting inequalities	Made Maori and low-income families priority ISSD recipients	74% ISSDs issued to Maori and 66% to low income families	Reduced mortality and inequalities for high-risk infants

possible for public health interventions such as the one we have described (26). Yet, we all want to know if this programme has contributed to the recent drop in deaths.

We have used programme logic to answer this question (27). This method communicates the intended relationship between outcomes and the elements of an intervention and Table 3 demonstrates the causal relationships between reduced mortality and the components of the Safe Sleep programme. The assumption is that if interventions respond to strong science, go straight to the source of the need, are shown to have had the desired participation, scale, uptake or impact, then it can be logically assumed that they have also contributed to improving health. Similar programme logic reasoning was also used to attribute the dramatic falls in infant mortality in the early 1990s to the 'Back to Sleep' campaigns.

The leadership provided by Māori in bringing in the wahakura and with it, the concept of 'safer bed sharing' rather than 'no bed sharing', was a tipping point in SUDI prevention in New Zealand. This work acted to mobilise Māori communities, strengthen community action, and build a sense of urgency for finding new ways to intervene. The wahakura has remained the 'cultural force' behind this programme that challenged the accepted norm of SUDI prevention at the time. However, to have a population effect when trying to prevent relatively rare events such as sudden infant deaths, an intervention needs to achieve sufficient scale (28), both in practical application (the ISSD) and in an all-encompassing conceptual base. 'Diffusion of innovations' theory provides the appropriate basis

for an 'end-stage' SUDI strategy (16). The building of networks of influence within priority communities enhances awareness of Safe Sleep principles where it is most needed. This is a core component of the ISSD approach for extending impact beyond the recipient of a single ISSD. Programme monitoring indicates that, on average, at least six 'others' are reached for each ISSD distributed (21).

The Safe Sleep champion network and e-learning mode are mechanisms for achieving a coordinated, consistent and large-scale approach to health professional education. These mechanisms most likely supported near-saturation levels for issue of printed health information materials to families, improvement to reported Safe Sleep knowledge and practice by parents, and referrals to ISSD services.

The prevention focus on protecting infant airways and the novel 'through the tubes' angle for discussions with families, makes it easier for health staff to have a different kind of conversation. Safety advice presented within this context, 'makes sense' to people, and becomes something they can explain to others using the tube, or a drinking straw. This draws more people into discussions about safe infant sleep, discussions that are generated by, and occur within, priority networks.

Groups most at risk of SUDI are often labelled 'hard to reach' or 'underserved'. They include Māori, disadvantaged families, women who smoked during pregnancy and bed share with their infants. These groups either do not receive the information at all, or do not receive it in a form that leads to understanding and adoption of safe practice; or they reject it for various reasons, and hold fast to their

current behaviours, which puts their babies at risk. The ISSD intervention specifically works to be useful to such families and is most intensive in regions with high Māori birth rates. It is encouraging that the fall in mortality has been most marked for Māori.

On average, 27% of the estimated vulnerable infant population of New Zealand received a new ISSD in the four years 2012–2015 (based on 43% of Māori smoking in pregnancy and 13% for non-Māori) (29). Coverage is likely to be extended considerably due to sharing of ISSDs in communities, a practice that is encouraged, although levels of reuse are not known. It may also be that the higher awareness generated within priority communities of the hazardous combination of smoking and bed sharing has led some families to reduce one or other of these practices and decouple the compound risk.

ISSDs provide a means of engaging with priority families and delivering a personalised intervention that informs, enables and empowers the family members who then spread Safe Sleep knowledge to others. Both versions, Pēpi-Pod and wahakura, are acceptable. Although the Pēpi-Pod accounts for more than 90% of ISSD distribution, as it is easier to supply in bulk, the wahakura, with its traditional flax construction, provides additional Māori cultural appeal to the ISSD programme.

'Their first 500 sleeps' reports that 72% of families accepting an ISSD already had a bed for their infant (21). It would seem that the problem is not so much that families do not have an infant bed, but that traditional cots and bassinets do not always meet the needs of babies and families, especially at night and for families with both a

mobile (and sometimes transient) lifestyle and a number of possible caregivers for 'loco parentis' duties. Portability of ISSDs, in particular in 'shared-bed' use, facilitates close proximity of infant to parent and breastfeeding, and the low sides make it easier to comfort the infant. Being portable, capable of being used in a shared bed and low-sided are important differentiating features of ISSDs over other infant bed types. The rigid, compact construction of the Pēpi-Pod avoids risk from assembly errors or collapse. We define the infant Safe Sleeping device as 'a portable compartment for sleeping anywhere'. Table 4 lists essential safety features of a generic ISSD for use in any location where a traditional infant bed is not available or suitable.

The advice to avoid bed sharing when the parent is asleep has been controversial, which has resulted in conflicting messages. Controversy, especially when played out in the media, tends to immobilise prevention. The deliberate effort made to resolve controversy in the design of education, and align people with evidence for which there is strong agreement, has been important. Attention has turned to protecting more vulnerable infants as the priority,

Many programmes fail where local adaptation removes the core components that make the interventions work (30). The design of the ISSD programme has been protected by systems, standards and agreements so that families are assured of a similar standard in the distribution of the programme. This balance of adaptation and fidelity is an important aspect of its successful application across health regions.

Strong policy is essential for directing Safe Sleep evidence into systematic action by health care teams.

Table 4 Essential features of an infant Safe Sleeping device (ISSD) for preventing sudden infant death while sleeping

Context	The infant Safe Sleep device needs to be usable as an infant sleeping space in all the situations and locations that are known to increase the risk of sudden infant death and traditional options fail.	
Features	Portable Low-sided (15 cm sides) Rigid construction Firm sides (not padded or soft) Compact Size (40cmW x 72cmL x 15cmD) Supplied with mattress + bedding For young infants (unable to roll) Comes with 'rules' of protection Supplied as a health intervention	Can be easily carried with baby sleeping in it Enables easy comforting with loving touch No assembly required (so no risk from assembly errors) Reduced suffocation risk Can be placed in the parental bed To last babies through the 4–5 months of increased risk To ensure snug fit and be 'ready to go' Not for older babies, or babies who can roll Safe Sleep and infant health principles built-in Not 'furniture' as such. Primary purpose is protection against sudden infant death Peer education role integrated into supply
For use	Recipient invited to help spread Safe Sleep knowledge and practice In any situation, where a baby is not sleeping in a traditional baby bed Or, as a complete system for settling and sleep in the vulnerable first months	For example when sleeping in, or on, an adult bed, or on a couch; for use as a 'day' bed, when visiting, travelling, out and about, and where a makeshift bed is needed. For example when no other infant bed is available
Position	Baby lies flat and level in the ISSD (not inclined)	To avoid positional changes from propping or slipping

While the emphasis on developing DHB-wide Safe Sleep policies may have come later in the overall Safe Sleep programme, it helps maintain the changes already made and support further reductions. We may need champions to get things started, but strong health policy builds a new status quo that is reliant on systematic rather than *ad hoc* action.

In recent years, we have not introduced a new vaccine, changed smoking in pregnancy levels, or changed the nature of deprivation in socio-economically poor communities, but we have supplied ISSDs to vulnerable infants to improve the safety of bed sharing. While, bed sharing has remained common for this group of infants, death rates have fallen by 29%. A traditional cot or bassinet is not always suitable or available. The ISSD offers a safe and convenient option for when high-risk babies sleep in or on adult beds, on couches, or when away from home and makeshift beds are needed.

CONCLUSIONS

The recent fall in postperinatal mortality in New Zealand, is unlikely to have happened by chance. It is more likely that the components of: end-stage strategy, focus on preventing accidental suffocation, education 'blitz', targeted supply of ISSDs and strengthened health policy, have all contributed to varying degrees. The extension of the Safe Sleep programme with its range of approaches, including the targeted supply of ISSDs, may be needed to further reduce SUDI mortality for those infants currently at increased risk.

CONFLICT OF INTEREST

EA Mitchell and D Tipene-Leach declare no conflict of interest. S Cowan declares a professional interest as the developer of education programmes described, and commercial involvement related to coordinating the supply of Pēpi-Pod devices. These were supplied on a cost-recovery basis by a limited liability company with charitable status. No individual or agency profited financially from their sale.

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