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**THE CONSULTATIVE COUNCIL  
ON OBSTETRIC AND PAEDIATRIC  
MORTALITY AND MORBIDITY**

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**ANNUAL REPORT  
FOR THE YEAR 1999**

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**INCORPORATING THE 38TH SURVEY  
OF PERINATAL DEATHS IN VICTORIA**

**Annual Report  
for the Year 1999**  
Incorporating the 38th Survey  
of Perinatal Deaths in Victoria

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

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## ACKNOWLEDGEMENTS

The publication of this report was made possible by the generous assistance of many individuals in varied professional groups.

Members of the Consultative Council on Obstetric and Paediatric Mortality and Morbidity, and of its committees, have widely diverse areas of expertise, and continue to contribute their specialist knowledge and wisdom.

Midwives provide detailed information concerning every birth in Victoria to the Perinatal Data Collection Unit of the Council. The Birth Defects Register is provided with valuable notifications from Maternal and Child Health Nurses, as well as from the Mercy Hospital for Women, the Monash Medical Centre, the Royal Children's Hospital, and the Royal Women's Hospital.

Medical practitioners 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, but not including, the 15th birthday, is a considerable workload 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.dhs.vic.gov.au/phb/perinatal/index.htm>

## EXECUTIVE SUMMARY

- In Victoria in 1999, there were 62,442 births of infants with birthweight of 500g or greater.
- The Victorian birth rate was 13.2 per 1,000 mean estimated population.
- There were nine maternal deaths, but in expert review, none of the cases were found to have deficiencies of care to such an extent that the death was classified as avoidable. Five of the deaths were unrelated to pregnancy.
- Of the 62,442 births, 293 were stillborn and 171 infants died within the first month of life.
- The perinatal mortality rate was 7.4 per 1,000 births. This means that one out of approximately every 135 babies with a birthweight 500g or more, was either stillborn or died in the first month of life. This is regardless of gestational age or presence of birth defect.
- The commonest cause of stillbirth was antepartum hypoxia (mostly unexplained) accounting for 85 cases, followed by birth defects, which accounted for 41 stillbirths.
- The commonest cause of neonatal death was birth defects, accounting for 80 deaths.
- For babies without birth defects, the commonest cause of perinatal death was antepartum hypoxia and antepartum haemorrhage/placental abruption.
- Of the stillbirths, 25% 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, 9% were considered to have suspected preventable factors. These included inadequate resuscitation and inadequate paediatric management.
- Multiple births accounted for 3.4% of births and 13.3% of all perinatal deaths.
- 259 infants died in the first year of life, giving an infant mortality rate of 4.2 deaths per 1,000 live births.
- Two thirds of infant deaths occurred in the first month of life, and one third between one month of age and the first birthday.
- The commonest cause of infant mortality was birth defects (110 deaths).
- Fourteen per cent of infant deaths were attributable to Sudden Infant Death Syndrome (37 deaths).

- The number of postneonatal infant and child deaths (children aged 29 days until the 15th birthday) was 225, the lowest ever recorded in Victoria.
- 137 children died between one year of age and their fifteenth birthday.
- The commonest causes of death of children were birth defects and malignancy, each accounting for 32 deaths.
- Twenty one children died as a result of motor vehicle accidents, the lowest number since 1994.
- Two infants and twelve children died as result of drowning.

## CHAIRMAN'S REPORT

Since its inception in 1962 (firstly as a neonatal mortality committee), until the year 2000, the Consultative Council on Obstetric and Paediatric Mortality and Morbidity, has had, over these 38 years, only two Chairmen. The first was the late Professor Sir Lance Townsend (from 1962 until 1983) and second, Professor Norman Beischer (from 1984 until 1999).

Over this time, there has been an impressive reduction in maternal, infant and perinatal mortality. Much of this is attributable to improvements in overall health and advances in socio-economic wellbeing and family planning, but there is no doubt that advances in clinical care have also made a substantial contribution to the reduction in death and disability from pregnancy and childbirth.

Due credit must be paid to these two Chairmen and the members of these Consultative Councils who, by their dedication to systematic analysis of adverse events in maternal and child health care, have identified areas where clinical care may be improved, which they translated into practical recommendations in these 38 consecutive reports.

Professor Beischer joined the Consultative Council in 1969, and therefore served as a member for 31 years and as chairman for 16 years. On behalf of previous Councils and its members, I would like to acknowledge the enormous debt of gratitude that Victoria's mothers, babies and children owe Professor Beischer for his tireless and sustained efforts on their behalf.

I consider it a great personal honour to have been offered the opportunity to be the third Chair of the Victorian Consultative Council on Obstetric and Paediatric Mortality and Morbidity and accept this responsibility mindful that there is still much room for improvement in maternal and child health outcomes, at least some of which can be identified by systematic case review of maternal, infant and paediatric mortality.

As the new Chair of the Council I would like to thank colleagues for the warm welcome extended to me. In particular, I am grateful to Dr Rosemary Lester, Manager of the Prevention and National Health Priorities Section of the Victorian Department of Human Services, Dr Jane Halliday, Manager of the Perinatal Data Collection Unit, colleagues within that Unit, and members of the Council and the sub-committees for their support and encouragement.

The Council's infrastructure has been strengthened, most notably by the appointment of Rosemary Warren as Research Officer. I would like to acknowledge her very significant contribution to the functioning of the Council and its subcommittees and to the production of this report, particularly with the painstaking work related to coding of cases and maintaining the relevant databases.

The Council is supported by two part-time administrative assistants, Luli Zyka and Aida Lapuz, whose cheerful and dedicated assistance is much appreciated. The assistance of Dr Cathy Rose in assisting with coding of cases is also gratefully acknowledged.

It should be noted that the previous Council's triennium finished at the end of 1999, and the new Council was not convened until mid 2000. For this reason, this report in large part covers the cases reviewed by the previous Council and many of the clinical comments and recommendations contained within it, are based on considerations of the previous Council.

The Council expresses its gratitude to Victoria's medical practitioners who willingly provide confidential clinical information which assists the Council and the subcommittees in their deliberations. Any information provided to the Council is privileged by legislation, and is not accessible by any third party, including the Courts.

I look forward to assisting with the work of the Council and its sub committees, with the goal of improving the health and safety of Victoria's mothers, infants and children.

Respectfully submitted,

James Forrester King, MB, MPH, FRCSC, FRCOG, FRANZCOG  
Chairman, Victorian Consultative Council on Obstetric and Paediatric Mortality and Morbidity

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Mrs Jillian Wheatley	PDCU Administrative assistant
Dr Catherine Rose	Consultant Medical Officer
Ms Rosemary Warren	Research Officer (CCOPMM)

## 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 (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 the 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.

# PERINATAL MORTALITY REVIEW

## INTRODUCTION

This report is the 38th consecutive Survey of Perinatal Deaths in Victoria.

For this review, Council reports only on perinatal deaths of infants with a **birthweight of 500g or more**, or if the birthweight is unknown, infants of  $\geq 22$  weeks gestation. This differs from the definition used by other Australian States and Territories, which adhere to the definition now used by the Australian Bureau of Statistics and the National Perinatal Statistics Unit i.e., a minimum **birthweight of 400g or  $\geq 20$  weeks gestation**. These definitional differences are important and make comparisons with other regions difficult. Council plans to adopt the 400g/20 week definition for deaths from 2000 onwards. This will need to be taken into account in subsequent accounts when interpreting trend analyses.

Using the  $\geq 500$ g definition, there were 464 perinatal deaths in Victoria in 1999, giving a perinatal mortality rate (PMR) of 7.4 per 1,000 births, similar to the 1998 rate. The stillbirth rate was 4.7 per 1,000 total births, and the neonatal death rate 2.7 per 1,000 live births. The PMR in Victoria has remained relatively constant since 1992.

If in 1999 all deaths of infants weighing  $\geq 400$ g were included, the total would be 705 (rather than 464) and the perinatal mortality rate would be 11.3 per 1,000 births, rather than 7.4.

The Council compiles a case file on every perinatal death and submits selected cases to the specialist committees so that any potentially avoidable factors in management can be identified. This allows all practitioners to share the benefits of their colleagues' experience. Clinical lessons that might not emerge from an individual practice may readily be apparent from the cumulative experience of around 62,000 births annually.

Council relies on the co-operation of obstetricians, neonatologists, paediatricians, midwives, general practitioners and medical records personnel to assist with gaining 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, often the information contained in this document is 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 paediatrician, obstetrical information is sometimes deficient.

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

In order to adequately consider and classify perinatal deaths, Council also requires copies of relevant pathology reports. In particular, in every case of perinatal death, the **placenta** should be sent for histological examination and a copy should be provided for the Council. Clinicians are reminded that if the cause of perinatal death is not apparent, an autopsy may well provide important information for the parents in planning for future pregnancy, and this information needs to be transmitted to the parents in a sensitive manner.

***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, practitioner or institution.***

## DEFINITIONS

In this report, the Council has continued to use the definitions referred to previously and described below, and classifies conditions according to the International Classification of Diseases 10th Revision Clinical Modification (ICD 10 AM). From the year 2000 perinatal deaths will be classified using the clinical classifications developed by the working party of the Perinatal Society of Australia and New Zealand.

Unless otherwise stated, the following definitions apply:

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

*Stillbirth rate* (per 1,000 total births)

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

*Neonatal mortality rate* (per 1,000 livebirths)

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

*Perinatal mortality rate* (per 1,000 total births)

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

# LEGAL REQUIREMENTS FOR REGISTRATION OF PERINATAL DEATHS

The Australian Bureau of Statistics and the Registry of Births, Deaths, and Marriages notify Council of all perinatal deaths registered in Victoria. The legal requirements for registration are set out in the Medical Certificate of Cause of Perinatal Death.

**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 20 weeks or more, 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 **live birth** is the birth of an infant, regardless of maturity or birth-weight, 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.

The PDCU reports on all these births. However, as explained above, unless otherwise specified, Council reports on deaths only where the birthweight is  $\geq 500\text{g}$ .

From 2000 onwards, Council will adopt the definition accepted throughout Australia of reporting on births and perinatal deaths where the gestational age is 20 weeks or more or the birth weight is 400g or more.

## COMPARISON OF COUNCIL DATA WITH OTHER SOURCES

The following information is relevant to those undertaking the frustrating, and potentially confusing, task of comparing data from other sources. There are three main problem areas:

### 1. Birthweight and gestational age criteria for inclusion of cases

The Council has used the definition described above since the 1980 report. Both neonatal deaths, and stillbirths of birthweight under 500g (or under 22 weeks if the birthweight is unknown), are **excluded** from all tables, unless otherwise specified.

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

From 1984, the year of inception of the Victorian Perinatal 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 occurred in the year following the birth. In contrast, the Australian Bureau of Statistics publishes statistics according to *the year when the death is registered*, not the year of birth or death.

### 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 data refer to deaths occurring in Victoria, irrespective of the State, Territory, or country of birth.

## **CHANGES IN COUNCIL DEFINITIONS SINCE 1962**

If trends in mortality rates over time are to be interpreted in a meaningful way, it is important to note the criteria for inclusion of cases since the first annual report in 1962.

From 1962 until 1971, neonatal deaths were included if the gestation was at least 20 weeks (400g if the gestation was unknown); stillbirths were first reported in 1965 and until 1971, were included if the gestation was at least 28 weeks (1,250g if the gestation was unknown).

From 1972 to 1979, the primary criterion for all perinatal deaths was a birthweight of at least 400g, or a gestation of 20 weeks if the birthweight was unknown. From 1980 onward the Council adopted, and continues to use the criteria as outlined above ( $\geq 500$  g), although the PDCU collates data on all births for 20 weeks upwards.

As stated above, from 2000 onwards, Council will adopt the definition accepted throughout Australia of reporting on births and perinatal deaths where the gestational age is 20 weeks or more or the birth weight is 400g or more.

# PERINATAL DEATH REVIEW

## PERINATAL DEATHS

The denominator for the perinatal mortality rate is based on all births in Victoria in 1999 (62,442) of birth weight  $\geq 500$  grams or  $\geq 22$  weeks gestation. Six neonates who died in Victoria but were born elsewhere were excluded from this report. In 1999 there were 293 stillbirths and 171 neonatal deaths, giving a total of 464 deaths and a perinatal mortality rate of 7.4 per 1,000 births (Tables 1 and 2). Those perinatal deaths that occurred at 20 weeks gestation or later but had a birthweight less than 500 grams, are separately reported in Table 5.

**Table 1 Perinatal deaths 1990–1999**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Livebirths	66,350	64,632	65,815	64,284	64,376	63,214	62,429	61,815*	61,634	62,149
Stillbirths	376	375	325	286	329	315	291	269	290	293
Neonatal deaths	273	224	191	165	184	193	157	160	164	171
Perinatal deaths	649	599	516	451	513	508	448	429	454	464

\* Amended figure since 1997 report

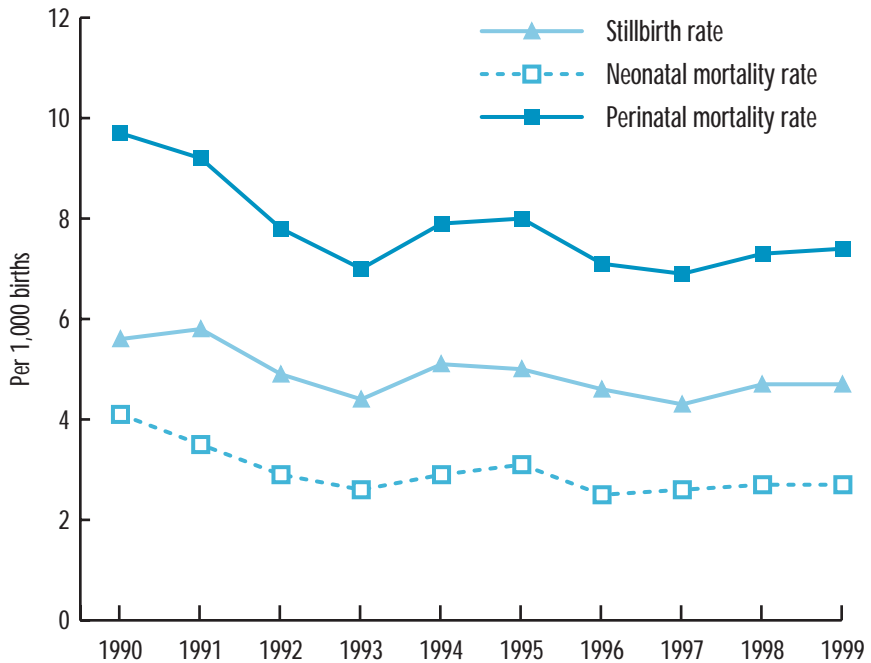
**Table 2 Perinatal death rates 1990–1999**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Stillbirth rate*	5.6	5.8	4.9	4.4	5.1	5.0	4.6	4.3	4.7	4.7
Neonatal death rate**	4.1	3.5	2.9	2.6	2.9	3.1	2.5	2.6	2.7	2.7
Perinatal mortality rate*	9.7	9.2	7.8	7.0	7.9	8.0	7.1	6.9	7.3	7.4

\* Rate per 1,000 births.

\*\* Rate per 1000 live births

**Figure 1 Perinatal mortality rates 1990–1999**



## INTERNATIONAL COMPARISONS OF PERINATAL MORTALITY

For the purposes of international comparison, WHO also recommends the publication of a standard mortality rate in which numerator and denominator are restricted to fetuses and infants of birth-weight 1,000g or over, or if birth-weight 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.

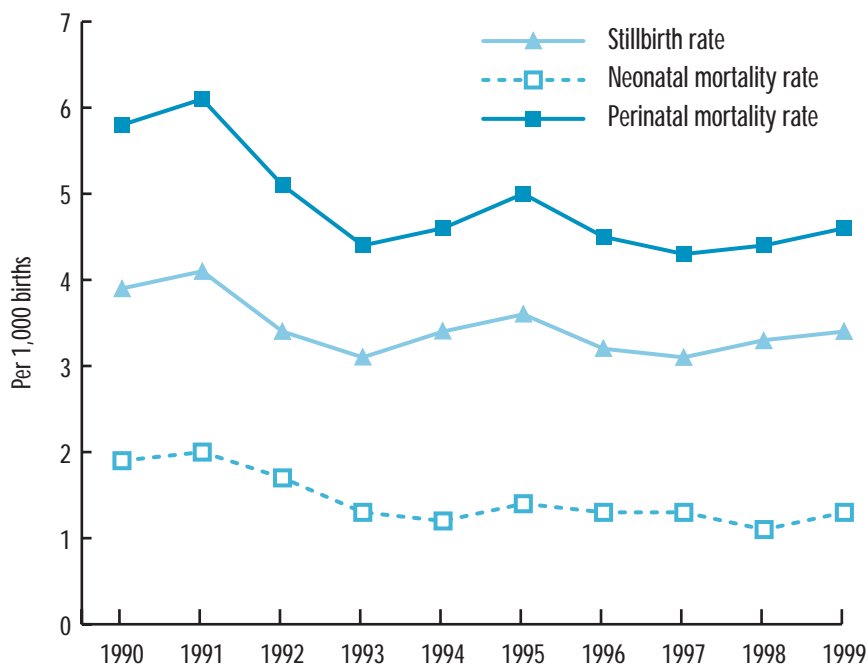
*Neonatal death* A death occurring in an infant whose birthweight was at least 1,000g (or if the birthweight is not known, an infant born after at least 28 weeks gestation) who dies within **seven** days of birth.

Victorian data using the above definitions are presented in Table 3 and Figure 2. Many countries do not use these definitions, and there is considerable variation from country to country in the way perinatal deaths are defined, ascertained and reported. Caution must always be exercised in comparing published mortality rates.

**Table 3 Perinatal mortality rates for international comparison 1990–1999**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Stillbirth rate	3.9	4.1	3.4	3.1	3.4	3.6	3.2	3.1	3.3	3.4
Neonatal mortality rate	1.9	2.0	1.7	1.3	1.2	1.4	1.3	1.3	1.1	1.3
Perinatal mortality rate	5.8	6.1	5.1	4.4	4.6	5.0	4.5	4.3	4.4	4.6

**Figure 2 Perinatal mortality rates for international comparison 1990–1999**



## VICTORIAN BIRTH RATES

In 1999, the number of births was 62,442\*. The livebirth rate is the number of livebirths per 1,000 of the estimated mean resident population for the year indicated. In 1999, the livebirth rate was 13.2. The birth rate in Victoria has been slowly but steadily declining since 1971.

**Table 4 Total births in Victoria 1962–1999\***

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	62,429	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

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

## PERINATAL DEATHS REGISTERED, BUT EXCLUDED FROM THIS SURVEY

There were 241 perinatal deaths legally required to be registered in Victoria in 1999 (see page 4), which, because of Council's definitions, have been excluded from all other tables in this report. These included 176 stillbirths and 65 neonatal deaths that were registered because they occurred at 20 weeks gestation or later, but had a birthweight under 500g (or gestation under 22 weeks' if birthweight was unknown). Sixty seven (28 per cent) had birth defects and the pregnancy was terminated in all but one of these cases.

If these extra 241 cases were included, they would represent 34% of the new total and the perinatal mortality rate would, as a result of their inclusion, rise from 7.4 to 11.3 per 1,000 births.

There were 6 neonatal deaths of infants who were born interstate and referred to Victoria for treatment. These are not included in the statistical calculations.

**Table 5 Cause of death in infants of birthweight under 500g**

Cause of death	<200		200-299		300-399		400-499		Unknown		Total
	SB	NND	SB	NND	SB	NND	SB	NND	SB	NND	
Malformation	4	-	8	4	22	4	19	4	1	1	67
Infection	1	-	2	2	2	1	4	2	-	-	14
Other	18	1	22	5	30	20	41	20	2	1	160
Total	23	1	32	11	54	25	64	26	3	2	241

There were four 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. Three had birth defects and the pregnancy was terminated in all four cases.

## SUSPECTED PREVENTABLE FACTORS IN PERINATAL DEATHS

The Stillbirth and Neonatal Committees of the Council consider cases after all available 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 initial consideration, 52.6 per cent (154 of 293) of the stillbirths were presented to the Stillbirth Committee. Of these, 82 cases were classified as unpreventable. In the remaining 72 cases (24.6% of all stillbirths), 'suspected preventable' factors were identified (Table 6).

#### *1. Inadequate antenatal monitoring*

As in previous years, this remains the most frequent preventable factor identified in stillborn infants. Antenatal monitoring is not synonymous with cardiotocography. Antenatal monitoring implies the careful consideration of maternal and fetal well being and the ordering and judicious interpretation of appropriate investigations. There was inadequate monitoring when clinical need was apparent in 31 cases. Misinterpretation of, or undue reliance on the test occurred in 9 cases.

#### *2. Inadequate detection and management of the growth restricted fetus*

A growth restricted fetus has a birthweight under the 10th percentile for gestational age. Inadequate detection or management of such cases was found in 19 of the 293 stillbirths. Council recommends symphysial fundal-height measurement with a tape measure and ultrasound investigation of suspected fetal growth restriction.

Council repeats the advice that **a fetus which is growth restricted due to placental failure is unlikely to benefit from further prolongation of pregnancy**. Consideration has to be given to the delivery of a suspected growth restricted fetus, at or beyond 37 weeks' gestation, even when tests of fetal well-being are normal, and earlier if such tests indicate compromise.

#### *3. Inadequate intrapartum care*

Inadequate intrapartum fetal heart rate monitoring was noted in four cases. A Caesarean section was performed too late in two cases, and in two further cases there was failure to perform the caesarean section when factors indicated the need to do so. It was considered that surgical induction was undertaken too late in five cases, and there was failure to expedite vaginal delivery in four other cases.

#### *4. Inadequate management of preeclampsia, eclampsia and maternal hypertension*

There was one stillbirth (seven in 1998) associated with inadequate management of maternal hypertensive conditions. The Council reiterates that the **presence of persistent proteinuria in association with hypertension is usually a signal for prompt delivery** regardless of the results of other antenatal tests.

### ***5. Inadequate management of a suspected macrosomic infant***

Six babies with birthweight above the 90th percentile according to gestational age were inadequately managed by failure to perform appropriate investigations. Suspected macrosomia warrants ultrasound estimation of fetal weight. Clinicians are warned of the **potential for mechanical problems (shoulder dystocia, obstructed labour) and the need for glucose tolerance testing of the mother** if macrosomia is suspected.

### ***6. Family neglect or ignorance and delay in reporting decreased movements***

Family neglect or ignorance was implicated in three cases. There was delay in reporting decreased fetal movements in eight cases.

### ***7. Inadequate management of a diabetic mother***

There were six stillbirths identified in association with inadequate management of maternal diabetes, an increase from one in 1998. Women with existing gestational diabetes require close monitoring of blood sugars, in collaboration with clinicians with expertise in the management of this condition.

### ***8. Inadequate management of a prolonged pregnancy or malpresentation***

Inadequate management of a pregnancy of over 42 weeks gestation was implicated in one stillbirth. There were two cases where a breech or other malpresentation was inadequately managed. Oligohydramnios in a prolonged pregnancy is an indication for induction and close intrapartum surveillance. If suspected, ultrasound measurement of amniotic fluid volume is recommended. **Council recommends that in the management of otherwise uncomplicated prolonged pregnancy, induction of labour be considered between 41 and 42 completed weeks of gestation.**

### ***9. Maternal smoking and inappropriate maternal drug use***

Although maternal smoking is known to adversely affect placental functioning and fetal growth, with current available information it is not possible to determine with confidence the precise number of stillbirths in which smoking was the major determinate of the fetal death. Maternal narcotics drug use was identified as the probable cause of fetal death in three cases.

**Maternal smoking is one of the readily identifiable preventable causes of perinatal mortality and morbidity. Appropriate counselling of mothers who smoke has been shown to be effective in reducing smoking and improving outcomes.**

### ***10. Multiple pregnancy***

Inadequate management of multiple pregnancy was implicated in ten cases.

**The antenatal and intrapartum care of women with multiple pregnancies should be undertaken in collaboration with a consultant obstetrician.**

## ***Neonatal deaths***

All neonatal deaths (n=171) were reviewed by a member of the Neonatal Committee, and of these, 47 cases (27.5 per cent) were selected for presentation to the Neonatal Committee. Those infants not referred were either extremely immature, had major birth defects, or there were no controversial features. Suspected preventable factors were considered to be present in 16 of the 47 neonatal deaths considered (9.4 per cent of all neonatal deaths).

Suspected preventable factors relating to either obstetric and/or paediatric care are presented in Table 6. Inadequate resuscitation was identified in six neonatal deaths, inadequate paediatric management in four cases, inadequate nursery care in two cases, and delays, difficulties or failure to transfer an infant in two cases.

For obstetric factors, inadequate intrapartum care was the most frequently noted suspected preventable factor in neonatal deaths. Inadequate intrapartum care factors included failure to perform a Caesarean section (or performing it too late), unsuitable hospital for delivery, inadequate intrapartum monitoring, induction of labour too late and failure to expedite delivery. Inadequate management of fetal distress was identified in two cases.

**Table 6 Suspected preventable factors in perinatal deaths**

Suspected preventable factor	Number of cases with this factor*	
	SB	NND
<b>Mother</b>		
Antenatal care:		
Insufficient antenatal care	8	–
Delay/no consultation in high-risk pregnancy	5	–
Inadequate antenatal management of:		
Antepartum haemorrhage	1	–
Premature rupture of membranes	1	–
Multiple pregnancy	10	–
Diabetes	6	–
Rh immunisation	1	–
Hypertension, preeclampsia	1	–
Prolonged pregnancy	2	–
Growth restricted fetus	19	–
Macrosomia	6	–
Narcotics	3	–
Smoking	10	–
Patient/family non-compliance	3	–
Failure/delay reporting decreased movements	8	–
Inadequate antenatal monitoring:		
Clinical need apparent	31	–
Misinterpretation/undue reliance on test	9	–

**Table 6 Suspected preventable factors in perinatal deaths – continued**

Suspected preventable factor	Number of cases with this factor*	
	SB	NND
Intrapartum care:		
Unsuitable hospital for delivery	1	1
Failure to perform Caesarean section	2	1
Caesarean section too late	2	2
Induction too late	5	1
Inadequate intrapartum monitoring	4	1
Failure to expedite delivery – other	4	1
Inadequate intrapartum management of:		
Breech/malpresentation	2	1
Premature rupture of membranes	–	1
Obstructed labour	1	–
Fetal distress	1	2
Forceps delivery	1	–
Prolonged labour	1	–
Failure to transfer patient		
Premature rupture of membranes before 34 weeks	–	1
Other maternal factor	5	1
<b>Infant and fetus</b>		
Delay/failure to transfer infant	–	2
Inadequate Resuscitation	–	6
Inadequate Paediatric management	–	4
Inadequate Nursery care	–	2
Total number of cases	293	171
Cases with one or more suspected preventable factors (% of total)	72 (24.6%)	16 (9.4%)

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

## RECOMMENDATIONS FROM THE COUNCIL ON PERINATAL DEATHS

The consideration of the obstetric and paediatric suspected preventable factors in 1999, and in previous years, leads the Council to make some observations and suggestions.

The ratio of stillbirths to neonatal deaths in 1999 was 1.7 to 1 (293 to 171), yet the ratio of suspected preventable factors was 5.7 to 1. **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 stillbirths.**

A suspected preventable factor is considered to be present when the management of the mother of infant was considered sub-optimal.

### ***Tests of fetal well-being are recommended in all pregnancies departing from normal***

Council recommends that tests of fetal well-being such as ultrasound imaging, (for growth and biophysical profile, and in particular amniotic fluid volume estimation) and/or cardiotocography be used in all cases where there is increased risk of fetal compromise. These conditions include:

- Medical disorders including hypertension, preeclampsia, and diabetes mellitus;
- Suspected delay in fetal growth;
- Oligohydramnios;
- Polyhydramnios;
- Reduced fetal movements;
- Maternal age >35 years;
- Obesity;
- Pregnancy as the result of assisted reproduction;
- Previous perinatal death;
- Poor attendance.

### ***Encourage prompt reporting of reduced fetal movements***

Council recommends that women be encouraged to report reduced fetal movements promptly.

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 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 neonatal death 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 12mg, 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 transfer to a centre with neonatal intensive care facilities.
3. If time permits, transfer of the mother to an appropriate hospital for the delivery should be considered; extremely immature infants have lower mortality and morbidity rates if born in Level 3 centres (ie centres with Neonatal Intensive Care units).
4. Exogenous surfactant given to babies with respiratory distress has been shown to improve survival rates of these infants.

### ***Initiate management of obstetric patients prior to transfer***

When transfer of obstetrical patients needing intensive care is contemplated or necessary, it is the responsibility of the referring doctor, **with advice from the receiving unit**, to initiate appropriate management of the condition before the transfer. Severe preeclampsia warrants anticonvulsant therapy and control of hypertension for the mother before transfer. If delivery of an immature infant is likely, the administration of steroids to the mother before her transfer should be commenced.

### ***Exercise care when using prostaglandins***

Several fetal deaths have been associated with attempts to ripen the unfavourable cervix with vaginal prostaglandins. Council emphasises that 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 indications should be pressing and continuous fetal monitoring under such circumstances is recommended.

Council is also aware of cases of rupture of an unscarred uterus following the use of prostaglandins, particularly when followed by oxytocin infusion. Careful surveillance of patients in labour under such circumstances is required.

### ***Exercise care when using oxytocin infusions in multiparas***

The use of an oxytocin infusion to initiate or augment labour in a multipara carries definite increased risk of fetal and maternal complications, and should be administered very judiciously, in accordance with a written protocol. All patients treated in such a way should have a vaginal examination beforehand and continuous electronic fetal monitoring while the infusion is running.

### ***Infertility patients are at increased risk of adverse outcome***

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

### ***Monitor hypertensive mothers***

In pregnancies complicated by hypertension, meticulous monitoring during the pregnancy and in labour is required in collaboration with a specialist obstetrician, and induction of labour should be undertaken when indicated.

### ***Be aware that multiple pregnancy increases the risk of perinatal death***

In 1999, 12.1 per cent of perinatal deaths were from multiple pregnancies, and the multiple pregnancy was believed to be the primary cause of death in 10.5 per cent of all perinatal deaths. Council recommends the management of all cases 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.

### ***Take swabs when pre labour rupture of the membranes occurs***

When pre labour rupture of the membranes occurs prior to 37 weeks, it is recommended that cervical swabs be taken for microscopy and bacterial culture, and prophylactic antibiotic treatment be commenced. Swabs for GBS should be taken from the lower one third of the vagina and the perineum.

In the presence of cervical incompetence with a cervical suture, with or without evidence of infection, the recommended management is to remove the suture after the membranes have ruptured, perform bacteriological culture on the suture, and commence antibiotics. It is usually indicated to deliver within 48 hours, and steroid therapy should be considered if the gestation of pregnancy is less than 34 weeks.

### ***Consider a Kleihauer test***

Local and overseas studies have shown that fetomaternal haemorrhage is the cause of a significant proportion of unexpected intrauterine deaths 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, a Kleihauer test should be performed to check that sufficient Rh anti-D gamma globulin has been given.

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 is particularly the case with anti-D, anti-C 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 prepregnancy diabetes mellitus should be managed in consultation with a specialist obstetrician.

### ***Check fetal maturity in obese women***

Early confirmation of gestational age by ultrasound is particularly important in obese women.

### ***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 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 – either antenatal screening (at 35–36 weeks) or identification of intrapartum risk factors and treatment with appropriate antibiotics. These risk factors include: birth prior to 35 weeks; intrapartum fever >38°C; and duration of membranes rupture >18 hours. 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 mature infants with severe respiratory distress***

In the case of an infant of birthweight greater than 2,500g with severe respiratory distress, consideration should be given to transferring the infant directly to a Neonatal Intensive Care Unit which has the availability of nitric oxide, high frequency ventilation, and extra corporeal membranes oxygenation (ECMO). The NETS consultative services should be contacted (phone 9347 7441).

### ***Continue respiratory support in significantly asphyxiated infants.***

Infants with cardio-respiratory depression sufficiently severe to require 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).

### ***Discourage smoking in pregnancy***

Maternal substance abuse, particularly heavy cigarette smoking, continues to be an important contributing factor in adverse perinatal outcomes. Smoking cessation intervention has been shown to be effective in reducing smoking in pregnancy.

## CAUSES OF PERINATAL DEATHS

In 1999, birth defects accounted for 26.1 per cent (121 of 464) of perinatal deaths. Of the remaining heterogeneous group of deaths of 'non-malformed' infants, 21 (4.5 per cent) were attributable to infection. Note that in the Council's classification system cases are assigned to a single category based on the principal cause of death. Further details on the deaths due to birth defects are given in Table 11.

In considering the tables below, the limitations of this classification are illustrated by the virtual absence of erythroblastosis and "cot death" as categories of perinatal death and by the observation that in 1999, more than two-thirds of perinatal deaths are classified in the nebulous category of "other".

For perinatal deaths from 2000 onwards, in view of the increased understanding of causes of perinatal and neonatal mortality, Council will be using the new national classification systems developed by the perinatal mortality working party of the Perinatal Society of Australia and New Zealand (ANZACPM).

**Table 7 Principal causes of perinatal deaths, by birthweight group**

Birthweight (g)	500–999		1,000–2,499		≥2,500		Unknown		Total	(%)
	SB	NND	SB	NND	SB	NND	SB	NND		
Malformation	22	16	16	32	3	32	–	–	121	(26.1)
Non-malformation										
Infection	5	6	3	3	3	1	–	–	21	(4.5)
Cot death	–	–	–	1	–	2	–	–	3	(0.7)
Other	57	52	84	7	99	19	1	–	317	(68.7)
Total	84	74	103	43	105	54	1	–	464	(100)

**Table 8 Perinatal deaths by major cause, proportion of yearly total, 1990–1999**

Cause of death	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	%	%	%	%	%	%	%	%	%	%
Malformation	21.4	20.7	22.9	22.9	20.5	22.0	20.1	22.6	18.5	26.1
Non-malformation										
Infection	4.0	4.0	1.7	5.8	4.5	4.9	3.3	4.2	3.8	4.5
Erythroblastosis	0.5	0.2	0.6	0.9	0.8	0.4	0.4	–	0.4	–
Other	74.1	75.1	74.8	70.4	74.2	72.7	76.2	73.2	78.8	69.4

**Table 9 Causes of perinatal death, incidence per 1,000 births, 1990–1999**

Cause of death	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Malformation	2.1	1.9	1.8	1.6	1.6	1.8	1.4	1.6	1.4	1.9
Non-malformation										
Infection	0.4	0.4	0.1	0.4	0.4	0.4	0.2	0.3	0.3	0.3
Other	7.2	6.9	5.8	4.9	5.9	5.8	5.4	5.0	5.6	5.2

***Classification of causes of Perinatal Death***

Details of perinatal deaths in the 'non-malformation' group (n=343) are provided in Table 10.

**Antepartum haemorrhage/placental abruption** remains the predominant principal maternal cause of perinatal deaths (45 cases). Other important conditions were:

- **Multiple pregnancy (35 cases).**
- **Premature rupture of the membranes (12 cases).**
- **Preeclampsia/eclampsia (11 cases).**
- **Placental infarction/insufficiency (8 cases).**
- **Cord compression (9 cases).**

**Antepartum hypoxia** accounted for 85 stillbirths.

It should be noted, however, that to clinicians, attributing fetal death to 'antepartum hypoxia' adds nothing to the understanding of the cause of death; antepartum hypoxia always precedes fetal death. By appearing to be an explanation this "classification" may even retard the process of finding explanations for such deaths. What we need to understand is what caused the hypoxia. It is for this reason that clinicians find the ICD coding process unhelpful, and why agencies such as the Council need to employ more meaningful clinical classification systems which give some indication of the root cause of the problem, or acknowledge our state of ignorance and classify the cause of death as "unexplained". In 1999, there were 48 unexplained fetal deaths after 36 weeks' gestation. These stillbirths were neither growth restricted nor malformed, and where an autopsy was carried out, no cause of death was found. Such unexplained deaths remain a major challenge to those conducting obstetrical care.

**Intrapartum hypoxia** was associated with 6 neonatal deaths, and 19 stillbirths. It is generally accepted in these cases, that if the hypoxia were identified earlier and delivery effected more expeditiously, the outcome would have been improved. This unfortunately is not always the case – "fetal distress" in labour may be the manifestation of previous severe hypoxic insult, with consequent cerebral injury – and therefore not reversible by prompt delivery. Until we have more discriminatory tests we must always assume that the problem is acute and potentially reversible.

**Sudden Infant Death Syndrome** was the diagnosis in three infants aged less than 28 days.

**Table 10 Principal cause of the perinatal deaths (excluding birth defects)**

ICD code	Conditions	Birthweight (g)								Total	%
		500–999		1,000–2,499		≥2,500		Unknown			
		SB	NND	SB	NND	SB	NND	SB	NND		
O71.0	Uterine rupture	–	–	–	–	1	–	–	–	1	0.3
P00.0	Preeclampsia and eclampsia	5	–	5	1	–	–	–	–	11	3.2
P00.2	Maternal infections	–	–	–	–	1	–	–	–	1	0.3
P00.5	Maternal injury	1	–	–	–	–	–	–	–	1	0.3
P00.8	Other maternal disorders	2	–	2	–	–	–	–	–	4	1.2
P01.0	Incompetent cervix	2	3	–	–	–	–	–	–	5	1.4
P01.1	Premature rupture of membranes	3	7	1	1	–	–	–	–	12	3.5
P01.5	Multiple pregnancy	5	16	7	1	4	1	1	–	35	10.2
P02.0	Placenta praevia	1	1	–	–	1	–	–	–	3	0.9
P02.1	Antepartum haemorrhage	12	6	10	–	14	3	–	–	45	13.1
P02.2	Placental infarction/insufficiency	3	–	4	–	1	–	–	–	8	2.3
P02.3	Twin to Twin transfusion	3	1	2	–	1	–	–	–	7	2.0
P02.4	Prolapsed cord	1	–	–	–	–	1	–	–	2	0.6
P02.5	Cord compression	–	–	2	–	6	1	–	–	9	2.6
P02.6	Other cord conditions	–	–	3	–	1	2	–	–	6	1.7
P02.7	Chorioamnionitis	3	6	2	–	2	–	–	–	13	3.8
P03.8	Other labour/delivery complications	–	–	–	–	–	1	–	–	1	0.3
P04.4	Affected by maternal drugs	–	–	2	–	1	–	–	–	3	0.9
P05.1	Fetal growth restriction	5	–	12	–	5	–	–	–	22	6.4
P07.0–											
P07.2	Immaturity	–	13	–	–	–	–	–	–	13	3.8
P08.0	Macrosomia	–	–	–	–	3	–	–	–	3	0.9
P08.2	Postterm	–	–	–	–	1	–	–	–	1	0.3
P10	Birth trauma	–	–	–	1	–	1	–	–	2	0.6
P20.0	Hypoxia, antepartum	9	–	31	–	45	2	–	–	87	25.4
P20.1	Hypoxia, intrapartum	1	–	1	1	8	3	–	–	14	4.1
P21.0	Severe birth asphyxia	–	–	–	–	–	2	–	–	2	0.6
P26	Pulmonary haemorrhage	–	1	–	–	–	1	–	–	2	0.6
P27	Chronic respiratory disease	–	–	–	–	–	1	–	–	1	0.3
P35	Congenital viral diseases	2	–	–	1	–	–	–	–	3	0.9
P36	Bacterial sepsis	–	–	1	2	–	1	–	–	4	1.2
P50.4	Haemorrhage into maternal circulation	2	–	1	–	1	–	–	–	4	1.2
P55.0	Haemolytic disease										
	Rh isoimmunization	–	–	–	–	1	–	–	–	1	0.3
P70.0	Maternal gestational diabetes	–	–	1	–	2	–	–	–	3	0.9
P70.1	Maternal diabetes	–	–	–	–	3	–	–	–	3	0.9
P77.0	Necrotizing enterocolitis	–	4	–	–	–	–	–	–	4	1.2
P83.2	Nonimmune hydrops	2	–	–	2	–	–	–	–	4	1.2
R95	Cot death	–	–	–	1	–	2	–	–	3	0.9
Total		62	58	87	11	102	22	1	–	343	100*

\* Please note due to rounding up, total percentage is more than 100 (100.3).

## PERINATAL DEATHS DUE TO BIRTH DEFECTS

There were 121 perinatal deaths due to congenital malformations or birth defects (Table 11). Birth defects of the cardiovascular system accounted for 21 deaths, multi-system malformations and multiple malformations for 18 deaths, and chromosomal abnormalities for 40 deaths.

The proportion of all perinatal deaths due to birth defects was 26.1 per cent. Of the 121 perinatal deaths with a birth defect, the pregnancy was terminated in 32 cases (26.4 per cent), compared to 19% in 1998.

**Table 11 Perinatal deaths due to birth defects**

ICD code	Conditions	Birthweight (g)						Total
		500–999		1,000–2,499		≥2,500		
		SB	NND	SB	NND	SB	NND	
C76.8	Abdominal-pelvic teratoma	1	-	-	-	-	-	1
D43.0	Intracerebral teratoma	-	-	1	-	-	-	1
D56.0	Alpha thalassaemia	1	-	-	-	-	-	1
E87.2	Primary lactic acidosis	-	-	-	1	-	-	1
G12.0	Werdnig-Hoffman disease	-	-	-	1	-	-	1
P56	Hydrops	-	-	-	2	-	-	2
Q00.0	Anencephalus	-	-	3	-	-	1	4
Q01.2	Encephalocele	1	-	-	1	-	-	2
Q02	Microcephaly	-	-	-	-	-	1	1
Q03	Hydrocephalus	3	-	2	1	-	-	6
Q04	Other brain anomaly	1	-	-	-	-	1	2
Q05	Spina bifida	2	-	-	-	-	-	2
Q20–Q28	Cardiovascular anomalies	1	4	3	2	-	11	21
Q30–Q34	Respiratory system anomalies	-	-	-	3	-	-	3
Q39	Oesophageal anomaly	-	1	-	-	-	-	1
Q60–Q64	Urinary system anomalies	1	1	-	2	-	4	8
Q71.8	Upper limb anomaly	-	1	-	-	-	-	1
Q74.3	Arthrogryposis multiplex congenita	-	1	-	1	-	-	2
Q77–Q78	Osteochondrodysplasia	-	-	1	-	1	5	7
Q79.0	Diaphragmatic hernia	-	-	-	1	-	4	5
Q87	Multiple system defects	1	-	-	2	-	2	5
Q89.7	Multiple malformations	2	2	1	6	1	1	13
Q90	Trisomy 21	4	1	1	-	-	1	7
Q91.4–.7	Trisomy 13	-	-	1	2	1	-	4
Q91.0–.3	Trisomy 18	2	-	2	4	-	-	8
Q92–99	Other chromosomal anomalies	2	5	1	3	-	1	12
Total		22	16	16	32	3	32	121

## INFECTION INVOLVED IN PERINATAL DEATHS

Amongst the perinatal deaths there was evidence of infection in 43 cases (9%), with half of these deaths being primarily caused by the infection (as listed in Tables 7 to 10). These cases are examined further, by birthweight, in Table 12.

**Table 12 Perinatal deaths due primarily to infection, by birthweight**

Conditions	Birthweight (g)						Total
	500–999		1,000–2,499		≥2,500		
	SB	NND	SB	NND	SB	NND	
Chorioamnionitis	3	6	2	–	2	–	13
Congenital infections	2	–	1	2	–	1	6
Perinatal sepsis	–	–	–	1	–	–	1
Maternal infection	–	–	–	–	1	–	1
<b>Total</b>	<b>5</b>	<b>6</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>21</b>

It is highly likely that the assigning of infection as a cause of perinatal death reflects significant under ascertainment. More consistent investigation of perinatal deaths by microbiological cultures and placental histology is likely to reveal a much higher rate of infection in association with perinatal death, particularly in preterm infants.

In 22 cases, infection was not considered the principal cause of death, although it was noted in the history. The main causes of death in these cases are listed in Table 13.

**Table 13 Principal cause of perinatal death in cases with evidence of infection**

Condition	SB	NND	Total
Premature rupture of membranes	–	3	3
Multiple pregnancy	–	7	7
Hypoxia	2	1	3
Placental abruption/APH	3	1	4
Prematurity	–	1	1
Birth defects	1	3	4
<b>Total</b>	<b>6</b>	<b>16</b>	<b>22</b>

Where the organisms have been identified for all infection cases, the information has been collated in Table 14.

**Table 14 Organisms involved in perinatal deaths with infection**

Organism	SB	NND	Total
Group B streptococcus (GBS)	3	3	6
Other streptococcus group	1	1	2
Staphylococcus aureus	–	1	1
Coagulase negative staphylococcus	–	1	1
Escherichia coli	1	2	3
Enterococcus faecalis	1	2	3
Candida albicans	–	1	1
Listeria monocytogenes	–	1	1
Pseudomonas	–	2	2
Ureaplasma urealyticum	1	1	2
Parvovirus	1	–	1
Adenovirus	–	2	2
Cytomegalovirus	1	1	2
Mycoplasma	1	–	1
Meningococcus	1	–	1
Organism not identified	6	8	14
<b>Total</b>	<b>17</b>	<b>26</b>	<b>43</b>

There were six documented deaths with Group B Streptococcal (GBS) infection in 1999, eight in 1998, and six in 1997. This too is likely to be an underestimate of the true incidence of perinatal death caused by perinatally acquired fetal or neonatal GBS sepsis. All maternity units should have a written protocol outlining the institution's approach to prevent GBS infection by either maternal antenatal screening and intrapartum treatment or intrapartum prophylaxis on the basis of risk factors, and also a protocol for the management of the newborn at risk of developing early onset sepsis.

The low number of staphylococcus aureus and coagulase negative staphylococcus infection reported as primary cause of death undoubtedly significantly understates the contribution of these organisms to mortality and morbidity in neonatal intensive care. In complex 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 infection in neonatal intensive care and are major contributors to mortality. In light of the growing emergence of multiply resistant organisms excellence in antibiotic and infection control practice is going to become progressively more important in the coming years.

## TIME OF FETAL DEATH IN STILLBIRTHS

Death occurred during labour in 18 per cent of stillbirths in 1999, which was similar to the proportion in 1998 (17.8 per cent). Of stillbirths with a birthweight  $\geq 2,500$  grams, 21% were intrapartum deaths.

**Table 15 Time of fetal death in stillbirths**

Birthweight (g)	Before the onset of labour										Total
	During labour	Under 1 day	2nd–3rd day	4th–7th day	2nd week	3rd week	4th week	>4 weeks	Unknown days	Unknown before or during labour	
500–999	24	14	17	5	4	–	1	3	10	6	84
1,000–1,499	4	6	15	1	2	1	–	–	3	4	36
1,500–1,999	1	8	6	1	1	–	–	–	4	2	23
2,000–2,499	2	6	23	4	–	1	–	1	4	3	44
2,500–2,999	9	12	14	3	–	–	–	–	1	1	40
3,000–3,499	6	11	14	4	–	–	–	–	3	1	39
3,500–3,999	2	6	3	1	–	–	–	–	–	2	14
$\geq 4,000$	5	2	4	–	–	–	–	–	1	–	12
Unknown								1			1
Total	53	65	96	19	7	2	1	5	26	19	293
(%)	18.1	22.2	32.7	6.5	2.4	0.7	0.3	1.7	8.9	6.5	(100)

## TIME OF NEONATAL DEATH

Over a third of neonatal deaths occurred within six hours of birth.

**Table 16 Age at time of death for neonates**

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
500–999	37	5	4	11	2	6	4	5	74
1,000–1,499	7	2	2	1	3	2	–	–	17
1,500–1,999	3	–	2	7	2	–	–	–	14
2,000–2,499	4	–	1	–	3	1	2	1	12
2,500–2,999	5	–	–	6	3	2	1	3	20
3,000–3,499	5	2	1	4	2	3	1	2	20
3,500–3,999	3	1	2	2	2	1	–	–	11
$\geq 4,000$	1	–	–	–	2	–	–	–	3
Total	65	10	12	31	19	15	8	11	171
(%)	(38.0)	(5.9)	(7.0)	(18.1)	(11.1)	(8.8)	(4.7)	(6.4)	(100)

## PERINATAL AUTOPSY SERVICE

Medical Practitioners are reminded of their statutory obligation to provide the Registrar of Births, Deaths and Marriages with a Death Certificate within 48 hours of a perinatal death. In addition, practitioners are requested to assist the Council by completing a Confidential Medical Report on each perinatal death. Often death certificates are not well completed and Council recommends that if the completion of the death certificate is delegated to a trainee, that the clinician in charge should review the information recorded in the death certificate and the confidential medical report.

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

In circumstances where there is uncertainty about the precise cause of death, a perinatal autopsy and pathological examination of the placenta will often provide helpful information for the parents as well as for clinicians.

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 post mortem 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.

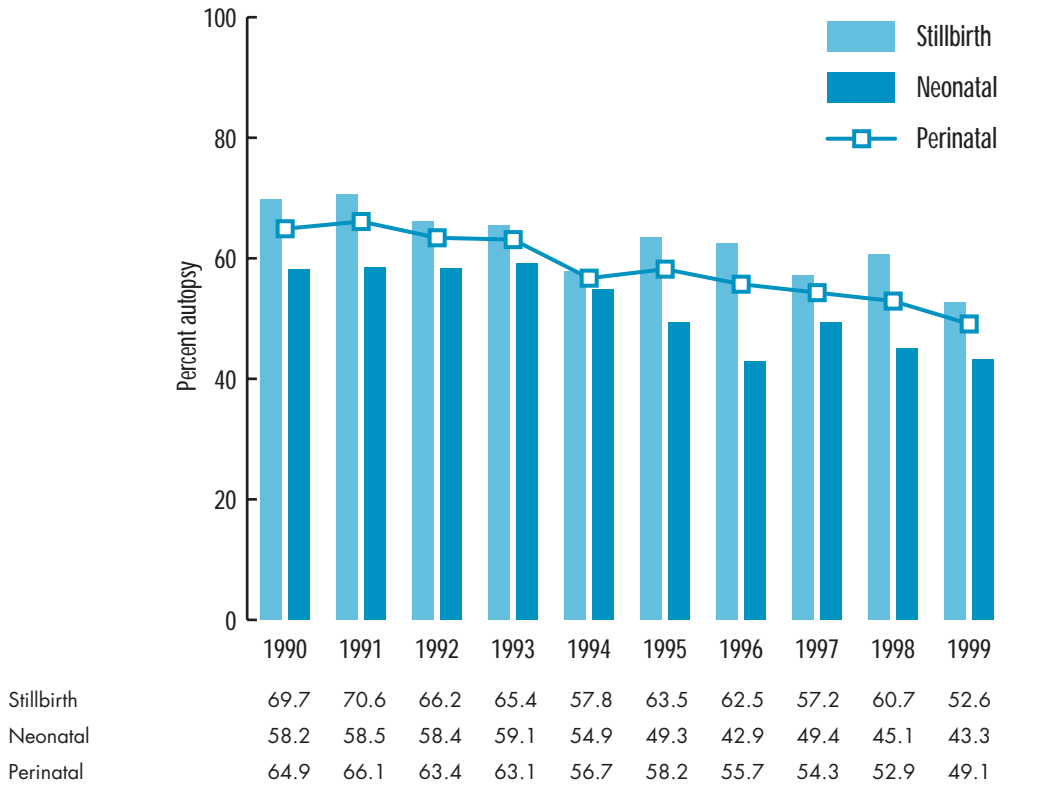
In view of the recent adverse publicity surrounding infant autopsies, the Department of Human Services has issued guidelines for hospitals with respect to gaining consent and other aspects of the retention, use and disposal of tissue obtained at autopsy. These guidelines are available by contacting Elizabeth Birbilis, Project Officer, Communicable Diseases Section, Department of Human Services (telephone 9637 5220).

It is vital to the accuracy of the Council’s surveys that full advantage be taken of the free autopsy service available for perinatal deaths occurring in Victoria. 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

In 1999, an autopsy was performed on 52.5 per cent (154 of 293) of stillbirths, and on 43.3 per cent (74 of 171) of neonatal deaths. The proportion of perinatal deaths that have had a autopsy over the past 10 years is shown in Figure 3, which illustrates that there is a progressive decline in the perinatal autopsy rate from 64.9 per cent in 1990 to 49.1 per cent in 1999.

**Figure 3 Perinatal autopsy rates 1990–1999**



***Placental Pathology***

As above stated, the placenta should be sent to pathological examination in all cases of fetal death, and where possible for all early neonatal deaths. 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

## VICTORIAN BIRTH DATA 1999

The Victorian Perinatal Data Collection Unit (PDCU), under the auspices of the Consultative Council on Obstetric and Paediatric Mortality and Morbidity, 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. **However, in this report, only the infants of birthweight  $\geq 500\text{g}$ , or of 22 weeks gestation if the birthweight is unknown, have been included in the tables.**

In previous years, this section has contained tables with general birth data. However for this report, only tables referring to perinatal mortality have been included. For details of all birth data, refer to publications from the PDCU (website: <http://www.dhs.vic.gov.au/phb/perinatal/index.htm>), or contact the PDCU on 03 9616 2696.

**Table 17 Gender of infants**

Sex	Births		Stillbirths (n)	Neonatal deaths (n)	Perinatal deaths (n)	Stillbirth rate	Neonatal mortality rate	Perinatal mortality rate
	(n)	(%)						
Male	31,938	51.1	145	93	238	4.5	2.9	7.5
Female	30,502	48.9	148	76	224	4.9	2.5	7.3
Indeterminate or unknown	2	–	–	2	2	–	–	–
Total	62,442	100.0	293	171	464	4.7	2.8	7.4

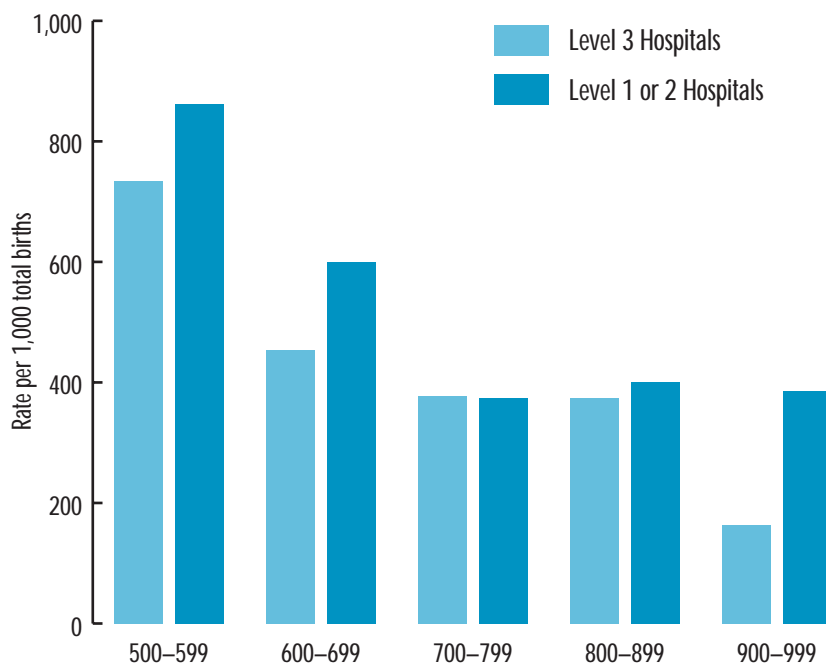
**Table 18 Birthweight distribution and perinatal mortality rate**

Birthweight (g)	Births		Stillbirths (n)	Neonatal deaths (n)	Perinatal mortality rate
	(n)	(%)			
500–999	323	0.5	84	74	492.2
1,000–1,499	400	0.6	36	17	132.5
1,500–1,999	801	1.3	23	14	46.2
2,000–2,499	2,573	4.1	44	12	21.8
2,500–2,999	9,936	15.9	40	19	5.9
3,000–3,499	22,233	35.6	39	21	2.7
3,500–3,999	18,899	30.3	14	11	1.3
4,000–4,499	6,228	10.0	5	3	1.3
4,500–4,999	922	1.5	7	–	7.6
$\geq 5,000$	123	0.2	–	–	–
Not known	4	–	1	–	–
Total	62,442	100.0	293	171	7.4

## PERINATAL MORTALITY BY HOSPITAL OF BIRTH

While only 0.5 per cent of all infants weighed between 500 and 999g at birth, they accounted for 34 per cent of perinatal deaths (158 of 464, Table 18). Council emphasises that **infants of birthweight <1,000 grams have better prospects for survival if delivered in a Level 3 centre** (a hospital with fetal/maternal and neonatal specialists and a neonatal intensive care unit). The perinatal mortality at such centres compared to all other hospitals, for each 100g weight group under 1,000g, is shown in Figure 4.

**Figure 4** Extremely low birthweight infant mortality rate\*, by hospital level at delivery



### Level 3 hospital births

Alive (n)	11	27	28	25	35
Infant death (n)	2	2	–	–	1
Neonatal death (n)	22	14	8	6	3
Stillbirth (n)	14	10	9	9	4
Perinatal mortality rate	735	453	378	375	163

### Levels 1 and 2 hospital births

Alive (n)	4	7	4	9	8
Infant death (n)	–	1	–	–	1
Neonatal death (n)	9	6	3	2	2
Stillbirth (n)	16	6	9	4	3
Perinatal mortality rate	862	600	375	400	385

\* Mortality rate per 1,000 births.

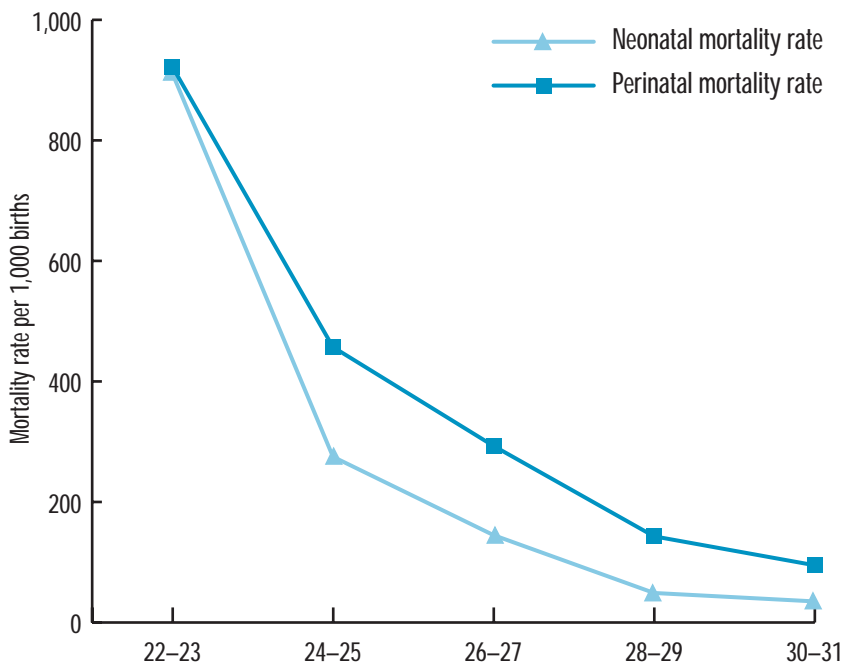
Figure 5 shows the neonatal, stillbirth and perinatal mortality rates (per 1,000 births) for the gestational age range of 22 to 31 weeks. Council considers this information will be useful to obstetricians caring for mothers who are likely to deliver an extremely immature infant, and where the fetal weight is not known with certainty.

In 1999 7.8 per cent (4 of 51) of the infants born at 22–23 weeks survived into infancy. This survival rate rose to 54 per cent at 24–25 weeks and 71 per cent for those born at 26–27 weeks gestation.

There were seven infants born weighing  $\geq 500\text{g}$  at a gestation under 22 weeks, five were stillborn and two were neonatal deaths.

In addition, there were 250 infants registered with the Perinatal Data Collection Unit who were under 500g (or under 22 weeks gestation if the birthweight was unknown). Of these infants, there were four who survived beyond 28 days.

**Figure 5 22–31 weeks gestation, perinatal mortality rates**



Survivor >28 days (n)*	4	50	94	174	249
Neonatal deaths (n)	31	19	16	9	9
Stillbirths (n)	16	23	23	20	17
Neonatal mortality rate	911	275	145	49	35
Perinatal mortality rate	922	457	293	143	95

*Note:* The estimates are sometimes uncertain for the gestational age groups shown in Figure 5.

## MULTIPLE BIRTHS

In 1999, there were 2,135 multiple births (1,017 sets of twins and one twin born in 1999 whose sibling was born in 2000: 32 sets of triplets, and one set of quadruplets). The comparable figures for sets of twins were 938 in 1998, 936 in 1997, 870 in 1996 and 915 in 1995.

Multiple births comprised 3.4 per cent of all births  $\geq 500\text{g}$ , but contributed 13.3 per cent of perinatal deaths. For very low birthweight infants (500–1,499g), 30 per cent were from multiple pregnancies, and they contributed 17.1 per cent of the deaths in this weight group.

**The perinatal mortality rate for multiple births of birthweight  $\geq 500\text{g}$  was 29.2 per 1,000 births compared with 6.7 for singleton births.**

**Table 19 Multiple births mortality rate and birthweight distribution, 1999**

Birthweight (g)	Multiple births		Stillbirths	Neonatal deaths	Perinatal mortality rate
	(n)	(%)			
<500*	15	0.7	10	5	1000.0
500–999	82	3.8	8	18	317.0
1,000–1,499	136	6.4	6	4	73.5
1,500–1,999	254	11.9	1	1	7.9
2,000–2,499	597	28.0	7	2	15.0
2,500–2,999	720	33.7	4	4	11.1
3,000–3,499	282	13.2	–	1	3.5
3,500–3,999	41	1.9	1	–	24.3
$\geq 4,000$	3	0.1	–	–	–
Unknown	5	0.2	5	–	–
<b>Total</b>	<b>2,135</b>	<b>100.0</b>	<b>42</b>	<b>35</b>	<b>36.0</b>

\* There were fifteen multiple birth infants (13 twins and two triplets) of birthweight <500g who had a heavier ( $\geq 500\text{g}$ ) co-twin. The inclusion of these 15 infants of birthweight under 500g is a possible source of confusion. These infants are included for completeness in this table of multiple births, however being under 500g they are not included in other tables in this report. There were an additional two registered multiple births (one set of twins) not included in the report, as both twins weighed under 500g.

## BIRTH DEFECTS

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 staff of the Perinatal Data Collection Unit, who also maintain the Birth Defects Register.

The frequency of birth defects among infants born in 1999 (summarised in Table 20) **represents the number of infants notified rather than the number of malformations**. All infants with a recognisable syndrome or with multiple-system malformations are classed as 'multiple'. Those with a single defect, or single-system defects, are listed according to the anatomical site of the malformation (nervous system, cardiovascular etc.).

Table 20 shows the overall number and proportion of birth defects in 1999. These figures fluctuate from year to year and in 1999 there was a slight increase across almost all categories compared with 1998. The frequency of fetuses or newborn babies with reported birth defects was 4.5% (35.9/1,000) in 1999.

**Down syndrome was the most common chromosomal defect.** There were 88 fetuses with Down syndrome detected in which delivery was induced before 20 weeks gestation (Table 22). Another four infants with Down syndrome died in the perinatal period. Of the 100 infants surviving with a chromosome abnormality, 55 had Down syndrome.

**Table 20 Notifications to the Birth Defects Register for infants born in 1999**

Category	Induced <20 weeks (n)	SB (n)	NND (n)	Infant/child death (n)	Alive (n)	Total (n)	Estimated rate (per 1,000 births)
Multiple	15	34	35	7	146	237	3.8
Chromosomal	166	28	26	10	100	330	5.3
Neurosystem	59	17	7	2	45	130	2.1
Cardiovascular	5	13	24	4	331	377	6.0
Gastrointestinal	0	0	1	0	149	150	2.4
Urogenital	11	4	5	1	780	801	12.8
Respiratory	0	0	2	1	19	22	0.3
Musculoskeletal/limb	21	6	13	2	523	565	9.0
Genetic/metabolic	4	2	3	1	54	64	1.0
Other**	7	3	3	3	95	111	1.8
<b>Total</b>	<b>288</b>	<b>107*</b>	<b>119</b>	<b>31</b>	<b>2,242</b>	<b>2,787</b>	
<b>(rate per 1,000 births)</b>	<b>(4.6)</b>	<b>(1.7)</b>	<b>(1.9)</b>	<b>(0.5)</b>	<b>(32.2)</b>	<b>(35.9)</b>	

\* Includes infants of birthweight at least 400g or if the birthweight is unknown, at least 20 weeks gestation.

\*\* 'Other' includes: cystic hygroma, conjoined twins, hydrops fetalis, neoplasms, lymphangioma, cytomegalovirus infection, eye anomalies, ear anomalies, anomalies of the integument, developmental delay, unspecified congenital anomalies, situs inversus (triad), hamartoses

**Table 21 Sources of notifications to the Birth Defects Register, 1996–1999**

Source	1996		1997		1998		1999	
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
Perinatal (birth) forms	1,698	48.8	1,768	51.7	1,838	58.2	1,935	55.9
Death certificates	182	5.2	189	5.5	175	5.5	192	5.5
Autopsy reports	126	3.6	134	3.9	103	3.3	101	2.9
Cytogenetic reports	233	6.7	247	7.2	233	7.4	231	6.7
Hospitals	972	27.9	848	24.9	590	18.7	787	22.8
Maternal, child health services	260	7.5	218	6.4	200	6.3	187	5.4
Paediatricians private practice	3	0.1	2	0.1	4	0.1	12	0.3
Other	4	0.1	12	0.4	15	0.5	14	0.4
Total	3,478	100.0	3,418	100.0	3,158	100.0	3,462	100.0

Table 21 summarises the sources of notifications received over four years. The direct reporting system with the Royal Children’s Hospital and Monash Medical Centre has been in place now for many years and this makes an important contribution to the register. Almost 56% of notifications were obtained from the perinatal forms, which are completed by midwives during, or at completion of, the mother’s postnatal hospital stay. Cytogenetic laboratories continue to provide their information to the Register. **The confidential nature of the information from all sources is of utmost importance and is always recognised and dealt with accordingly.**

## TERMINATION OF PREGNANCY FOR A BIRTH DEFECT

Information on termination of pregnancy for fetal birth defect is obtained independently of the perinatal data. Table 22 summarises the categories of birth defects recognised in the pregnancies terminated. All were under 20 weeks gestation.

**Table 22 Termination of pregnancy under 20 weeks for a birth defect**

Anomaly	(n)
<b>Chromosome anomalies</b>	
Down syndrome	88
Trisomy 13	12
Trisomy 18	20
Other autosomal anomalies	9
Triploidy	13
Turner syndrome	15
Klinefelter syndrome	4
Other sex chromosome anomalies	1
Other chromosome anomalies	4

**Table 22 Termination of pregnancy under 20 weeks for a birth defect – continued**

Anomaly	(n)
<b>Nervous system</b>	
Anencephalus	22
Spina bifida with/without hydrocephalus	28
Encephalocele	2
Congenital hydrocephalus	4
Other nervous system defect	3
<b>Cardiac system</b>	
Hypoplastic left heart syndrome	1
Multiple cardiac	1
Other cardiac system defect	3
<b>Urogenital system</b>	
Potter syndrome	5
Cystic kidney disease	2
Other urogenital system defect	4
<b>Musculoskeletal system</b>	
Arthrogryposis multiplex congenita	1
Osteogenesis imperfecta	1
Chondrodystrophy	3
Achondroplastic dwarfism	1
Other specified dwarfing syndromes	1
Exomphalos	1
Diaphragmatic hernia	1
Other multiple musculoskeletal system defect	3
Other musculoskeletal system defect	9
<b>Genetic/metabolic</b>	
Thalassaemia	3
Cystic fibrosis	1
<b>Hydrops/effusions</b>	1
<b>Leukodystrophy</b>	1
<b>Congenital factor VIII disease</b>	1
<b>Cerebral lipidoses</b>	1
<b>Multiple system defects</b>	15
<b>Other unspecified congenital anomaly</b>	3
Total	288

Overall in 1999 there was an increase in the number of reported terminations of pregnancy for a birth defect, from 269 in 1998 to 288 in 1999. This increase was evident in the chromosomal abnormality group, where there were more fetuses with Down syndrome.

## 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.

## PRENATAL DIAGNOSIS AND GENETIC COUNSELLING IN RELATION TO BIRTH DEFECTS

The increasing role of prenatal diagnosis can be seen by comparing terminations for birth defects in the past 10 years: 139 (1990), 138 (1991), 154 (1992), 213 (1993), 250 (1994), 259 (1995), 260 (1996) 287 (1997), 269 (1998), and 288 (1999). Prenatal diagnosis by amniocentesis, by chorionic villus sampling (CVS), and occasionally by fetoscopy or fetal blood sampling is well established in Victoria. The public hospital and private cytogenetic laboratories who analyse the fetal samples provide data to the Murdoch Childrens Research Institute or the Perinatal Data Collection Unit so that an annual report can be compiled for distribution to service providers. (Available from Jane Halliday at PDCU). Use of ultrasound is not monitored in the same way but is known to be widespread in Victoria, and is responsible for identifying many of the birth defects.

Concern over the risk of Down syndrome in women aged 37 years and older is the most frequent reason for amniocentesis and chorionic villus sampling. However, each year there are more younger women utilising these diagnostic services as a result of an increasing uptake of first trimester ultrasound and both first and second trimester maternal serum screening.

It is important for clinicians to inform all women about prenatal screening. Second trimester maternal serum screening is widely available and this testing option should be offered to pregnant women of all ages. Advice should be offered in a way that respects the rights of women who do not want screening or diagnosis. Recommended best practice guidelines for prenatal screening [developed jointly by the Royal Australia New Zealand College of Obstetricians and Gynaecologists, (RANZCOG), and the Human Genetics Society of Australasia, (HGSA)] and a policy on prenatal diagnosis are available on the HGSA website: [www.hgsa.com.au](http://www.hgsa.com.au)

Most of the other groups of women for whom prenatal diagnosis is appropriate are certain to be aware of its availability because the indication is usually related to family history or a previous child with a birth defect. This applies to prenatal diagnosis of neural tube defects, inborn errors of metabolism, thalassaemia, and to couples who already have a child with a chromosomal abnormality.

The availability of prenatal diagnosis has increased the importance of making a precise diagnosis in any baby with a birth defect, and in offering skilled genetic counselling to the parents of all such babies.

Expertise in diagnosing birth defects and counselling families is available in the clinics of the Genetic Health Services Victoria at the Royal Children's Hospital, the Royal Women's Hospital, the Mercy Hospital for Women and the Monash Medical Centre. Services are also available at the Royal Melbourne Hospital, St Vincent's Hospital, the Royal Victorian Eye and Ear Hospital, and centres in Albury/Wodonga, Ballarat, Bendigo, Frankston, Geelong, Mildura, Sale, Shepparton, Traralgon, Warragul and Warrnambool. Genetic Health Services Victoria can be contacted on 8341 6201.

## POSTNEONATAL INFANT AND CHILD DEATH REVIEW

This section reports on postneonatal infant and child deaths which occurred during the 1999 calendar year.

The Consultative Council wishes to thank medical practitioners who provide additional information on infant and child deaths. As there are continuing reductions in childhood mortality the Council wishes to stress the importance of accurate data collection in these age groups. Such assistance with data provision to the Council is encouraged and greatly appreciated.

*Infant death* A death, occurring within one year of birth in a liveborn infant whose birthweight was at least 500g or at least 22 weeks gestation if the birthweight was not known. This category includes neonatal deaths as defined above.

*Child death* A death of a child occurring after and including their first birthday and up to, but not including, their 15th birthday.

*Infant mortality rate* (per 1,000 livebirths)

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

Six infant and eleven child deaths have been excluded because the children lived outside Victoria and died in Victoria after having been referred for treatment of a serious illness, such as a congenital cardiac malformation (6 cases), or for malignancies (5 cases).

**Table 23 Neonatal and postneonatal deaths 1990–1999**

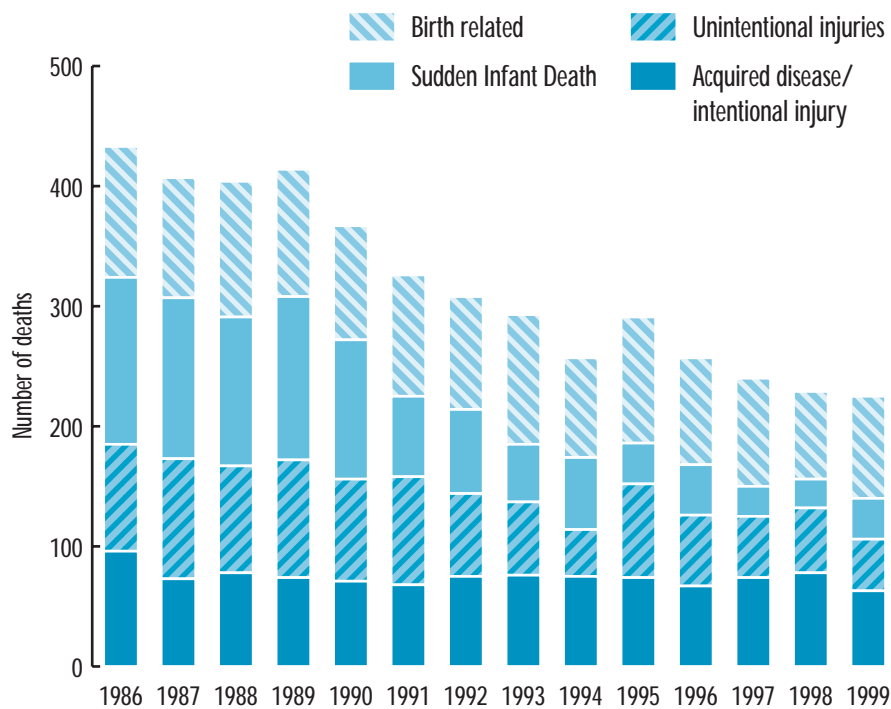
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Livebirths	66,350	64,632	65,815	64,284	64,376	63,214	62,429	61,815*	61,634	62,149
Neonatal deaths	273	224	191	165	184	193	157	160	164	171
Postneonatal deaths	175	123	120	96	102	94	82	87	77	88
Total infant deaths#	448	347	311	261	286	287	239	247	241	259
Infant mortality rate	6.8	5.4	4.7	4.1	4.4	4.5	3.8	4.0	3.9	4.2

\* Amended figure since 1997 report

# Neonatal and postneonatal infant deaths.

In 1999, there were 225 deaths in infants and children aged 29 days to 14 years (until the 15th birthday), comprising 88 postneonatal infant deaths and 137 child deaths. The numbers of postneonatal infant and child deaths from 1986 to 1999 are shown by category of death in Figure 6, and by age at death in Figure 7.

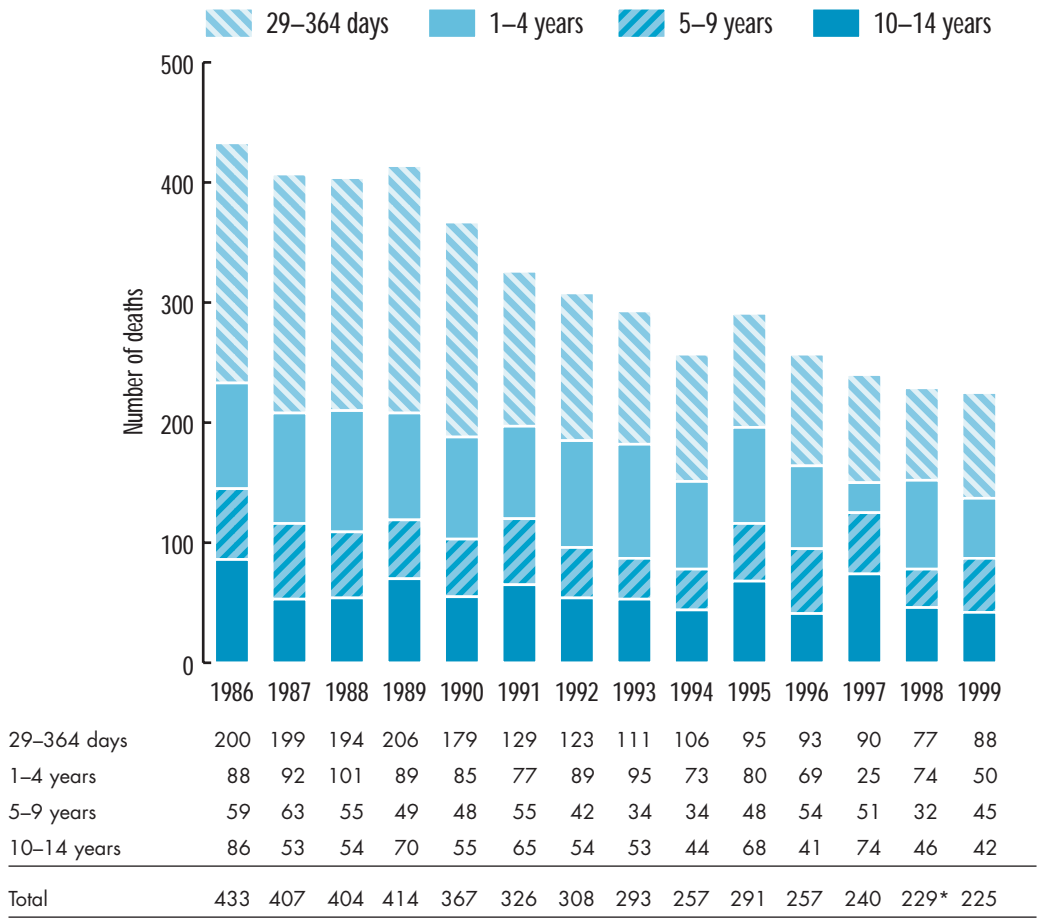
**Figure 6 Postneonatal infant and child deaths by major cause 1986–1999.**



	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Birth related	109	100	113	106	95	101	94	108	83	105	89	90	73	85
Sudden Infant Death	139	134	124	136	116	67	70	48	60	34	42	25	24	34
Unintentional injuries	89	100	89	98	85	90	69	61	39	78	59	51	54	43
Acquired disease/ intentional injury	96	73	78	74	71	68	75	76	75	74	67	74	78	63
<b>Total cases</b>	<b>433</b>	<b>407</b>	<b>404</b>	<b>414</b>	<b>367</b>	<b>326</b>	<b>308</b>	<b>293</b>	<b>257</b>	<b>291</b>	<b>257</b>	<b>240</b>	<b>229*</b>	<b>225</b>

\* Amended figure since 1998 report

**Figure 7 Postneonatal infant and child deaths by age group 1986–1999**



\* Amended figure since 1998 report

**Table 24 Cause of postneonatal infant and child deaths by age group**

Category	Age				Total
	29–364 days	1–4 years	5–9 years	10–14 years	
<b>Determined at birth</b>					
1A Birth hypoxia/asphyxia	2	3	1	3	9
1B Malformation/birth defect	30	13	11	8	62
1C Prematurity	10	1	1	–	12
1D Other	–	–	2	–	2
Subtotal	42	17	15	11	85
<b>Sudden Unexpected Death in Infancy</b>					
2A Explained (positive findings at autopsy)	–	–	–	–	0
<b>Sudden Infant Death Syndrome (SIDS)</b>					
2B Significant pathology (insufficient to explain death)	4	1	–	–	5
2C Minor condition	13	2	–	–	15
2D No significant abnormality detected	14	–	–	–	14
Subtotal	31	3	–	–	34
<b>Unintentional injuries</b>					
3A Motor vehicle	–	5	9	7	21
3B Drowning	2	9	1	2	14
3C Fire	1	2	–	1	4
3D Asphyxiation	–	1	–	–	1
3E Train	–	–	–	–	0
3F Other	–	–	2	1	3
Subtotal	3	17	12	11	43
<b>Acquired disease/Intentional injury</b>					
4A Infection	6	1	1	2	10
4B Malignancy	3	7	14	11	35
4C Other acquired disease*	3	4	3	3	13
4D Intentional trauma	–	1	–	–	1
4E Suicide	–	–	–	4	4
Subtotal	12	13	18	20	63
Total	88	50	45	42	225

\* Includes underdetermined cause

## CAUSES OF POSTNEONATAL INFANT AND CHILD DEATH DETERMINED AT BIRTH

### ***1A Perinatally acquired hypoxia/asphyxia***

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

### ***1B Birth defects***

There were 62 postneonatal infant and child deaths due to birth defects (Table 25). Birth defects are the major cause of postneonatal infant death, accounting for 71% of deaths in this age group. Cardiovascular system malformations were the largest group with 19 cases, followed by chromosomal and genetic disorders with 14 cases.

**Table 25 Deaths from birth defects**

Type of anomaly	Age				Total
	29–364 days	1–4 years	5–9 years	10–14 years	
Cardiovascular system	10	3	5	1	19
Multiple malformations	1	1	–	–	2
Chromosomal/genetic disorder	10	1	2	1	14
Neural tube/CNS	4	2	1	1	8
Muscular atrophy/dystrophy	2	1	–	–	3
Respiratory/diaphragmatic defects	2	–	–	–	2
Cystic fibrosis	–	1	–	3	4
Gastrointestinal/liver	1	–	–	–	1
Skeletal dysplasias	–	–	–	–	0
Metabolic disorders	–	3	3	1	7
Miscellaneous	–	1	–	1	2
<b>Total</b>	<b>30</b>	<b>13</b>	<b>11</b>	<b>8</b>	<b>62</b>

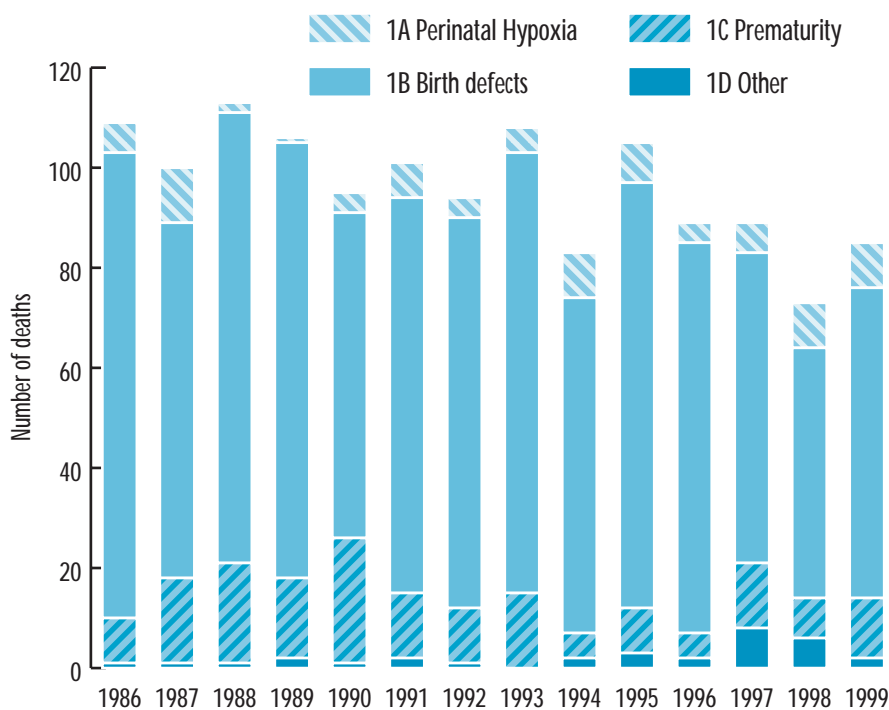
### ***1C Prematurity***

There were twelve postneonatal infant and child deaths in 1999 due to consequences of prematurity compared to eight in 1998 and thirteen in 1997. Eight infants had birthweights under 850 grams and the remaining four had birthweights between 850 and 1,150 grams. Six died from chronic lung disease, three from sepsis (*Candida*, *Pseudomonas* and Group B streptococcus), two from respiratory failure and one from heart failure.

### ***ID Other causes determined at birth***

There were two children in this group. One died from complications of cerebral palsy of undetermined cause and one from epilepsy.

**Figure 8 Causes of death determined at birth 1986–1999**



1A Perinatal hypoxia	6	11	2	1	4	7	4	5	9	8	4	6	9	9
1B Birth defects	93	71	90	87	65	79	78	88	67	85	78	62	50	62
1C Prematurity	9	17	20	16	25	13	11	15	5	9	5	13	8	12
1D Other	1	1	1	2	1	2	1	0	2	3	2	8	6	2
<b>Total cases</b>	<b>109</b>	<b>100</b>	<b>113</b>	<b>106</b>	<b>95</b>	<b>101</b>	<b>94</b>	<b>108</b>	<b>83</b>	<b>105</b>	<b>89</b>	<b>89</b>	<b>73</b>	<b>85</b>

## SUDDEN UNEXPECTED DEATH IN INFANCY (SUDI)

In 1999 there were 34 postneonatal infant and child deaths considered under this category, compared with 24 cases in 1998. In addition, 3 neonatal deaths were considered and reviewed in this category (Table 10). This brings the total number of sudden unexpected death in infancy in 1999 to 37 cases.

### *Terminology and classification*

The term *Sudden Unexpected Death In Infancy* (SUDI) is used by Council to include all infants and very young children where the death is sudden and unexpected on the basis of the clinical history, and replaces the term *cot death* which had been used in previous reports. As all cases must be referred to a Coroner, a thorough autopsy is almost invariably performed. **Council restricts the term *Sudden Infant Death Syndrome* (SIDS) to those cases where an autopsy fails to reveal an adequate cause of death.** There

are four subgroups of SUDI recognised by Council, of which only groups 2B, 2C and 2D are categorised as SIDS. These groups are determined after autopsy. The groups are:

- 2A Death explained by a medical condition. Significant pathology detected, sufficient to explain death.
- 2B Significant pathology identified, insufficient to explain death
- 2C Associated minor condition identified
- 2D No significant abnormality identified

Figure 9 shows the number of sudden unexpected deaths of neonates, infants and children in each category for the previous 13 years. There was a sharp decline in the number of sudden unexpected deaths in infancy since 1990, which was associated with the extensive public education campaign carried out by the Sudden Infant Death Research Foundation. **The campaign highlighted the association between the face-down sleeping position and other risk factors with an increased incidence of SIDS.**

### ***2A Death explained***

This category (where the cause of a sudden unexpected death can be explained by the detection at autopsy of such conditions as acute myocarditis, septicaemia, accidental asphyxiation and some metabolic abnormalities) is retained by the Council. There were no cases in this category in 1999.

### ***2B and 2C SIDS, Significant or minor pathology identified***

The majority of cases (62 per cent) fall into categories 2B or 2C where associated conditions are detected at autopsy but are insufficient to explain the death. The principal pathological findings for these cases are listed in Table 26. The most common conditions found at autopsy were respiratory infections and otitis media.

### ***2D SIDS-No significant abnormality detected***

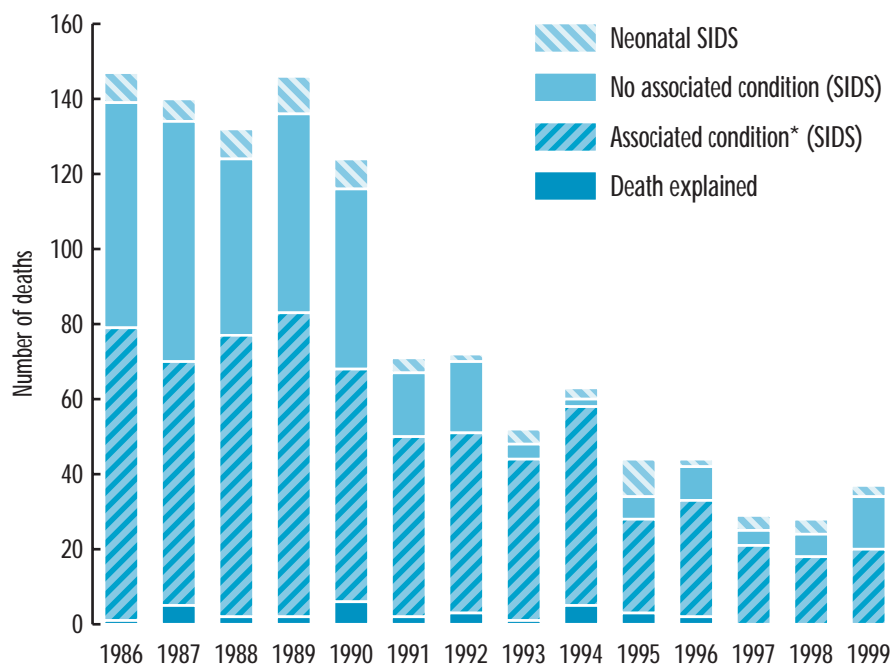
In 1999, fourteen cases (38 per cent) had no significant pathology detected.

**Table 26 Principal conditions associated with sudden unexpected deaths in infancy**

	Category	
	<b>2C</b> Minor pathology	<b>2B</b> Significant pathology
Respiratory tract/pulmonary infection	3	1
Otitis media	6	1
Pulmonary haemorrhage	0	2
Renal infection	1	0
Cerebral anomalies	0	1
Gastrointestinal conditions	2	0
Other	4	2
<b>Total*</b>	<b>16</b>	<b>7</b>

\* Three neonatal deaths included: (2C n=2; 2B n=1).

**Figure 9 Sudden unexpected deaths of neonates, infant and children 1986–1999**



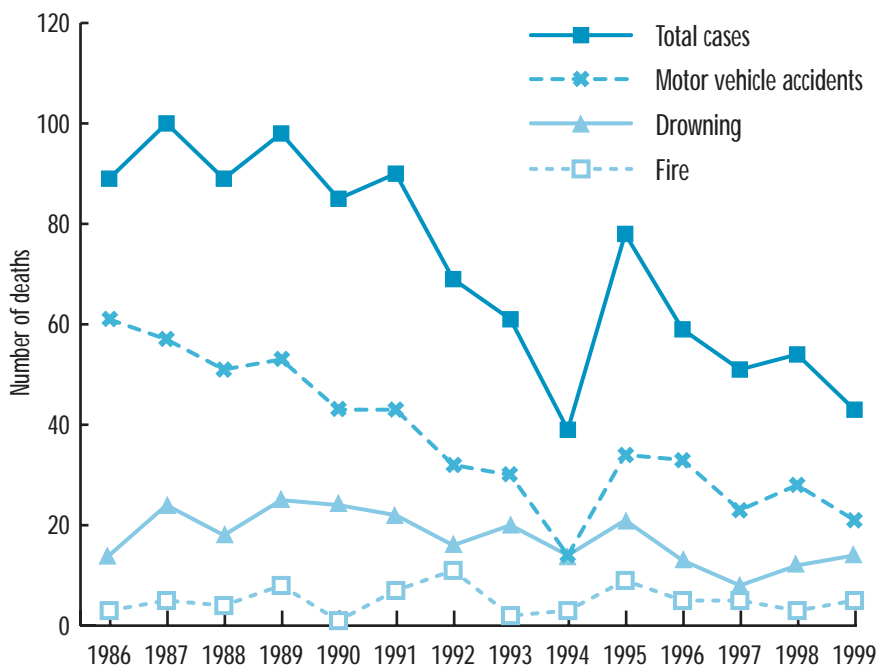
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Infant/child deaths	86	87	88	89	90	91	92	93	94	95	96	97	98	99
Death explained	1	5	2	2	6	2	3	1	5	3	2	-	-	-
Associated condition* (SIDS)	78	65	75	81	62	48	48	43	53	25	31	21	18	20
No associated condition (SIDS)	60	64	47	53	48	17	19	4	2	6	9	4	6	14
Subtotal infant/child cases	139	134	124	136	116	67	70	48	60	34	42	25	24	34
Neonatal SIDS	8	6	8	10	8	4	2	4	3	10	2	4	4	3
All age cases	147	140	132	146	124	71	72	52	63	44	44	29	28	37

\* Includes categories 2B and 2C

## UNINTENTIONAL INJURY DEATHS

There were 43 late postneonatal infant and child deaths due to unintentional injury in 1999 (Figure 10), compared to 54 deaths in 1998.

**Figure 10 Unintentional injury deaths 1986–1999**



Motor vehicle accidents	61	57	51	53	43	43	32	30	14	34	33	23	28	21
Drowning	14	24	18	25	24	22	16	20	14	21	13	8	12	14
Fire	3	5	4	8	1	7	11	2	3	9	5	5	3	4
Asphyxiation*	5	5	3	6	6	7	3	3	4	8	2	7	9	1
Train accidents*	1	0	5	2	1	2	2	2	1	2	0	3	0	0
Other*	5	9	8	4	10	9	5	4	3	4	6	5	2	3
<b>Total cases</b>	<b>89</b>	<b>100</b>	<b>89</b>	<b>98</b>	<b>85</b>	<b>90</b>	<b>69</b>	<b>61</b>	<b>39</b>	<b>78</b>	<b>59</b>	<b>51</b>	<b>54</b>	<b>43</b>

\* Not shown in Figure

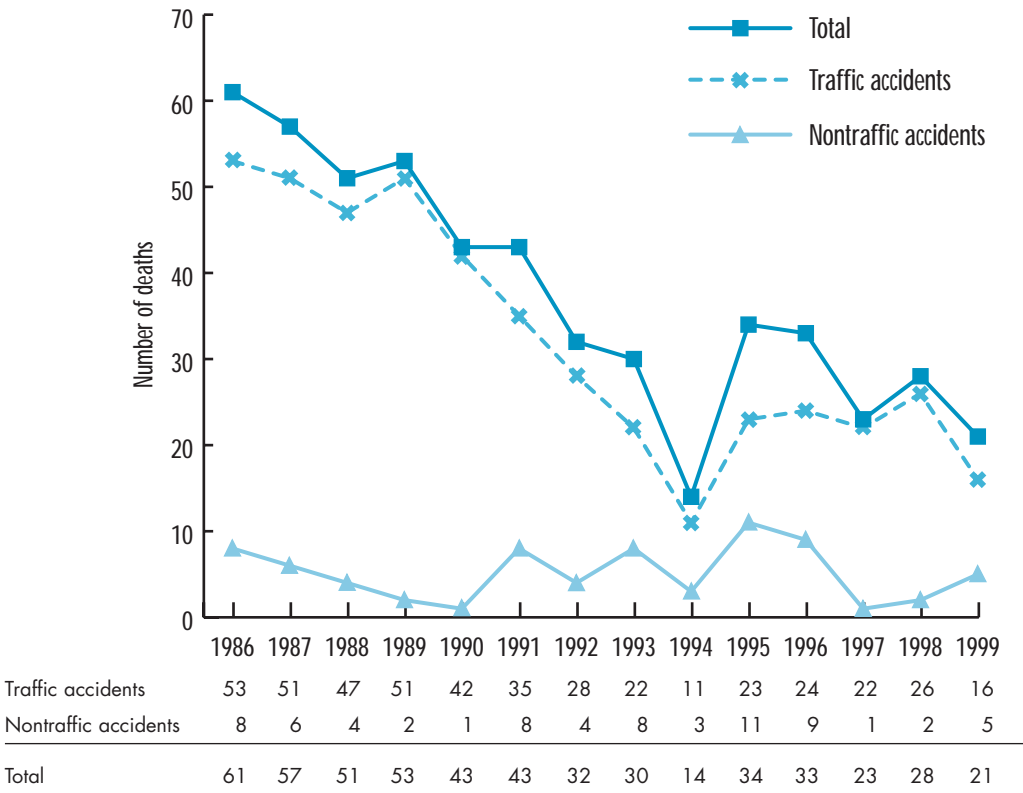
### 3A Motor vehicle

In 1999, the number of motor vehicle accident fatalities decreased to 21 (from 28 in 1998), and is the lowest since 1994. The mode of travel is listed in Table 36. In 85 per cent of these cases, at least one preventable factor was listed.

**Table 27 Mode of travel in motor vehicle fatalities**

Mode of travel	(n)
Passenger in motor vehicle	9
Pedestrian	5
Pedal cyclist	2
Falls from utility tray, trailer or tractor	4
Other: Rollerblades	1
<b>Total</b>	<b>21</b>

**Figure 11 Motor vehicle fatalities 1986–1999**



For the nine motor vehicle passenger deaths, six involved drivers losing control of the vehicle, and three were hit by another car or truck. Two cyclists crossed into the path of an oncoming car. Two pedestrians were run over in a driveway, two were attempting to cross a busy road, and one was crushed by a vehicle on private property.

### ***3B Drowning***

**There were fourteen deaths due to drowning in 1999, compared to 12 in 1998, and 8 in 1997.** The age range was from eight months to fourteen years, with 11 of the 14 deaths occurring in children aged three years or younger. Twelve cases had preventable factors identified.

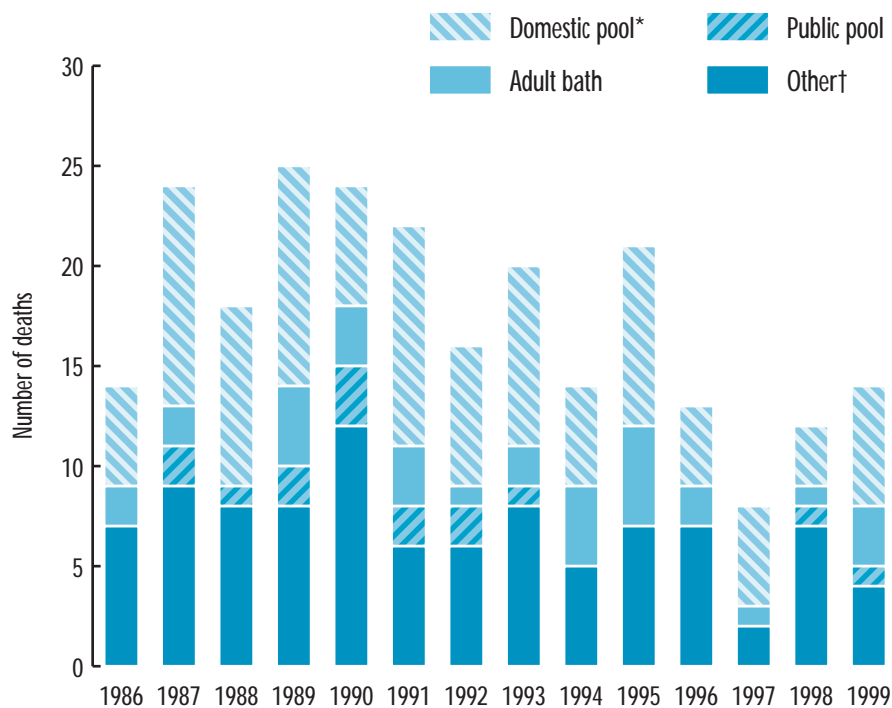
**Table 28 Location of drowning fatalities**

Location	(n)
Private pool	6
Public Pool	1
Dam	2
River/Sea	2
Adult bath	3
Total	14

For the six cases of drownings in a private pool, five were in fenced pools. The gate latch was faulty in one, and in another a child was left unsupervised inside a fenced pool. In the other cases the infant or child gained access to a fenced pool.

Two young children (both aged one year) drowned after being left in a bath with older siblings, while one eight month old infant drowned after being left unattended in a bath.

**Figure 12 Drowning fatalities 1986–1999**



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

\* 'Domestic Pool' includes spa, wading pool.

† 'Other' includes river, sea, dam, irrigation channel.

### **3C Fire**

There were four deaths as a result of fire, one more than in 1998. The children were aged from 11 months up to 12 years of age. Two died as a result of smoke inhalation and two from burns and smoke inhalation.

### **3D Asphyxiation**

There was one death in 1999 due to non-intentional (accidental) asphyxiation (compared to nine in 1998). There was one strangulation of an infant in a playpen near a venetian blind cord.

### **3F Other causes of unintentional injury death**

There were three children who died from other types of injuries. One child died from an explosion of a gas cylinder, another child died as a result of a snake bite, while one child died from injuries sustained from an unknown cause.

## PREVENTABLE FACTORS IN FATAL INJURIES

The Council considered that at least 81 per cent (35 of 43) of unintentional/accidental injury deaths were potentially preventable. This opinion is based on positive 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.

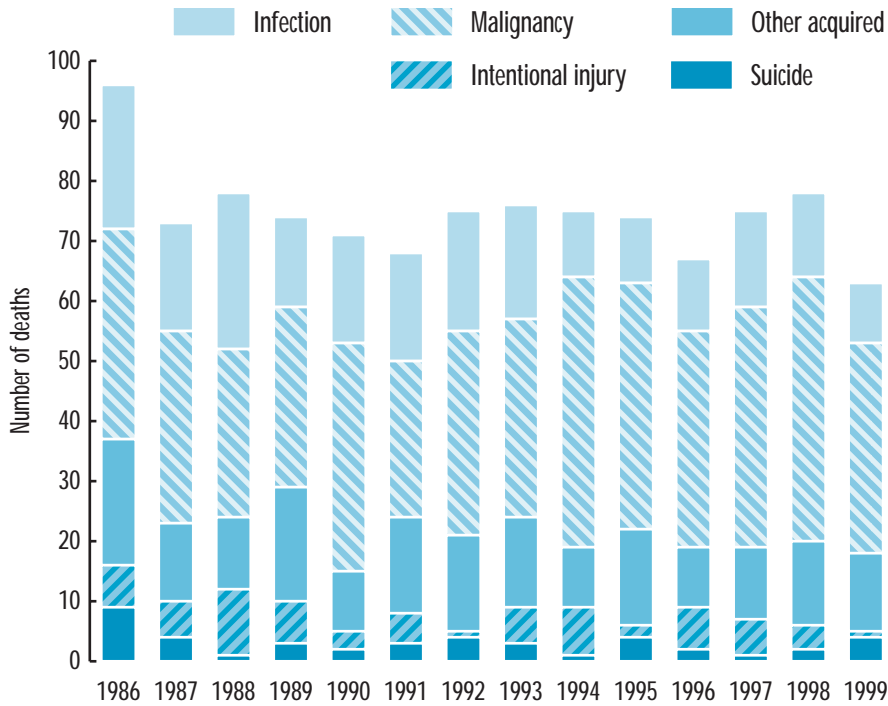
**Table 29 Preventable factors in unintentional injury deaths**

Preventable factor	Motor vehicle	Drowning	Fire	Asphyxiation	Other	Total
Seat restraint not used or not available	3	-	-	-	-	3
Excess speed	4	-	-	-	-	4
Alcohol/drugs	1	-	1	-	-	2
No helmet	1	-	-	-	-	1
Lack of median barrier	2	-	-	-	-	2
Poor road condition	1	-	-	-	-	1
In-line skater on public road	1	-	-	-	-	1
Inadequate caretaker supervision	8	12	2	1	-	23
Underage driver	1	-	-	-	-	1
Unfenced pool or spa	-	5	-	-	-	5
Failure of pool or house fence	-	3	-	-	-	3
Inadequate hazard protection	-	1	-	-	-	1
No smoke detector or failure	-	-	2	-	-	2
Exposed venetian blind cord	-	-	-	1	-	2
Substandard equipment	-	-	1	-	-	1
Inappropriate						
Total number of cases	20	14	4	2	3	43

## ACQUIRED DISEASE AND INTENTIONAL INJURY

There were 63 postneonatal infant and child deaths due to acquired diseases and intentional injuries in 1999, compared to 78 deaths in 1998. The number of cases in each acquired disease category since 1986 is shown in Figure 13.

**Figure 13 Acquired conditions and intentional injuries 1986–1999**



Infection	24	18	26	15	18	18	20	19	11	11	12	16	14	10
Malignancy	35	32	28	30	38	26	34	33	45	41	36	40	44	35
Other acquired	21	13	12	19	10	16	16	15	10	16	10	12	14	13
Intentional injury	7	6	11	7	3	5	1	6	8	2	7	6	4	1
Suicide	9	4	1	3	2	3	4	3	1	4	2	1	2	4
<b>Total</b>	<b>96</b>	<b>73</b>	<b>78</b>	<b>74</b>	<b>71</b>	<b>68</b>	<b>75</b>	<b>76</b>	<b>75</b>	<b>74</b>	<b>67</b>	<b>75</b>	<b>78</b>	<b>63</b>

#### **4A Infection**

There were 10 postneonatal infant and child deaths due to infection in 1999, outlined in Table 30.

**Table 30 Infections resulting in postneonatal infant and child deaths**

Type of infection	29–364 days	1–4 years	5–9 years	10–14 years	Total
Meningococcal septicaemia/meningitis	–	–	–	1	1
Pneumococcal meningitis	1	–	–	–	1
Escherichia coli meningitis	1	–	–	–	1
Haemophilus influenzaeC bronchopneumonia	1	–	–	–	1
Pneumonia: Varicella-zoster virus	–	1	–	–	1
Tracheobronchitis	1	–	–	–	1
Encephalitis	–	–	1	–	1
Myocarditis	1	–	–	–	1
Septic shock- unknown organism	1	–	–	1	2
Total	6	1	1	2	10

#### **4B Malignancy**

There were 35 postneonatal infant and child deaths due to malignancy, a decrease from 44 deaths in 1998. The types of tumours are listed in Table 31 by age group of child.

**Table 31 Deaths from malignancies**

Type of tumour	Infant	1–4 years	5–9 years	10–14 years	Total
Central nervous system					
Medulloblastoma	–	2	1	–	3
Brain stem glioma	–	–	3	1	4
Ependymoma	–	2	–	1	3
Glioblastoma	–	–	1	2	3
Choroid plexus papilloma	1	–	–	–	1
Leukaemia					
Acute leukaemia (not specified)	1	–	–	–	1
Acute myeloid leukaemia	–	–	–	1	1
Acute lymphatic leukaemia	1	–	6	1	8
Lymphoma	–	–	–	1	1
Neuroblastoma	–	1	1	–	2
Renal tumours					
Wilm’s tumour	–	–	1	–	1
Clear cell carcinoma	–	1	–	–	1
Sarcoma					
Rhabdomyosarcoma	–	–	1	1	2
Osteosarcoma	–	–	–	1	1
Neurofibrosarcoma	–	1	–	–	1
Ewing’s sarcoma	–	–	–	1	1
Multiple Endocrine neoplasia	–	–	–	1	1
Total	3	7	14	11	35

#### **4C Other acquired diseases**

There were 13 deaths due to other acquired diseases in 1999. There were four deaths as a result of asthma and three deaths related to epilepsy. The remaining deaths were from each of the following conditions: primary pulmonary hypertension, cardiomyopathy, cerebral oedema, cerebral thrombosis, haemolytic uremic syndrome, and one death related to dehydration.

#### **4D Intentional injury**

In 1999 there was one death in a young child as a result of abuse, compared to four deaths in 1998.

#### **4E Suicide**

There were four children, two aged 13 years and two aged 14 years, whose deaths were attributed to suicide, all by hanging.

## RECOMMENDATIONS FROM THE COUNCIL ON INFANT AND CHILD DEATHS

### ***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](http://www.sidsaustralia.org.au)

### ***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.

### ***Poisoning***

**Since the late 1970s, there has been a substantial reduction in infant and child deaths resulting from poisoning.**

**\* Remind new parents of risks, seek advice from the Poisons Information Centre**

Child-resistant packaging, publicity regarding prevention, and the availability of more effective treatment of most poisonings are among the factors contributing to this improvement.

Infant and child deaths from poisoning are now infrequent, but poisoning remains a common indication for hospital admission in children less than 5 years of age. The parents of each new generation of toddlers need to be reminded of the preventive measures that include:

- Buying products with child-resistant closures.
- Installing a child-resistant storage cupboard.
- Putting medications and poisons away immediately after use.
- Never leaving medications or poisons on a bench or table.

Practitioners are reminded that advice on the optimal management of children suspected of ingesting toxic substances is readily available from the Poisons Information Centre, telephone 13 11 26.

### ***Dog-bites***

#### **\* Choose the right breed for the family**

Dog bites are a significant cause of injury in young children. It is important that families choose the breed of dog carefully to suit their lifestyle and environment. Certain breeds may not be appropriate if young children are in the household. **Young children should always be supervised around dogs and separated from them at feeding time.** Information on responsible dog ownership and dog-bite prevention is available through The Safety Centre, Royal Children's Hospital Melbourne, telephone (03) 9345 5085.

### ***Nursery furniture***

#### **\* Cot design standard now mandated**

To prevent hazardous cots coming onto the market, as of mid-1998, the Australian/New Zealand Standard on the design and manufacture of infant domestic cots has been mandated. This means that all cots sold or supplied must now conform with the Standard. The risk of injury, particularly asphyxiation, still exists if the cot is broken or the mattress ill-fitting. Parents of infants and toddlers must be aware of such dangers and advised about the appropriate sleeping environment for their children. Further information is available from Kidsafe Victoria (Child Accident Prevention Foundation of Australia) telephone (03) 9427 1008 or visit the Kidsafe Victoria website: [www.kidsafe.com.au](http://www.kidsafe.com.au).

### ***Depression or suicidal thoughts***

#### **\* Refer to a specialist**

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.

### ***Cigarette lighters, matches, and candles***

#### **\* Use child-resistant lighters**

Children playing with matches or cigarette lighters continue to cause injuries and fatalities. As of October 1, 1997, new laws on the sale of disposable cigarette lighters came into force. Such lighters are now required to have child-resistant features (that is, a device that impedes small children from operating the lighter) and warning labels. The Council also wishes to stress the danger of house fires if lit candles are left unattended.

### ***Trailers and utilities***

Council wishes to repeat its warning on the dangers of allowing children to travel in a trailer or in the tray of a utility, whether it be on or off road.

### ***Referral for paediatric intensive care***

There is strong evidence that critically ill children have a lower mortality if they are looked after in specialist paediatric intensive care units in tertiary hospitals, rather than mixed adult and paediatric units or units in nontertiary hospitals.

All children who need endotracheal intubation for more than 24 hours should be referred to a paediatric intensive care unit, and the Unit should be advised well in advance if this is considered a possibility. A 1997 study, after adjustment for severity of illness, found that Victorian children in intensive care had a mortality rate that was only 57 per cent of the rate for children from the Trent region of England where intensive care services for children are decentralised (*Lancet* 1997;349:1213–1217).

Children less than 16 years of age should be referred to the Paediatric Emergency Transport Service (PETS) for transfer to a paediatric intensive care unit if they have:

- Any condition likely to need intubation for more than 24 hours (for example, severe croup, asthma or bronchiolitis).
- Shock or a need for inotropes (for example, severe sepsis).
- Coma (for example, due to head injury, prolonged convulsions, drowning or asphyxia).
- Meningitis in any child <2 years old.
- Diabetic ketoacidosis in any child <2 years old.

### ***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) if the following exists:

#### *CNS*

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

#### *Respiratory*

- Retraction – moderate or severe chest retraction

#### *CVS*

- Pallor – sudden onset of persistent generalised pallor

#### *Uncommon findings*

- Bilious vomiting, grunting, apnoea, fits

\* Information obtained from the history.

### ***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).

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).

### ***Sudden death from asthma***

**\* Every child with asthma must have a crisis plan**

Children with unrecognised or under-treated persistent asthma are at risk of a sudden fatal episode. In addition, children with apparently trivial, infrequent asthma can develop (extremely rapidly) a severe episode of bronchospasm that may be fatal unless appropriate emergency measures are undertaken. It is thus essential that **every patient with asthma should have a crisis plan to cope with a sudden severe episode**. If there is no response to one or two doses of the normal bronchodilator medication, urgent professional help should be sought and usually this should be an ambulance. While awaiting the arrival of this help, the patient should continue to take very frequent or continuous doses of inhaled sympathomimetic.

Good treatment for asthma requires excellent communication between the patient, the parents, and the medical practitioners involved. In several deaths in previous years, the Council was concerned that there appeared to be inadequate communication between specialist and family practitioner on the nature of the child's asthma and its treatment. Every effort must be made to ensure full information is transmitted between all doctors and the family involved in a particular patient's care.

### ***Corticosteroids in children with severe sepsis***

Children who have not yet started antibiotics may benefit from a single large dose of steroids (for example, hydrocortisone 50mg/kg, maximum 1 gram) if this can be given 10 minutes before they receive the **first** dose of antibiotics.

## ***Meningitis***

**\* Avoid lumbar puncture if there is coma, prolonged fits or focal signs**

Fatal cerebral herniation (coning) may occur in children with meningitis following lumbar puncture. It is advised that lumbar puncture should not be performed in a child with an acute febrile illness if there is:

- Coma (with no purposeful response to pain).
- Prolonged fitting, or
- Focal neurological signs.

Parenteral antibiotic therapy should be commenced, after taking a blood culture where possible, in such children. Children with suspected meningitis who are comatose or have prolonged fitting should be referred to a paediatric intensive care unit (see the section on the Paediatric Emergency Transport Service).

## ***Diabetic ketoacidosis***

**\* Give fluid 10–20 mL/kg if poor perfusion, then slow rehydration**

Some children with diabetic ketoacidosis develop subclinical cerebral oedema that is evident on a CT scan. About 1 per cent develop clinical signs of cerebral oedema with a high mortality; most are newly-diagnosed diabetics. The risk of cerebral oedema in diabetic ketoacidosis means that the fluid deficit should be replaced evenly over 48 to 72 hours (except that 10 to 20 mL/kg boluses of replacement fluid should be given immediately if there is hypotension or poor peripheral perfusion). In children over 12 months of age, the fluid given (replacement plus maintenance) should have a potassium concentration of 20 to 40 mmol/L and a sodium concentration of 125 mmol/L for the first 12 hours, and 75 mmol/L for the next 32 hours.

## ***Dehydration***

**\* Consider dangers of sedation**

In dehydrated infants and children, consideration should be given to omitting or giving a much reduced dose of sedatives, narcotics and preoperative medications such as papaveratum (Omnopon).

## ***Gastroenteritis***

**\* Continue breast feeds and/or solids; avoid high sugar fluids**

The need for hospitalisation for young children with gastroenteritis should be carefully assessed. If admission is not chosen, there is a need for repeated reviews of the child's condition as deterioration can occur quite rapidly.

Mortality from gastroenteritis has decreased since the dangers associated with the use of lemonade have been appreciated. **Dehydration can be prevented or treated by the oral administration of a solution containing 1 to 2 per cent glucose.** However, higher concentrations of glucose may exacerbate diarrhoea by an osmotic effect. Undiluted lemonade or fruit juices, which contain 8 to 10 per cent sugar, must never be used to treat gastroenteritis. Breast feeding and/or solids should be continued.

Mild diarrhoea can be treated by encouraging the child to drink extra normal fluids. Severe diarrhoea should be treated with a commercially available oral rehydrating fluid containing sodium, potassium, chloride, citrate, and 1 to 2 per cent glucose (such as Gastrolyte).

### ***Urinary tract infection***

**\* May present as pyrexia of unknown origin PUO, vomiting or failure to thrive**

Urinary tract infection in an infant often presents as pyrexia of unknown origin (PUO), unexplained vomiting and/or failure to thrive. It should always be suspected in such cases.

### ***Paracetamol***

Paracetamol provides useful relief of symptoms caused by minor acute infections, for postoperative pain, and after vaccination.

**However, it is rarely appropriate to use paracetamol to treat fever.** Fever is part of the normal host immune response to infection. Treatment with paracetamol increases the duration of symptoms in chickenpox (*Journal of Pediatrics* 1989;114:1045–48) and measles (*Indian Journal of Pediatrics* 1981;18:49–52), decreases the antibody response to infection (*Journal of Paediatrics and Child Health* 1993;29:84–85), and increases mortality in severe infections (*Lancet* 1995;345:338). Paracetamol does not provide effective prophylaxis against febrile convulsions (*Journal of Pediatrics* 1995;126:991–995).

Paracetamol may be used sparingly to relieve discomfort in mild acute infections, but it should not be used to treat fever. There is a danger that children with serious illness will be treated at home with paracetamol, and that this will delay effective treatment for their illness.

### ***Surgical emergencies***

**\* Consult a specialist paediatric surgeon**

In children with suspected appendicitis that is not confirmed at laparotomy, the patient should be carefully reviewed as there are other serious causes of abdominal pain to be excluded. Council's opinion is that paediatric specialists, surgical and resuscitatorial, should be involved in childhood surgical emergencies.

### ***Immunisation***

The importance of routine immunisation is again stressed. The National Health and Medical Research Council schedule is included in the section on vaccine-preventable diseases.

### ***Very preterm babies***

**\* Recognise families that need social and economic support**

Many extremely immature and very low birthweight infants born in or transferred to tertiary maternity hospitals are discharged to a regional or district hospital before finally going home. Support to ameliorate economic and social adversity is important to the preterm infant and the family after the infant is discharged. There is evidence to show this improves developmental outcome and leads to more appropriate utilisation of health services in infancy and later in childhood.

Parents should be made aware of the importance of regular follow-up assessments and appreciate that, in the first two years of life, more hospital admissions for medical and surgical indications may be necessary compared with infants born at term.

### ***Snakebite***

#### **\* Discuss with the Royal Children's Hospital Intensive Care Unit**

Snakebite may be lethal or cause serious illness in children. The lethal species found in Victoria are Tiger, Brown, Copperhead and Red-belly Black snakes. If envenomation has occurred and the species of the snake is unknown, give one ampoule of Tiger snake antivenom (3,000 units) and one ampoule of Brown Snake antivenom (1,000 units) intravenously. The dose depends on the amount of venom injected, not the size of the patient. Higher doses of antivenom may be required depending on the child's clinical state and blood coagulation tests (prothrombin time, partial thromboplastin time, fibrinogen and platelet count). The treatment of a child with snakebite should be discussed with the Intensive Care Unit at the Royal Children's Hospital, telephone (03) 9345 5211.

# IMMUNISATION AND VACCINE-PREVENTABLE DISEASES

In 1999, Victoria's immunisation programme continued with universal service provided by all local governments, over 2,000 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.

The enhanced measles surveillance programme, funded by the Victorian Department of Human Services, in collaboration with the Victorian Infectious Diseases Reference Laboratory continued in 1999. All suspected cases of measles reported to DHS are intensively followed up and serology is requested. As measles may be confused with other viral rashes, individuals with suspected measles are also tested for recent rubella or parvovirus infection. The mobile immunisation service contract to operate in the Western Metropolitan Region targeting children under the age of seven who were overdue for scheduled immunisations concluded in mid 1999. Similar services which commenced in early 1998 in three other Department of Human Services' regions – the Grampians, Southern and Hume – continued to operate throughout 1999. Performance evaluation processes of these three mobile immunisation services commenced in late 1999.

As usual, the incidence of vaccine-preventable diseases was monitored through the Health (Infectious Diseases) Regulations 1990 and by supplementary surveillance activities. A detailed analysis was published in the report *Surveillance of Notifiable Infectious Diseases in Victoria 1999*, Public Health Division, Department of Human Services, 2000.

In 1999, the Health (Immunisation) Regulations 1990 were updated to the Health (Immunisation) Regulations 1999 to reflect the current ASVS. Accordingly, children entering primary school in Victoria from the 2000 school year onwards require two doses of measles mumps rubella (MMR) vaccine and 5 doses of diphtheria tetanus pertussis (DTP) vaccine to be regarded as fully immunised. Exemptions exist for appropriate catch up schedules if required.

## ***1. Vaccine Preventable Diseases***

### ***Measles***

There were 99 confirmed cases of measles identified in Victoria in 1999 and a further 10 clinically compatible cases which could not be laboratory confirmed or epidemiologically linked to a laboratory confirmed case.

Five episodes of measles imported into Victoria were detected during 1999. These and the cases linked to them accounted for 98 of the 99 confirmed cases, including 75 cases which were part of the largest identified measles outbreak in Victoria since the re-introduction of notification in the early 1990s. The first case in this outbreak was a 21 year old female who had become infected with measles while holidaying in Bali. Of the 75 cases in this cluster, 64 (85 per cent) were born between 1968 and 1981; 28 (37 per cent) were hospitalised for a total of 97 inpatient days; and five (7 per cent) were health care workers (see <http://www.dhs.vic.gov.au/phd/vidb/vidbv2i2.pdf>). In another outbreak, 12 cases of measles (three laboratory confirmed and nine epidemiologically linked) were identified among the East Timorese evacuees at the Puckapunyal Safe Haven in September and October 1999.

The enhanced surveillance system has facilitated the early identification and improved management of measles clusters in the Victorian community. The surveillance data show that the clusters of measles in Victoria were triggered by virus importation and that, if exposed, young adults aged 18–30 years in 1999 are at high risk of measles infection.

### ***Haemophilus influenzae Type b (Hib) Infection***

The number of Hib infections notified to the Department remains low. There were two notifications of meningitis due to Hib and two other cases of septicaemia due to Hib in 1999; no epiglottitis notifications due to Hib were reported. All were children aged under five years. The notification rate in this age group has fallen from 71.7 per 100,000 population in 1991 to 0.6 per 100,000 in 1999.

### ***Pertussis***

There were 998 notifications of pertussis in 1999, of which 54 per cent were female. The median age of cases was 20 years (range 0–86 years). The age distribution varied according to gender, with female cases (median 25 years) being generally older than male cases (median 16 years). Only 112 notifications involved children aged over 2 months and under 8 years, which is the age range for pertussis vaccination.

### ***Mumps***

There were 73 notifications of mumps in 1999, of which 29 (40 per cent) were female and 44 (60 per cent) were male. Six cases (8 per cent) were confirmed by a laboratory, while a clinical diagnosis was the basis of the remainder of cases. Seventy-four per cent of notifications were for children and young adults aged under 20 years.

### ***Rubella***

There were 123 notifications of rubella in 1999, of which 71 (58 per cent) were male and 52 (42 per cent) were female. The notification rate was highest among males aged under 5 years. Males aged under 1 year accounted for 27 cases (38 per cent of notifications among males) compared with 13 females in the same age group (25 per cent of notifications among females). Fifteen notifications were for females aged 15–44 years, compared with 12 in males in this age group. There have been no cases of congenital rubella syndrome identified since 1996.

## ***2. Immunisation coverage***

At December 1999, full immunisation coverage at 12 months of age was 88.0%. Coverage with three doses of diphtheria tetanus pertussis (DTP) vaccine was 89.0%, three doses of *Haemophilus influenzae* type b (Hib) vaccine 88.6% and three doses of oral polio vaccine 89.1%. All of these estimates are slightly above the national average, which was 87.0% for full immunisation coverage at 12 months of age. At two years of age, 90.5% of children had received the first dose of measles mumps rubella (MMR) vaccine; 83.5% had received the fourth dose of DTP vaccine, and 76.8% of children were fully immunised. Again, Victoria was above the national average, with 74.9% 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.

The current immunisation schedule endorsed by the Department of Human Services Victoria is shown in Table 32.

**Table 32 Recommended immunisation schedule, 0–19 years (September 2001)**

Age	Immunisation
Birth	Hepatitis B Vaccine
2 months	Diphtheria/Tetanus/Pertussis Vaccine Oral Polio Vaccine Hib (Haemophilus influenzae type b)/Hepatitis B Vaccine
4 months	Diphtheria/Tetanus/Pertussis Vaccine Oral Polio Vaccine Hib (Haemophilus influenzae type b)/Hepatitis B Vaccine
6 months	Diphtheria/Tetanus/Pertussis Vaccine Oral Polio Vaccine
12 months	Measles/Mumps/Rubella Vaccine Hib (Haemophilus influenzae type b)/Hepatitis B Vaccine
18 months	Diphtheria/Tetanus/Pertussis Vaccine
4 years	Diphtheria/Tetanus/Pertussis Vaccine Oral Polio Vaccine Measles/Mumps/Rubella Vaccine
Year 7 at school	Hepatitis B Vaccine (1st dose)
4–6 months later	Hepatitis B Vaccine (2nd dose)
Prior to leaving school 15–19 years	Adult Diphtheria/Tetanus Vaccine

# 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), which defines maternal death as:

**“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”. The WHO definition includes death from abortion and ectopic pregnancy, but **excludes incidental deaths** from causes unrelated to pregnancy, such as death from injury. In this and in other reports on maternal deaths in Australia, incidental deaths are included. Council reviews and reports separately 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 this may even apply within Australia. Council is making systematic effort 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.

## *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, heart disease, 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 is difficult to determine that a death from apparent suicide or a death from homicide was entirely unrelated to the pregnancy. This is an important reason for including “incidental” deaths in the consideration of maternal mortality.

## ***Maternal mortality ratios***

The Maternal Mortality ratio is defined as follows:

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

The term *ratio* is used rather than rate in acknowledgement that the true denominator (ie actual numbers of women pregnant in a given year) cannot be accurately determined.

## ***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 in 1953, to just under 10 in 1993. Since 1993 the ratio has been relatively constant, averaging just over 9 per 100,000 with minor fluctuations. The members of the maternal mortality committee agree that continued surveillance of these deaths should continue, and that we have not reached an irreducible minimum incidence of maternal deaths.

**Table 33 Maternal deaths in Victoria 1953–1999**

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

**Table 33 Maternal deaths in Victoria 1953–1999**

Year	Births			Maternal deaths	Maternal Mortality ratio (per 100,000 total births)*
	Livebirths	Stillbirths	Total births		
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
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

\* Deaths per 100,000 births. Previous reports have used rate per 1,000 births

\*\* Updated from the 1998 report

### ***Maternal Deaths for 1999***

In 1999, there were nine maternal deaths: 2 direct, 2 indirect and 5 incidental deaths. Council notes the increase in the numbers of maternal deaths in 1999 compared to 1998, from 3 to 9, and the consequent increase in the rate from 4.8 to 14.4 per 100,000 total births. The major contribution to this increase was in the category of incidental deaths, which largely lie outside the area of responsibility of clinicians. This increase is partly explained by better ascertainment.

It should also be noted that when numerators are very small and denominators very large, as is the case with the Maternal Mortality Ratio, chance fluctuations should not be over-interpreted. In the process of confidential inquiry into each of these maternal deaths, the maternal mortality subcommittee did not identify any emerging pattern of causation or preventability. The committee will continue to monitor these deaths carefully.

## ***Avoidable factors***

The review of these nine cases serves as a reminder that most of the deaths are consequent on exceptionally rare chance adverse events, with no avoidable factors, but the committee made the following comments:

- The importance of seat belts for pregnant motor vehicle passengers is emphasised.
- In the initial assessment of vague or non-specific symptoms in a pregnant woman, the possibility of sepsis needs to be considered. This may allow early and appropriate investigation and treatment to be initiated and if necessary, prompt transfer to a centre with intensive care facilities.

## ***Causes of the nine maternal deaths:***

### ***Direct deaths***

- Multipara. Previous lower segment caesarean section. At 35 weeks gestation, developed abdominal pain - progressed. Presented to Level II hospital assessment: suspected ruptured caesarean section scar – prompt resuscitation and laparotomy. Fetus stillborn. Large retroperitoneal haematoma – possibly originating from renal artery. Developed severe disseminated intravascular coagulation. Transferred to ICU. Died despite expert resuscitation. Post mortem: Unable to determine site of origin of bleeding (There is a possibility that this may be an indirect death – the findings of the Coronial investigation are awaited).
- First pregnancy. Spontaneous onset of labour at 41 weeks gestation. Emergency caesarean for non-progressive labour, despite oxytocin augmentation and epidural. No operative difficulties. On day 2, sudden collapse with dyspnoea – rapidly deteriorated. Could not be resuscitated. Post mortem examination: Large saddle embolus within pulmonary artery. Bilateral deep calf vein thromboses. No apparent risk factors for thrombo-embolism. No coagulation studies reported.

*Note: The UK RCOG Working Party on Prophylaxis against Thromboembolism recommends that any patient undergoing emergency caesarean section during labour be considered at moderate risk for thromboembolism and receive either subcutaneous heparin thrombo prophylaxis or mechanical methods such as elastic stockings. The Australian Advisory Committee on Maternal Morbidity and Mortality recommends that prophylaxis should be considered for risk factors such as obesity and immobilisation, but has not yet recommended thrombo prophylaxis as a routine for emergency caesarean section during labour.*

### ***Indirect deaths***

- Multipara. Previous severe postnatal depression requiring hospitalisation. Elective repeat caesarean section at term. Under care of consultant psychiatrist. Four weeks later – fatal overdose of antidepressant medication.
- Multipara. No relevant past medical history. First trimester – 10 day history of nausea and vomiting. Collapsed at home with headache and seizures. Transferred from rural hospital to tertiary neurosurgical service. MRI suggested extensive sagittal and transverse sinus thrombosis. Treated with steroids and supportive therapy. Coagulation studies negative. Progressive neurological deterioration. No post-mortem examination.

### ***Incidental deaths***

- Elective Caesarean section at 35 weeks gestation in a patient with known extensive metastatic melanoma. Died 4 weeks post partum.
- Pregnant woman at term, front seat passenger in motor vehicle accident. Not wearing seat belt.
- Thirty weeks pregnant. Known heroin addiction. Accidental heroin overdose.
- Motor vehicle accident – pedestrian, mid trimester.
- Multipara, uncomplicated pregnancy. Developed sore throat and malaise at 35 weeks, followed by vague abdominal pain and fever. Rapid deterioration over a two hour period after presenting to maternity admission area. Transferred to ICU. Moribund on arrival. Caesarean section performed – infant stillborn. Mother died despite expert resuscitation. Blood cultures subsequently grew *Neisseria Meningitidis*. Postmortem examination: destruction of adrenal glands consistent with overwhelming meningococcal infection.

### ***Addendum***

An additional indirect maternal death was identified for 1998.

- Multipara. History of depression for a number of years. First trimester. Found dead in bath. Toxicology showed high levels of narcotics and anti-depressant medication. Coroner's finding: Suicide, depression, possibly exacerbated by pregnancy.

Reference:

The National Maternal Mortality Triennial Reports may be accessed through: [www.health.gov.au/nhmrc/publications](http://www.health.gov.au/nhmrc/publications).

## AT-RISK PREGNANCIES

While obstetric complications may occur in any pregnancy at any time, Council reminds practitioners that certain categories of patient 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***

Age (younger than 20 years, or older than 35 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

When birth is anticipated at gestation under 34 weeks or for any other indication in which a neonatal intensive care unit is anticipated, consultation with the Newborn Emergency Transport Service (NETS) is strongly recommended.

Direct communication at Consultant Obstetrician level is encouraged in order to ensure the transfer is appropriate and safe. Where decisions about mode of transfer or need for a medical escort are unclear NETS can often provide important information about the logistics of the various options.

## NEWBORN EMERGENCY TRANSPORT SERVICE (NETS)

During 1999 there were 1,405 transfers, similar to the previous record year. 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 34 Transfers by NETS 1991–1999**

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Primary transfers, metropolitan	476	502	457	410	497	489	474	502	499
Primary transfers, country, road	119	104	123	103	114	111	99	125	147
Primary transfers, country, air ambulance	98	123	94	118	126	98	121	134	115
Return transfers	183	238	219	207	265	456	556	658	628
Special investigations	10	6	10	4	9	17	17	14	16
Total	886	973	903	842	1,011	1,171	1,267	1,433	1,405

### *Selection of infants for transfer*

For comprehensive information on the Newborn Emergency Transport Service visit the NETS website:

<http://www.rch.unimelb.edu.au/NETS/>

The following are some suggested reasons for transport. It is vital to assess the time and the staff and facilities requested 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.

### **1. Respiratory distress**

An infant with an oxygen requirement of more than 40 per cent needs to be in a hospital with skilled personnel and facilities for monitoring arterial blood gases. An infant needing more than 60 per cent oxygen usually 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 paediatric consultant and requires referral to a NICU.

### **2. 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 an intensive care consultant including the advisability of and arrangement for transfer.*

### **3. 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 Level 3 nursery.

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:

1. 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.

2. 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. Intensive care units are situated at the Mercy Hospital for Women, Monash Medical Centre, Royal Children's Hospital and Royal Women's Hospital. A transport team will be dispatched to the referring hospital and will assume responsibility for the care of the baby on arrival or at such time after arrival as the referring doctor releases the infant.

**In most instances NETS advises that the impulse to 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:

Newborn Emergency Transport Service Education Division  
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 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 Victoria.

Information and bookings for educational sessions, may be made by telephoning (03) 9344 2419 or (03) 9344 2355, or visit the NETS website: [www.rch.unimelb.edu.au/NETS](http://www.rch.unimelb.edu.au/NETS).

## 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: [henningr@cryptic.rch.unimelb.edu.au](mailto:henningr@cryptic.rch.unimelb.edu.au), or from the PETS website: [www.rchpets.org](http://www.rchpets.org).

**Table 35 Transfers by PETS, 1990–1999**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Injuries:										
head injury	12	19	22	19	17	19	20	24	18	20
immersion	6	9	9	3	10	–	5	4	4	9
poisoning	7	5	–	6	4	7	5	6	6	4
other	9	6	5	15	9	6	5	7	7	25
Cardiovascular	4	8	10	9	3	10	2	1	3	1
Neurology:										
fits	18	18	18	24	16	19	19	22	42	36
meningitis	15	12	20	10	3	9	5	7	10	10
other	6	7	8	4	13	6	10	8	6	9
Respiratory:										
asthma	15	23	31	34	47	23	28	30	33	37
bronchiolitis	8	6	4	7	4	9	8	8	9	17
croup	50	34	53	27	44	18	24	19	15	19
epiglottitis	36	28	27	11	3	2	1	1	1	0
other	10	11	17	18	21	18	24	14	16	16
Miscellaneous:										
septic shock	4	3	2	4	5	13	9	8	6	14
other	1	5	5	10	8	1	15	10	10	20
<b>Total</b>	<b>201</b>	<b>194</b>	<b>231</b>	<b>201</b>	<b>207</b>	<b>160</b>	<b>180</b>	<b>169</b>	<b>186</b>	<b>237</b>

## ***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.

### ***Septic and hypovolaemic shock***

- Lack of adequate venous access.
- Inadequate volume replacement.
- Failure to use dopamine.
- Failure to monitor blood pressure adequately.
- Uncorrected acidosis or anaemia.
- Uncorrected hypoxia or hypoventilation.

**CONSULTATIVE COUNCIL  
ON  
OBSTETRIC AND PAEDIATRIC  
MORTALITY AND MORBIDITY**

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