
THE CONSULTATIVE COUNCIL
ON OBSTETRIC AND PAEDIATRIC
MORTALITY AND MORBIDITY

ANNUAL REPORT FOR THE YEAR 2001



INCORPORATING THE 40TH SURVEY
OF PERINATAL DEATHS IN VICTORIA

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of Perinatal Deaths in Victoria

**The Consultative Council on Obstetric
and Paediatric Mortality and Morbidity**

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Members of the Consultative Council on Obstetric and Paediatric Mortality and Morbidity, and of its sub-committees, have diverse areas of expertise, and their contributions to the consideration and classification of maternal, perinatal, infant and paediatric deaths form the basis of this report.

Medical practitioners voluntarily complete the confidential medical reports on perinatal deaths, and frequently provide much additional information on perinatal and paediatric deaths. The autopsy reports by anatomical and forensic pathologists continue to play an indispensable part in the deliberations of the committees.

The State Coroner's Office, and personnel from the Victorian Institute of Forensic Medicine, provide valuable information to the Council on all relevant cases investigated by Coroners in Victoria.

The Australian Bureau of Statistics assists with the ascertainment of maternal deaths.

The Newborn Emergency Transport Service provides additional information on infants transferred to, and from, tertiary neonatal centres. The Intensive Care Unit of the Royal Children's Hospital provides the data on paediatric emergency transfers.

The Department of Human Services contributes the information on childhood immunisation and vaccine-preventable diseases in Victoria.

The formidable task of collecting, collating, and analysing data on all Victorian births and deaths, from 20 weeks of gestation up to the 15th birthday, is a considerable challenge for the Council's small, dedicated staff listed in this report.

The printing and distribution costs of this publication have been funded by the Victorian Government Department of Human Services.

This report is available on the CCOPMM/PDCU website: <http://www.health.vic.gov.au/perinatal>

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PERINATAL DATA COLLECTION UNIT, BIRTH DEFECTS REGISTER

The Consultative Council on Obstetric and Paediatric Mortality and Morbidity (CCOPMM) was established in 1962 under the *Health Act 1958*, and is the advisory body to the Minister for Health on maternal, perinatal and paediatric mortality. The Victorian Perinatal Data Collection Unit (PDCU) was established in 1982, by an amendment to the Health Act under the auspices of the Consultative Council on Obstetric and Paediatric Mortality and Morbidity (CCOPMM). The Birth Defects Register (BDR) was established in 1984 also under the auspice of the CCOPMM and collects information on all infants born since January 1, 1982.

THE VICTORIAN PERINATAL DATA COLLECTION UNIT (PDCU)

The Victorian Perinatal Data Collection Unit (PDCU) has collated data on all Victorian births under a legislated reporting system since 1982.

The Unit routinely collects information on all births of infants of 20 weeks gestation or more, or weighing $\geq 400\text{g}$ if the gestation is unknown.

For details of all birth data, refer to publications from the PDCU: <http://www.health.vic.gov.au/perinatal> or contact the PDCU on (03) 9616 2696.

BIRTH DEFECTS REGISTER

Under the legislation by which it is constituted, Council is required to maintain a register of birth defects, and to provide information to the medical profession for research into the epidemiology of these disorders. Responsibility for these functions is vested in the staff of the PDCU, who also maintain the Birth Defects Register.

For details of all birth defects data, refer to publications from the PDCU: <http://www.health.vic.gov.au/perinatal> or contact the Births Defects Register on (03) 9616 2696.

IMPORTANCE OF BIRTH DEFECTS NOTIFICATION

Council wishes to emphasise the importance of reporting cases of suspected or proven birth defects, regardless of whether they are believed to have been notified from another source. It is only in this way that a comprehensive register of relevant conditions can be established and maintained. **The register is frequently used to answer questions about the prevalence of specific defects in Victoria, and to respond to queries about possible clusters of birth defects. These functions require full and reliable information on birth defects.**

Notification forms can be obtained by contacting the Birth Defects Register
GPO Box 4003, Melbourne 3001, (03) 9616 2696 or 1300 858 505.

A birth defect recognised in a child up to 15 years of age should be notified to the register.

PROVISION OF DATA FOR STATISTICAL AND RESEARCH PURPOSES

Under the auspices of the Consultative Council on Obstetric and Paediatric Mortality and Morbidity, the Perinatal Data Collection Unit has collated information on all Victorian births from 20 weeks of gestation since 1982. The Unit also maintains the Birth Defects Register for Victorian children born from 1982. The Council also undertakes extensive data collection on perinatal, infant, child deaths (up to, but not including, their 15th birthday), and maternal mortality. *The Council encourages the release of data to all health professionals; however, foremost consideration is that the release of data by the Council will not endanger the confidentiality of information.*

The Council reviews all research projects requesting information from PDCU. If access to individual case records is requested, stringent conditions apply to safeguard the security and confidentiality of any data released by the Council. In all instances, a Council nominee must be one of the project supervisors.

Formal research proposals must conform to the National Health and Medical Research Council *National Statement on Ethical Conduct in Research Involving Humans 1999*. Before any project can begin, a properly constituted Humans Research Ethics Committee must have approved it. No contact with any patient or parent/guardian may be made without permission of the patient's physician at the time of birth/death, and, in the case of birth data, the hospital at which the birth took place.

All correspondence should be addressed to:

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The Council encourages the use of information and recommendations within this report providing appropriate acknowledgement of the source is made.

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CHAIRMAN'S REPORT

Since the inception of the Consultative Council on Obstetric and Paediatric Mortality and Morbidity in 1962, there has been an impressive reduction in maternal, perinatal, infant and paediatric mortality. Public health indicators such as these mortality rates are influenced by a complex set of interacting variables. These indicators reflect changes in socio-economic variables such as the overall health of the community, education, and distribution of wealth; other influences are socio-medical, such as access to family planning services, and some relate to medical care issues such as access to diagnostic and therapeutic services and standards of maternity, neonatal and paediatric care, both in institutional and community settings.

When mortality rates fall to very low levels, they are no longer sensitive indicators of maternal and child health, or of the quality of the health services, and small fluctuations are unlikely to be significant. For this reason we need to look beyond mortality, to morbidity, in order to reassure the community that they are being well served, with respect to maternal and child health. We also need to improve our ability to analyse subsets within the overall population who experience less favourable outcomes, which are obscured by inclusion in aggregate data, so that this disadvantage can be identified and addressed.

Nevertheless, it is the traditional public health surveillance indicators which are most amenable to trend analyses, and the data in this Report indicate that Victorians can be proud of what has been achieved in maternal and paediatric outcomes. That is not to say that further reductions in mortality are not possible, and in the Council's review of individual cases, it is not uncommon for absolute or relative deficiencies in standards of care to be identified. By identifying patterns of such deficiencies, Council endeavours in reports such as this to remind care providers of clinical opportunities to reduce mortality and morbidity. It is also hoped that by addressing the unambiguous outcome of mortality that the harder to measure categories of morbidity will be addressed in parallel.

Recent developments in prenatal diagnosis and terminations of pregnancy at or beyond 20 weeks gestation for non-lethal congenital malformations or for maternal psychosocial indications need to be considered when interpreting fluctuations in perinatal mortality rate, especially at lower gestational ages. In 2001, 23% of perinatal deaths were as a result of terminations of pregnancy procedures.

The Council expresses its gratitude to Victoria's medical practitioners who willingly provide confidential clinical information, which assists the Council's subcommittees in their deliberations. We also gain information with the cooperation of a variety of other agencies including the Registry of Births Deaths and Marriages, and the office of the State Coroner and the medical records departments of public and private hospitals. Any information provided to the Council is privileged by legislation, and is not accessible by any third party, including the Courts.

The previous triennium of the Council expired in February 2003, and a new Council was constituted at that time. The Council extends its appreciation to retiring Council members Dr Denys Fortune, Ms Vanessa Owen and Professor Roger Pepperell and welcomes new members Dr Jenny Bartlett, Dr Virginia Billson, Dr Mary Anne Biro, Professor Glenn Bowes and Professor Terry Nolan.

I would like also to sincerely thank the Council members and the members of the subcommittees for their support, advice and expertise, in assisting with the complexities of the Council's broad remit.

The Council is supported by a part-time administrative assistant, Luli Zyka, whose work with the Council is much appreciated. The assistance of Dr Cathie Rose with consideration of paediatric and malformation cases is also gratefully acknowledged.

I would like to again pay special tribute to the dedication of the research officer to the Council, Rosemary Warren, who skilfully maintains the functioning of the Council and its subcommittees as well as being instrumental in the production of this report.

I trust that readers will find the contents of this report informative and useful.

Respectfully submitted,

James Forrester King, MB, MPH, FRCSC, FRCOG, FRANZCOG
Chairman.

EXECUTIVE SUMMARY

PERINATAL MORTALITY

- In Victoria in 2001, there were 62,149 births of infants with birthweight of $\geq 400\text{g}$ or ≥ 20 weeks gestation.
- Of the 62,149 births, 444 were stillborn and 204 infants died within the first month of life.
- The perinatal mortality rate was 10.4 per 1,000 births. One out of approximately every 96 babies with a birthweight $\geq 400\text{g}$ or ≥ 20 weeks gestation, was either stillborn or died in the first month of life.
- The stillbirth rate was 7.1 per 1,000 births.
- The commonest cause of stillbirths was unexplained antepartum death accounting for 23.3% of stillbirths, followed by congenital abnormalities, which accounted for 20.6% of stillbirths.
- The neonatal death rate was 3.3 per 1,000 live births.
- The commonest cause of neonatal death was congenital abnormalities accounting for 37.1% of neonatal deaths, followed by spontaneous preterm birth, which accounted for 32.7% of neonatal deaths.
- Of the stillbirths reviewed by committee, approximately one in ten were considered to have suspected preventable factors. These included inadequate antenatal monitoring and inadequate detection and management of the growth-restricted fetus.
- Of the neonatal deaths reviewed by committee, nearly one in five were considered to have suspected preventable factors. These included deficiencies in intrapartum management, resuscitation and paediatric care.

DEATHS OF POSTNEONATAL INFANTS AND CHILDREN IN 2001

- 290 infants died in the first year of life, giving an infant mortality rate of 4.7 deaths per 1,000 live births.
- 202 of these infant deaths occurred in the first month of life, and 88 between one month of age and the first birthday.
- The commonest cause of postneonatal infant mortality was the presence of birth defects (28 deaths).
- Sudden Infant Death Syndrome (SIDS) accounted for 16.4 per cent of postneonatal infant deaths. The number of deaths from SIDS has fallen from 141 in 1989 to 12 in 2001.
- There were 182 postneonatal infant and child deaths.
- 109 children died between one year of age and their fifteenth birthday.
- The commonest causes of death of children were birth defects and malignancy, 54 deaths and 22 deaths respectively.
- Seven postneonatal infants and 12 children died as a result of infection.
- One postneonatal infant and 16 children died as a result of motor vehicle accidents.
- Eight children died as result of drowning.

MATERNAL

- There were three maternal deaths: 1 direct death and 2 indirect deaths, and 61,108 maternities giving a maternal mortality ratio of 4.9 per 100,000 maternities.

PERINATAL MORTALITY REVIEW

INTRODUCTION

This report is the 40th consecutive Survey of Perinatal Deaths in Victoria.

In order to align Council's reports with those of other States and Territories and comply with national definitions (National Perinatal Statistics Unit and Australian Bureau of Statistics), data are presented (since 2000) on perinatal deaths of **birthweight \geq 400g or gestation 20 weeks or more**.

Using this \geq 400g/20 weeks definition, there were **648** perinatal deaths in Victoria in 2001, giving a perinatal mortality rate (PMR) of **10.4** per 1,000 births. The stillbirth rate was **7.1** per 1,000 total births, and the neonatal death rate **3.3** per 1,000 live births.

As has been the practice since 1980, Council also reports on perinatal deaths of infants with a **birthweight of \geq 500g**, or if the birthweight is unknown, infants of **\geq 22 weeks gestation**. This definition has certain advantages as a public health perinatal indicator, because it excludes from the calculation those mostly pre-viable live births of $<$ 500g and also the majority of cases where the pregnancy was terminated for fetal or maternal indications. This Report also maintains this definition to enable trend analyses.

Using the \geq 500g/22 weeks definition, there were **441** perinatal deaths in Victoria in 2001, giving a perinatal mortality rate (PMR₅₀₀) of **7.1** per 1,000 births. The stillbirth rate was **4.6** per 1,000 total births, and the neonatal death rate **2.5** per 1,000 live births.

Process for the Council's review of perinatal deaths

The Council compiles a case file on every perinatal death and the cases are individually considered by the Chair of the Council and the Research Officer, and selected cases referred to the sub-committees because of suspected preventable factors (e.g. term perinatal death from intrapartum asphyxia). Those which are considered likely to be unavoidable (eg lethal congenital abnormalities or death following spontaneous birth of extremely preterm infant) are not usually referred to the sub-committees. All cases are classified and coded according to the classifications of the Perinatal Society of Australia and New Zealand (perinatal death classification and neonatal death classification, see Appendix A)

DEFINITIONS

Unless otherwise stated, the following definitions apply:

Stillbirth The birth of an infant weighing at least 400g or of at least 20 weeks gestation, which shows no signs of life after birth.

Neonatal death The death of a liveborn infant, within 28 days of birth, whose birthweight was at least 400g or of at least 20 weeks gestation.

Stillbirth rate (per 1,000 total births)

$$= \frac{\text{number of stillbirths}}{\text{total (stillbirths + livebirths)}} \times 1,000$$

Neonatal mortality rate (per 1,000 livebirths)

$$= \frac{\text{number of neonatal deaths}}{\text{total livebirths}} \times 1,000$$

Perinatal mortality rate (per 1,000 total births)

$$= \frac{(\text{number of stillbirths} + \text{neonatal deaths})}{\text{total (stillbirths + livebirths)}} \times 1,000$$

Other definitions

For purposes of continuity some tables contain data on infants of $\geq 500\text{g}$ or, if birthweight unknown, of at least 22 weeks gestation.

Stillbirth₅₀₀ The birth of an infant weighing at least 500g or, if the weight was not known, of at least 22 weeks gestation, which shows no signs of life after birth.

Neonatal death₅₀₀ The death of a liveborn infant, within 28 days of birth, whose birthweight was at least 500g or, if the weight was not known, of at least 22 weeks gestation.

VICTORIAN BIRTH RATES

In 2001, the number of births was 61,910*. The livebirth rate is the number of livebirths per 1,000 of the estimated mean resident population for the year indicated. In 2001, the livebirth rate was 12.7 per 1,000. The birth rate in Victoria has been steadily declining since 1971.

Table 1 Total births in Victoria, 1962–2001*

Year	Livebirths	Total births (live and still)	Estimated mean resident population	Livebirth rate
1962	65,890	66,665	2,983,715	21.1
1963	65,649	66,441	3,041,442	21.6
1964	64,990	65,761	3,105,685	21.0
1965	63,550	64,297	3,165,594	20.1
1966	64,008	65,788	3,221,403	19.9
1967	65,485	66,282	3,227,183	20.0
1968	70,228	70,996	3,328,451	21.1
1969	71,035	71,796	3,388,417	21.0
1970	73,019	73,801	3,450,523	21.2
1971	75,498	76,258	3,602,890	21.0
1972	71,807	72,649	3,661,084	19.6
1973	67,123	67,925	3,707,460	18.1
1974	66,201	66,988	3,754,761	17.6
1975	61,897	62,610	3,788,394	16.3
1976	60,667	61,283	3,810,400	16.0
1977	59,518	60,085	3,837,400	15.5
1978	58,861	59,436	3,863,800	15.2
1979	57,767	58,257	3,886,400	14.9
1980	58,206	58,653	3,914,300	14.9
1981	59,526	59,965	3,946,900	15.1
1982	59,965	60,455	3,994,100	15.0
1983	60,149	60,591	4,037,600	15.0
1984	60,278	60,704	4,078,500	14.8
1985	60,776	61,176	4,121,500	14.7
1986	60,863	61,253	4,161,400	14.6
1987	61,089	61,474	4,208,700	14.5
1988	63,126	63,542	4,262,600	14.8
1989	63,694	64,118	4,322,400	14.7
1990	66,350	66,726	4,406,600	15.1
1991	64,632	65,007	4,427,400	14.6
1992	65,815	66,140	4,444,818	14.8
1993	64,284	64,570	4,465,200	14.4
1994	64,376	64,705	4,475,500	14.5
1995	63,214	63,529	4,501,000	14.0
1996	62,429	62,720	4,561,817	13.7
1997	61,815	62,084	4,605,148	13.5
1998	61,634	61,924	4,689,776	13.1
1999	62,149	62,442	4,707,590	13.2
2000	62,092	62,354	4,765,856	13.0
2001	61,623	61,910	4,854,100	12.7

*All births $\geq 500\text{g}$, or ≥ 22 weeks' gestation if the birthweight is unknown.

PERINATAL MORTALITY 2001

Perinatal mortality rate birthweight $\geq 400\text{g}$ or ≥ 20 weeks

Unless otherwise specified, the numerator for calculating perinatal mortality is the number of stillbirths and neonatal deaths whose birthweight was at least 400g or of at least 20 weeks gestation.

As stated above Council has only been using this definition since 2000.

The denominator for the perinatal mortality rate is based on all births in Victoria of birthweight $\geq 400\text{g}$ or ≥ 20 weeks. In 2001 there were **62,149** births, **444** stillbirths and **204** neonatal deaths, giving a total of **648** perinatal deaths and a perinatal mortality rate of **10.4** per 1,000 births (Tables 2 and 3). Those perinatal deaths that occurred ≥ 20 weeks gestation but with birthweight less than 400g, are separately reported in Table 14.

Table 2 Perinatal deaths in Victoria, 2000–2001

	2000	2001
Livebirths	62,146	61,705
Stillbirths	416	444
Neonatal deaths	182	204
Perinatal deaths	598	648

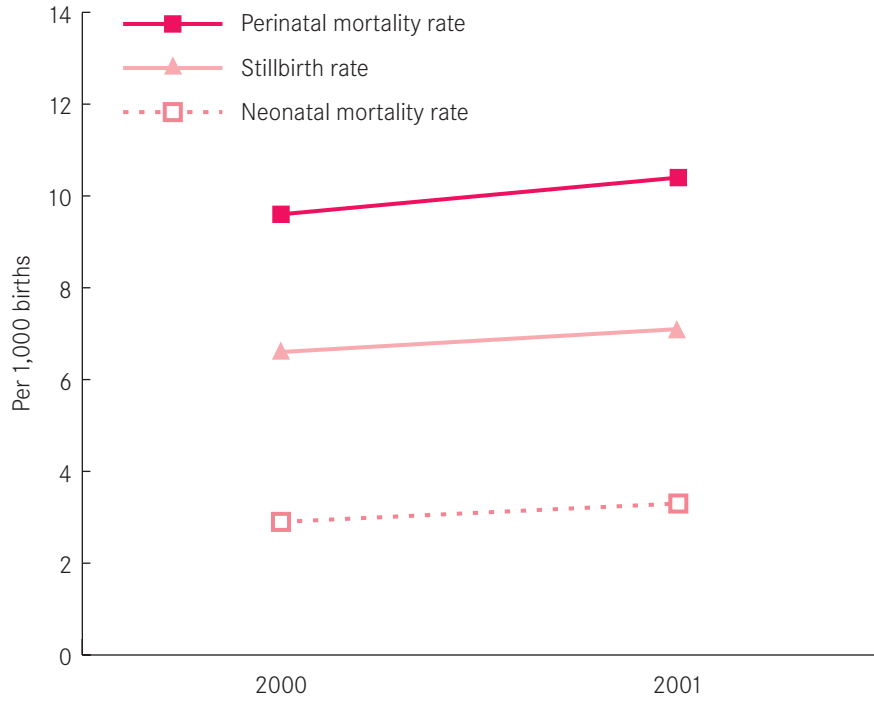
Table 3 Perinatal death rates in Victoria, 2000–2001

	2000	2001
Stillbirth rate*	6.6	7.1
Neonatal death rate**	2.9	3.3
Perinatal mortality rate*	9.6	10.4

* Rate per 1,000 births.

** Rate per 1,000 live births.

Figure 1 Perinatal mortality rates in Victoria, 2000–2001



PERINATAL MORTALITY RATE

Birthweight $\geq 500\text{g}$ or ≥ 22 weeks if birthweight unknown

The perinatal mortality rate (PMR₅₀₀) is based on all births in Victoria in 2001 (**61,910**) of birthweight $\geq 500\text{g}$ or ≥ 22 weeks gestation. Using this definition, in 2001 there were **287** stillbirths and **154** neonatal deaths, giving a total of **441** deaths and a perinatal mortality rate (PMR₅₀₀) of **7.1** per 1,000 births (Tables 4 and 5).

Table 4 Perinatal deaths in Victoria, 1992–2001 (birthweight $\geq 500\text{g}$ or ≥ 22 weeks gestation if birthweight unknown)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Livebirths	65,815	64,284	64,376	63,214	62,429	61,815	61,634	62,149	62,092	61,623
Stillbirths	325	286	329	315	291	269	290	293	262	287
Neonatal deaths	191	165	184	193	157	160	164	171	134	154
Perinatal deaths	516	451	513	508	448	429	454	464	396	441

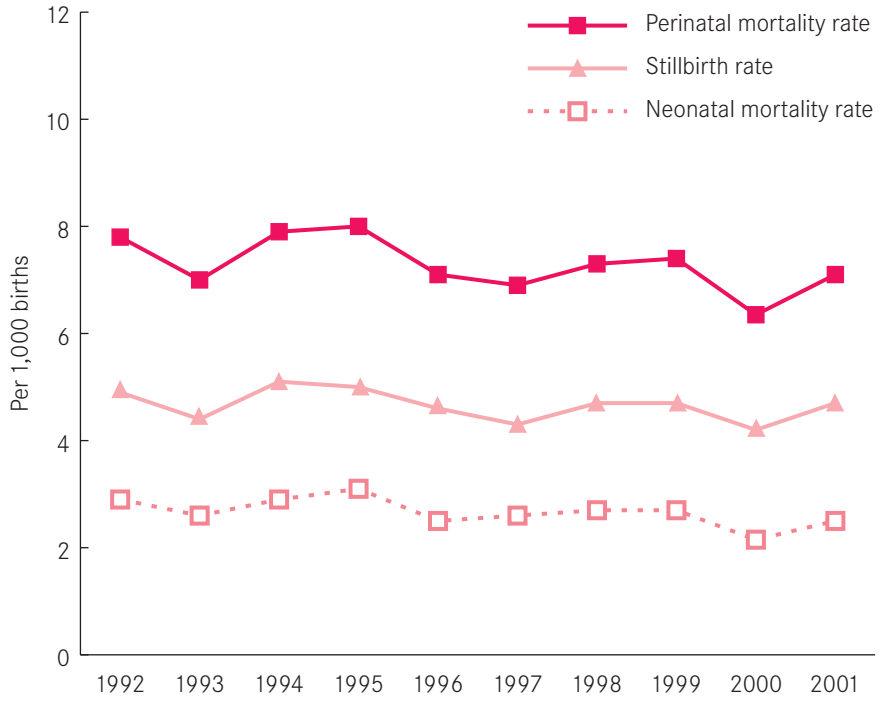
Table 5 Perinatal death rates in Victoria, 1992–2001 (birthweight $\geq 500\text{g}$ or ≥ 22 weeks gestation if birthweight unknown)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Stillbirth rate*	4.9	4.4	5.1	5.0	4.6	4.3	4.7	4.7	4.2	4.6
Neonatal death rate**	2.9	2.6	2.9	3.1	2.5	2.6	2.7	2.7	2.2	2.5
Perinatal mortality rate*	7.8	7.0	7.9	8.0	7.1	6.9	7.3	7.4	6.4	7.1

* Rate per 1,000 births.

** Rate per 1,000 live births.

Figure 2 Perinatal mortality rates in Victoria, 1992–2001 (birthweight $\geq 500\text{g}$ or ≥ 22 weeks gestation if birthweight unknown)



CAUSES OF PERINATAL DEATHS, 2001

Perinatal deaths are classified according to the perinatal classification systems developed by the perinatal mortality classification working party of the Perinatal Society of Australia and New Zealand (PSANZ), the PSANZ perinatal death classification (PSANZ PDC) and the PSANZ neonatal death classification (PSANZ NDC) – see Appendix A). These classifications are now being used by all States and Territories, and guidelines for classifications can be accessed through www.psanz.org.au.

Perinatal deaths by PSANZ PDC

Table 6 Perinatal deaths in Victoria in 2001, by cause (PSANZ PDC) and type

Cause of death PSANZ PDC	Type of perinatal death					
	Stillbirths (Fetal death)		Neonatal death		Total	
	n	%	n	%	n	%
Congenital abnormality**	91	20.5	76	37.3	167	25.8
Infection	7	1.6	1	0.5	8	1.2
Hypertension	13	2.9	4	2.0	17	2.6
Antepartum haemorrhage	40	9.0	16	7.8	56	8.6
Maternal conditions*	68	15.3	4	2.0	72	11.1
Specific perinatal conditions	37	8.3	16	7.8	53	8.2
Hypoxic peripartum death	8	1.8	14	6.9	22	3.4
Fetal growth restriction (FGR)	30	6.8	1	0.5	31	4.8
Spontaneous preterm	46	10.4	67	32.8	113	17.4
Unexplained antepartum death	104	23.4	–	–	104	16.0
No obstetric antecedent	–	–	5	2.5	5	0.8
Total	444	100	204	100	648	100.0

Note: Congenital abnormality** includes terminations ≥ 20 weeks. There were 71 stillbirths and 35 neonatal deaths classified in this category. Maternal conditions* includes terminations ≥ 20 weeks for psychosocial indications. There were 45 stillbirths classified in this category.

Table 7 Perinatal deaths as a result of Termination of Pregnancy in Victoria in 2001, by cause (PSANZ PDC) and type

Cause of death PSANZ PDC	Type of perinatal death					
	Stillbirths (Fetal death)		Neonatal death		Total	
	n		n		n	
Termination for congenital abnormality	71		35		106	
Terminations for psychosocial indications	45		–	–	45	
Total	116		35		151	

As a result of increasing uptake of prenatal ultrasound and diagnostic procedures, congenital abnormalities are now frequently being diagnosed and leading on to terminations of pregnancy. When this occurs at or beyond 20 weeks gestation, these cases are recorded as births and perinatal deaths (in 2001 there were 71 stillbirths and 35 neonatal deaths in this category, 16% of perinatal deaths). TOP procedures undertaken for maternal psycho-social indications at or beyond 20 weeks gestation, require registration as births and perinatal deaths (in 2001 there were 45 stillbirths in this category, which comprised 7% of perinatal deaths). 41% of TOPs ≥ 20 weeks for maternal psycho-social indications were undertaken for women whose place of residence was outside Victoria.

Figure 3 Causes of perinatal deaths, PSANZ PDC, Victoria, 2001

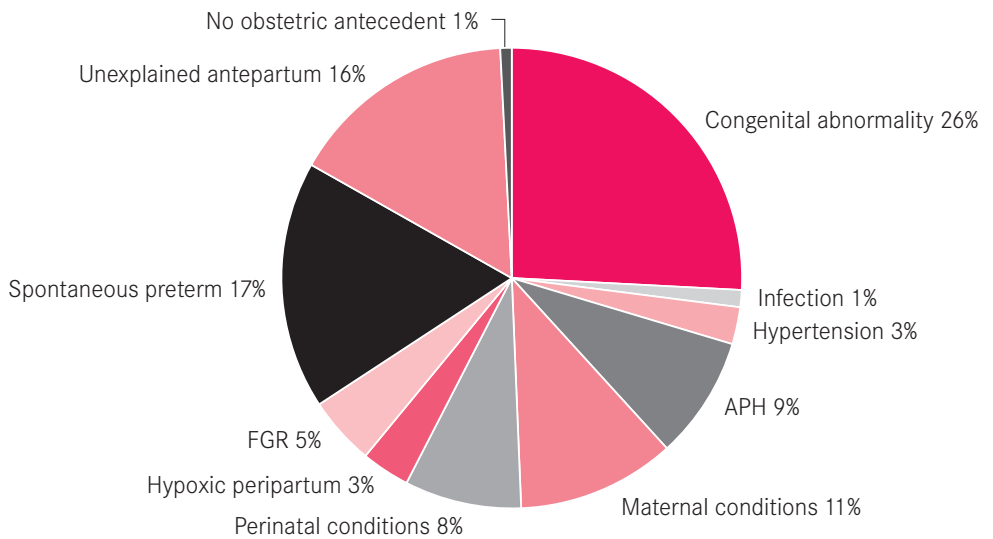


Figure 4 Causes of perinatal deaths, PSANZ PDC, Victoria, 2001 indicating terminations of pregnancies

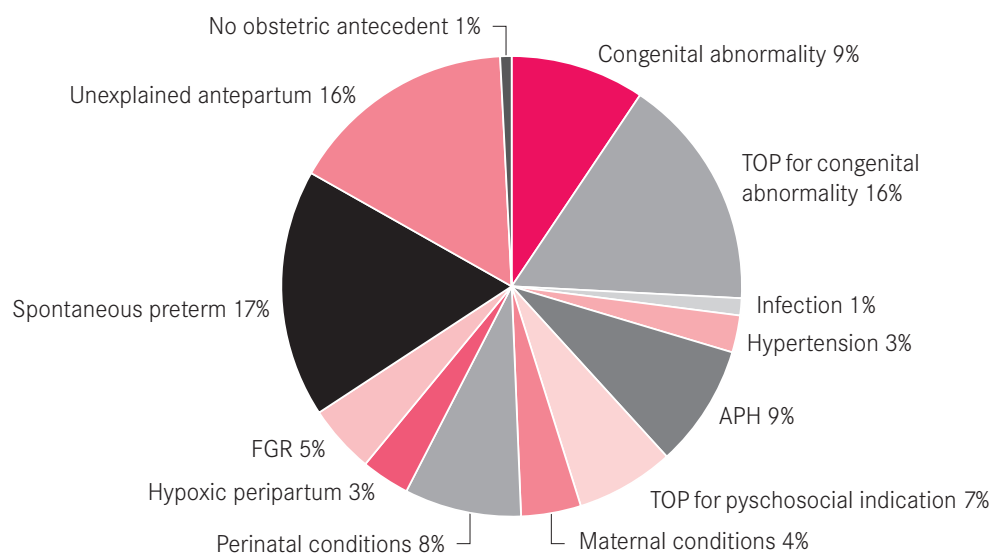


Table 8 Perinatal deaths in Victoria in 2001, by cause (PSANZ PDC) and birthweight

Cause of death PSANZ PDC	Birthweight (g)						Total	
	<1,000		1,000–2,499		≥2,500		n	%
Congenital abnormality**	105	28.5	35	28.2	27	17.3	167	25.8
Infection	3	0.8	3	2.4	2	1.3	8	1.2
Hypertension	9	2.4	6	4.8	2	1.3	17	2.6
Antepartum haemorrhage	20	5.4	18	14.5	18	11.5	56	8.6
Maternal conditions*	58	15.8	8	6.5	6	3.8	72	11.1
Specific perinatal conditions	32	8.7	9	7.3	12	7.7	53	8.2
Hypoxic peripartum death	-	-	1	0.8	21	13.5	22	3.4
Fetal growth restriction	14	3.8	12	9.7	5	3.2	31	4.8
Spontaneous preterm	107	29.1	6	4.8	-	-	113	17.4
Unexplained antepartum death	20	5.4	26	20.9	58	37.2	104	16.0
No obstetric antecedent	-	-	-	-	5	3.2	5	0.8
Total	368	100.0	124	100.0	156	100.0	648	100.0

Note: Congenital abnormality** includes terminations ≥20 weeks. There were 71 stillbirths and 35 neonates classified in this category.

Maternal conditions* includes terminations ≥20 weeks for psychosocial indications. There were 45 stillbirths classified in this category.

Table 9 Perinatal deaths in Victoria in 2001, by cause (PSANZ PDC) and gestational age

Cause of death PSANZ PDC	Gestational age									
	20–27 weeks		28–31 weeks		32–36 weeks		37+ weeks		Total	
	n	%	n	%	n	%	n	%	n	%
Congenital abnormality**	107	28.9	7	17.9	23	26.4	30	19.6	167	25.8
Infection	4	1.1	–	–	2	2.3	2	1.3	8	1.2
Hypertension	8	2.2	3	7.7	2	2.3	4	2.6	17	2.6
Antepartum haemorrhage	22	5.9	5	12.8	12	13.8	17	11.1	56	8.6
Maternal conditions*	58	15.8	1	2.6	10	11.5	3	1.9	72	11.1
Specific perinatal conditions	30	8.1	6	15.4	6	6.9	11	7.2	53	8.2
Hypoxic peripartum death	–	–	–	–	3	3.5	19	12.4	22	3.4
Fetal growth restriction	12	3.3	3	7.7	7	8.0	9	5.9	31	4.8
Spontaneous preterm	108	29.3	5	12.8	–	–	–	–	113	17.4
Unexplained antepartum death	20	5.4	9	23.1	22	25.3	53	34.6	104	16.0
No obstetric antecedent	–	–	–	–	–	–	5	3.3	5	0.8
Total	369	100.0	39	100.0	87	100.0	153	100.0	648	100.0

Note: Congenital abnormality** includes terminations ≥ 20 weeks. There were 71 stillbirths and 35 neonates classified in this category.

Maternal conditions* includes terminations ≥ 20 weeks for psychosocial indications. There were 45 stillbirths classified in this category.

Stillbirths by PSANZ PDC

Table 10 Stillbirths (fetal deaths) in Victoria in 2001, by cause (PSANZ PDC) and birthweight

Cause of death PSANZ PDC	Birthweight (g)							
	<1,000		1,000–2,499		$\geq 2,500$		Total	
	n	%	n	%	n	%	n	%
Congenital abnormality**	73	29.1	15	17.0	3	2.9	91	20.5
Infection	3	1.2	3	3.4	1	0.9	7	1.6
Hypertension	7	2.8	5	5.7	1	0.9	13	2.9
Antepartum haemorrhage	14	5.6	13	14.8	13	12.4	40	9.0
Maternal conditions*	54	21.5	8	9.1	6	5.7	68	15.3
Specific perinatal conditions	22	8.7	5	5.7	10	9.5	37	8.3
Hypoxic peripartum death	–	–	–	–	8	7.6	8	1.8
Fetal growth restriction	14	5.6	11	12.5	5	4.8	30	6.8
Spontaneous preterm	44	17.5	2	2.3	–	–	46	10.4
Unexplained antepartum death	20	8.0	26	29.5	58	55.2	104	23.4
No obstetric antecedent	–	–	–	–	–	–	–	–
Total	251	100.0	88	100.0	105	100.0	444	100.0

Note: Congenital abnormality** includes terminations ≥ 20 weeks. There were 71 stillbirths classified in this category.

Maternal conditions* includes terminations ≥ 20 weeks for psychosocial indications. There were 45 stillbirths classified in this category, all with birthweight less than 1,000g.

Table 11 Stillbirths (fetal deaths) in Victoria in 2001, by cause (PSANZ PDC) and gestational age

Cause of death PSANZ PDC	Gestational age									
	20–27 weeks		28–31 weeks		32–36 weeks		37+ weeks		Total	
	n	%	n	%	n	%	n	%	n	%
Congenital abnormality**	73	29.6	5	17.9	9	13.2	4	3.9	91	20.5
Infection	4	1.6	-	-	2	2.9	1	0.9	7	1.6
Hypertension	7	2.8	2	7.1	2	2.9	2	1.9	13	2.9
Antepartum haemorrhage	13	5.3	3	10.7	11	16.2	13	12.9	40	9.0
Maternal conditions*	54	21.9	1	3.6	10	14.7	3	2.9	68	15.3
Specific perinatal conditions	20	8.1	3	10.7	6	8.8	8	8.0	37	8.3
Hypoxic peripartum death	-	-	-	-	-	-	8	8.0	8	1.8
Fetal growth restriction	12	4.9	3	10.7	6	8.8	9	8.9	30	6.8
Spontaneous preterm	44	17.8	2	7.1	-	-	-	-	46	10.4
Unexplained antepartum death	20	8.1	9	32.1	22	32.4	53	52.5	104	23.4
No obstetric antecedent	-	-	-	-	-	-	-	-	-	-
Total	247	100.0	28	100.0	68	100.0	101	100.0	444	100.0

Note: Congenital abnormality** includes terminations ≥ 20 weeks. There were 71 stillbirths classified in this category. Maternal conditions* includes terminations ≥ 20 weeks for psychosocial indications. There were 45 stillbirths classified in this category.

Figure 5 Causes of stillbirth (fetal death), PSANZ PDC, Victoria, 2001

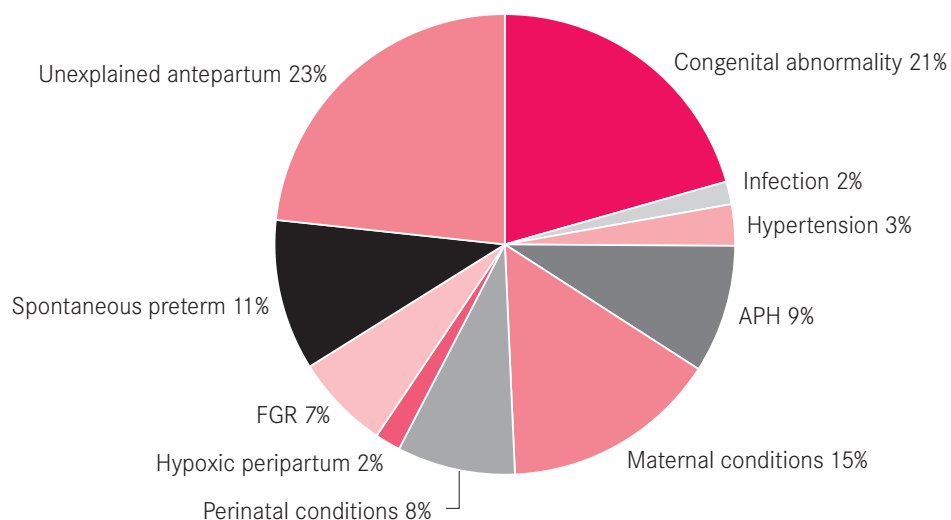
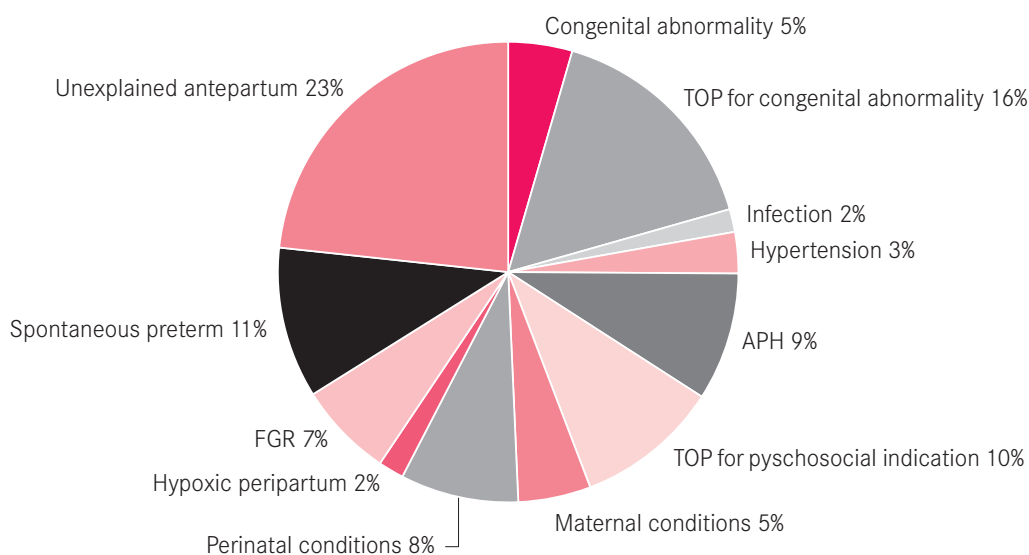


Figure 6 Causes of stillbirth (fetal death), PSANZ PDC, Victoria, 2001, indicating terminations of pregnancies



Neonatal deaths by PSANZ PDC

Table 12 Neonatal deaths in Victoria in 2001, by cause (PSANZ PDC) and birthweight

Cause of death PSANZ PDC	Birthweight (g)						Total	
	<1,000		1,000-2,499		≥2,500		n	%
Congenital abnormality**	32	27.4	20	55.6	24	47.1	76	37.3
Infection	-	-	-	-	1	1.9	1	0.5
Hypertension	2	1.7	1	2.8	1	1.9	4	2.0
Antepartum haemorrhage	6	5.1	5	13.9	5	9.8	16	7.8
Maternal conditions	4	3.4	-	-	-	-	4	2.0
Specific perinatal conditions	10	8.5	4	11.1	2	3.9	16	7.8
Hypoxic peripartum death	-	-	1	2.8	13	25.5	14	6.9
Fetal growth restriction	-	-	1	2.8	-	-	1	0.5
Spontaneous preterm	63	53.8	4	11.1	-	-	67	32.8
Unexplained antepartum death	-	-	-	-	-	-	-	-
No obstetric antecedent	-	-	-	-	5	9.8	5	2.5
Total	117	100.0	36	100.0	51	100.0	204	100.0

Note: Congenital abnormality** includes terminations ≥20 weeks. There were 35 neonates classified in this category.

Note that there were 13 cases of neonatal death in infants weighing ≥2,500g, where the death was ascribed to peripartum hypoxia. In several of these cases, deficiencies were identified in intrapartum management and/or neonatal resuscitation.

Table 13 Neonatal deaths in Victoria in 2001, by cause (PSANZ PDC) and gestational age

Cause of death PSANZ PDC	Gestational age									
	20–27 weeks		28–31 weeks		32–36 weeks		37+ weeks		Total	
	n	%	n	%	n	%	n	%	n	%
Congenital abnormality**	34	27.9	2	18.2	14	73.7	26	50.0	76	37.3
Infection	–	–	–	–	–	–	1	1.9	1	0.5
Hypertension	1	0.8	1	9.1	–	–	2	3.8	4	2.0
Antepartum haemorrhage	9	7.4	2	18.2	1	5.3	4	7.7	16	7.8
Maternal conditions*	4	3.3	–	–	–	–	–	–	4	2.0
Specific perinatal conditions	10	8.2	3	27.3	–	–	3	5.8	16	7.8
Hypoxic peripartum death	–	–	–	–	3	15.7	11	21.2	14	6.9
Fetal growth restriction	–	–	–	–	1	5.3	–	–	1	0.5
Spontaneous preterm	64	52.5	3	27.3	–	–	–	–	67	32.8
Unexplained antepartum death	–	–	–	–	–	–	–	–	–	–
No obstetric antecedent	–	–	–	–	–	–	5	9.6	5	2.5
Total	122	100.0	11	100.0	19	100.0	52	100.0	204	100.0

Note: Congenital abnormality** includes terminations ≥20 weeks. There were 35 neonates classified in this category.

Figure 7 Causes of neonatal deaths, PSANZ PDC, Victoria, 2001

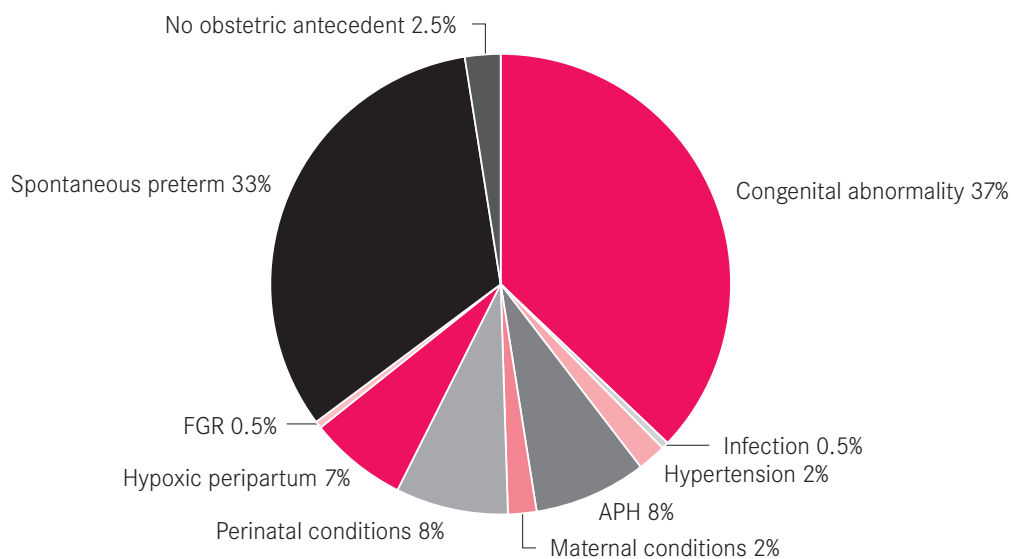
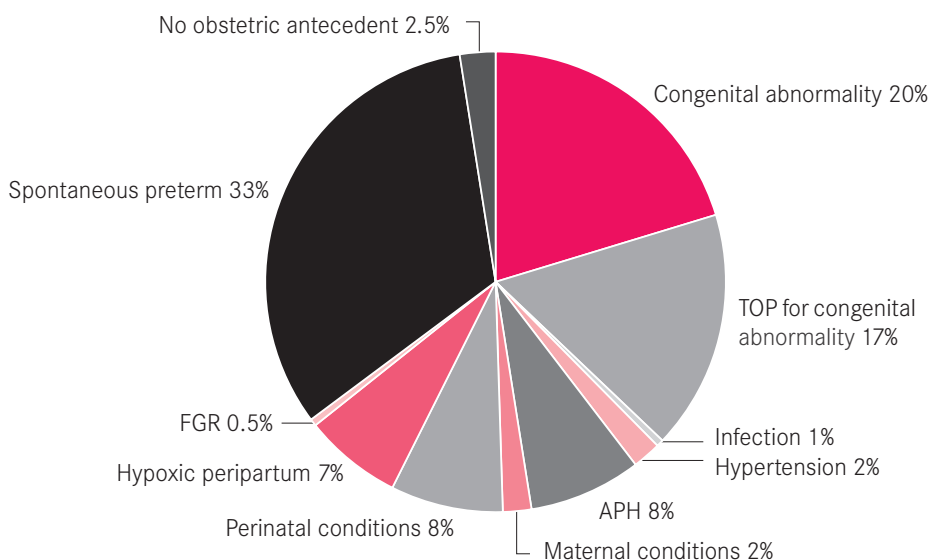


Figure 8 Causes of neonatal deaths, PSANZ PDC, Victoria, 2001, indicating terminations of pregnancies



Neonatal deaths by PSANZ NDC

Table 14 Neonatal deaths in Victoria in 2001, by cause (PSANZ NDC, major categories) and birthweight

Cause of death PSANZ NDC	Birthweight (g)						Total	
	<1,000		1,000–2,499		≥2,500		n	%
Congenital abnormality**	32	27.4	20	55.6	24	47.1	76	37.3
Extreme prematurity	42	35.9	-	-	-	-	42	20.6
Cardio-respiratory disorders	31	26.5	7	19.4	2	3.9	40	19.6
Infection	5	4.3	3	8.3	3	5.9	11	5.4
Neurological	-	-	5	13.9	17	33.3	22	10.8
Gastrointestinal	7	6.0	1	2.8	2	3.9	10	4.9
Other	-	-	-	-	3	5.9	3	1.5
Total	117	100.0	36	100.0	51	100.0	204	100.0

Note: Congenital abnormality** includes terminations ≥20 weeks. There were 35 neonates classified in this category.

Table 15 Neonatal deaths in Victoria in 2001, by cause (PSANZ NDC, major categories) and gestational age

Cause of death PSANZ NDC	Gestational age									
	20–27 weeks		28–31 weeks		32–36 weeks		37+ weeks		Total	
	n	%	n	%	n	%	n	%	n	%
Congenital abnormality**	34	27.9	2	18.2	14	73.7	26	50.0	76	37.3
Extreme prematurity	42	34.4	–	–	–	–	–	–	42	20.6
Cardio-respiratory disorders	36	29.5	2	18.2	–	–	2	3.8	40	19.6
Infection	4	3.3	4	36.4	–	–	3	5.8	11	5.4
Neurological	–	–	1	9.1	5	26.3	16	30.8	22	10.3
Gastrointestinal	6	4.9	2	18.2	–	–	2	3.8	10	4.9
Other	–	–	–	–	–	–	3	5.8	3	1.5
Total	122	100.0	11	100.0	19	100.0	52	100.0	204	100.0

Note: Congenital abnormality** includes terminations ≥ 20 weeks. There were 35 neonates classified under this category.

Figure 9 Causes of neonatal deaths, PSANZ NDC, Victoria, 2001

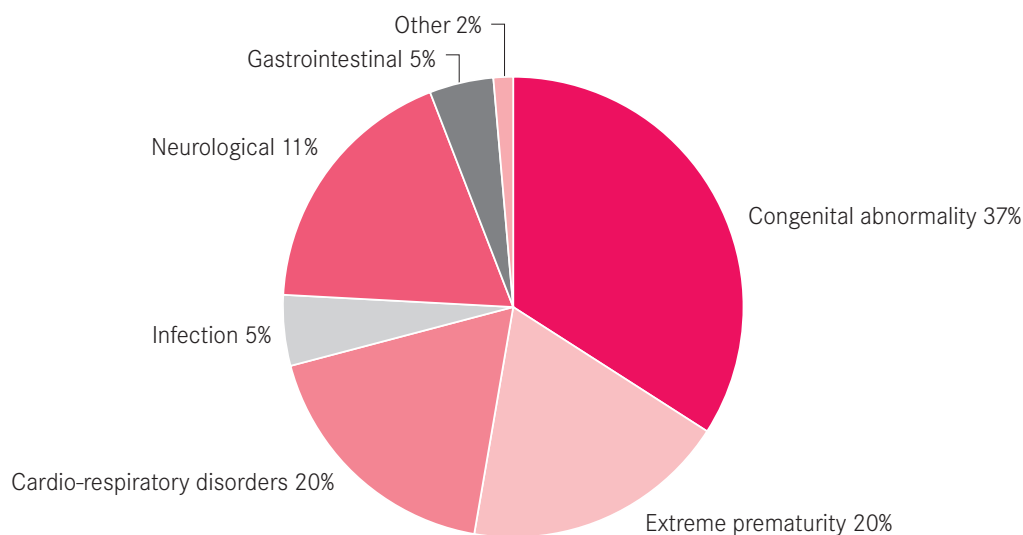


Figure 10 Causes of neonatal deaths, PSANZ NDC, Victoria, 2001, indicating terminations of pregnancies

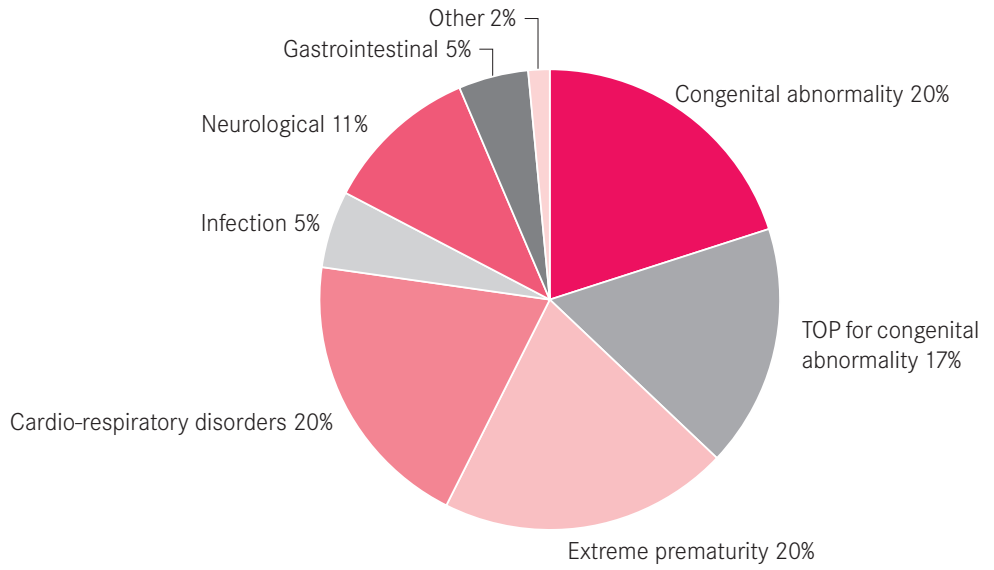


Table 16 Neonatal deaths in Victoria in 2001, by cause (PSANZ NDC, expanded categories) and birthweight

Cause of death PSANZ NDC	Birthweight (g)						Total	
	<1,000		1,000–2,499		≥2,500		n	%
	n	%	n	%	n	%	n	%
Congenital abnormality**	32	27.4	20	55.6	24	47.1	76	37.3
Extreme prematurity	42	35.9	-	-	-	-	42	20.6
Cardio-respiratory disease								
Hyaline membrane disease/ Respiratory distress syndrome	26	22.2	5	13.9	-	-	31	15.2
Meconium aspiration	-	-	-	-	-	-	-	-
Pulmonary hypoplasia	5	4.3	2	5.6	-	-	7	3.4
Chronic neonatal lung disease	-	-	-	-	-	-	-	-
Other cardio-respiratory	-	-	-	-	2	3.9	2	1.0
Infection								
Congenital bacterial	1	0.9	-	-	-	-	1	0.5
Acquired bacterial	2	1.7	3	8.3	2	3.9	7	3.4
Congenital viral	-	-	-	-	-	-	-	-
Acquired viral	-	-	-	-	1	1.9	1	0.5
Fungal	2	1.7	-	-	-	-	2	1.0
Unspecified organism	-	-	-	-	-	-	-	-
Neurological								
Hypoxic ischaemic encephalopathy/ perinatal asphyxia	-	-	5	13.9	17	33.3	22	10.8
Intracranial haemorrhage	-	-	-	-	-	-	-	-
Gastrointestinal								
Necrotising enterocolitis	7	6.0	1	2.8	2	3.9	10	4.9
Other								
SIDS	-	-	-	-	1	1.9	1	0.5
Trauma	-	-	-	-	1	1.9	1	0.5
Unknown	-	-	-	-	1	1.9	1	0.5
Total	117	100.0	36	100.0	51	100.0	204	100.0

Note: Congenital abnormality** includes terminations ≥20 weeks. There were 35 neonates classified in this category.

Table 17 Neonatal deaths in Victoria in 2001, by cause (PSANZ NDC, expanded categories) and gestational age

Cause of death PSANZ NDC	Gestational age									
	20–27 weeks		28–31 weeks		32–36 weeks		37+ weeks		Total	
	n	%	n	%	n	%	n	%	n	%
Congenital abnormality**	34	27.9	2	18.2	14	73.7	26	50.0	76	37.3
Extreme prematurity	42	34.4	-	-	-	-	-	-	42	20.6
Cardio-respiratory disease										
Hyaline membrane disease/ Respiratory distress syndrome	30	24.6	1	9.1	-	-	-	-	31	15.2
Meconium aspiration	-	-	-	-	-	-	-	-	-	-
Pulmonary hypoplasia	6	4.9	1	9.1	-	-	-	-	7	3.4
Chronic neonatal lung disease	-	-	-	-	-	-	-	-	-	-
Other cardio-respiratory	-	-	-	-	-	-	2	3.8	2	1.0
Infection										
Congenital bacterial	1	0.8	-	-	-	-	-	-	1	0.5
Acquired bacterial	2	1.6	3	27.3	-	-	2	3.8	7	3.4
Congenital viral	-	-	-	-	-	-	-	-	-	-
Acquired viral	-	-	-	-	-	-	1	1.9	1	0.5
Fungal	1	0.8	1	9.1	-	-	-	-	2	1.0
Unspecified organism	-	-	-	-	-	-	-	-	-	-
Neurological										
Hypoxic ischaemic encephalopathy/ perinatal asphyxia	-	-	1	9.1	5	26.3	16	30.8	22	10.8
Intracranial haemorrhage	-	-	-	-	-	-	-	-	-	-
Gastrointestinal										
Necrotising enterocolitis	6	4.9	2	18.2	-	-	2	3.8	10	4.9
Other										
SIDS	-	-	-	-	-	-	1	1.9	1	0.5
Trauma	-	-	-	-	-	-	1	1.9	1	0.5
Unknown	-	-	-	-	-	-	1	1.9	1	0.5
Total	122	100.0	11	100.0	19	100.0	52	100.0	204	100.0

Note: Congenital abnormality** includes terminations ≥ 20 weeks. There were 35 neonates classified in this category.

Perinatal deaths in birthweight and gestational age categories

The following two tables (Table 18 and Table 19) present data for stillbirths and neonatal deaths in birthweight and gestational age categories.

The neonatal mortality rate is calculated by dividing the number of infants born alive who die in the first 28 days of life by the total number of infants born in that birthweight or gestational age category.

For stillbirths, the risk of death is calculated by dividing the number of infants born dead in that birthweight or gestational age category by the number of all infants in that and subsequent categories (ie: in ongoing pregnancies).

Terminations of pregnancy performed ≥ 20 weeks for maternal psycho-social indications are excluded from these calculations as they are the result of direct iatrogenic procedures, and affect the interpretability of the data.

Table 18 Birthweight distribution and perinatal mortality, Victoria, 2001 (excludes TOPs for maternal psycho-social indications)

Birthweight	Births		Stillbirths		Stillbirth	Neonatal death		Neonatal
	n	%	n	%	risk*	n	%	mortality rate**
<500	205	0.3	134	33.6	2.2	50	24.5	704
500-999	290	0.5	69	17.3	1.1	67	32.8	303
1,000-1,499	392	0.6	36	9.0	0.6	13	6.4	36.5
1,500-1,999	826	1.3	22	5.5	0.4	9	4.4	11.2
2,000-2,499	2,428	3.9	30	7.5	0.5	14	6.9	5.8
2,500-2,999	9,579	15.4	36	9.0	0.6	12	5.9	1.3
3,000-3,499	22,206	35.8	44	11.0	0.9	24	11.8	1.1
3,500-3,999	18,785	30.2	15	3.8	0.6	9	4.4	0.5
4,000-4,499	6,266	10.1	9	2.3	1.2	6	2.9	0.96
4,500-4,999	980	1.6	1	0.3	0.9	-	-	-
$\geq 5,000$	130	0.2	-	-	-	-	-	-
Not known	17	0.02	3	0.8		-	-	-
Total	62,104	100.0	399	100.0	6.4	204	100.0	3.3

* Stillbirth risk: per 1,000 fetuses remaining in utero

** Neonatal death rate per 1,000 livebirths

Note: There were 45 stillbirths resulting from terminations performed ≥ 20 weeks for maternal psycho-social indications which were excluded from this table.

Table 19 Gestational age and perinatal mortality, Victoria, 2001 (excludes TOPs for maternal psycho-social indications)

Gestational age	Births		Stillbirths		Stillbirth risk*	Neonatal death		Neonatal mortality rate**
	n	%	n	%		n	%	
20-27 weeks	479	0.8	202	50.6	3.3	122	59.8	440.4
28-31 weeks	484	0.8	28	7.0	0.5	11	5.4	24.1
32-36 weeks	3,717	5.9	68	17.0	1.1	19	9.3	5.2
37-41 weeks	56,652	91.2	100	25.0	1.7	51	25.0	0.9
>41 weeks	767	1.2	1	0.3	1.3	1	0.5	1.3
Not known	5	n/a	-	-	-	-	-	-
Total	62,104	100.0	399	100.0	6.4	204	100.0	3.3

* Stillbirth risk: per 1,000 fetuses remaining in utero

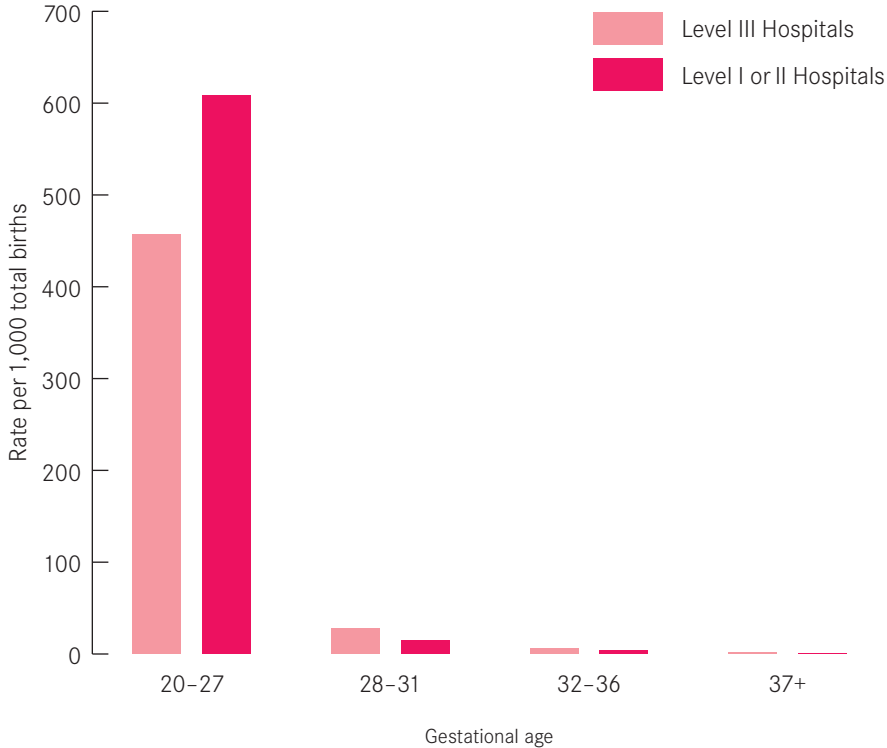
** Neonatal death rate per 1,000 livebirths

Note: There were 45 stillbirths resulting from terminations performed ≥ 20 weeks for maternal psycho-social indications which were excluded from this table.

Neonatal mortality by hospital of birth

Council emphasises that **infants of gestation <32 weeks have better prospects for survival if delivered in a Level III centre** (a hospital with maternal-fetal and neonatal specialists and a neonatal intensive care unit). The mortality at such centres compared to all other hospitals, for each gestational age category, is shown in Figure 11. Terminations of pregnancies are excluded from these calculations. In 2001, 43% of live births of infants <28 weeks gestation were born in Level III hospitals

Figure 11 Gestational age neonatal mortality rate, by hospital level at delivery, Victoria, 2001



	20-27 weeks (n)	28-31 weeks (n)	32-36 weeks (n)	37+ weeks (n)
Level III hospital births				
Surviving >28 days	129	308	1,060	10,850
Neonatal death	58	9	6	16
Live births	187	317	1,066	10,866
Neonatal mortality rate	457	28.4	5.6	1.5
Level I and II hospital births				
Surviving >28 days**	20	134	2571	46,408
Neonatal death	31	2	10	38
Live births	51	136	2,581	46,446
Neonatal mortality rate	608	14.7	3.9	1.0

Source: data for this table was provided by the PDCU.

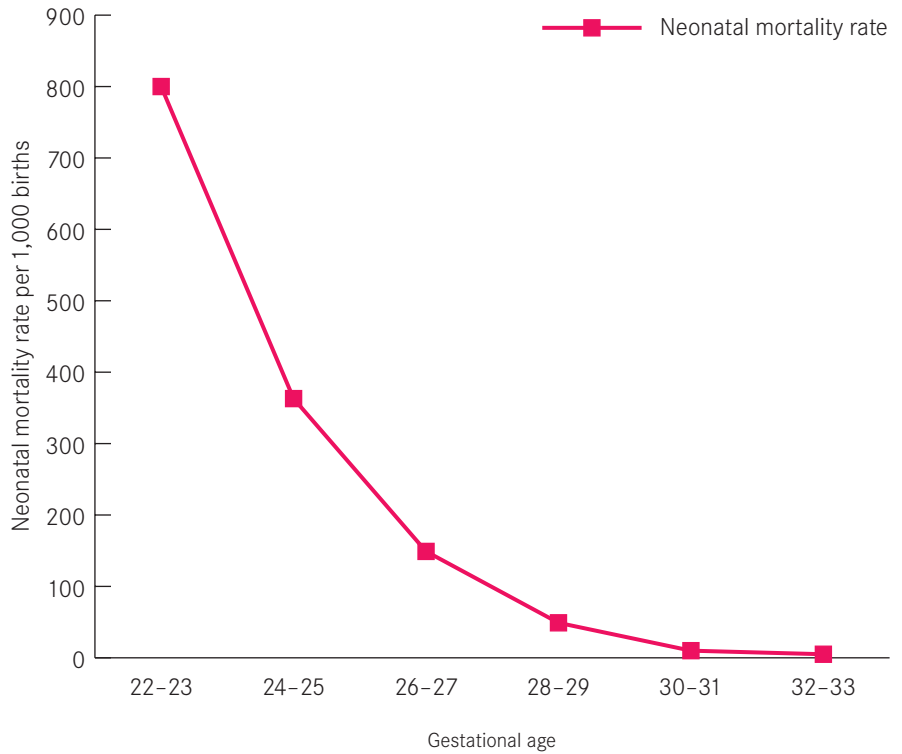
** Note: five infants of unknown gestation born at Level I & II hospitals survived >28 days. There were 35 neonatal deaths as the result of terminations. They have been excluded from calculation of the neonatal mortality rate in this Figure.

Neonatal mortality rates, 22–33 weeks gestation

Figure 12 shows the neonatal mortality rates (per 1,000 births) for the gestational age range of 22 to 33 weeks. Council considers this information will be useful to obstetricians caring for mothers who are likely to deliver an extremely immature infant, and where the fetal weight is not known with certainty.

There were 35 neonates in which the pregnancy was terminated, and these have been excluded from calculation of the neonatal mortality rate.

Figure 12 Neonatal mortality rate, 22–33 weeks gestation, Victoria, 2001 (excluding TOPS)



	22-23 weeks	24-25 weeks	26-27 weeks	28-29 weeks	30-31 weeks	32-33 weeks
Survivor >28 days*	8	42	86	156	286	556
Neonatal death	32	24	15	8	3	3
Neonatal mortality rate	800	363	149	49	10	5

There were 35 neonatal deaths as the result of terminations. They have been excluded from calculation of the neonatal mortality rate in this Figure. Note: * Source of survivor data: PDCU.

Multiple births

In 2001, there were **2,054** infants born from multiple pregnancies (**987** sets of twins, 24 sets of triplets and 2 sets of quadruplets). Multiple births comprised **3.3** per cent of all births $\geq 400g$, but contributed 12.3 per cent of perinatal deaths. **The perinatal mortality rate for multiple births of birthweight $\geq 400g$ was 38.9 per 1,000 births compared with 9.5 per 1,000 births for singleton births.**

Table 20 Perinatal mortality in singleton and multiple births, Victoria, 2001

	Total births	Stillbirths	Neonatal death	Perinatal mortality rate
Multiple births*	2,054	47	33	38.9
Singleton births	60,095	397	171	9.5
Total births	62,149	444	204	10.4

* Source Of Multiple Births Denominator Data: PDCU.

Perinatal infection

Cases are included in this category when the fetal or neonatal death is attributed to primary infection. Perinatal deaths occurring with chorio-amnionitis secondary to preterm rupture of membranes are excluded from this category and counted under “spontaneous preterm”.

Table 21 Stillbirths attributed to perinatal infection in Victoria, 2001 (PSANZ PDC)

Perinatal Infection PSANZ PDC	Stillbirths	
	n	%
Bacterial		
Group B Streptococcus	1	14.3
E coli	2	28.6
Viral		
Cytomegalovirus	1	14.3
Other viral	2	28.6
Protozoal eg Toxoplasma	1	14.3
Total	7	100.00

Table 22 Neonatal deaths attributed to perinatal infection in Victoria, 2001 (PSANZ NDC)

Perinatal infection PSANZ NDC	Neonatal deaths	
	n	%
Congenital bacterial	1	9.1
Acquired bacterial	7	63.6
Acquired viral	1	9.1
Fungal	2	18.2
Total	11	100.0

Of these eleven infants (Table 22), eight succumbed to perinatal infection associated with spontaneous preterm labour. Two deaths were as a result of nosocomial candidiasis and one death as a result of disseminated herpes simplex infection. There were no recorded cases of deaths from early onset GBS disease.

There appears to be underestimation of the true incidence of perinatal death caused by perinatally acquired fetal or neonatal GBS sepsis. Council is addressing this by undertaking a population based survey of positive isolates for GBS.

All maternity units should have a written protocol outlining the institution's approach to prevent GBS infection preferably by maternal antenatal screening and intrapartum antibiotic prophylaxis for GBS positive women. An alternative approach, by assessing risk factors at the onset of labour and administering intrapartum antibiotics is also acceptable (see page 36 for *The Three Centre Guidelines for Antenatal Care* reference). Maternity units should also have a separate protocol for the management of the newborn at risk of developing early onset sepsis.

The low number of staphylococcus aureus and coagulase negative staphylococcus infections reported as the primary cause of death is also thought to understate the contribution of these organisms to mortality and morbidity in neonatal intensive care. In premature infants or other infants with multi-system disease it may be difficult to attribute a single primary cause of death. These organisms are the commonest cause of nosocomial bacteraemia in neonatal intensive care and are major contributors to mortality. In light of the growing emergence of resistant organisms, best practice in antibiotic administration and infection control is going to become progressively more important in the coming years.

Perinatal deaths due to congenital abnormality

There were **167** perinatal deaths due to congenital abnormalities (Table 23) in infants who had a birthweight $\geq 400\text{g}$ or were ≥ 20 weeks gestation (**25.8%** of all perinatal deaths).

Chromosomal abnormalities accounted for 38 deaths, multiple abnormalities for 29 deaths and central nervous system abnormalities for 29 deaths. Of the **167** perinatal deaths of infants with a congenital abnormality, of birthweight $\geq 400\text{g}$ or ≥ 20 weeks gestation, the pregnancy was terminated in **106** cases (63%).

Table 23 Perinatal deaths in Victoria in 2001 due to congenital abnormality by PSANZ PDC, also indicating terminations of pregnancy for congenital abnormality

Cause of death	Type of perinatal death					
	Stillbirths		Neonatal death		Total	
	(Fetal death)					
Congenital abnormality PSANZ PDC	n	%	n	%	n	%
Central nervous system abnormalities	2	2.2	4	5.3	6	3.6
Termination for central nervous system abnormalities	14	15.5	9	11.8	23	13.8
Cardiovascular system abnormalities	4	4.4	9	11.8	13	7.8
Termination for cardiovascular system abnormalities	11	12.1	3	3.9	14	8.4
Urinary tract abnormalities	1	1.1	3	3.9	4	2.4
Termination for urinary tract abnormalities	4	4.4	3	3.9	7	4.2
Gastrointestinal tract abnormalities	2	2.2	-	-	2	1.2
Termination for gastrointestinal tract abnormalities	1	1.1	1	1.3	2	1.2
Chromosomal abnormalities	5	5.5	4	5.3	9	5.4
Termination for chromosomal abnormalities	17	18.7	12	15.8	29	17.4
Metabolic abnormalities	-	-	5	6.6	5	2.9
Termination for metabolic abnormalities	-	-	-	-	-	-
Multiple abnormalities	3	3.3	6	7.9	9	5.4
Termination for multiple abnormalities	16	17.6	4	5.3	20	11.9
Musculoskeletal abnormalities	1	1.1	3	3.9	4	2.4
Termination for musculoskeletal abnormalities	3	3.3	2	2.6	5	2.9
Respiratory abnormalities	-	-	-	-	-	-
Termination for respiratory abnormalities	-	-	-	-	-	-
Diaphragmatic hernia	1	1.1	2	2.6	3	1.8
Termination for diaphragmatic hernia	1	1.1	1	1.3	2	1.2
Other abnormalities	1	1.1	5	6.6	6	3.6
Termination for other abnormalities	4	4.4	-	-	4	2.4
Total	91	100	76	100	167	100.0

Time of fetal death in stillbirths

Death occurred during labour in 20.6 per cent of stillbirths (birthweight \geq 400g or \geq 20 weeks gestation) in 2001. Of 105 stillbirths with a birthweight \geq 2500 grams, 13 (12%) were intrapartum deaths (see Table 24). Many of these have avoidable factors related to intrapartum management.

Table 24 Time of fetal death in stillbirths in Victoria, 2001

Birthweight (g)	Prior to labour	During labour	Unknown before or during labour	Total
<400g*	32	23	27	82
400-499	40	21	12	73
500-999	63	20	9	92
1,000-1,499	28	3	5	36
1,500-1,999	16	6	-	22
2,000-2,499	25	4	1	30
2,500-2,999	32	2	2	36
3,000-3,499	36	5	3	44
3,500-3,999	11	4	-	15
\geq 4,000	8	2	-	10
Unknown	1	1	2	4
Total	292	91	61	444
(%)	65.7	20.5	13.7	

* Note there were 82 stillbirths born at \geq 20 weeks gestation whose birthweight was less than 400g.

Time of neonatal death

Fifty-five per cent of neonatal deaths occurred within 24 hours of birth (46.1% within the first 6 hours). Of the 94 infants who died at less than 6 hours of age, 34 were the result of a termination for a congenital abnormality. Terminations resulting in the birth of live infants are increasingly being reported following the use of vaginal misoprostol, both ≥ 20 weeks gestation and < 20 weeks gestation. Those terminations of pregnancy < 20 weeks gestation resulting in live births are not included as perinatal deaths.

Table 25 Age at time of death for neonates, Victoria, 2001

Birthweight (g)	<6 hours	6-11 hours	12-23 hours	2nd-3rd day	4th-7th day	1-<2 weeks	2-<3 weeks	3-<4 weeks	Total
<400g*	21	1	-	-	-	-	-	-	22
400-499	27	-	-	1	-	-	-	-	28
500-999	30	6	3	4	5	11	7	1	67
1,000-1,499	4	1	1	3	3	-	-	1	13
1,500-1,999	3	-	2	-	2	-	1	1	9
2,000-2,499	4	-	1	1	3	3	2	-	14
2,500-2,999	-	-	-	5	2	3	1	1	12
3,000-3,499	3	-	-	8	5	4	3	1	24
3,500-3,999	2	-	2	3	1	1	-	-	9
$\geq 4,000$	-	-	1	1	1	2	-	1	6
Total	94	8	10	26	22	24	14	6	204
(%)	46.1	3.9	4.9	12.7	10.8	11.8	6.9	2.9	

* Note there were 21 neonates born at 20 weeks gestation with a birthweight < 400 g.

COMPARISON OF COUNCIL DATA WITH OTHER SOURCES

There is considerable variation between regions and countries in the way perinatal deaths are defined, ascertained and reported. Caution must always be exercised in comparing published mortality rates.

The following information is relevant to those undertaking the potentially confusing task of comparing perinatal mortality data from other sources within Australia and from other countries.

There are three main problem areas:

1. Birthweight and gestational age criteria for inclusion of cases

To enable consistency for trend analysis, Council continues to present data according to the '≥500g' definition used since 1980. Since 2000, Council presents data for fetuses and newborns whose birthweight was ≥400g or of at least 20 weeks gestation.

It is also noted that there are increasing registrations of neonatal deaths of pre-viable infants (20–23 weeks gestation) who exhibit transient signs of life after birth following terminations of pregnancy for congenital abnormalities using vaginal misoprostol.

2. Reporting of perinatal death by year of birth, not death

From 1984, the year of inception of the Victorian Perinatal Data Collection Unit, the Council has tabulated data according to **the year in which the birth occurred**. This means a few neonatal deaths and many infant deaths occur in the year following the birth. In contrast, the Australian Bureau of Statistics (ABS) publishes statistics according to **the year when the death is registered**, not the year of birth or death. Council is collaborating with ABS in investigating discrepancies between the two databases.

3. Infants born in Victoria

The Council's perinatal mortality data refer only to those infants born in Victoria, whereas the Australian Bureau of Statistics refer to deaths occurring in Victoria, irrespective of the State, Territory, or country of birth.

These definitional differences give rise to slight differences in rates reported by various agencies.

INTERNATIONAL COMPARISONS OF PERINATAL MORTALITY

For the purposes of international comparison, World Health Organisation (WHO) also recommends publication of mortality rates in which the numerator and denominator are restricted to fetuses and infants of birthweight 1,000g or over, or if birthweight is unavailable, 28 weeks' gestation and over. The definitions are:

Stillbirth A stillborn infant weighing at least **1,000g** or, if the birthweight is not known, born after at least **28 weeks** gestation.

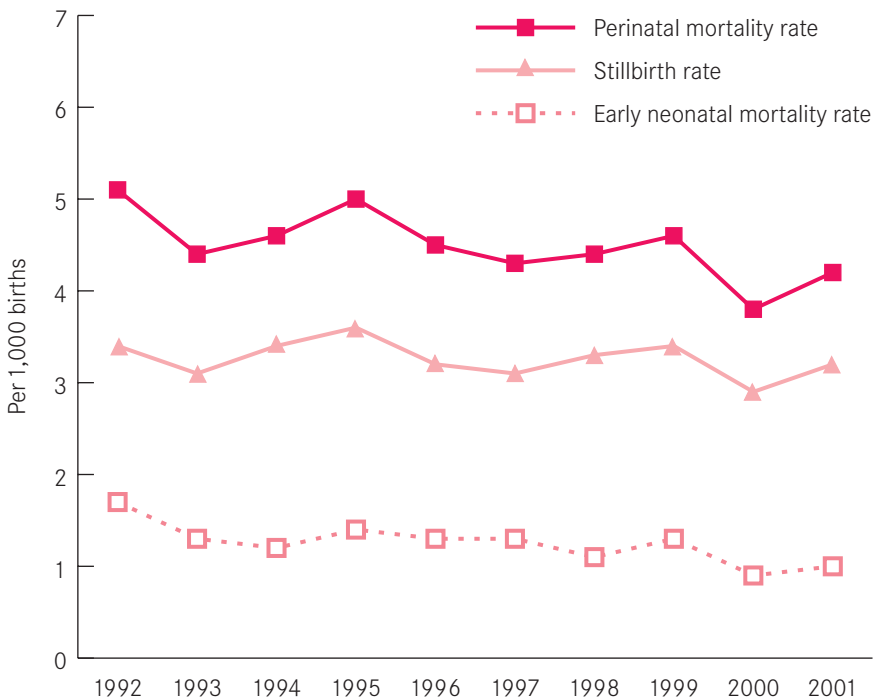
Early neonatal death A death occurring in an infant whose birthweight was at least 1,000g (or if the birthweight is not known, an infant born after at least 28 weeks gestation) who dies within **seven days** of birth.

Table 26 Perinatal mortality rates for international comparison, Victoria, 1992–2001

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Stillbirth rate	3.4	3.1	3.4	3.6	3.2	3.1	3.3	3.4	2.9	3.2
Early neonatal mortality rate	1.7	1.3	1.2	1.4	1.3	1.3	1.1	1.3	0.9	1.0
Perinatal mortality rate	5.1	4.4	4.6	5.0	4.5	4.3	4.4	4.6	3.8	4.2

* Rate per 1,000 births (birthweight \geq 1,000g or gestation \geq 28 weeks. Neonatal deaths within seven days of birth)

Figure 13 Perinatal mortality rates for international comparison, Victoria, 1992–2001



The latest perinatal mortality rates (birthweight $\geq 1,000\text{g}$) per 1,000 births, available from WHO, are for 1995: Western Europe 7, North America 9, South America 39, South-East Asia (not including Australia) 37, and Africa 75 (source: WHO, 2003).

PERINATAL DEATHS EXCLUDED FROM SURVEY

The following ten infants were excluded from the statistical calculations:

- Two were neonatal deaths of infants who were born interstate and referred to Victoria for treatment for congenital cardiac abnormalities.
- Eight were deaths of pre-viable infants of less than 20 weeks gestation, but who showed signs of life after birth and who were therefore registered as livebirths and neonatal deaths. Four had congenital abnormalities and the pregnancy was terminated in three cases.

PERINATAL DEATHS UNDER 400 GRAMS

There were 104 perinatal deaths legally required to be registered in Victoria in 2001, which had a birthweight under 400g and were born ≥ 20 weeks gestation. These included 82 stillbirths and 22 neonatal deaths that were registered as births, but had a birthweight under 400g (see Table 16).

Table 27 Perinatal deaths of infants of birthweight under 400g, Victoria, 2001

Cause of death	Birthweight (g)						Total
	<200		200–299		300–399		
	SB	NND	SB	NND	SB	NND	
Total	12	1	24	6	46	15	104

There were four stillbirths who are not included in Table 27 that were delivered at or beyond 20 weeks gestation but whose birthweight is unknown.

Information on the 104 infants born at ≥ 20 weeks gestation whose birthweight was $< 400\text{g}$ is presented in the Table 28. Forty one of these infants (39.4 per cent) had congenital abnormalities and the pregnancy was terminated in all but two of these cases.

Table 28 Perinatal deaths, by cause (PSANZ PDC) and type (birthweight <400g), Victoria, 2001

Cause of death	Type of perinatal death					
	Stillbirths		Neonatal death		Total	
	(Fetal death)					
PSANZ PDC	n	%	n	%	n	%
Termination for congenital abnormality	27	32.9	12	54.5	39	37.5
Spontaneous preterm	21	25.6	6	27.3	27	25.9
Specific peripartum conditions	10	12.2	–	–	10	9.6
Unexplained antepartum death	9	11.0	–	–	9	8.7
Fetal growth restriction	6	7.3	–	–	6	5.8
Maternal conditions	3	3.7	3	13.6	6	5.8
Antepartum haemorrhage	3	3.7	–	–	3	2.9
Congenital anomaly	2	2.4	–	–	2	1.9
Perinatal Infection	1	1.2	–	–	1	0.9
Specific perinatal conditions	–	–	1	4.5	1	0.9
Total	82	100.00	22	100.00	104	100.00

SOURCES OF INFORMATION

Council relies on the co-operation of obstetricians, neonatologists, paediatricians, midwives, general practitioners and medical records personnel to assist with providing the maximum amount of relevant information on each case. One of the most important documents is the Confidential Medical Report on Perinatal Death (CMR). The Council wishes to thank medical staff who complete these forms.

However, the information in this document is often incomplete. For stillbirths, results of antenatal tests for fetal well-being are often not included (for example, glucose tolerance test, cardiotocography, and ultrasound assessment). For neonatal deaths, where the Confidential Medical Report has been completed by a member of the paediatric staff, obstetrical information is rarely adequate for full consideration of the clinical circumstances surrounding the death, and a separate obstetrical summary should be provided.

Council recognises that there is often room for improvement in the completion and submission of this information and requests that the Perinatal Death Certificate and the Confidential Medical Report be reviewed for completeness and be countersigned by the most senior clinician involved.

The Council advises practitioners that all information provided to the Council is handled with strict confidentiality, and is not able to be accessed by any third party, including the courts. The Council does not reveal in any of its reports the identity of any individual person or practitioner.

Institutions should ensure that they are using current versions of the Medical Certificate of Cause of Perinatal Death and Confidential Medical Report on Perinatal Death forms. These can be obtained from the Registry of Births, Deaths and Marriages (GPO Box 4322, Melbourne 3001).

LEGAL REQUIREMENTS FOR REGISTRATION OF PERINATAL DEATHS

The Registry of Births, Deaths, and Marriages notifies Council of all perinatal deaths registered in Victoria. The legal requirements for registration are stipulated in the *Registration of Births, Deaths and Marriages Act*.

For the purpose of Registration, the *Registration of Births, Deaths and Marriages Act*, dictates that a **'stillborn child'** is any child born at a gestation of at least 20 weeks gestation, who did not, at any time after being born, breathe or show any signs of life. Where the duration of pregnancy is not reliably ascertainable this applies to any fetus weighing 400g or more.

The same Act dictates that a **livebirth** is the birth of an infant, regardless of maturity or birthweight, who breathes or shows any other signs of life after being born. **All such infants must be registered**, and if death subsequently occurs within 28 days, the Act dictates that a Perinatal Death Certificate is also required. However for statistical purposes, live born infants <20 weeks' gestation are not included in perinatal mortality calculations.

PERINATAL AUTOPSY SERVICE

In circumstances where there is uncertainty about the precise cause of death, an expert perinatal autopsy and pathological examination of the placenta will often provide helpful information for the parents as well as for clinicians. Such examinations are best performed in tertiary perinatal referral institutions.

In cases where circumstances are suspicious or where there are suspected serious deficiencies in care, the Coroner should be consulted.

In seeking consent for a perinatal or infant postmortem examination, the understandable reluctance of parents to subject their infant to such a procedure must be respected and dealt with sensitively. Many parents in retrospect regret not having the answers that a postmortem examination may provide, whether they be positive or negative. Furthermore, the results of a postmortem examination may be helpful in the management of a subsequent pregnancy. In approximately one third of "unexplained" stillbirths, an expert postmortem examination reveals an explanation for the death.

When performed, autopsy information and placental pathology should be forwarded to the Council for all perinatal deaths, by the pathology department undertaking the examinations.

In view of the recent adverse publicity surrounding infant autopsies, the Department of Human Services has issued guidelines for hospitals with respect to gaining consent and other aspects of the retention, use and disposal of tissue obtained at autopsy. These guidelines are available on the internet (www.dhs.vic.gov.au/phd/postmortem/index.htm).

Subsidised autopsy service

It is vital to the accuracy of the Council's surveys that full advantage be taken of the autopsy service available for perinatal deaths occurring in Victoria subsidised by DHS. To use the service, the attending doctor, following the obtaining of consent, should contact the *pathology department of the nearest teaching hospital* and arrange with a funeral director to transport the infant and the placenta to the pathology centre. The Consultative Council meets costs associated with the autopsy service, and the service involves no expense for parents. Pathologists and funeral directors should send their accounts, showing all relevant details, to:

The Executive Officer
Consultative Council on Obstetric and Paediatric Mortality and Morbidity
GPO Box 4923
Melbourne 3001

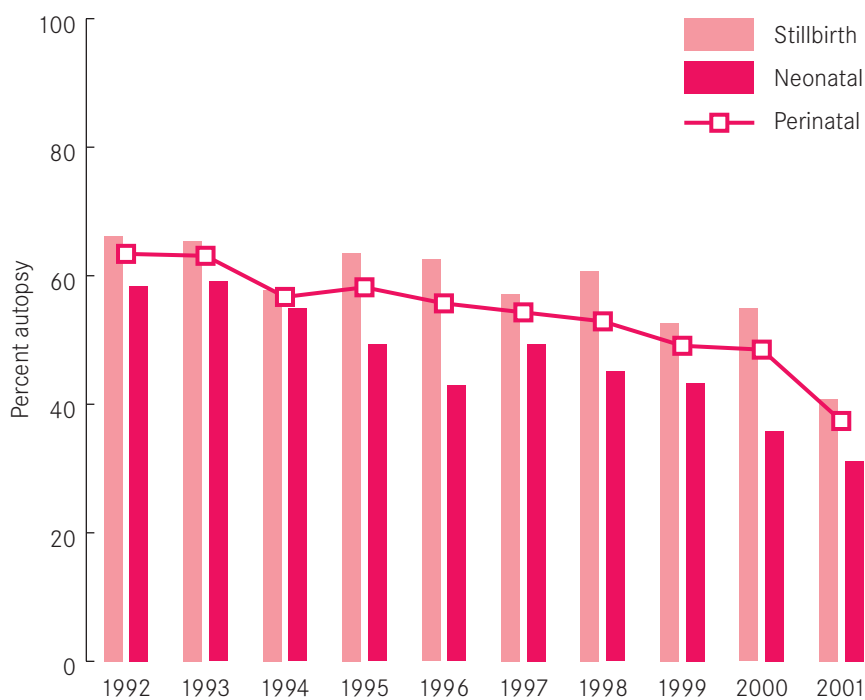
Autopsy rates for infants $\geq 400\text{g}$ or ≥ 20 weeks gestation

In 2001, an autopsy was performed on **41.2 per cent (183 of 444)** of stillbirths, and on **30.4 per cent (62 of 204)** of neonatal deaths. The perinatal autopsy rate for infants ($n = 648$) with a birthweight $\geq 400\text{g}$ or ≥ 20 weeks gestation, **was 37.8 per cent in 2001, compared to 50.2 per cent in 2000.**

Autopsy rates for infants $\geq 500\text{g}$ or ≥ 22 weeks gestation if birthweight unknown

In 2001, an autopsy was performed on **40.8 per cent (117 of 287)** of stillbirths, and on **31.2 per cent (48 of 154)** of neonatal deaths of infants with a birthweight of $\geq 500\text{g}$. The proportion of perinatal deaths that have had a autopsy over the past 10 years is shown in Figure 14, which illustrates that there is a progressive decline in the perinatal autopsy rate from **63.4 per cent in 1992 to 37.4 per cent in 2001.**

Figure 14 Perinatal autopsy rates, Victoria, 1992–2001 (birthweight \geq 500g)



Stillbirth	66.2	65.4	57.8	63.5	62.5	57.2	60.7	52.6	54.9	40.8
Neonatal	58.4	59.1	54.9	49.3	42.9	49.4	45.1	43.3	35.8	31.2
Total	63.4	63.1	56.7	58.2	55.7	54.3	52.9	49.1	48.5	37.4

Placental Pathology

As above stated, the placenta should be sent for pathological examination in all cases of fetal death, and where possible for all early neonatal deaths. The placenta should preferably be chilled and then promptly sent unfixed to the pathology service to enable microbiological cultures and when necessary, chromosomal cultures to be performed. If a delay is likely, cultures should be taken from the fetal surface of the placenta in cases of actual or suspected infection. The placenta should be sent for pathological examination in the following additional circumstances:

- Neonatal hypoxic ischaemic encephalopathy
- Small for gestational age
- Preterm delivery <34 weeks
- Antepartum haemorrhage
- Suspected chorioamnionitis
- Diabetes
- Preeclampsia
- Macroscopic placental abnormalities

SUSPECTED PREVENTABLE FACTORS IN PERINATAL DEATHS

The Stillbirth and Neonatal Committees of the Council consider selected cases after information is collated. On the basis of this information, a judgement is made about suspected preventable factors.

In deciding that a suspected preventable factor was present, the determination is not that death was certainly preventable, but that if a preferable course of action had been followed, the risk of death would be likely to have been reduced.

Stillbirths: After consideration, of 287 cases (birthweight $\geq 500\text{g}$ or ≥ 22 weeks gestation), **32** cases (11%) were classified as having preventable factors.

Neonatal deaths: Of the 154 cases (birthweight $\geq 500\text{g}$ or ≥ 22 weeks gestation), there were **23** cases (15%) in which suspected preventable factors were identified.

The following categories of avoidable factors were identified:

Obstetric factors

- Inadequate detection and management of the growth restricted fetus
- Maternal smoking and inappropriate maternal drug use
- Insufficient antenatal care
- Inadequate antenatal monitoring (clinical need apparent)
- Misinterpretation of/undue reliance on tests
- Patient/family non-compliance
- Inadequate intrapartum management of fetal distress
- Inadequate intrapartum management of forceps delivery
- Inadequate management of diabetes
- Failure to expedite delivery
- Inadequate management of suspected macrosomia
- Inadequate counselling prior to termination

Paediatric factors

- Inadequate resuscitation
- Patient/family non-compliance
- Inadequate nursery care
- Substandard neonatal observations
- Failure to consult with NETS
- Inadequate neonatal observations

With respect to standards for routine antenatal care, practitioners are reminded of the guidelines developed by the three tertiary centres in Melbourne, *The Three Centres Guidelines for Antenatal Care*, available at www.3centres.com.au

**Table 29 Suspected preventable factors in perinatal deaths in Victoria, 2001
(birthweight \geq 500g)**

Suspected preventable factor	Number of cases with this factor*		Total
	SB	NND	
Mother			
Antenatal care:			
Insufficient antenatal care	1	-	1
Failure to attend/no antenatal care	2	-	2
Delay/no consultation in high-risk pregnancy	2	-	2
Inadequate antenatal management of:			
Prelabour rupture of membranes (term)			
Antepartum haemorrhage	-	1	1
Multiple pregnancy	-	1	1
Diabetes	4	-	4
Growth restricted fetus	11	2	13
Macrosomia	-	1	1
Narcotics	5	-	5
Smoking	1	-	1
Counselling prior to termination of pregnancy	1	-	1
Patient/family non-compliance	3	1	4
Inadequate antenatal monitoring:			
Clinical need apparent	2	-	2
Misinterpretation of/undue reliance on test	3	1	4
EFM indicated. Mother declined	-	1	1
Intrapartum care:			
Failure to perform Caesarean section	-	1	1
Caesarean section too late	1	3	4
Unsuitable hospital for delivery	-	1	1
Inadequate intrapartum monitoring	3	7	10
Failure to expedite delivery - other	2	1	3
Inadequate intrapartum management of:			
Fetal distress	2	3	5
Forceps delivery	1	3	4
Infant and fetus			
Inadequate Resuscitation	-	6	6
Inadequate Paediatric management	-	3	3
Inadequate Nursery care	-	1	1
Substandard neonatal observations	-	1	1
Family neglect of ignorance	-	3	3
Delay or lack of consultation	-	1	1
TOTAL number of preventable factors identified*	44	42	86
Total number of cases	287	154	441
Cases with one or more suspected preventable factors (% of total)	32 (11.1%)	23 (14.9%)	55 (12.5%)

* Note: cases may have more than one suspected preventable factor present

RECOMMENDATIONS FROM THE COUNCIL ON PERINATAL DEATHS

The consideration of suspected preventable factors in obstetric and paediatric care enables the Council to make some observations and suggestions.

Further reduction in perinatal mortality depends on preventing some of the stillbirths, many of whom were not low birthweight, and many of which were “unexplained”. Careful consideration and documentation of the circumstances and thorough and appropriate maternal, fetal and placental investigation is required for all unexplained stillbirths.

A suspected preventable factor is considered to be present when aspects of management of the mother or infant were considered to be deficient or inconsistent with best practice.

Detect growth restriction or macrosomia

Council recommends that tests of fetal well-being such as ultrasound imaging (for growth and biophysical profile, and amniotic fluid volume estimation), Doppler umbilical blood flow studies, and/or cardiotocography be considered in all cases where there is suspected fetal compromise ≥ 26 weeks gestation.

These conditions include:

- Medical disorders including hypertension, preeclampsia, and diabetes mellitus;
- Suspected delay in fetal growth;
- Oligohydramnios;
- Polyhydramnios;
- Reduced fetal movements;
- Multiple pregnancy;
- Maternal age >35 years;
- Obesity (risk factor for both fetal growth restriction and macrosomia);
- Pregnancy as the result of assisted reproduction;
- Previous perinatal death;
- Poor antenatal attendance;
- Suspected macrosomia;
- Deprived socio-economic circumstances;
- Drugs or alcohol misuse;
- Heavy smoking.

Encourage prompt reporting of reduced fetal movements

Council recommends that women be encouraged to report when fetal movements are perceived to be reduced for more than 12 hours. Cardiotocography may be useful in the management of this problem. Reduced fetal movements are an indication for consideration of delivery, even when cardiotocographic findings are normal. The clinical circumstances of the case including gestation, presentation, station of the presenting part, and state of the cervix need to be considered in reaching a management decision in this situation.

Consider tocolysis, corticosteroids, Level 3 centre, surfactant – for extreme immaturity

Extreme immaturity continues to contribute heavily to the perinatal mortality rate. Clinicians may be able to improve the outcome for the infant in several ways:

1. A single course of corticosteroid therapy given to the mother <24 hours prior to birth (betamethasone 11.8mg, 12hrly for two doses) is strongly supported by evidence, up to and including 33 weeks gestation.
2. If there are no contra-indications, short term tocolysis should be considered, in consultation with the referral centre, for women in pre-term labour <34 weeks gestation, to enable steroids to take effect and to provide time for in-utero transfer to a centre with neonatal intensive care facilities. Oral nifedipine has been shown to be more effective than betamimetics, with fewer adverse maternal effects. (For administration protocol, contact perinatal referral centre).
3. Transfer of the mother to a Level III hospital for the delivery should be considered; extremely immature infants have lower mortality and morbidity rates if born in Level III centres (ie centres with Neonatal Intensive Care units).

Initiate management of obstetric patients prior to transfer

When transfer of obstetrical patients is being considered, it is the responsibility of the referring doctor, **following consultation with the receiving unit**, to initiate appropriate management before the transfer. Severe preeclampsia warrants anticonvulsant prophylaxis with magnesium sulphate and control of hypertension for the mother before transfer.

A course of antenatal corticosteroids should be commenced prior to in-utero transfer, if delivery is anticipated prior to 34 weeks.

Exercise care when using prostaglandins

Fetal deaths have been associated with attempts to ripen the unfavourable cervix with vaginal prostaglandins. When prostaglandins are used, the fetal heart should be monitored electronically before and after insertion. Prostaglandins can be used for induction of labour when the cervix is unfavourable, however the indication should be pressing and closer fetal surveillance under such circumstances is recommended.

Council is also aware of cases of rupture of the uterus following the use of prostaglandins, particularly when combined with oxytocin infusion. Careful surveillance of patients in labour under such circumstances is required particularly if multiparous or if there has been a previous caesarean section. Such cases should be managed in collaboration with a specialist obstetrician.

Exercise care when using oxytocin infusions, especially in multiparas

The use of oxytocin infusion to initiate or augment labour in a multiparous woman carries increased risk of fetal and maternal complications, and should be administered very judiciously, in accordance with a written protocol. All such patients should have an initial vaginal examination and continuous electronic fetal monitoring while the infusion is running. Such cases should be managed in collaboration with a specialist obstetrician.

Infertility patients are at increased risk of adverse outcome

Infertility patients particularly when the pregnancy is a result of assisted reproductive technology/ovulation induction, should have the pregnancy closely monitored including serial assessment of fetal growth by ultrasound.

Monitor hypertensive mothers

In pregnancies complicated by hypertension, increased maternal and fetal surveillance in pregnancy and labour is required, in collaboration with a specialist obstetrician.

Be aware that multiple pregnancy increases the risk of perinatal death

Council recommends the management of multiple pregnancy should be undertaken in collaboration with a specialist obstetrician.

Availability of an anaesthetist

It is recommended that availability of an anaesthetist and access to a theatre should be a priority in the management of high risk deliveries such as multiple pregnancies, and for planned vaginal birth for women with prior caesarean section.

Take swabs when pre labour rupture of the membranes occurs

When pre labour rupture of the membranes occurs prior to 37 weeks gestation, it is recommended that cervical swabs be taken for microscopy and bacterial culture, and (unless contraindicated) prophylactic oral **erythromycin** be administered. Unless already taken, swabs for GBS should be taken from the lower one third of the vagina and the ano-rectum, and placed in transport medium. If a cervical suture is present and the membranes have ruptured, the suture should be removed.

Consider a Kleihauer test

Fetomaternal haemorrhage is a cause of unexpected intrauterine death at or near term and Kleihauer testing should be performed in this situation prior to induction of labour. A haemoglobin estimation should be performed immediately on any pale or shocked neonate since a timely blood transfusion may be lifesaving.

When Rhesus anti-D immunoglobulin is required, RANZCOG guidelines should be followed (www.ranzcog.edu.au).

When routine screening detects a positive indirect Coombs test, regardless of the antibody involved, the titre should be checked in a reference laboratory (major teaching hospital). Except for anti-P and anti-Lewis antibodies, any of the antibodies can have an adverse effect on the fetus. This includes anti-D, anti-C and anti-c, anti-E and anti-Kell antibodies. Such pregnancies should be managed in consultation with a major teaching hospital with the necessary expertise in fetal blood sampling and fetal intravascular transfusions.

Ensure appropriate monitoring of mothers with diabetes

Mothers with gestational or pre-pregnancy diabetes mellitus should be managed in consultation with a specialist obstetrician. Increased fetal surveillance is indicated with induction of labour at or before 40 weeks.

Check fetal maturity in obese women

Early confirmation of gestational age by ultrasound prior to 18 weeks is particularly important in obese women, who have an increased risk of a wide range of obstetric complications.

Investigate pruritus in pregnancy

The occurrence of pruritus and obstetric cholestasis carries an increased risk of perinatal mortality and morbidity. When pruritus occurs in pregnancy, tests of maternal liver function and fetal well-being should be performed, together with obstetrical consultation.

Avoid surgery

Elective surgery should usually be avoided during pregnancy.

Use antibiotics early for neonates with suspected sepsis

Council has noted several instances of deaths in newborn infants caused by bacterial infections where antibiotic therapy has been delayed. Sepsis should be considered in babies if there is evidence of respiratory distress, temperature instability, poor feeding, a change in behaviour, or seizures. Antibiotics should not be delayed because of failure to obtain appropriate cultures. Penicillin and Gentamycin (intramuscularly if there is no venous access) are appropriate initial antibiotics in most cases of neonatal sepsis. If in doubt, the Newborn Emergency Transport Service can be contacted on (03) 9347 7441 for advice.

With regard to group B streptococcal (GBS) infection, evidence suggests that mortality is reduced by about 90 per cent if an appropriate preventive strategy is in place. Antenatal screening (at 35–36 weeks by low vaginal and ano-rectal culture) and intrapartum penicillin antibiotic prophylaxis for GBS carriers is the preferred approach. An alternative approach is to identify intrapartum risk factors and treat with appropriate antibiotics. These risk factors include: birth prior to 37 weeks; intrapartum fever $\geq 38^{\circ}\text{C}$; duration of membrane rupture >18 hours, and previously GBS affected infant. Each maternity service should have in place a written protocol for the prevention and treatment of early onset GBS neonatal infection, and for management of the newborn at risk of sepsis.

Ensure appropriate transfer of infants at term with respiratory distress

In the case of any term infant with respiratory distress the NETS consultative services should be contacted (phone 9347 7441), and consideration should be given to transferring the infant directly to a Neonatal Intensive Care Unit.

Continue respiratory support in significantly asphyxiated infants

Infants with cardio-respiratory depression requiring intubation and ventilation for more than 5 minutes should have the endotracheal tube left in situ and arrangements made for transfer of the infant to an Intensive Care Unit, (see section on Newborn Emergency Transfer, page 76).

Discourage smoking in pregnancy

Maternal substance abuse, including heavy cigarette smoking, continues to be an important contributing factor in adverse perinatal outcomes. Repeated smoking cessation advice has been shown to be effective in reducing smoking in pregnancy, and improves perinatal outcomes.

Clinical recommendations

Any infant which fails to pass meconium within 24 hours of birth requires paediatric consultation and assessment for bowel obstruction.

The importance of neurological irritability in an infant with a medical condition can be an ominous sign with the clinical reminder that sedation may produce severe cardio-respiratory depression.

Royal Australasian College of Paediatricans paediatric policy on the examination of the newborn.
Website: www.racp.edu.au/hpu/paed/examination

RANZCOG guidelines for fetal monitoring. Website: www.ranzcog.edu.au

POSTNEONATAL INFANT AND CHILD DEATH REVIEW

This section reports on postneonatal infant and child deaths which occurred during the 2001 calendar year.

The Consultative Council wishes to thank medical practitioners who provided additional information on infant and child deaths, and stresses the importance of accurate data collection in these age groups. Such assistance with data provision to the Council is encouraged and greatly appreciated.

DEFINITIONS

Infant death	The death of an infant occurring within one year of birth (excludes stillbirths).
Neonatal death	The death of an infant within 28 days of birth.
Postneonatal infant death	The death of an infant between 29 and 364 days.
Child death	The death of a child occurring after and including the first birthday and up to, but not including, the 15th birthday.

Infant mortality rate

$$= \frac{\text{(number of infant deaths)}}{\text{total livebirths}} \times 1000 \text{ (per index year of birth)}$$

INFANT MORTALITY RATE

(Birthweight $\geq 500\text{g}$ or ≥ 22 weeks gestation if birthweight unknown)

The infant mortality rate for Victorian infants 1992–2001 (with a birthweight $\geq 500\text{g}$ or ≥ 22 weeks gestation if birthweight unknown) is shown in Table 30.

Table 30 Neonatal and postneonatal infant deaths, infant mortality rate, Victoria, 1992–2001 (birthweight $\geq 500\text{g}$)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Livebirths	65,815	64,284	64,376	63,214	62,429	61,815	61,634	62,149	62,092	61,623
Neonatal deaths	191	165	184	193	157	160	164	171	136	154
Postneonatal deaths	120	96	102	94	82	87	77	90*	72	86
Total infant deaths#	311	261	286	287	239	247	241	261	208	240
Infant mortality rate (per 1,000 livebirths)	4.7	4.1	4.4	4.5	3.8	4.0	3.9	4.2	3.3	3.9

Neonatal and postneonatal infant deaths.

The infant mortality rate is calculated on infant born in an index year (their year of birth). There were 86 infants born in 2001 (birthweight $\geq 500\text{g}$) who died. Fifty three infants died in 2001, and 33 died in 2002. Details of the 33 infants who died in the calendar year 2002 will be included in 2002 Annual Report.

INFANT MORTALITY RATE

(including all livebirths regardless of birthweight or gestation)

The legal definition of livebirths includes any infant, regardless of weight or gestation, which shows signs of life after separation from its mother, such as a heart beat.

Because of this definition, Council also reports on infant mortality including deaths of infants who weighed less than 500g or were less than 22 weeks gestation. Most infants under 500g or 22 weeks gestation are nonviable or the result of termination of pregnancy. Council considers the first definition to be the more reliable public health indicator, but presents the second category for completeness.

There were 51 infant deaths with birthweight less than 500 grams. If these infants are included, this increases the infant mortality rate to 4.7 per 1,000 live births. Table 31 shows the number of infant deaths and infant mortality rate for the years 2000 and 2001

Table 31 Neonatal and postneonatal infant deaths, infant mortality rate, Victoria, 2000–2001 (regardless of birthweight and gestation)

	2000	2001
Livebirths	62,154	61,705
Neonatal deaths	191	204
Postneonatal deaths	73	88
Total infant deaths#	264	292
Infant mortality rate (per 1,000 livebirths)	4.2	4.7

Neonatal and postneonatal infant deaths.

There were 88 infants born in 2001 who died. Fifty five infants died in 2001, and 33 died in 2002. Details of these 33 infants who died in 2002 will be included in 2002 Annual Report.

POSTNEONATAL INFANT AND CHILD DEATHS EXCLUDED FROM THIS REPORT

Five postneonatal infants and four children have been excluded because they lived outside Victoria and died in Victoria. There were six deaths that occurred in postneonatal infants and children who resided in other states or territories, or overseas, having been referred for treatment of a serious illness:

- five deaths from congenital cardiac malformations;
- one death from infectious disease (haemophagocytic syndrome);
- one death from malignancy
- one death from a motor car accident;
- one death from Sudden Infant Death syndrome.

There were two children who resided in Victoria but who died overseas and are excluded from this report:

- one death from a fall;
- one death, with no details of the cause of death.

MAJOR CAUSE OF DEATH IN POSTNEONATAL INFANT AND CHILD DEATHS IN VICTORIA, 1988–2001

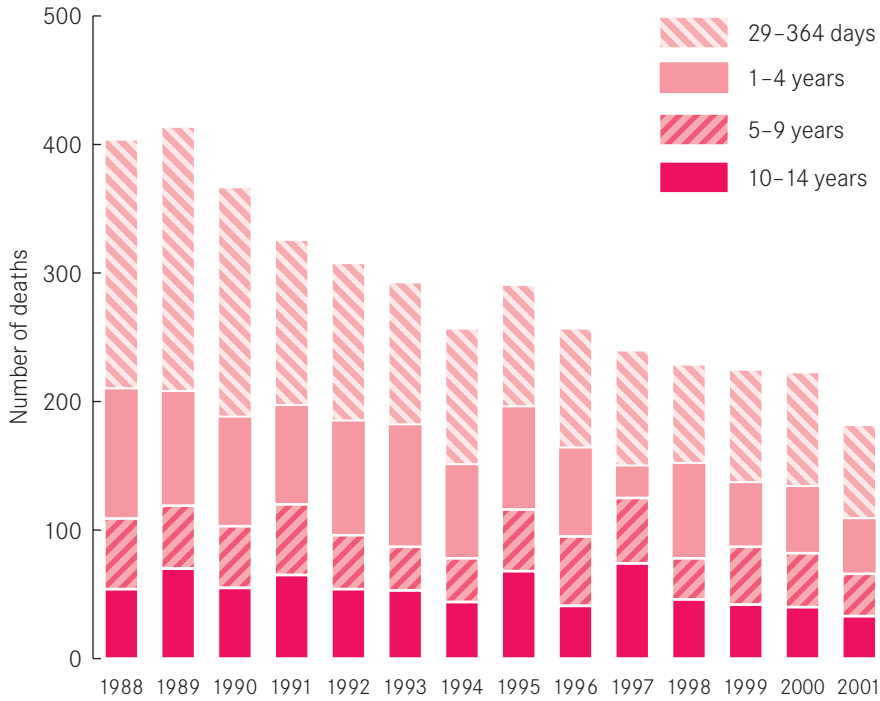
In 2001, there were 182 deaths in infants and children aged 29 days to 14 years (up to the 15th birthday), comprising 73 postneonatal infant deaths and 109 child deaths. The numbers of postneonatal infant and child deaths from 1988 to 2001 are shown by category of death in Figure 15, and by age at death in Figure 16.

Figure 15 Postneonatal infant and child deaths by major cause, Victoria, 1988–2001



POSTNEONATAL INFANT AND CHILD DEATHS BY AGE GROUP IN VICTORIA, 1988–2001

Figure 16 Postneonatal infant and child deaths by age group, Victoria, 1988–2001



29–364 days	194	206	179	129	123	111	106	95	93	87	77	88	89	73
1–4 years	101	89	85	77	89	95	73	80	69	63	74	50	52	43
5–9 years	55	49	48	55	42	34	34	48	54	40	32	45	42	33
10–14 years	54	70	55	65	54	53	44	68	41	50	46	42	40	33
Total	404	414	367	326	308	293	257	291	257	240	229	225	233	182

CAUSE OF DEATH IN POSTNEONATAL INFANT AND CHILD DEATHS IN VICTORIA IN 2001

Table 32 Cause of postneonatal infant and child deaths by age group, Victoria, 2001

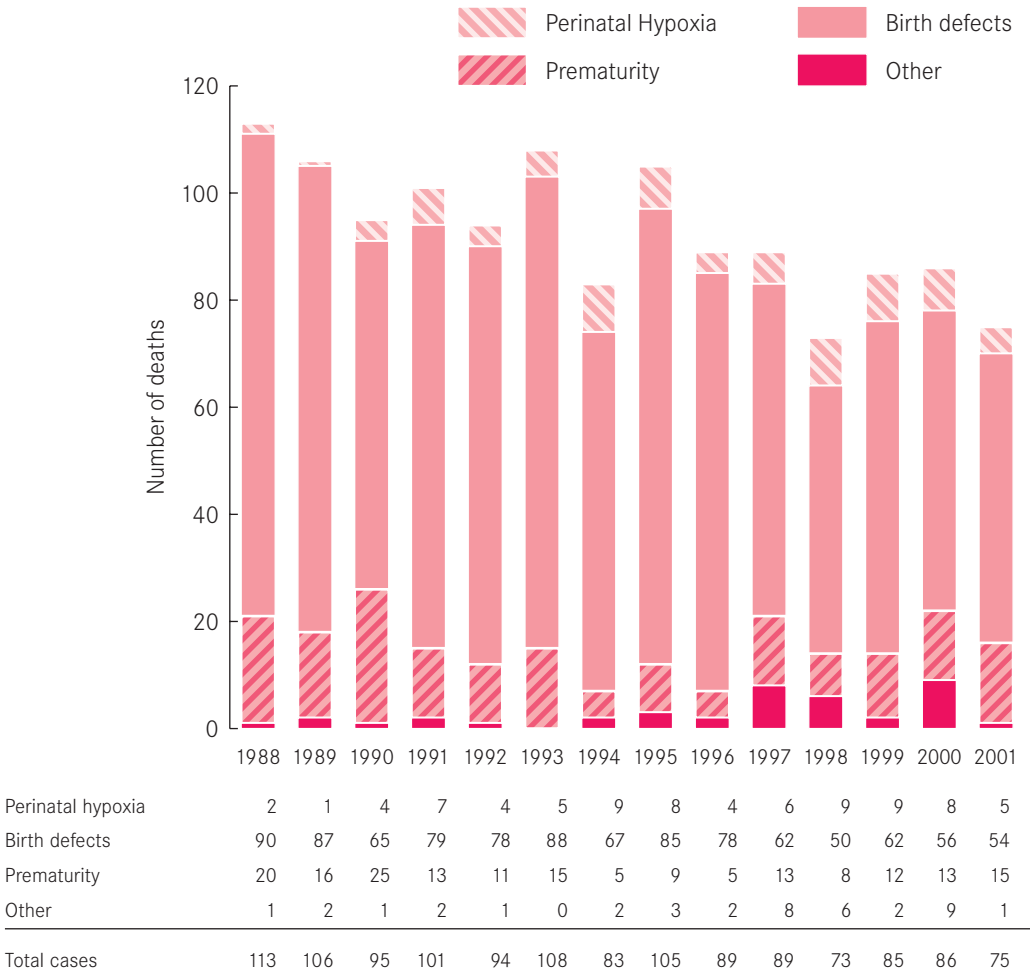
Category	Age				Total
	29–364 days	1–4 years	5–9 years	10–14 years	
Determined at birth					
Birth hypoxia/asphyxia	3	–	–	2	5
Malformation/birth defect	28	11	10	5	54
Prematurity	15	–	–	–	15
Other	–	–	–	1	1
Subtotal	46	11	10	8	75
Sudden Infant Death syndrome					
Sudden Infant Death Syndrome	12	–	–	–	12
Subtotal	12	–	–	–	12
Unintentional injuries					
Motor vehicle	1	5	4	7	17
Drowning	–	6	1	1	8
Fire	1	–	–	–	1
Asphyxiation	–	2	1	–	3
Train	–	–	–	1	1
Other	–	2	2	4	8
Subtotal	2	15	8	13	38
Acquired disease					
Infection	7	7	3	2	19
Malignancy	–	6	10	6	22
Undetermined*	5	–	–	–	5*
Other acquired disease	–	2	1	3	6
Subtotal	12*	15	14	11	52
Intentional injury					
Intentional trauma	1	2	1	–	4
Suicide	–	–	–	1	1
Subtotal	1	2	1	1	5
Total	73	43	33	33	182

* There were 5 infant deaths whose cause of death was undetermined. Three infants had autopsy performed, while two infants had no autopsy performed.

CAUSES OF POSTNEONATAL INFANT AND CHILD DEATH DETERMINED AT BIRTH

In 2001 there were 75 deaths in postneonatal infants and children from perinatally acquired hypoxia/asphyxia, birth defects, prematurity or other conditions arising from the perinatal period. Figure 17 shows the causes of death determined at birth for the years 1988–2001.

Figure 17 Causes of death determined at birth, postneonatal infants and children, Victoria, 1988–2001



Perinatally acquired hypoxia/asphyxia

Of the five deaths resulting from severe perinatal hypoxia, three died in infancy, and two died in childhood.

Birth defects and genetically determined causes

There were 54 postneonatal infant and child deaths due to birth defects (Table 33). Birth defects are the major cause of postneonatal infant death, accounting for 38% of deaths in this age group. Cardiovascular system defects were the largest group for postneonatal infant and child deaths due to birth defects with 10 cases, followed by metabolic disorders with 9 cases, and chromosomal and genetic disorders with six cases.

Table 33 Deaths from birth defects, postneonatal infants and children, Victoria, 2001

Type of birth defect	Age				Total
	29–364 days	1–4 years	5–9 years	10–14 years	
Cardiovascular system	8	2	–	–	10
Chromosomal/genetic disorder	4	1	1	–	6
Metabolic disorders	4	3	2	–	9
Mitochondrial disorder	–	–	1	–	1
Spinal muscular atrophy	1	2	1	–	4
Cystic fibrosis	–	–	1	2	3
Muscular dystrophy	1	1	–	–	2
CNS defect	3	–	1	1	5
Digestive system defect	1	–	–	–	1
Diaphragmatic defect	4	–	–	–	4
Respiratory defect	–	1	–	–	1
Neuro degenerative disorder	–	–	1	–	1
Haemangioma	–	–	1	–	1
Noonan's syndrome	1	–	–	–	1
Peters-plus syndrome	1	–	–	–	1
Coffin-Lowry syndrome	–	–	–	1	1
Hypoglossia – situ inversus syndrome	–	1	–	–	1
Multiple congenital defect	–	–	1	–	1
Granulomatous disorder	–	–	–	1	1
Total	28	11	10	5	54

Prematurity

There were fifteen postneonatal infant deaths in 2001 due to consequences of prematurity (compared to thirteen in 2000 and twelve in 1999). Of the fifteen postneonatal infants, twelve had birthweights ≤ 850 g. Twelve died from chronic lung disease, and three from necrotising enterocolitis.

Other causes determined at birth

There was one child death from the complications of epilepsy.

SUDDEN UNEXPECTED DEATH IN INFANCY

There has been much confusion in the way in which sudden unexpected infant deaths are classified. In this report Council has aligned with the Child Death Review Team report, New South Wales, by accepting the following ICD-10 categories. This group of deaths include all infants (under 1 year of age) who die suddenly and unexpectedly. Deaths where a cause of death is identified (usually at autopsy) are also included in this category under ‘Explained’, but are also included within other appropriate categories (eg Congenital anomaly, infection) elsewhere in this report.

It is important to see Sudden Infant Death syndrome (SIDS) as a sub-group within the category of Sudden Unexpected Deaths in Infancy (SUDI) so that changes in classification practices or variations within Coronial approaches to autopsy do not obscure the broader public health picture of sudden and unexpected infant mortality. **Any unexpected death of an infant requires reporting to the Coroner** with full investigation and consideration of avoidable factors, and all such cases are considered and reported on by Council.

The causes of death for Sudden Unexpected Deaths of Infants (SUDI) can include:

- Sudden Infant Death syndrome (SIDS)
- Other sudden death cause unknown (autopsy performed)
- Other ill defined and unspecified causes of mortality (no autopsy performed)
- Suffocation whilst sleeping (including asphyxiation by bedclothes and overlying)
- Explained: Child abuse/homicide, infection, metabolic disorders, genetic disorder, etc

In 2001 there were 28 SUDI deaths: 8 neonates ranging in age from 2 to 27 days, and 20 post neonatal infants ranging in age from 1 to 7 months. In ten cases the infant was co-sleeping with either parent(s) or sibling at the time of death. Cause of death was identified in nine cases (see Explained category in Table below).

The following table, Table 34, shows the cause of death using ICD-10 codes. Cases where an autopsy was performed and the cause of death was undetermined were coded R96. For those cases where an autopsy was not performed the code R99 was assigned.

Table 34 SUDI deaths: Cause of death, ICD-10 codes, Victoria, 2001

ICD10 code		Total
R95	Sudden infant death syndrome	13
R96*	Other sudden death	3
R99	Other ill defined and unspecified causes of mortality	3
Explained		
J13-18, B00	Infection: bronchopneumonia (2 cases), disseminated herpes simplex Type 1,	
A39	Meningococcal septicaemia	4
E88.8	MCAD	3
E84.9	Cystic fibrosis (of pancreas)	1
T74.1*	Battered Child syndrome	1
Total		28

ICD-10 is the International Statistical Classification of Diseases and Related Health Problems.

* Cases coded R96 and R99 are categorised under the Council category of ‘Undetermined’ in the Acquired Illness section.

Case coded T74.1 is included under the Council category of ‘Intentional Injury’.

SUDDEN INFANT DEATH SYNDROME (SIDS)

In 2001 there were 12 post neonatal infant deaths classified as SIDS compared with 21 cases in 2000 and 31 cases in 1999. In addition, one neonatal death was considered and reviewed in this category. This brings the total number of SIDS in 2001 to 13 cases.

Council uses the definition recommended by the National Institute of Child Health and Human Development (NICHD) 1991 for SIDS:

‘The sudden death of an infant under one year of age which remains unexplained after a thorough case investigation, including death scene investigation, performance of a complete autopsy, and review of the clinical history’.¹

The term SIDS remains therefore, one of exclusion and is not used if there is evidence of possible accidental asphyxiation, or if inflicted injuries or significant organic diseases are present.

When arbitrary cut-off points are established for pathological events such as SIDS, definitional problems inevitably arise, such as when a case meets all the other definitional criteria but the death occurs after the first birthday. Such cases are considered and reported on, but are excluded from the strict definition.

Another definitional problem arises in the circumstance when the Coroner upholds parents’ objection (on religious grounds) to an autopsy examination. Even though the death scene investigation and the clinical history might indicate that this is a SIDS case, under the constraints of the above definition, it cannot be classified as SIDS. In cases such as this Council uses the category ‘Undetermined’.

Despite the apparent unambiguity of the definition, it is not uncommon to find cases which are difficult to classify with absolute confidence, and for which Council also uses the category ‘Undetermined’.

For example, there can be debate about the significance of autopsy findings. Haemosiderin in the lungs is thought to be a clue to possible asphyxiation, and the unexpected finding of such deposits may warrant exclusion from classification under SIDS, and yet be insufficient to justify categorisation under asphyxiation. Likewise, evidence of previous trauma might raise suspicion of intentional injury as the cause of death, but without direct evidence, the case would be also classified as ‘undetermined’.

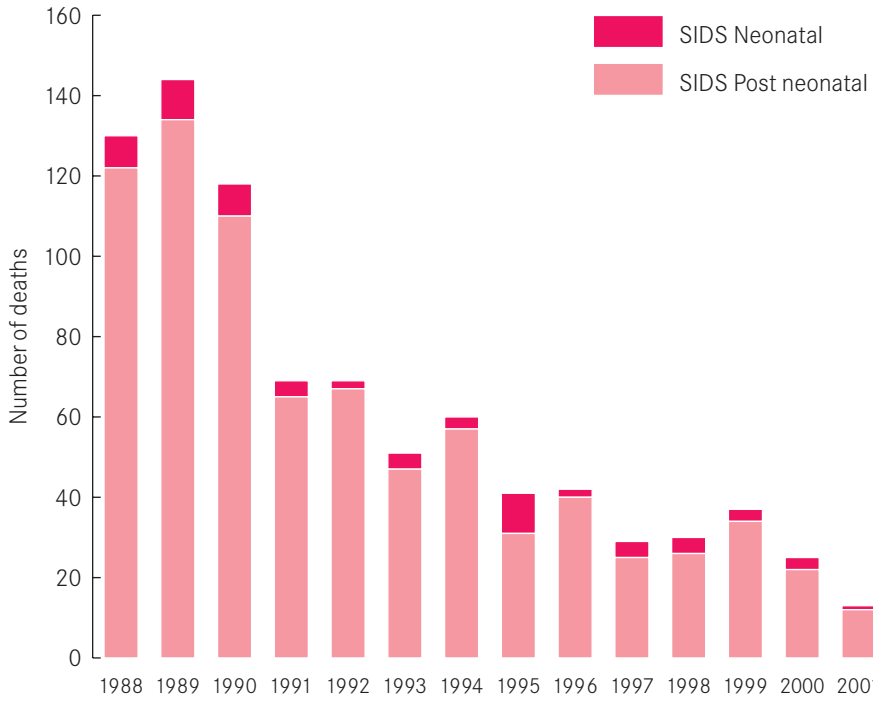
Similar difficulties arise with regard to findings related to infection. A sudden infant death where autopsy reveals clear evidence of bronchopneumonia would require classification under ‘Infection’, but a sudden infant death where autopsy revealed mild tracheitis would be classified as SIDS. Between these examples there are cases where there is evidence of either early or resolving infection, the significance of which may be debatable, and consensus is sometimes difficult to reach, and these are usually categorised as ‘other sudden death cause unknown’.

Figure 18 shows the number of SIDS of neonates and postneonatal infants for the previous 13 years. There has been a sharp decline in the number of SIDS since 1990, which was associated with the extensive public education campaign carried out by the Sudden Infant Death Research Foundation (now SIDS and Kids Victoria).

1. Willinger, James, Catz. ‘Defining the sudden infant death syndrome (SIDS): deliberations of an expert panel convened by the National Institute of Child Health and Human Development’. *Pediatric Pathology*, 1991;11:67–784.

The campaign highlighted the association between the face-down sleeping position and other risk factors with an increased incidence of SIDS.

Figure 18 SIDS, infants, Victoria, 1988–2001



SIDS Post neonatal	114	131	107	58	65	44	51	27	39	24	22	31	21	12
SIDS Neonatal	8	10	8	4	2	4	3	10	2	4	4	3	3	1
Total	122	141	115	62	67	51	54	37	41	28	26	34	24	13

This figure has been updated to include only infants <12months of age

Age and sex of infants

The age range of the 13 infants who died from SIDS was from 27 days of age to 7 months of age. There were more males (n = 9) than females (n = 4).

Table 35 SIDS by sex and age at death, Victoria, 2001

Age at death	Females (n)	Males (n)	Total (n)
< 1 month	-	1	1
1 month	1	1	2
2 months	1	3	4
3 months	1	1	2
4 months	-	2	2
5 months	1	-	1
7 months	-	1	1
Total	4	9	13

Co-sleeping

Four of the 13 infants were co-sleeping (or bed sharing). Two infants were co-sleeping with one parent, and two infants were co-sleeping with both parents.

Sudden Infant Death Syndrome (SIDS)

The Council endorses the recommendations of The Sudden Infant Death Research Foundation (Victoria) and the National SIDS Council of Australia. It is suggested that the following measures are likely to reduce the incidence of sudden infant death:

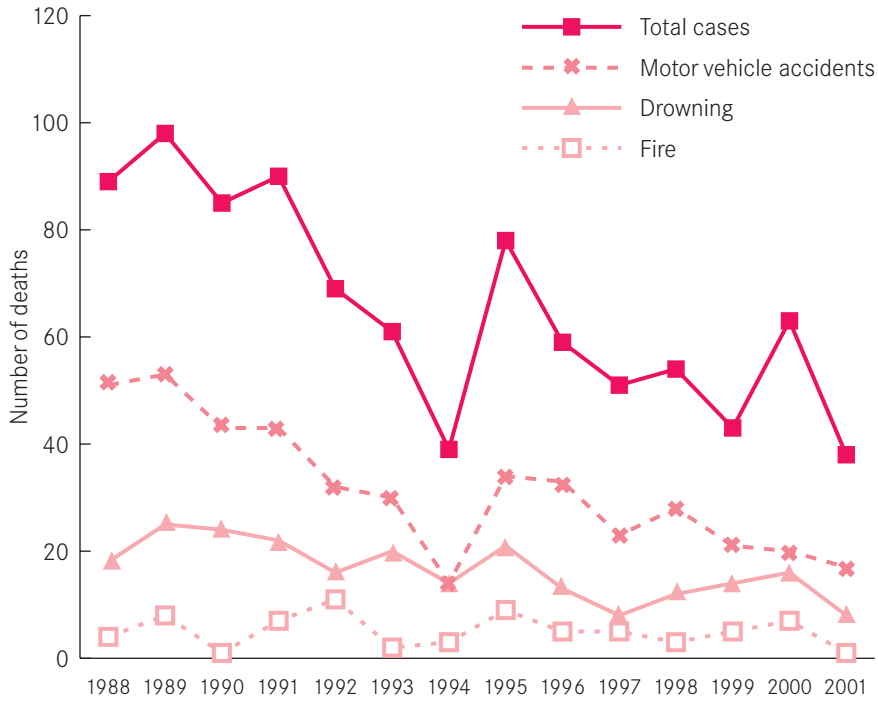
- Infants should be put to sleep on the back (supine), not on the side or face down (prone).
- Cigarette smoking during pregnancy should be avoided and a smoke-free home should be maintained.
- The infant's head should remain uncovered during sleep.

Further information can be obtained from SIDS organisations in each state. In Victoria contact (03) 9822 9611 or 1800 240 400, or visit the SIDS website: www.sidsaustralia.org.au

UNINTENTIONAL INJURY DEATHS

There were 38 postneonatal infant and child deaths due to unintentional injury in 2001 (Figure 19), compared to 63 deaths in 2000 and 43 deaths in 1999.

Figure 19 Unintentional injury deaths, postneonatal infants and children, Victoria, 1988–2001



Motor vehicle accidents	51	53	43	43	32	30	14	34	33	23	28	21	20	17
Drowning	18	25	24	22	16	20	14	21	13	8	12	14	16	8
Fire	4	8	1	7	11	2	3	9	5	5	3	4	7	1
Asphyxiation*	3	6	6	7	3	3	4	8	2	7	9	1	3	3
Train accidents*	5	2	1	2	2	2	1	2	0	3	0	0	1	1
Other*	8	4	10	9	5	4	3	4	6	5	2	3	16	8
Total cases	89	98	85	90	69	61	39	78	59	51	54	43	63	38

* Note: Deaths from asphyxiation, train accidents and other unintentional injuries are not shown in Figure 14

Motor Vehicle Accidents

In 2001 there were 17 deaths due to motor vehicle accidents, compared to 20 deaths in 2000. The mode of travel is listed in Table 36.

Table 36 Mode of travel in motor vehicle fatalities by age groups, postneonatal infants and children, Victoria, 2001

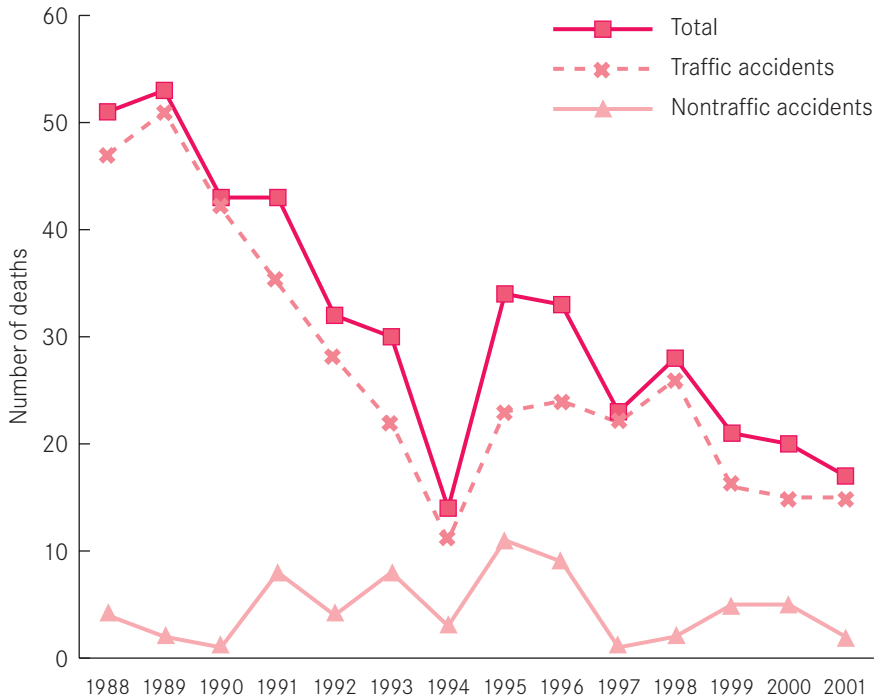
Mode of travel	Age				Total
	29-364 days	1-4 years	5-9 years	10-14 years	
Passenger in motor vehicle	1	4	2	3	10
Pedestrian	-	1	2	3	6
Pillion passenger Motor cycle	-	-	-	1	1
Total	1	5	4	7	17

For the ten motor vehicle passenger deaths, six involved drivers losing control of the vehicle, and three were hit by another car or truck. One young child fell out of a moving vehicle on private property.

For the six pedestrian deaths, three were attempting to cross a busy road, and one young child ran onto a road. One child was hit by a vehicle that veered onto a median strip, while another child slipped down an embankment onto a roadway.

A pillion passenger on a motorcycle died after the rider lost control of the vehicle.

Figure 20 Motor vehicle fatalities, postneonatal infants and children, Victoria, 1988–2001



Traffic accidents	47	51	42	35	28	22	11	23	24	22	26	16	15	15
Nontraffic accidents	4	2	1	8	4	8	3	11	9	1	2	5	5	2
Total	51	53	43	43	32	30	14	34	33	23	28	21	20	17

Drowning

There were eight deaths due to drowning in 2001, compared to 16 in 2000 and 14 in 1999. The age range was from 18 months to 14 years, with six of the eight deaths occurring in children aged three years or younger. Private pools and dams were the most common locations of drownings in 2001.

Table 37 Location of drowning fatalities by age groups, postneonatal infants and children, Victoria, 2001

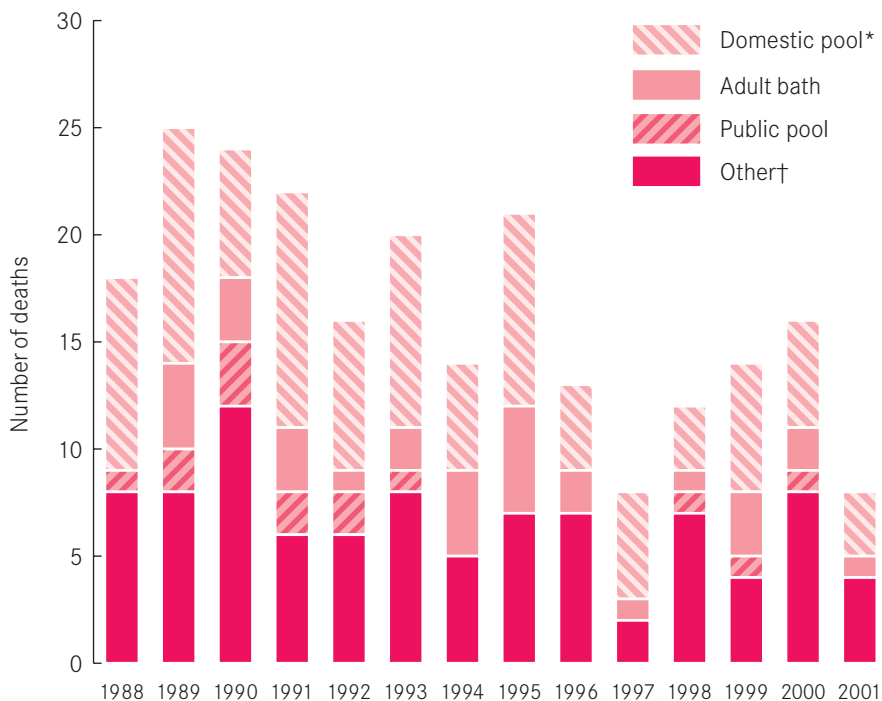
Location of drowning	Age				Total
	29–364 days	1–4 years	5–9 years	10–14 years	
Private pool/spa	–	1	1	1	3
Dam	–	2	–	–	2
Adult bath	–	1	–	–	1
Ornamental Pond	–	1	–	–	1
Causeway	–	1	–	–	1
Total	0	6	1	1	8

For the three cases of drownings in private pools, two were in fenced pools. One child gained access through a gate that was wedged open.

One child (aged 2 years) drowned after falling into a filled bath.

Two children (aged 1 year and 3 years) drowned in dams. One child (aged 2 years) drowned in an ornamental pond and while another child (aged 2 years) drowned in a causeway.

Figure 21 Drowning fatalities, postneonatal infants and children, Victoria, 1988–2001



Domestic pool*	9	11	6	11	7	9	5	9	4	5	3	6	5	3
Adult bath	0	4	3	3	1	2	4	5	2	1	1	3	2	1
Public pool	1	2	3	2	2	1	0	0	0	0	1	1	1	0
Other†	8	8	12	6	6	8	5	7	7	2	7	4	8	4
Total cases	18	25	24	22	16	20	14	21	13	8	12	14	16	8

* 'Domestic Pool' includes spa, wading pool.

† 'Other' includes river, sea, dam, irrigation channel, reservoir, storm drain, creek.

Drowning

Fence swimming pools, supervise toddlers, remember life jackets

Deaths of infants and children from drowning is a continuing public health concern each year and the Council again emphasises the danger to toddlers of unprotected swimming pools and adult baths, particularly if children are disabled. Even with protected pools and spas, parental vigilance and supervision is still required because protection may be inadequate or defective.

In rural areas, fencing the home and children's play areas is extremely important, as toddlers continue to drown in farm dams, creeks and rivers.

As of July 1, 1997, regulations requiring the fencing of all swimming pools came into force in Victoria.

Life jackets and other personal flotation devices can prevent drowning, and the Council reiterates the Victorian regulations stating that all children must be provided with a personal flotation device whenever they are on board a watercraft, and that children under 10 years must actually wear the device.

A 2003 survey by the Victorian Injury Surveillance and Applied Research (VISAR) was published in *Hazard* (Edition 55).

The survey entitled, 'Local government enforcement of private pool safety regulations – Survey of council building surveyors/inspectors', investigated the extent of private pool data collection by councils, council enforcement of regulations including their inspection processes, and barriers to enforcement. The report can be assessed on the VISAR website: <http://www.general.monash.edu.au/muarc/visar>

Fire

There was one death as a result of fire, (compared to seven deaths in 2000 and four deaths in 1999). The infant aged three months, died as a result of smoke inhalation in a house fire.

Asphyxiation

There were three deaths in 2001 due to non-intentional (accidental) asphyxiation (compared to three deaths in 2000 and one death in 1999). A 14 month old child choked on a piece of cantaloupe while a four year old was asphyxiated after being entrapped in a car window. There was strangulation of a child, 7 years of age, in a pillow case on a clothesline.

Other causes of unintentional injury death

There were eight child deaths from other types of injuries, compared to 16 deaths in 2000 and three deaths in 1999.

Table 38 Deaths due to other types of unintentional injuries by age groups, postneonatal infants and children, Victoria, 2001

Type of injury	Age				Total
	29–364 days	1–4 years	5–9 years	10–14 years	
Fall through skylight	-	-	1	1	2
Crush injury (home)	-	2	1	-	3
Crush injury (farm)	-	-	-	1	1
Struck by falling tree	-	-	-	1	1
Methadone toxicity	-	-	-	1	1
Total	-	2	2	4	8

Preventable factors in fatal injuries

The Council considered that at least some of unintentional/accidental injury deaths were potentially preventable. This opinion is based on evidence provided in Coroner's, police and autopsy reports. In some instances, information was incomplete, so the number of preventable cases may have been higher than stated. Sometimes, more than one preventable factor was present.

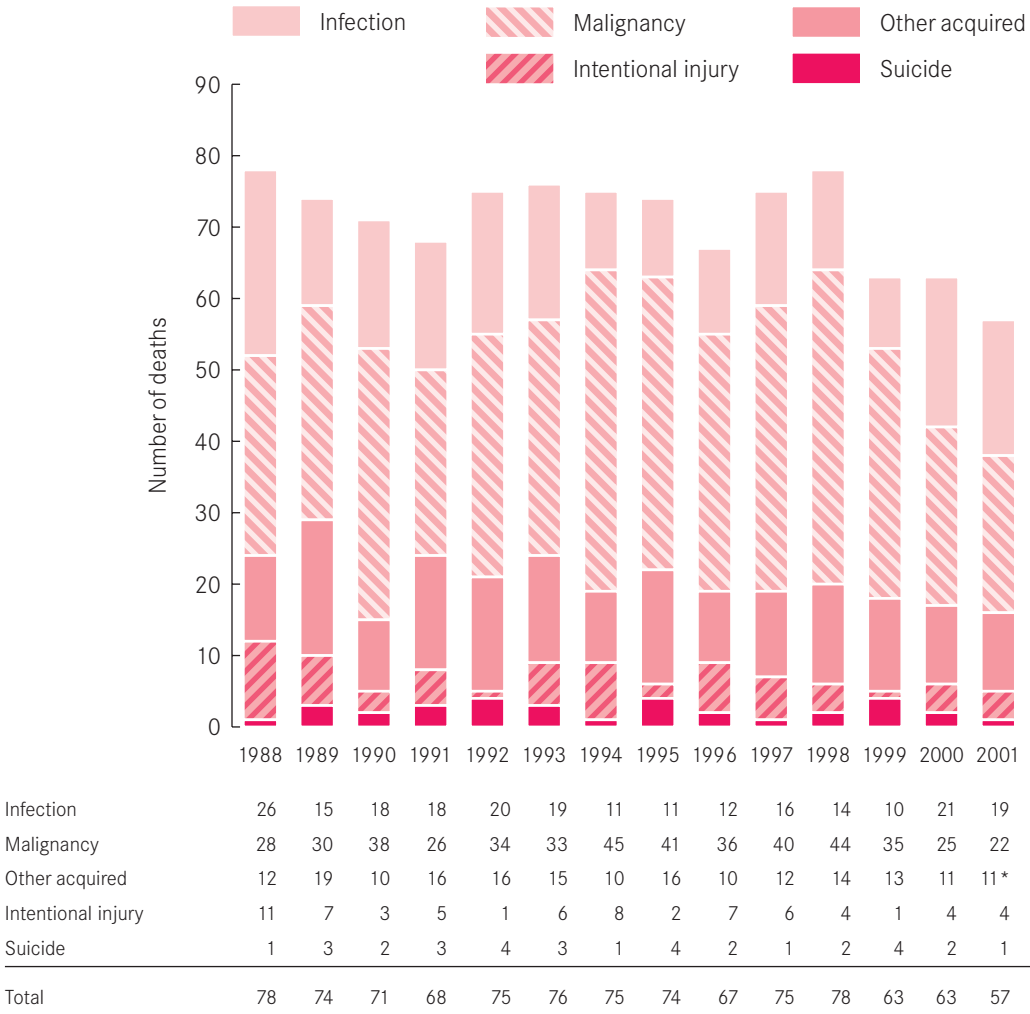
Table 39 Preventable factors in unintentional injury deaths, postneonatal infants and children, Victoria, 2001

Preventable factor	
Inadequate caretaker supervision	12
Excess speed	4
Driver affected by alcohol and/or drugs	3
Poor/unsafe road surface	1
Poorly signed intersection	1
Underage driver	1
Seat restraint not used	1
Seat restraint inadequately anchored	1
Unfenced pool	1
Gate to pool left open	1
Inadequate hazard protection (dam, pond)	3
Known risk: substandard structure	1
Inappropriate use/storage of volatile substance	1

ACQUIRED DISEASE AND INTENTIONAL INJURY

There were 57 postneonatal infant and child deaths due to acquired diseases and intentional injuries in 2001, compared to 63 deaths in both 2000 and 1999. The number of cases in each acquired disease category since 1988 is shown in Figure 22.

Figure 22 Acquired conditions and intentional injuries, postneonatal infant and child deaths, Victoria, 1988–2001



Other acquired includes five infant deaths where cause of death is undetermined.

ACQUIRED DISEASE

Infection

There were 19 postneonatal infant and child deaths due to infection in 2001, compared to 21 deaths in 2000 and 10 deaths in 1999. These deaths are outlined in Table 40.

Table 40 Infections resulting in postneonatal infant and child deaths by age groups, Victoria, 2001

Type of infection	29–364 days	1–4 years	5–9 years	10–14 years	Total
Meningococcal septicaemia/meningitis	1	1	1	1	4
Pneumococcal septicaemia	1	2	–	–	3
Staph aureus septicaemia	1	–	–	–	1
Streptococcal septicaemia	–	1	1	–	2
Myocarditis (presumed viral)	–	1	–	–	1
Pneumocystis carinii pneumonia	1	–	–	–	1
Bronchopneumonia: Streptococcal	1	–	–	–	1
Bronchopneumonia (unspecified)	1	1	–	1	3
Cytomegalovirus	1	–	–	–	1
Laryngotracheobronchitis	–	1	–	–	1
Pharyngitis: Streptococcal	–	–	1	–	1
Total	7	7	3	2	19

There were four deaths due to meningococcal infection in 2001 (three from serogroup C, one unspecified) compared to five deaths in 2000 and one death in 1999.

Immunisation

The importance of routine immunisation is again stressed. **A funded Meningococcal C vaccine program started in January 2003 in Victoria, and is available for all 1–19 years. Conjugate pneumococcal vaccine and varicella vaccine are also available but as yet not fully funded, which can be offered to parents.** Further information on immunisations is available from the Department of Human Services (www.dhs.vic.gov.au/phd/immunisation/) and from the Immunisation Service at the Royal Children's Hospital.

National Immunisation Program (NIP)

The National Immunisation Program (NIP) has information on the Australian Standard Vaccination Schedule (ASVS): <http://immunise.health.gov.au/nip/providers.htm>

Malignancy

In 2001 there were 22 child deaths due to malignancy, compared to 24 deaths in 2000 and 35 deaths in 1999. The types of tumours by age group are listed in Table 41.

Table 41 Deaths from malignancies, postneonatal infants and children, by age groups, Victoria, 2001

Type of tumour	Infant	1–4 years	5–9 years	10–14 years	Total
Central nervous system					
Medulloblastoma	-	1	-	1	2
Brain stem glioma	-	1	1	-	2
Ependymoma	-	-	1	-	1
Glioblastoma	-	-	2	1	3
Leukaemia					
Acute myeloid leukaemia	-	-	1	2	3
Acute lymphatic leukaemia	-	2	2	-	4
Neuroblastoma	-	1	-	-	1
Sarcoma					
Ewing's sarcoma	-	-	1	-	1
Sarcoma (cerebral)	-	1	-	-	1
Rhabdomyosarcoma	-	-	-	2	2
Wilm's tumour	-	-	1	-	1
Clear cell (renal)	-	-	-	1	1
Total	0	6	9	7	22

Undetermined

There were five postneonatal infant deaths where the cause of death was undetermined. Two infants (aged 5 weeks and 4 months) died unexpectedly while co-sleeping with parent(s), and there was no autopsy performed. Three infants died unexpectedly and autopsy did not reveal a cause of death but the circumstances surrounding the death precluded attributing the deaths to SIDS.

Other acquired diseases

There were six child deaths due to other acquired diseases in 2001. Three deaths (children aged 3 years, 11 years and 14 years) were as a result of asthma. Other deaths were due to chronic lung disease, aspiration pneumonitis and cerebral haemorrhage.

Table 42 Other acquired diseases by age groups, postneonatal infants and children, Victoria, 2001

	Age				Total
	29-364 days	1-4 years	5-9 years	10-14 years	
Asthma	-	1	-	2	3
Cerebral haemorrhage	-	-	-	1	1
Aspiration pneumonitis	-	1	-	-	1
Chronic lung disease	-	-	1	-	1
Total	-	2	1	3	6

INTENTIONAL INJURY

Intentional trauma

In 2001 there were four deaths as a result of abuse: one infant (aged 7 months of age), and three children (aged 2, 3 and 6 years), compared to five deaths in 2000 and one death in 1999.

Suicide

A child aged 13 years was struck by a train, and the death was attributed to suicide.

Depression or suicidal thoughts

Although suicide in children less than the age of 15 years is uncommon, it should be noted that a number of deaths occur in ambiguous circumstances, and may therefore be classified as accidental when they were, in fact, suicide. **In children, the possibility of depression should not be overlooked, and threats of suicide should not be ignored.** Such threats or suspected depression usually indicate the need for referral to a specialist.

Children subjected to bullying are particularly vulnerable, and bullying should be promptly reported to appropriate authorities.

RECOMMENDATIONS FROM THE COUNCIL ON INFANT AND CHILD DEATHS

Signs of severe illness in infants

Several findings suggest that infants less than 6 months old may need admission to hospital (*Archives of Diseases in Childhood* 1990;65:750–56). They can be remembered as ABC-Uncommon:

Activity

- Sleepy – does not wake fully and cry strongly
- Low activity – moves arms and legs less than normal (information from history)
- Low intake – <50% of normal feeds in last 24 hours (information from history)

Breathing

- Retraction – moderate or severe chest retraction

Circulation

- Pallor – sudden onset of persistent generalised pallor

Uncommon findings

- Bilious vomiting, grunting, apnoea, fits

Recognising serious illness in babies

The **Child Health Record** is given to parents of babies born in Victoria. A Child Health Information booklet within the kit contains a guide for parents on **Recognising Serious Illness** in babies (p3).

Signs of severe sepsis in children

The Council has reviewed the deaths of a number of children where the signs of developing severe sepsis have not been recognised by medical or nursing staff. In some children this failure of recognition has occurred at the time of presentation and in others during the course of hospitalisation.

The features of severe sepsis are non-specific and may include:

- Fever or hypothermia
- Pallor
- Poor peripheral perfusion (check colour, temperature and capillary refill of hands and feet)
- Tachycardia
- Tachypnoea
- Impaired consciousness
- Hypotension (this may only appear in the terminal stages of sepsis or may only be evident as postural hypotension).

Practitioners should be alert for these features; be aware of the age-specific norms of heart rate, respiratory rate and blood pressure; and pay attention to trends in repeated observations (e.g. a rising heart rate).

IMMUNISATION AND VACCINE-PREVENTABLE DISEASES

In 2001, Victoria's immunisation programme continued with universal service provided by all local governments, over 2000 general practices and Aboriginal Medical Services in Victoria. Vaccines on the NHMRC Australian Standard Vaccination Schedule (ASVS) are distributed free of charge to all immunisation providers. Immunisation coverage for children up to the age of 7 years is assessed by the Australian Childhood Immunisation Register, administered by the Health Insurance Commission.

Some of the key influences on increasing coverage have undoubtedly been both parent and provider incentives for immunisation and for submission of data, pilot activities on "data cleaning" to reduce duplications and errors in the data stored on ACIR, and targeted outreach program to offer immunisation to those identified as truly overdue for some missed dose(s). An evaluation of the ACIR recommended that additional effort be directed towards data cleaning activities.

To assist with this, the Health Insurance Commission, which administers the ACIR, assigned short-term field officers in each state to work with providers on local data issues. The Victorian Government continued to provide \$500,000 annually for Regional Data Quality Officers to work with providers at a regional level to correct any data errors, then ensure that those children who are truly overdue for dose(s) be followed up individually.

Several years after the NHMRC first recommended universal infant immunisation with hepatitis B, this program was implemented in May 2000. The NHMRC recommended that a monovalent hepatitis B vaccine be administered at birth by maternity hospital staff, followed by three further doses in a combination vaccine. Concurrent with the implementation of this program, a formulation of vaccine without the preservative thiomersal became available, which was considered more appropriate for young babies. This formulation is now used in the neonatal program.

As usual, the incidence of vaccine-preventable diseases was monitored through the Health (Infectious Diseases) Regulations 2001 and by supplementary surveillance activities. A detailed analysis was published in the report *Surveillance of Notifiable Infectious Diseases in Victoria 2001*, RRHACS Division, Department of Human Services, 2002.

Vaccine Preventable Diseases

Measles

There were 344 notifications of measles received in 2001, the highest number recorded since the commencement of enhanced surveillance in 1997. One hundred and thirty-four notified cases (39 per cent) met the NHMRC clinical case definition for suspected measles (that is, a morbilliform rash, cough, and fever at rash onset), 199 (58 per cent) did not meet the definition of a suspected case and there was insufficient clinical information to classify the remaining 11 notified cases (3 per cent). Laboratory specimens were obtained for 323 (94 per cent) of the notified cases. Of the 344 notified cases, 82 (24 per cent) were classified as measles in the data set.

For the 82 cases classified as measles, the notification rates were highest for adults aged 20–29 years all of these cases were laboratory confirmed or epidemiologically linked to a laboratory confirmed case. The initial peak among children aged 0–4 years was predominantly due to the inclusion of clinically compatible cases. Of the 14 cases aged less than five years, nine were classified clinically compatible: seven were unvaccinated infants (age range 4 months to 13 months) who were measles IgM negative on an early serology but the parents did not consent to a follow-up specimen being collected; one was a two year old vaccinated child for whom laboratory specimens were not collected; and one was a three year old vaccinated child who was not immune on an early serology but the parents did not consent to a follow-up specimen being collected.

Of the 70 laboratory confirmed cases, 12 (17 per cent) reported a history of previous measles vaccination; five of these were able to provide documentation to validate the history. Of the 185 laboratory rejected cases, 123 (66 per cent) reported previous measles vaccination and, of these, 114 (93 per cent) were immune to measles (IgG positive).

There were two outbreaks of measles in Victoria during 2001. In January 2001, a 19-year-old Sydney resident, who had recently returned from India, visited Melbourne for four days while infectious with measles. A further 50 measles cases were subsequently identified, mainly among young adults. Thirty-eight cases (75 per cent) were in the same birth cohort (born between 1968 and 1981) that was identified as at high risk of measles infection after a previous outbreak in Victoria involving 75 cases. None of the cases had documentation of receiving the recommended number of doses of measles-containing vaccine for their age. A high proportion of cases, 22 (43 per cent) were hospitalised after multiple visits to various health care providers.

Between 21 October and 31 December 2001, 18 laboratory-confirmed cases and one case epidemiologically linked to a laboratory confirmed case were notified, of whom nine (50 per cent) were hospitalised. One case was not considered part of the outbreak as their infection was acquired overseas. Eighty-eight per cent of cases were aged 18–34 years, none of whom had a documented history of measles vaccination. A source for the outbreak was not identified.

Enhanced measles surveillance in Victoria continues to facilitate the early identification and improved management of measles clusters in the community. Repeated outbreaks clearly demonstrate that young adults remain the group at highest risk of measles infection in Victoria. MMR vaccine is now available free of charge to all 18 to 34 year olds and should be encouraged in high-risk groups particularly healthcare workers and travellers.

Haemophilus influenzae Type b (Hib) Infection

In 2001, there were two notifications of *Haemophilus influenzae* type b (one septicaemia and one pneumonia/septicaemia), both in children aged four and five years, and two notifications of clinical epiglottitis in adults aged 32 and 36 years. All cases were hospitalised and there were no deaths. Notifications for those most at risk, children aged less than five years, continue to decline. Both confirmed Hib cases had documented evidence of receipt of four doses of Hib vaccine. Both children were previously healthy with no specific risk factors identified, and the cases were not epidemiologically linked.

The dramatic decline in Hib notifications over the past decade can be attributed to the introduction of the conjugate vaccine. Hib is now a rare disease and sustaining high immunisation coverage rates is critical to maintaining low levels of infection and transmission in the community. While the Hib vaccines are highly efficacious (>95 per cent), early detection and treatment of the rare cases that occur is critical in preventing mortality.

Pertussis

A total of 845 notifications for pertussis were received in 2001, with a rate of 17 per 100,000 population. Of these, 376 (44 per cent) were for males and 61 (7 per cent) were aged under five years. The peak age group of the notified cases was 10–14 year olds with 189 (22 per cent) of cases reported in this age group. In children under five years of age (n = 58), 22 cases (36 per cent) were hospitalised. This information was not available for three cases. One child who was too young for vaccination died. One child required a prolonged period in hospital and has persisting sequelae. Approximately 50 per cent of cases were notified in the last quarter of the year, consistent with a national increase in pertussis notifications towards the end of 2001.

Mumps

In 2001, there were 76 notifications of mumps, compared to 43 notifications in 2000. In the middle of the year, the passive surveillance system was enhanced to include routine serological testing, as is done for Measles. Only 9 per cent (3/35) of these cases were able to be laboratory-confirmed as Mumps cases, suggesting that the clinical diagnosis of Mumps alone, like that of Measles, is not highly predictive of true Mumps at a time of high MMR coverage.

Rubella

In 2001, there were 102 notifications of rubella, compared to 66 notifications in 2000. No cases of congenital rubella syndrome were reported in 2001.

In the middle of the year, the passive surveillance system was enhanced to include routine serological testing, as is done for Measles. Only 51 per cent (33/65) of these met a clinical case definition for rubella. Eighty-five per cent of these notifications were laboratory tested, with only a third able to be laboratory confirmed. The median age of the laboratory confirmed cases was 22 years (range: 2–37 years).

In September 2001 there was an outbreak of rubella at a Melbourne work place where three laboratory-confirmed cases were identified. All were males, aged between 20 and 30 years and had similar onset dates. No source could be determined. Free vaccination was offered at the site.

Enhanced surveillance has shown that the majority of true cases of rubella were adult males, which can be attributed to a selective rubella vaccination strategy of adolescent schoolgirls that commenced in 1971 and ceased in 1994, and left a large cohort of susceptible males. Measles-mumps-rubella vaccine is now being promoted for all adults aged 18–34 years.

Enhanced surveillance has also shown that clinical notifications, especially in children with high MMR coverage, are not a good indicator of rubella activity. The rash illness is likely to be due to other causes. Parvovirus B19 was established as a differential diagnosis in six cases and other causes that were not tested for include adenovirus and enteroviruses. Without laboratory confirmation, accepting clinical diagnosis alone as a notification over-estimates the incidence of rubella.

Immunisation coverage

At December 2001, full immunisation coverage at 12 months of age was 91%. Coverage with three doses of diphtheria tetanus pertussis (DTP) vaccine was 92.8% three doses of Haemophilus influenzae type b (Hib) vaccine 95% and three doses of oral polio vaccine 92.8%. All of these estimates are slightly above the national average, which was 90.5% for full immunisation coverage at 12 months of age. At two years of age 94.1% of children had received the first dose of measles mumps rubella (MMR) vaccine; 90.9% had received the fourth dose of DTP vaccine, and 88.8% of children were fully immunised. Again, Victoria was above the national average, with 87.8% of children across Australia recorded as fully immunised. It is recognised that these are minimum estimates of coverage, and subsequent intensive efforts to correct data errors and follow up those children who are truly overdue for one or more doses have resulted in higher demonstrated immunisation coverage.

For information on the current recommendation on immunisation, is available from the Department of Human Services (www.dhs.vic.gov.au/phd/immunisation/) and from the Immunisation Service at the Royal Children's Hospital.

The National Immunisation Program (NIP) has information on the Australian Standard Vaccination Schedule (ASVS): <http://immunise.health.gov.au/nip/providers.htm>

MATERNAL DEATHS IN VICTORIA

Definitional issues

Council uses the definition of maternal death recommended by the most recent revision of the International Classification of Diseases (ICD-10):

“the death of a woman while pregnant or within 42 days of the termination of the pregnancy irrespective of the cause of death.”

This definition is broader than that used by the World Health Organisation (WHO), which defines maternal death as “the death of a woman during pregnancy, childbirth or in the 42 days of the puerperium, irrespective of the duration and site of the pregnancy, **from any cause related to or aggravated by the pregnancy or its management**”. This WHO definition includes death from abortion and ectopic pregnancy, but **excludes incidental deaths** from causes unrelated to pregnancy, such as death from injury or malignancy. In this and other reports on maternal deaths in Australia, incidental deaths are included. Council also reviews those deaths which fall into the category of ‘late maternal death’, i.e. when death occurs within a year of the birth or termination of the pregnancy when the death is from direct or indirect causes, although these occurrences are very rare.

Because of varying definitions and ascertainment practices, it is difficult to make valid comparisons with international data, and variations in ascertainment may occur within Australia. Council is endeavouring to ensure maximum ascertainment of deaths by establishing formal notification mechanisms with the Australian Bureau of Statistics and with the office of the State Coroner. If, as appears to be the case in other jurisdictions, there has been under-ascertainment of maternal deaths, improvement in reporting will result in an apparent increase in the number and rates of deaths. This will need to be taken into account when interpreting trends.

The Report on Maternal Deaths in Australia 1994–1996 (Australian Institute of Health and Welfare) was released in 2001. One hundred deaths were reported in this triennium, an increase of 16 deaths over the previous triennium, which reversed the continuing downward trend observed over the previous 15 years. The ratio for the triennium was 13.0/100,000 confinements. The National Maternal Mortality Triennial Reports may be accessed through: www.health.gov.au/nhmrc/publications.

The National report for the triennium 1997–1999 is awaited with interest to determine whether the increase seen in 1994–1996 is a trend or a chance fluctuation. As can be seen from Table 45, there is no suggestion from Victorian data to indicate any upward trend in maternal mortality.

Classification

Maternal deaths are classified into three groups:

- **Direct** maternal deaths, where the death is considered to be due to a complication of the pregnancy itself (for example, haemorrhage from placenta praevia).
- **Indirect** maternal deaths where the death is considered to be due to a pre-existing condition aggravated by the physiological changes of pregnancy (for example, deterioration in pre-existing heart disease or diabetes).
- **Incidental** deaths, where death is considered unrelated to pregnancy (for example, motor vehicle accident).

It should be noted that sometimes it is not easy to distinguish with certainty whether a death was directly or indirectly related to pregnancy or its management, or was totally unrelated. For example, it may be difficult to determine that deaths from apparent suicide or a homicide are related to the pregnancy or incidental. This is an important reason for including “incidental” deaths in maternal mortality analyses.

Maternal mortality ratio

The Maternal mortality ratio is defined as follows:

$$\text{Maternal mortality ratio} = \frac{\text{number of maternal deaths (all categories)}}{\text{(number of maternities)}} \times 100,000$$

Maternities definition = The number of women delivered of infants following pregnancy of 20 weeks gestation or greater, regardless of plurality or pregnancy outcome.

Maternal Deaths in Victoria for 2001 (per 100,000 maternities)

In Victoria in 2001 there were 3 maternal deaths identified: 1 direct and 2 indirect deaths, and 61,108 maternities, giving a maternal mortality ratio of 4.9 per 100, 000 maternities. The Council was also notified of one late (direct) maternal death, occurring 49 days post delivery.

Table 43 Maternal deaths in Victoria, 2000–2001 (per 100,000 maternities)

Year	Maternities	Maternal deaths	Maternal mortality ratio (per 100,000 maternities)*
2000	61,569	5	8.1
2001	61,108	3	4.9

Trends in Maternal Deaths

In the 47 years of systematic analysis of maternal deaths in Victoria, there has been a steady and impressive decline in their numbers. The ratio has fallen from 66 per 100, 000 (total births) in 1953, to 4.8 per 100,000 (total births) in 2001. It should be noted that when numerators are very small and denominators very large, as is the case with the Maternal Mortality Ratio, year-to-year fluctuations in rates need to be interpreted with caution.

The members of the maternal mortality committee agree that continued surveillance of these deaths should continue, and that the scope of the review should be broadened to include selected cases of severe morbidity. This work will commence in 2003.

The AIHW National Maternal Mortality Advisory Group has recommended that in the calculation of the maternal mortality ratio maternities (or confinements) should be used as the denominator rather than live births. (WHO uses live births as the denominator because this is usually readily available). Although the ratio is almost identical in these two definitions, for the purposes of consistency, Council presents in the following Table the rates using total births as the denominator.

Table 44 Maternal deaths in Victoria, 1953–2001 (per 100,000 births)

Year	Births			Maternal deaths	Maternal Mortality ratio (per 100,000 total births)*
	Livebirths	Stillbirths	Total births		
1953	53,561	817	54,378	36	66.0
1954	54,660	794	55,454	35	63.1
1955	56,336	788	57,124	39	68.3
1956	58,393	819	59,212	17	28.7
1957	60,464	894	61,358	31	50.5
1958	61,269	826	62,095	29	46.7
1959	62,245	799	63,044	29	46.0
1960	64,025	850	64,875	28	43.2
1961	65,886	885	66,771	26	38.9
1962	65,890	775	66,665	17	25.5
1963	65,649	792	66,441	17	25.6
1964	64,990	771	65,761	22	33.4
1965	63,550	747	64,297	29	45.1
1966	64,008	780	64,788	20	30.9
1967	65,485	797	66,282	18	27.2
1968	70,228	768	70,996	21	29.6
1969	71,035	761	71,796	13	18.1
1970	73,019	782	73,801	29	39.3
1971	75,498	760	76,258	19	24.9
1972	71,807	842	72,649	12	16.5
1973	67,123	802	67,925	7	10.3
1974	66,201	787	66,988	9	13.4
1975	61,897	713	62,610	9	14.4
1976	60,667	616	61,283	12	19.6
1977	59,518	567	60,085	5	8.3
1978	58,861	575	59,436	11	18.5
1979	57,767	490	58,257	8	13.7
1980	58,206	447	58,653	10	17.0
1981	59,526	439	59,965	8	13.3
1982	59,965	490	60,455	6	9.9

Table 44 Maternal deaths in Victoria, 1953–2001 (continued)

Year	Births			Maternal deaths	Maternal Mortality ratio (per 100,000 total births)*
	Livebirths	Stillbirths	Total births		
1983	60,149	442	60,591	5	8.2
1984	60,278	426	60,704	8	13.2
1985	60,776	398	61,174	5	8.2
1986	60,863	390	61,253	10	16.3
1987	61,089	385	61,474	5	8.1
1988	63,126	416	63,542	11	17.3
1989	63,694	424	64,118	8	12.5
1990	66,350	376	66,726	12	17.9
1991	64,632	375	65,007	9	13.8
1992	65,815	323	66,140	4	6.0
1993	64,284	286	64,570	6	9.3
1994	64,376	329	64,705	7	10.8
1995	63,214	315	63,529	8	12.6
1996	62,429	291	62,720	3	4.8
1997	61,815	269	62,084	5	8.1
1998*	61,634	290	61,924	3	4.8
1999	62,149	293	62,442	9	14.4
2000	62,092	262	62,354	5	8.0
2001	62,092	262	62,354	3	4.8

* Note Deaths per 100,000 total births.

Details of the three maternal deaths

Direct deaths

- Admitted at 27 weeks gestation with preterm rupture of membranes. Developed hypertension 5 days later, live infant delivered by Caesarean section. Intra-operative haemorrhage ensued. Multiple uterine fibroids. Bleeding unable to be controlled, leading to fatal cardiac arrest. No post mortem performed.

Diagnosis – Obstetric haemorrhage

Classification – Direct

Indirect deaths

- Transferred to Level 3 hospital at 31 weeks gestation with 9 day history of persistent pyrexia unresponsive to antibiotics. Encephalopathic on admission. Emergency caesarean section performed: live infant. Progressive deterioration. Liver biopsy revealed herpes simplex virus infection. Despite treatment, continued bleeding from gastrointestinal tract and multi-organ failure, and died 16 days post delivery.

Post mortem – Fulminant hepatic necrosis secondary to herpes simplex virus II infection.

Classification – Indirect

- History of heart disease with repair of an atrial septal defect and repair of mitral valve cleft, and sick sinus syndrome treated with pacemaker. Presented at 32 weeks gestation with vomiting and anorexia, and signs of cardiac decompensation. Caesarean section performed, live infant. Postoperatively ECMO instigated because of inability to maintain oxygen saturation, progressive deterioration. Died 2 days post delivery

Post mortem – cardiogenic shock, multi-system failure, moderate cardiomegaly

Cause of death – Heart failure from congenital heart disease

Classification – Indirect

Details of the late maternal death

Late maternal death

- Previously healthy woman delivered by Caesarean section at 34 weeks gestation for placental abruption. Developed severe hypertension in the postpartum period and thrombotic microangiopathy. Transferred to intensive care unit. Intractable microangiopathy unresponsive to plasmapheresis and multiple blood transfusion. Died 49 days post delivery. No post mortem performed.

Cause of death – Thrombotic thrombocytopenia purpura (post partum)

Classification – Direct

Avoidable factors

The review of these cases serves as a reminder that most maternal deaths are consequent on rare and unpredictable occurrences, in which there are very limited opportunities to apply preventive interventions.

In consideration of the management of the direct and indirect cases, the Committee was of the view that in none of them were there factors involved in the medical care which would have prevented the death.

The committee recommended that clinicians be reminded that:

- **caution be exercised with the use of corticosteroids in pregnant women with fulminating sepsis.**
- **Pre-labour lower uterine segment caesarean section in pre-term gestations involves negotiating a poorly formed lower uterine segment with attendant risk of extension into the broad ligament.**

AT-RISK PREGNANCIES

While obstetric complications may occur in any pregnancy at any time, Council reminds practitioners that certain categories of patients are at increased risk of adverse maternal and perinatal death, and morbidity. The accompanying list is presented to remind all those practising obstetrics of these conditions. It is recommended that patients falling into these groups should be monitored carefully, and that if more than minor complications exist, consideration should be given to referral to obtain appropriate specialist consultation.

1. General factors

Women older than 34 years
Nulliparity and Parity greater than 3
Weight (overweight or underweight)
Dietary aberrations
Previous Caesarean section
Cigarette smoking
Other drug dependency, or use of alcohol
Mental illness

2. Maternal diseases

Cardiovascular disease, including hypertension
Diabetes mellitus (Gestational)
Diabetes mellitus (Pre-existing)
Anaemias (all types)
Chronic renal disease, including recurrent urinary infection
Past history of venous thrombosis and/or pulmonary embolism

3. Family history of a genetic disorder

Consider referral for genetic counselling

4. Adverse obstetric history

History of recurrent miscarriage
Previous perinatal mortality
Previous preterm birth
Previous infant with growth restriction

5. Diseases peculiar to pregnancy

Preeclampsia
Rhesus or other blood group incompatibility

6. Bleeding in pregnancy

Threatened abortion
Abruptio placentae
Placenta praevia

7. Obstetric conditions detected antenatally

Malpresentation, especially breech presentation and transverse lie
Multiple pregnancy
Suspected fetal growth restriction
Prolonged pregnancy (>41 weeks)
Contractions prior to 35 weeks gestation
Pre labour rupture of the membranes

8. Patients having inadequate antenatal care

Failure to attend for regular antenatal checks
Non-booked cases
Late booked cases

9. Difficulties discovered during labour

Failure to progress satisfactorily, including prolonged labour
Fetal distress
Maternal pyrexia
Malpresentation

EMERGENCY TRANSFER

IN UTERO TRANSFER

Direct communication at Consultant Obstetrician level is encouraged in order to ensure the transfer is appropriate and safe. Problems with finding a bed in a perinatal centre should not delay initiation of the transfer nor should they undermine efforts to ensure appropriate stabilization measures are in place, and that the transfer is safe for both mother and baby. Where decisions about mode of transfer or need for a medical escort are unclear NETS can provide important information about the logistics of the various options (phone 9347 7441).

When birth outside perinatal centres is anticipated for babies at less than 33 weeks or for any other indication in which neonatal intensive care is anticipated, consultation with the Newborn Emergency Transport Service (NETS) is strongly recommended. In circumstances where in utero transfer is deemed inappropriate and delivery is imminent, NETS will mobilize a retrieval team with the aim of supporting the local team at or soon after the delivery of a high risk newborn.

NEWBORN EMERGENCY TRANSPORT SERVICE (NETS)

During 2001 there were 1811 transfers. Both primary and return transfers have increased compared to the 1537 transfers undertaken in 2000. The continuing high level of return transfers has been facilitated by the increased availability of trained medical and nursing staff and appropriate facilities available for looking after moderately ill term and preterm babies within Level 2 metropolitan and country hospitals.

Table 45 Transfers by NETS, Victoria, 1992–2001

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Primary transfers,										
metropolitan	502	457	410	497	489	474	502	499	572	696
Primary transfers,										
country, road	104	123	103	114	111	99	125	147	137	173
Return transfers, country,										
air ambulance	123	94	118	126	98	121	134	115	106	115
Return transfers	238	219	207	265	456	556	658	628	701	793
Special investigations	6	10	4	9	17	17	14	16	21	34
Total	973	903	842	1011	1171	1267	1433	1405	1537	1811

Selection of infants for transfer

For comprehensive information on the Newborn Emergency Transport Service visit the NETS website: <http://www.netsvic.org.au>

The following are some suggested reasons for transport. It is vital to assess the time available, and the staff and facilities required for managing such neonates. These will vary between different doctors and hospitals.

Critically ill infants should be transferred to a hospital with a neonatal intensive care unit (NICU), resourced to provide skilled medical and nursing care, and diagnostic and other supportive services on a 24-hour basis. Infants who are less seriously ill may only require transport to a hospital with specialist paediatric medical and nursing facilities (high dependency Level 2).

The requirement to transfer an infant is often obvious; however, the categories outlined below deserve emphasis.

- **Respiratory distress**

An infant with an oxygen requirement of more than 40 per cent needs to be under the direct care of a Consultant Paediatrician or Neonatologist in a hospital with specialist neonatal nurses and facilities for monitoring arterial blood gases. An infant needing more than 60 per cent oxygen requires management in a neonatal intensive care unit.

An infant with respiratory distress associated with apnoea, suspected bacterial pneumonia or significant meconium aspiration should be discussed with a Consultant Paediatrician and requires referral to a NICU.

- **Low birthweight (less than 2,500g)**

All low birthweight infants should be managed in hospitals with the facilities and staffing appropriate to the infants' requirements. Every hospital should have agreed guidelines for the weight and gestation of infants for which it can appropriately care. Infants of birthweight less than 1,250 grams should have an initial period of management in a NICU.

The management of infants with a gestation age of 22–33 weeks should be discussed with a Neonatologist including the advisability of and arrangement for transfer.

- **Cardio respiratory depression**

Transfer to a high dependency Level 2 or Level 3 nursery should be considered whenever infants require intubation and assisted ventilation during resuscitation, or have persistent nervous system depression. *All* intubated infants who have not established regular breathing by 5 minutes of age should remain intubated and require transfer to a NICU.

- **Other categories of infants requiring consideration for transfer:**
 - Infants with convulsions
 - Jaundiced infants in potential or immediate need of exchange transfusion
 - Infants bleeding from any site
 - Infants of diabetic mothers
 - Infants in need of surgery
 - Infants with severe or multiple congenital anomalies
 - “Unwell” infants manifested by lethargy, poor feeding, weak cry, cyanosis, jitteriness or vomiting
 - Any infant in need of special diagnostic and/or therapeutic services

Arranging the transport

There are two ways of arranging transfer:

- **Telephone the NETS ‘hot line’ (03) 9347 7441**

The call will be received by the transport nurse or NETS consultant. Telephone discussions with NETS staff may help in deciding whether or not transfer is the best option in a particular case. All calls are conferenced so that the referring doctor only has to provide information once to the NETS team.

Conferencing allows all parties to contribute to discussions about stabilization and transfer arrangements. If it is decided that the baby requires transfer NETS staff will arrange the ambulance and notify the receiving unit of the impending admission.

Clinical consultation with a Neonatologist is strongly encouraged whenever the referring doctor is uncertain about the management of a baby, irrespective of whether transfer is involved.

- **Discuss the patient with the receiving unit**

Alternatively, the doctor may wish to discuss the patient with the receiving unit, in which case the receiving unit will then notify NETS to arrange the transfer. Neonatal intensive care units are situated at the Mercy Hospital for Women, Monash Medical Centre, Royal Children’s Hospital and Royal Women’s Hospital.

In most instances NETS advises that the impulse to immediately send the infant by local ambulance with the thought of saving time must be resisted. Results are much better if the baby is kept in the referring hospital and stabilised before transfer.

Stabilisation and transport of newborn infants and at-risk pregnancies

There is a manual to help staff of the referring maternity hospitals in:

- Deciding on appropriate transfer
- Understanding basic stabilisation procedures
- Being informed about specialised stabilisation of some specific problems
- Obtaining the services of NETS
- Managing some acute obstetric problems

It is concise, well illustrated and informative, and has a number of useful appendices, including lists of resuscitation equipment and a resuscitation chart. Sections include notes on resuscitation of the newborn, medication commonly used in the newborn nursery, and neonatal jaundice.

Copies of the latest edition are available from:

NETS Education
132 Grattan Street
Carlton, Victoria 3053.

NETS Education

NETS Education provides ongoing education programmes in neonatal care for nursing and medical staff in Melbourne metropolitan, outer suburban, and country hospitals throughout Victoria.

In-service sessions are generally for staff from Melbourne metropolitan and outer suburban hospitals; study days and seminars involving local staff and NETS Education personnel can be arranged, particularly for staff from country hospitals.

NETS Education staff continues to coordinate the Continuing Education Program in Newborn Nursing Care in collaboration with staff from the four tertiary neonatal units.

In collaboration with the School of Nursing and Midwifery at Latrobe University NETS Education has developed a Distance Education Programme in Emergency and Special Care of the Newborn. The course can be undertaken for professional development only or may be used for direct credit towards a Graduate Certificate in Emergency and Special Care of the Newborn.

Material is largely print-based and learning is self-directed and self-paced. The course consists of 4 subjects. Subject 1, the core subject, is recommended for completion by all students. The remaining 3 may be taken as individual subjects or to complete the program. The program is available for registered midwives from Level 1 and Level 2 (High and Low Dependency) midwifery hospitals throughout Australia.

Information and bookings for educational sessions may be made by telephoning (03) 9344 2419 or visit the NETS website: www.netsvic.org.au

PAEDIATRIC EMERGENCY TRANSPORT SERVICE (PETS)

A statewide service for the transport of very ill children over 3 months old is provided by Paediatric Emergency Transport Service (PETS) run by the Intensive Care Unit at the Royal Children's Hospital. Consultation about the management of very ill children is also provided.

To contact the service, telephone ICU at the Royal Children's Hospital, (03) 9345 7007 or (03) 9345 5211 and then identify your call as a PETS call.

Advice about what to do before PETS arrives has previously been published:
(*Medical Journal of Australia* 1992;156:117–124).

A pamphlet on preparation of severely ill children for inter-hospital transport can be obtained by contacting PETS on (03) 9345 7007, or by email: robert.henning@rch.org.au or alison.fleming@rch.org.au or from the PETS website: www.rchpets.org.

Table 46 Transfers by PETS, Victoria, 1992–2001

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Injuries										
head injury	22	19	17	19	20	24	18	20	26	29
chest injury*									4	1
immersion	9	3	10	–	5	4	4	9	5	1
poisoning	–	6	4	7	5	6	6	4	13	10
other	5	15	9	6	5	7	7	25	13	15
Cardiovascular	10	9	3	10	2	1	3	1	6	5
Neurology:										
fits	18	24	16	19	19	22	42	36	34	22
meningitis	20	10	3	9	5	7	10	10	1	13
encephalitis*									5	–
other	8	4	13	6	10	8	6	9	23	16
Respiratory:										
asthma	31	34	47	23	28	30	33	37	45	48
bronchiolitis	4	7	4	9	8	8	9	17	10	24
croup	53	27	44	18	24	19	15	19	18	14
epiglottitis	27	11	3	2	1	1	1	–	1	–
other	17	18	21	18	24	14	16	16	20	35
Miscellaneous:										
septic shock	2	4	5	13	9	8	6	14	2	8
diabetic ketoacidosis*									3	5
other	5	10	8	1	15	10	10	20	27	39
Total	231	201	207	160	180	169	186	237	256	290

* denotes new category, first used in 2000 Report.

Common problems in the management of ill children

• Croup and epiglottitis

- Confusion in diagnosis between epiglottitis and croup.
- Sudden airways obstruction in epiglottitis.
- Examination of the throat in epiglottitis.
- Intubation too late.
- Inappropriate size or length of endotracheal tube.
- Inadequate humidification and suction of tube.
- Failure to recognise endotracheal tube obstruction.

• Asthma and bronchiolitis

- Suboptimal medical treatment for asthma.
- Failure to provide 100 per cent oxygen.
- Ventilation too late.

• Brain injuries (drowning, trauma, convulsions)

- Too much fluid.
- Use of fluids other than 0.9% saline.
- Failure to control seizures.
- Hypoventilation from seizures or anticonvulsants.
- Hypotension from hypovolaemia or failure to use dopamine.
- Failure to diagnose abdominal injuries after trauma.
- Poor airway and ventilatory management.
- Failure to decompress the stomach by orogastric tube.
- Inappropriate lumbar puncture in very ill children with coma.
- Failure to recognise severity of brain injury in young infants.

• Septic and hypovolaemic shock

- Lack of adequate vascular access.
- Inadequate volume replacement.
- Failure to use dopamine.
- Failure to monitor blood pressure adequately.
- Uncorrected acidosis or anaemia.
- Uncorrected hypoxia or hypoventilation.
- Intubation and ventilation too late.

APPENDIX A

Two classification systems have been developed by a working party of Perinatal Society of Australia and New Zealand (PSANZ) and endorsed by the National Perinatal Data Development Committee (NPDDC) for perinatal mortality by antecedent cause and for neonatal deaths, by conditions in the neonatal period, or prior to discharge home, leading to the death. The classification systems are the PSANZ Perinatal Death Classification and PSANZ Neonatal Death Classification. These classifications are now being used by all States and Territories, and guidelines for classifications can be accessed through www.psanz.org.au

PSANZ PERINATAL DEATH CLASSIFICATION

1. CONGENITAL ABNORMALITY (including terminations for congenital abnormalities)

- 1.1 Central nervous system
- 1.2 Cardiovascular system
- 1.3 Urinary tract
- 1.4 Gastrointestinal tract
- 1.5 Chromosomal
- 1.6 Metabolic
- 1.7 Multiple
- 1.8 Other congenital abnormality
 - 1.81 Musculoskeletal
 - 1.82 Respiratory
 - 1.83 Diaphragmatic hernia
 - 1.88 Other
- 1.9 Unspecified congenital abnormality

2. PERINATAL INFECTION

- 2.1 Bacterial
 - 2.11 Group B Streptococcus
 - 2.12 E coli
 - 2.13 Listeria monocytogenes
 - 2.18 Other bacterial
 - 2.19 Unspecified bacterial
- 2.2 Viral
 - 2.21 Cytomegalovirus
 - 2.22 Parvovirus
 - 2.23 Herpes simplex virus
 - 2.24 Rubella virus
 - 2.28 Other viral
 - 2.29 Unspecified viral
- 2.3 Protozoal eg Toxoplasma
- 2.4 Spirochaetal eg Syphilis
- 2.5 Fungal
- 2.8 Other
- 2.9 Unspecified organism

3. HYPERTENSION

- 3.1 Chronic hypertension: essential
- 3.2 Chronic hypertension: secondary, eg renal disease
- 3.3 Chronic hypertension: unspecified
- 3.4 Gestational hypertension
- 3.5 Pre-eclampsia
- 3.6 Pre-eclampsia superimposed on chronic hypertension
- 3.9 Unspecified hypertension

4. ANTEPARTUM HAEMORRHAGE (APH)

- 4.1 Placental abruption
- 4.2 Placenta praevia
- 4.3 Vasa praevia
- 4.8 Other APH
- 4.9 APH of undetermined origin

5. MATERNAL CONDITIONS

- 5.1 Termination of pregnancy (other than for congenital (fetal) abnormality)
- 5.2 Diabetes/Gestational diabetes
- 5.3 Maternal injury
 - 5.31 Accidental
 - 5.32 Non-Accidental
- 5.4 Maternal sepsis
- 5.8 Other maternal conditions, eg Lupus obstetric syndrome.

6. SPECIFIC PERINATAL CONDITIONS

- 6.1 Twin-to-twin transfusion
- 6.2 Fetomaternal haemorrhage
- 6.3 Antepartum cord complications (eg cord haemorrhage; true knot with evidence of occlusion)
- 6.4 Uterine abnormalities, eg bicornuate uterus, cervical incompetence.
- 6.5 Birth trauma (typically infants of >24 weeks gestation or >600g birthweight)
- 6.6 Haemolytic disease
- 6.7 Idiopathic hydrops
- 6.8 Other specific perinatal conditions (includes iatrogenic conditions such as rupture of membranes after amniocentesis, termination of pregnancy for suspected but unconfirmed congenital abnormality.)

7. **HYPOXIC PERIPARTUM DEATH (typically infants of >24 weeks gestation or >600g birthweight)**
 - 7.1 With intrapartum complications
 - 7.11 Uterine rupture
 - 7.12 Cord prolapse
 - 7.13 Shoulder dystocia
 - 7.18 Other
 - 7.2 No intrapartum complications
 - 7.9 Unspecified hypoxic peripartum death

8. **FETAL GROWTH RESTRICTION (FGR)**
 - 8.1 With evidence of uteroplacental insufficiency eg significant infarction, acute atherosis, maternal vascular thrombosis or maternal floor infarction
 - 8.2 With chronic villitis
 - 8.3 Without the above placental pathology
 - 8.4 No examination of placenta
 - 8.9 Unspecified FGR or not known whether placenta examined

9. **SPONTANEOUS PRETERM (<37 weeks gestation)**
 - 9.1 Spontaneous preterm with intact membranes, or membrane rupture ≥ 24 hours before delivery,
 - 9.11 with chorioamnionitis,
 - 9.12 without chorioamnionitis,
 - 9.13 no examination of placenta
 - 9.19 unspecified or not known whether placenta examined
 - 9.2 Spontaneous preterm with membrane rupture ≥ 24 hours before delivery,
 - 9.21 with chorioamnionitis,
 - 9.22 without chorioamnionitis,
 - 9.23 no examination of placenta
 - 9.29 unspecified or not known whether placenta examined
 - 9.3 Spontaneous preterm with membrane rupture of unknown duration before delivery,
 - 9.31 with chorioamnionitis,
 - 9.32 without chorioamnionitis,
 - 9.33 no examination of placenta
 - 9.39 unspecified or not known whether placenta examined

10. **UNEXPLAINED ANTEPARTUM DEATH**
 - 10.1 With evidence of uteroplacental insufficiency, eg significant infarction, acute atherosis, maternal vascular thrombosis or maternal floor infarction
 - 10.2 With chronic villitis
 - 10.3 Without the above placental pathology
 - 10.4 No examination of placenta
 - 10.9 Unspecified unexplained antepartum death or not known whether placenta examined.

11. NO OBSTETRIC ANTECEDENT

- 11.1 SIDS
 - 11.11 Consistent with SIDS
 - 11.12 Possible SIDS
- 11.2 Postnatally acquired infection
- 11.3 Accidental asphyxiation
- 11.4 Other accident, poisoning or violence (postnatal)
- 11.8 Other
- 11.9 Unknown/Unexplained

PSANZ NEONATAL DEATH CLASSIFICATION

1. CONGENITAL ABNORMALITY

- 1.1 Central nervous system
- 1.2 Cardiovascular system
- 1.3 Urinary tract
- 1.4 Gastrointestinal tract
- 1.5 Chromosomal
- 1.6 Metabolic
- 1.7 Multiple
- 1.8 Other congenital abnormality
 - 1.81 Musculoskeletal
 - 1.82 Respiratory
 - 1.83 Diaphragmatic hernia
 - 1.88 Other
- 1.9 Unspecified congenital abnormality

2. EXTREME PREMATUREITY

(typically infants of ≤ 24 weeks gestation or ≤ 600 g birthweight)

- 2.1 Not resuscitated
- 2.2 Unsuccessful resuscitation
- 2.9 Unspecified or not known whether resuscitation attempted

3. CARDIO-RESPIRATORY DISORDERS

- 3.1 Hyaline membrane disease/Respiratory distress syndrome (RDS)
- 3.2 Meconium aspiration syndrome
- 3.3 Primary persistent pulmonary hypertension
- 3.4 Pulmonary hypoplasia
- 3.5 Chronic neonatal lung disease (typically, bronchopulmonary dysplasia)
- 3.8 Other

4. INFECTION

- 4.1 Bacterial
 - 4.11 Congenital bacterial
 - 4.12 Acquired bacterial
- 4.2 Viral
 - 4.21 Congenital viral
 - 4.22 Acquired viral
- 4.3 Protozoal eg Toxoplasma
- 4.4 Spirochaetal eg Syphilis
- 4.5 Fungal
- 4.8 Other
- 4.9 Unspecified organism

5. NEUROLOGICAL

- 5.1 Hypoxic ischaemic encephalopathy/Perinatal asphyxia (typically infants of >24 weeks gestation or >600g birthweight)
- 5.2 Intracranial haemorrhage
- 5.8 Other

6. GASTROINTESTINAL

- 6.1 Necrotising enterocolitis
- 6.8 Other

7. OTHER

- 7.1 SIDS
 - 7.11 Consistent with SIDS
 - 7.12 Possible SIDS
- 7.2 Multisystem failure-only if unknown primary cause or trigger event
- 7.3 Trauma
- 7.8 Other
- 7.9 Undetermined/Unknown

APPENDIX B

WEBSITES

Consultative Council on Obstetric and Paediatric Mortality and Morbidity (CCOPMM)

Information on CCOPMM, the Perinatal Data Collection Unit (PDCU) and Birth Defects Registry (BDR) is available at <http://www.health.vic.gov.au/perinatal>

Antenatal Care

With respect to antenatal care, practitioners are reminded of the guidelines developed by the three tertiary centres in Melbourne, The Three Centres Guidelines for Antenatal Care, available at www.3centres.com.au

Examination of the Newborn

Health professionals are reminded of the guidelines developed by the Paediatrics & Child Health Division of The Royal Australasian College of Physicians, Examination of the Newborn, available at www.racp.edu.au/hpu/paed/examination

Postmortem Examination

The Department of Human Services has issued guidelines for hospitals with respect to gaining consent and other aspects of the retention, use and disposal of tissue obtained at autopsy. These guidelines are available at www.dhs.vic.gov.au/phd/postmortem/index.htm

Newborn Emergency Transport Service (NETS)

For comprehensive information on NETS and bookings for educational sessions

Telephone: (03) 9344 2567

Website: www.netsvic.org.au

Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG)

For information on RANZCOG guidelines

Website: www.ranzcog.edu.au

**CONSULTATIVE COUNCIL
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