



**MONASH** University  
Accident Research Centre

**Child and early adolescent drowning  
deaths in developing communities:  
Victoria, a case study**

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# 1. INTRODUCTION

Death due to drowning is a substantial global problem. An estimated 382,000 people drowned worldwide in 2002 [4]. The majority of drownings, 97%, occur in low- and middle-income countries [5] and many of the victims were children, with drowning being the leading cause of death of children in some countries.

One of the barriers to developing strategies to prevent drowning in developing countries has been the lack of detailed information concerning the size and nature of the problem in these communities. However, a number of recent studies have begun to provide data on the drowning problem in several lower income countries [6-11], thus contributing to the development of a knowledge base to inform drowning prevention policy and strategy in these communities.

Another potential source of data to inform this process is the experience of communities who have successfully reduced drowning deaths. One such community is the Australian state, Victoria<sup>1</sup>, which has experienced marked drowning reductions over its history since European settlement in the 19<sup>th</sup> century. In Victoria in 2006, the unintentional drowning rate for all ages was 0.72 deaths per 100,000 [12]. This represents a considerable reduction from earlier years. In 1863, Victoria experienced a year of extremely high drowning mortality with a total rate of 54.4 deaths per 100,000 [13], compared with an average of 35.6 deaths per 100,000 in the years preceding and following (1861,1862,1864,1865).

The study reported here is part of a broader historical eco-epidemiological study aiming to track the patterns of drowning deaths for people of all ages in Victoria, and to identify factors and historical trends that have led to a reduction in drowning deaths to inform the process of drowning prevention in contemporary high drowning risk communities.

## 1.1 Aims of study

This study specifically addresses the issue of drowning deaths in children (0-4 and 5-9 years of age) and early adolescents (10-14 years of age) in an evolving community. It does this by using the state of Victoria as a case study, investigating the state's experiences relating to drowning during its development.

The study compares the patterns of drowning deaths early in the state's development with those in more recent times. It aims to identify changes in the circumstances associated with drownings to enable an understanding of the factors or conditions that produced high drowning risk and those that are associated with a relatively low drowning mortality.

Specifically, it aims to compare, for 0-14 year olds, circumstances associated with drowning deaths and changes in patterns during a period of early development and high drowning incidence with a period of more advanced development and low drowning incidence.

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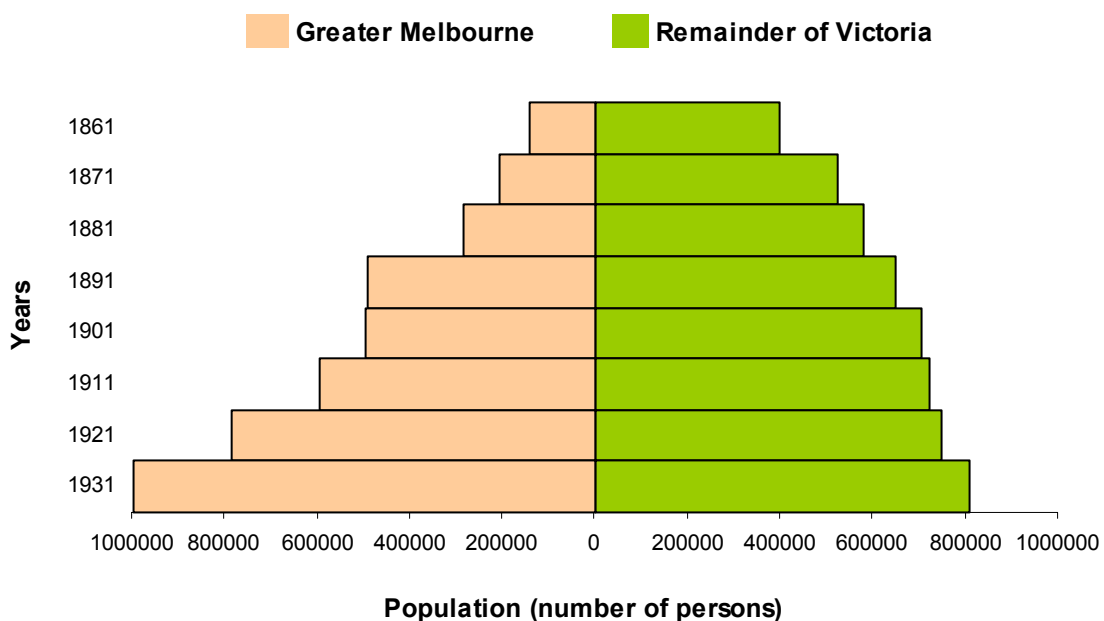
1. From 1836 to 1851, the region now known as Victoria was a district of New South Wales. It became an independent self administered colony in 1851 and a state in 1901.[3]

## 1.2 Overview of Victoria

Most of Victoria has a warm temperate climate. It covers 227,416 square kilometres, being 3% of Australia’s landmass, and agricultural activity occupies 61 percent of the land [14]. It has 2,512 kilometres of coastline [15] and an extensive series of river systems [16]. The state has a history of both widespread and localised flooding [17]. There are many natural and man made bodies of water, including bays, rivers, creeks, waterholes, lakes, reservoirs, farm dams, irrigation channels. The summer climate is conducive to recreational water use, the temperature at times exceeding 40° C. during this period. In 2006, Victoria had a population of 5,091,666, more than 3.5 million of whom live in the capital city, Melbourne [18] .

Victoria’s first main European settlement began in 1836 with the first settlers establishing their own defacto government on 1 June of that year [19]. Since that time the state has undergone considerable change. Following the discovery of gold deposits in 1851, the population of Victoria rose from 97,489 people in 1851, to 538,234 by 1860, and to 1,025,476 by 1887 [20]. Changes in the physical, social and economic environments were associated with these large and rapid population changes.

A major demographic change that occurred during the 19<sup>th</sup> century was the urbanisation of the population. In the mid 1800’s, the majority of Victoria’s population lived away from the metropolitan region (Figure 1), but towards the end of the 19<sup>th</sup> century there was a shift to urban locations. Seventy-five percent of Victoria’s 278,000-population increase from 1881 to 1891 was located in Melbourne [21]. By the 1930’s, the urban population exceeded the rural population. It has been demonstrated elsewhere that drowning risk is greater in rural communities [22, 23], and therefore this move away from rural living may be expected to be associated with drowning rate reductions.



**Figure 1** Relative distribution of population in Greater Melbourne region and the remainder of Victoria. Data source: Victorian Year Book, 1932-33 [24].

## 2. METHODS

Two time periods were chosen to provide a comparison of circumstances associated with different drowning risks, one in the 19<sup>th</sup> century and one in the 20<sup>th</sup> century. The year of 1863 was selected as an example of a year of high risk (total unintentional drowning rate of 54.4 deaths per 100,000), and where the level of development was such that it would have some resemblance to developing communities in the 21<sup>st</sup> century. This year was compared with the years 1969 and 1973 (total unintentional drowning rates of 2.3 and 1.9 deaths per 100,000 respectively). These two years were selected randomly from a time period when drowning mortality was relatively low and the level of development more closely resembled contemporary conditions in high-income communities. As the number of drowning deaths in the last half of the 20<sup>th</sup> century was much lower than in the 19<sup>th</sup> century, it was necessary to combine data from two years to allow sufficient case numbers to be able to make a comparison with the 1863 sample.

### 2.1 Circumstances of deaths

In Victoria from 1840, the death of a person by drowning required the conduct of an inquest to establish the cause of death. An inquest attempts to determine the identity of the deceased, the circumstances surrounding the death, the medical cause of death, the identity of any persons contributing to the cause of death and to gather information necessary to register the death.[25]

Inquests were presided over by a coroner, the earliest being either police, magistrates, barristers, solicitors or doctors. Findings were initially made on the basis of a verdict handed down by a jury of at least 12 persons, with agreement required from 12 members. From 1887 juries consisted of between 5 and 12 members with a majority verdict being accepted. The use of juries was abolished by an amendment to the Coroner's Act in 1903, although the Act specified their presence in cases where a coroner considered it desirable.

When an Inquest was held, it was generally held locally and the registration of the inquest and storage of the records was carried out centrally by the Registrar General. Prior to 1971 it was possible for an inquest to be presided over by a Justice of the Peace. These Inquests were known as "Magisterial Inquiries". [26]

Paper based records of inquests dating from 1840 have been preserved and are currently held by the Public Records Office of Victoria.

For this study, inquest records relating to drowning deaths for the years 1863, 1969 and 1973 were accessed. Drowning cases were identified using the Macbeth Inquest Index Victoria 1840-1985 [27].

The records were found to vary in the amount and nature of information they contained. In the 19<sup>th</sup> century, inquest records were hand written and showed considerable differences in nature and amount of content, depending on the person conducting the inquiry and the nature of the incident. These records varied from a single page statement of details of deceased, basic

circumstances and the inquest finding, to more extensive and thorough investigations into background and circumstances including statements from a number of sources: witnesses, family members and occasionally from police and medical practitioners. Post –mortem examinations were not common in 19<sup>th</sup> century inquiries.

By the mid-20<sup>th</sup> century, inquiries were more systematic and reports tended to follow standard formats and included a greater range of material: police and post-mortem reports, photographic material, diagrammatic representation of location etc. These later reports also tended to be more complete in the provision of data such as age, date of death, place of usual residence and physical health.

The following information was manually collected from the coronial records, where available:

- Inquest number
- Gender
- Age
- Location of death
- Circumstances of death

The main features of the cases were extracted from the depositions and recorded as text summaries. Information of particular interest were: relevant characteristics of deceased, the circumstances leading up to and at the time of the drowning incident, the nature of the incident, and information about the broader social and physical environment in which the incident occurred.

## **2.2 Analysis of coronial information**

The cases were analysed to determine:

- The activities the deceased was engaged in immediately prior to or at the time of the drowning event
- The location of the drowning event

These factors were also analysed on the basis of the victim's age. Three age groupings were employed: 0-4; 5-9; 10-14 years.

Knowledge of the activities and locations associated with the drowning events can be of value in several ways. It allows the identification of high-risk situations, which is a fundamental requirement for drowning prevention, and for an historical study such as this, it allows an understanding of an earlier lifestyle and the types of risks associated with that lifestyle. This historical component should allow an appreciation of the impact of changes in behavioural and physical factors, which may be of value in the prediction of consequences of future changes.

### **2.2.1 Problems with classification**

The coronial case records were found to vary greatly in the amount of information available concerning the activities of the deceased or the location of the event.

## **Unwitnessed**

Drownings of children aged 0-4 years, and to a lesser extent those aged 5-9 years, presented particular difficulties in identification of specific activities. The deaths of many of these younger children were unwitnessed, and therefore it was not possible to know exactly what they were doing at the time. Consequently, in the absence of statement of a specific activity these cases have been included in the category “playing or walking in or near water”. The primary intention of this category is to indicate that submersion in water was an unintentional consequence of being in close proximity to the body of water in which they drowned.

## **Swimming**

“Swim” in normal language use and as defined in dictionaries (Macquarie Dictionary: to move along or in water by movements of the limbs, fins, tail, etc.; move on or in water or other liquid in any way, especially on the surface; to float on the surface of water or other liquid) [28], makes no reference to the level of competency of this activity. Therefore, someone entering water for recreational purposes but unable to swim, or only able to swim a few strokes, is still referred to as having gone swimming. However, for the purposes of water survival, a higher level of swimming competency may be required, such that the person is able to move in water in such a way as to maintain respiration. Only occasionally do the coroner’s reports include comments about the level of swimming ability of the person.

In the analysis of the coronial information, the term “swimming” is used to indicate that the person has intentionally entered the water, primarily for recreational purposes. It says nothing about the level of swimming skills.

## **Waterhole**

The classification of the location “waterhole” also presented some problems. The term appeared to be used to refer to a number of different situations:

- Deep hole in creek or river
- Hole dug for the purpose of storing water, sometimes also referred to as dam, reservoir or well
- Hole dug for purpose other than water storage (eg gold mining, clay removal for building purposes) but which has become filled with rain water

For the purpose of analyses, it was often difficult to know to which type of waterhole reference was made. Where it was clear that the waterhole was in a creek or river, these cases were classified as being located in creek or river, not in waterhole. However, for cases classified as occurring in waterholes it was possible that some of them may have been more correctly classified as creek/river but there was insufficient information to show that this was the case.

## **2.3 Population of children and early adolescents**

Interpretation of changes in injury frequency across differing populations requires an appreciation of differences in the size of the target populations. Age specific population data for 1863 and 1969 was not available. However, age specific data was available for the census years 1861 and 1966 [29, 30] and these statistics have been used in the following analyses. While this reduces the accuracy, this is the best available data. Full age specific population data was obtained for 1973.

The populations of children and early adolescents in Victoria increased markedly between eras of interest (Figure 2). There were also considerable changes in the relative proportions of the age groups in the populations (Figure 3). While the age mix in the 1960's and 1970's show an even distribution of the ages, in the early 1860's, there was a predominance of younger children.

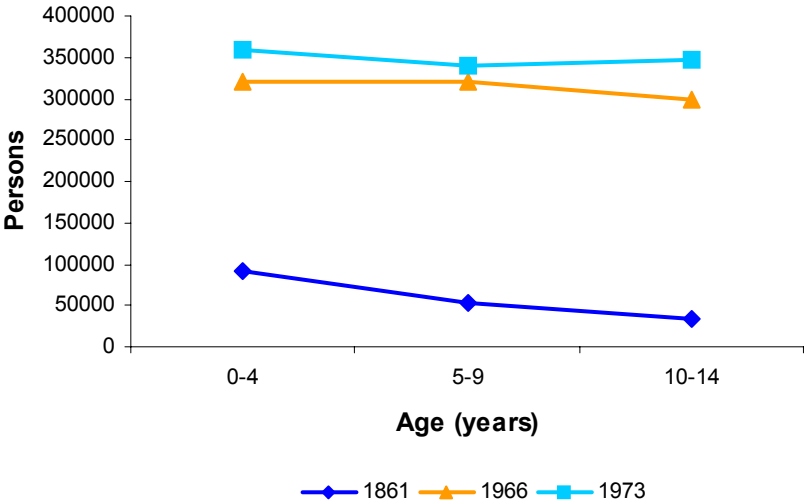


Figure 2 Numbers of children and early adolescents in the Victorian population during the target eras.

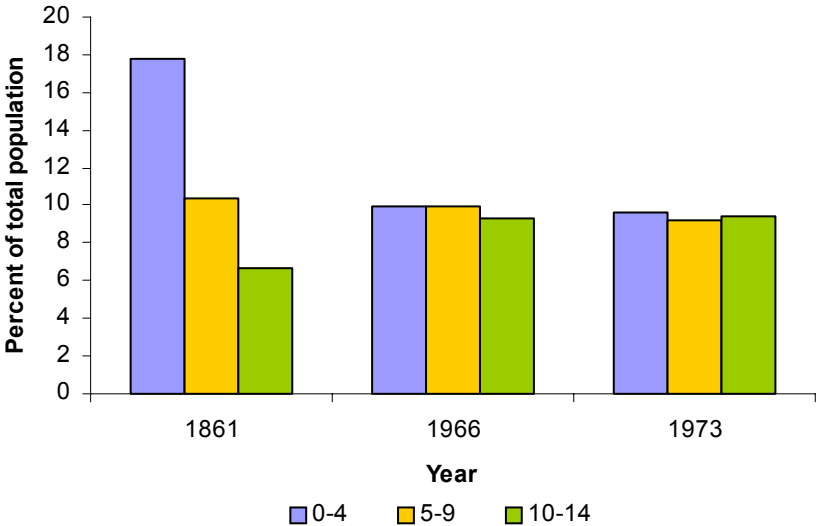


Figure 3 Age groups as a proportions of the total population of Victoria during the target eras

## 2.4 Expected drowning frequencies

Based on the increases in the target populations, if there had been no changes in risk factors, the number of drowning deaths would also be expected to increase proportionally. For example if there were 10 drownings of 0-4 year olds in waterholes in 1863, in 1969/73 if the

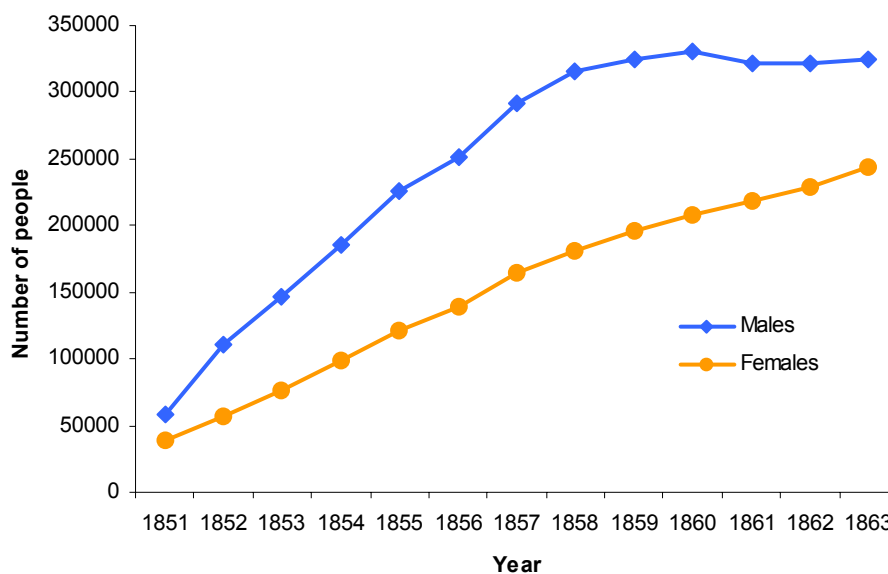
population of this age group was 4 times that in 1863, then it would be expected that there would be 40 drownings in 1969/73.

Therefore, comparisons were made between expected drowning frequencies, based on age-specific population change, and observed drowning frequencies for each age group to determine whether the level of hazard associated with locations had changed over time.

Expected frequencies were calculated using published population statistics. As no age specific population data was available for the years 1863 and 1969, the data for 1861 and 1966 were used in their stead. Age specific proportional population increases were calculated, averaging over 1966 and 1973, and these were used to determine the expected mortality for 1969/73 based on the mortality frequency in 1863 at specific locations.

## 2.5 Victoria in 1863

In 1863, Victoria had a total population of 567,906. In the years prior to 1863, Victoria had undergone a rapid increase in population (Figure 4) associated with the discovery of gold deposits in Victoria in 1851.

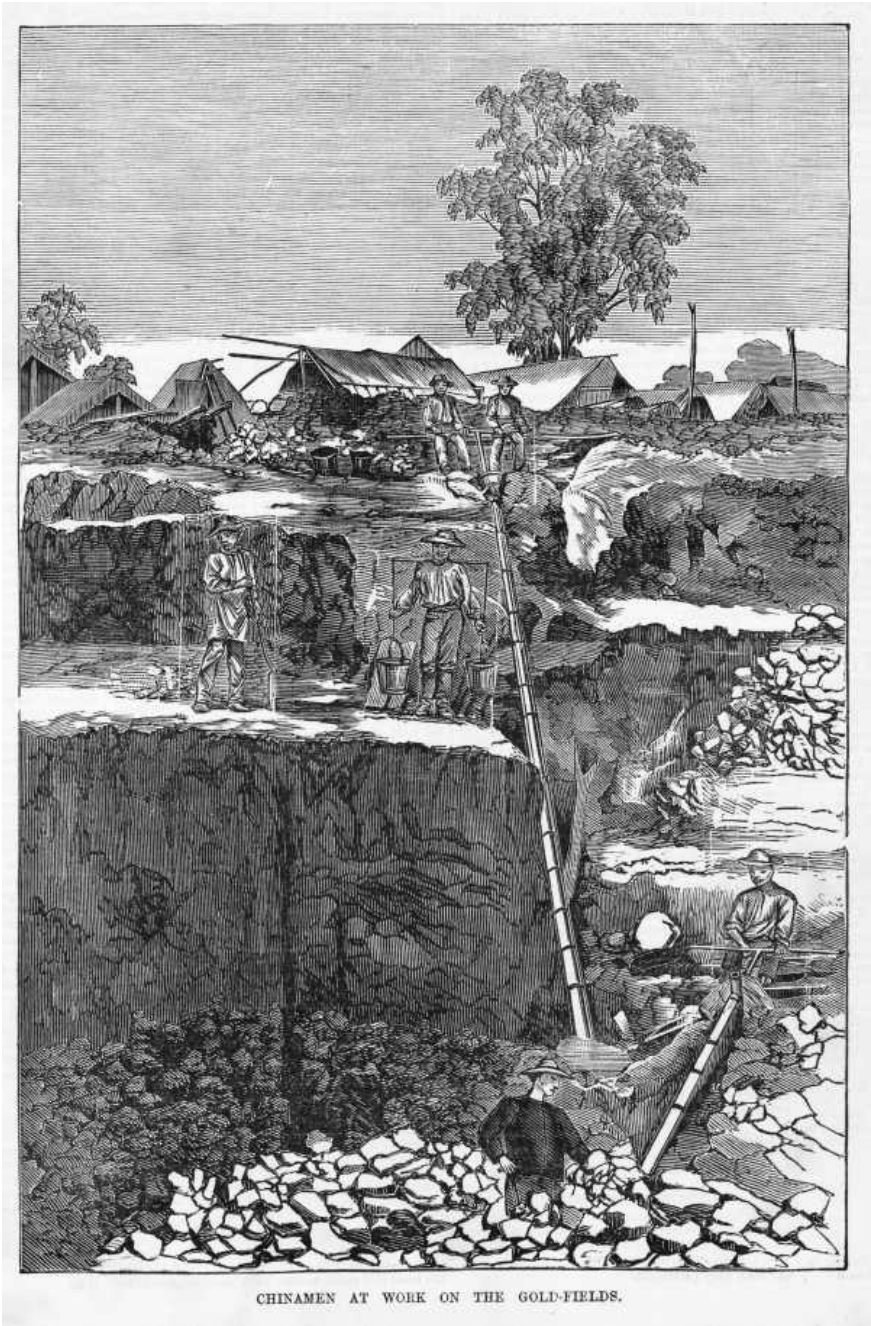


**Figure 4** Population of Victoria for the years following the discovery of gold.

In 1861, most (74%) of Victoria's population resided outside urban locations [24] and many dwellings were temporary in nature being constructed of canvas, bark or mud, with 39% of all the dwellings being of these types [31].

Many worked and lived on the gold fields with, by 1860, 42% of Victorians, including large numbers of children, living at these locations. In 1861 there was a total of 108,403 children under 15 years of age in Victoria, and over 45,000 of these lived in gold mining areas [32]. The dwellings of miners and their families were often in close proximity to the gold diggings and their associated water hazards, of open channels, dams, and water filled holes (Figure 5).

In 1863, Victoria also experienced the additional hazards associated with high levels of rainfall and floods. The Argus newspaper reported flooding in various regions around Victoria throughout the year with only the months of May and September being free of reported flooding. There were reports of flooding in many regions during the winter months of June and July, and in the spring month of October, with multiple reports of drowning incidents related to these floods.



**Figure 5** View of gold fields in Victoria, 1863, showing the close proximity of diggings and residences. Source – Latrobe Picture Collection, State Library Victoria

## 2.6 Victoria in 1960's and 70's

The results of the 1966 census [33] showed living conditions in Victoria substantially different to those of 1863. The population had increased to 3,219,526, and in contrast to the situation in 1861 where most lived outside the urban area, most people (85%) now lived in urban locations. Residences were now more substantial (Figure 6). Of the 881,448 private dwellings in Victoria in 1966, only 0.4% were temporary in nature (i.e. shed, hut or tent).

By this time private motorised transport availability was high, with a national rate of 1.1 motor vehicles for each occupied dwelling. In 1968, in Victoria, there were 364 motor vehicles registered per 1,000 of population and 100,922 miles of roadway open to general traffic. This high level of mobility enabled families to travel to more remote locations for recreational activities.

Agricultural industry was widely established and there were 1,313,888 acres of irrigated land.

By 1971, the population of Victoria had increased to 3,502,357 persons, with over a million dwellings [34]. By this time only a small minority of the Australian workforce were engaged in mining (1.4%) or rural occupations (7.4%).



**Figure 6** New housing estate in outer Melbourne suburb, 1970. Source: Latrobe Picture Collection, State Library Victoria

### 3. RESULTS AND DISCUSSION

#### 3.1 Activities

Sections 3.1.1 to 3.1.6 provide graphical summaries of activities associated with drowning deaths for each age group for each era. These sections also include brief summaries and/or excerpts from a sample of incidents. The findings are discussed in sections 3.1.7. and 3.1.8. The following format is used for identifying case examples in this section: Year of inquest/Inquest identification number e.g. 1863/479

##### 3.1.1 Activities: 0-4 years

###### 1863

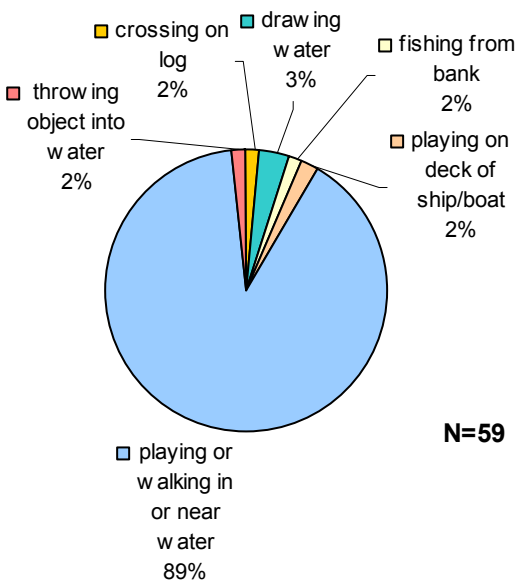
1863/479  
 3 years: male  
*Playing or walking in or near water.* Fell into waterhole 5 feet deep in yard of father’s residence. Playing alone in garden. Child was in habit of playing at the waterhole, which was usually dry, but had been filled by rain. Hole used to be fenced off but had been removed for repair.

1863/286  
 3 years 11 months: female  
*Crossing on log.* Drowned in water filled mining hole. Witness – “in going to a log which she was in the habit of crossing I saw a white froth over the water...then I saw her hair...the log is commonly used as a crossing place and is chopped narrow at one end.”

1863/731  
 2 years 5 months: male  
*Drawing water.* Drowned in waterhole close to the house. Mother left home at noon to take dinner to her husband, and left the child in care of his 15-year-old sister. Mother – “I am inclined to think the child must have gone for some water as I missed the "Billy" (*water container*) and found it afterwards in the waterhole.”

1863/7  
 4 years: male  
*Fishing from bank.* Fell into a cooler race (*mining channel*) while fishing. His fishing rod was not long enough so he stooped over and fell in headfirst. Accompanied by 8-year-old brother.

1863/307  
 3 years 9 months: male  
*Playing on deck of boat.* Aunt – “I have been living with my sister on board the block-ship about three weeks during her...confinement.... the child...was playing on the deck of the Hulk with the dog.” Found floating in the water.



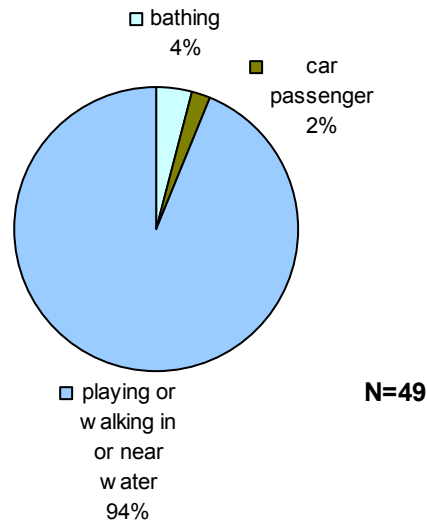
### 3.1.2 Activities: 0-4 years

#### 1969/73

1969/1445

2 years: male

*Playing or walking in or near water.* Nearly 3 years of age. Went missing with 3-year-old friend riding tricycles. His tricycle found near river and the deceased was found in the water. The river has a 3-foot tide, and at low ebb the water is not noticeable owing to grass and weeds along edge of bank. Mother knew deceased was playing in street outside home with other boy when he went missing. Seen playing near boat launch ramp.



1969/2315

4 years: male

*Bathing.* Drowned in bath. Mother was in habit of leaving the boy in bath to play with toys for 10-15 mins. On this occasion she had a lot of housework to do so left him in there 30 minutes, checking occasionally.

1973/315

6 months: female

*Car passenger.* Deceased was a passenger in car driven by her mother, which skidded on a bend in a wet road, and went down embankment into a creek.

1973/2112

1 year 5 months: male

*Playing or walking in or near water.* Drowned in a round concrete calf trough in the paddock near the farmhouse. The deceased been playing with 2 other children (approximately 4 years of age) in the rear garden. The mother went out occasionally to check on the children.

1973/2053

1 year 6 months: male

*Playing or walking in or near water.* Was in care of grandparents. Grandmother left him playing in backyard with his 8-year-old sister while she went into house to prepare a meal. Child appeared to have climbed onto a filtration system tank and then a further 18" into a swimming pool. Grandmother – "if I knew he could climb up there I would have taken some precautions."

### 3.1.3 Activities: 5-9 years

#### 1863

1863/321

6 years: female

*Crossing on log.* Mother... "I last saw her alive about 1.30pm yesterday, at which time she left my tent to go to school. I did not see her again until she was taken out of the waterhole, dead, last evening. She would have to cross the creek to reach school. I have seen deceased cross the creek on the log over the waterhole in which her body was found." Father - "I last saw her alive yesterday about 12.15pm. She was then coming from school to her dinner... people used a log as a crossing."

1863/849

8 years: female and 6 years: male

*Crossing on log.* Brother and sister last seen by mother going in direction of the creek. Witness – "saw the two children going in the direction of (creek) towards where there is a log over the creek, at one side of the log there is a deep hole... I have often seen the deceased playing about the creek, and they used to cross near where they were found."

1863/705

8 years: male

*Drawing water.* Waterhole 60 yards from the farmhouse. Employed by farmer for last 11 months. Was sent to waterhole by farmer's wife to get two buckets of water. Farmer's wife – "Only saw one bucket at the waterhole... went down to the hole and saw the boy's hat swimming in the water."

1863/182

5 years: male

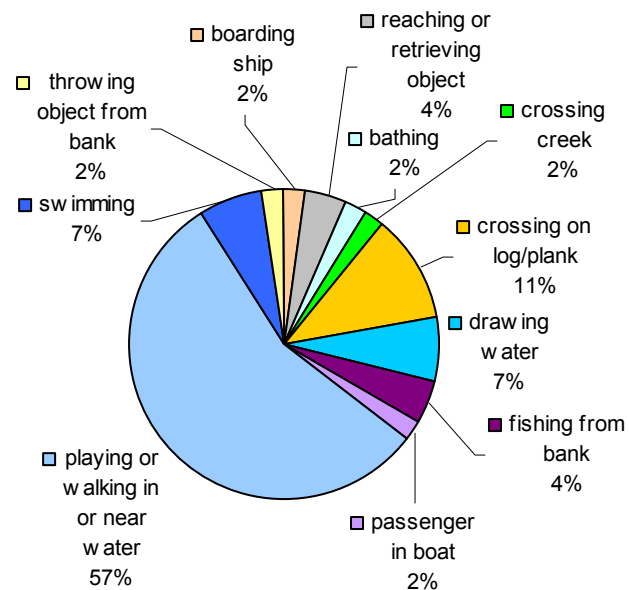
*Playing or walking in or near water.* Fell into river while playing on the bank on way home from school. With brother (7 years) and friends. Deceased was sitting on a post, which over hung the water and slipped off. Brother - "I held a stick to him but he did not take hold of it..."

1863/1166

9 years: male

6 years: male

*Swimming.* Neighbour saw the brothers bathing in a waterhole with other 6-year-old boy. She told them to come out but they refused. Waterhole was fenced down the middle, the side they were on was not deep but on the other side of the fence the hole was deep. Neighbour left them there as they were on the safe side. Witness – "most of the hole is about two and half feet of water until I came suddenly upon a deep place about 7 feet deep where we got the bodies."



N=45

### 3.1.4 Activities: 5-9 years

#### 1969/73

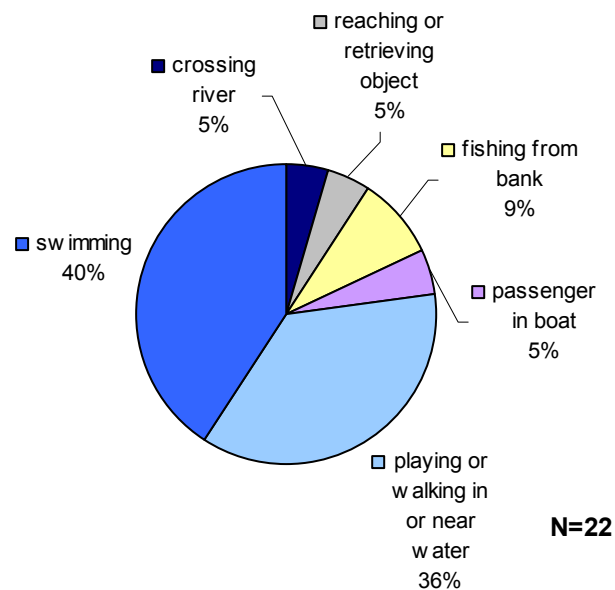
1969/1310  
8 years: male  
*Playing or walking in or near water.* Waded out to island of rocks 50 yards from beach, about 2 feet of water. Playing on island. Lost thong (*foot wear*) in water, and tried to retrieve it and fell in. The children were familiar with the island having played there before.

1969/677  
5 years: male  
*Swimming.* Family were camping at lake. The parents were on the bank watching the three children (11 years, 7 years & 5 years). The water was crowded with people. Deceased's mother noticed he was not with his siblings in the water. Deceased was seen floating under the water. Father – "my son had been swimming for 12 months and was very careful, he was frightened about going past his depth...previously swam in the baths."

1969/514  
7 years: male  
*Swimming.* Swimming at surf beach with other children, supervised by his father who had six children in his care. The father was distracted by two of the children going too far away up the beach. The deceased was carried out from shore by a current.

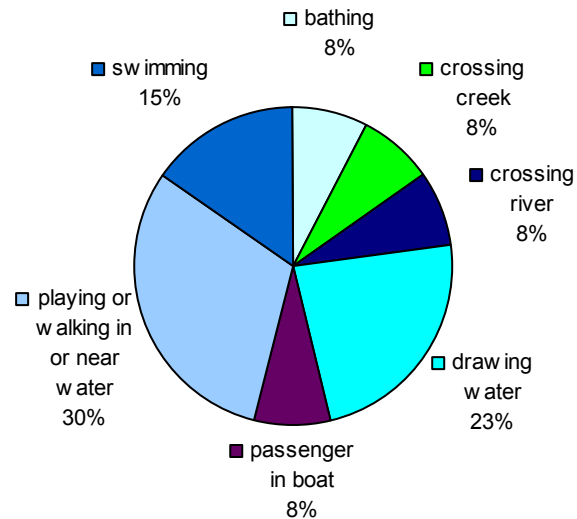
1973/812  
9 years: male  
*Crossing river.* Went for swim in river with older brother and brother's friends. Brother took him across the river so that he could play in the sand and left him there for several hours and told deceased to cross back by himself at shallow point in river. The deceased was a weak swimmer, could only swim a few strokes at a time, and he disappeared in trying to make the return crossing.

1973/307  
6 years: female  
*Swimming.* Went to a reservoir with her family for Football Club get together of about 100 people. Could swim a little (10 -15 yards). Swimming with 4-year-old sister, mother supervised from the bank and thought she had the children in her view. The sister was found floating face down and rescued. Sister – "(deceased) was carrying me into the deep water.... she slipped over in the deep water.... it was very slippery."



### 3.1.5 Activities: 10-14 years

#### 1863



1863/587

14 years: male

*Drawing water.* Farm servant. Farmer (employer) – “he was accustomed to go for water to the Deep Creek. I sent him down for water...cautioned him about the manner in which he was to get the water. I expressly told him to turn his horse before going into the water and then back the cart in. It appears however that he

must have driven the horse in and then turned by which means he got into deep water and was carried away by the current.” Witness (farm labourer) – “He was turning the horse in the stream. I saw that he was in difficulties and I ran to his assistance but before I could get to his assistance the cart and horse were swept away down the stream.... the deceased was getting a load of water at the regular place when the creek is down but not when it is high...the deceased ought to have known he was going in too far... the creek was high.”

1863/348

11 years: female

*Playing or walking in or near water.* Deceased’s schoolmistress asked her and several others to deliver messages to other pupils. On the way back she went with four others over a wooden bridge near the falls and got into a small boat. While in the boat she stooped down lost her balance and fell into the river.

1863/160

11 years: male

*Playing or walking in or near water.* Followed friend into dam - told friend he could not swim. Friend - "was standing at first on the edge just in the water...he slipped in upon a piece of pine into deeper water than I could stand in...he went down and came up again got his arms ... on the piece of wood but dropped off and did not come up again”.

1863/734

14 years: male

*Crossing river.* General servant. Deceased’s employer asked him to go to ... post letters and collect mail at the Post Office. He left on horseback. Employer – “I had no idea that the ... River was high on that day as I had crossed it in the evening before.” Deceased’s horse was found on riverbank without its rider and there were signs on the bank of the horse having gone into the river.

1863/1011

10 years: male

*Bathing.* Waterhole in disused quarry half a mile from deceased’s house. Child (6 years) witness - "went to the water hole and was sitting on the bank leaning on a stick washing his feet. The stick broke and the deceased slipped into the water, there was no big boy to help him and he sunk at once.”

### 3.1.6 Activities: 10-14 years

#### 1969/73

1969/263  
12 years: female  
*Swimming.* Incident occurred during a swimming class with a school group at a public swimming pool. The group was told to swim across width of pool. Deceased appeared to be swimming strongly, but was noticed to be floating in water and was pulled unconscious from water. Mother- "she was a good swimmer and had obtained her junior swimming certificate."

1969/862  
12 years: male

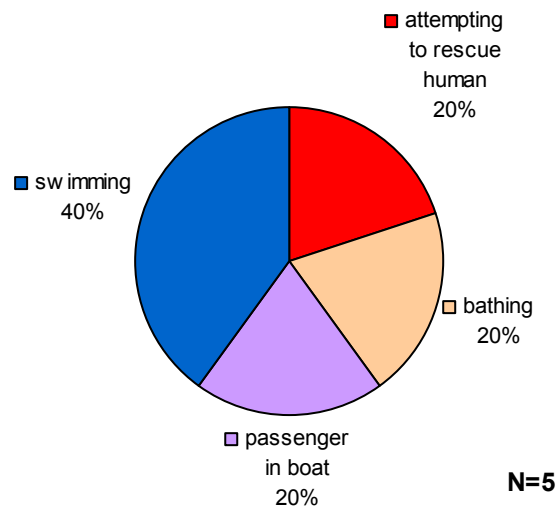
*Swimming.* Had been swimming in the river with two other school friends. They had swum at the spot several times before. Survey report – "some current was noticeable between pilings...and numerous branches and twigs were tangled amongst pilings and surrounding area reaching three to five feet above river bed."

1973/938  
11 years: male

*Attempting to rescue a human.* Non-swimmer. Went bathing in river with five friends, only one of who could swim. One of the girls floated too far out on a tyre tube and called for help (thought to be in jest) and the deceased walked into the water to cross the river and help her, but he went into deep hole and sank. It was the first time they had swum in this part of river.

1973/1964  
13 years: female

*Bathtub.* Drowning in bath due to onset of epileptic seizure.



### **3.1.7 Main features of activity results**

#### **0-4 years**

Figures 3.1.1 & 3.1.2

As most drowning incidents for this age group were unwitnessed, it was not possible to identify specific activities at the time of the incident for many of the cases, beyond that the victim was near water and had most probably become submerged unintentionally.

Of those cases where activities were identified, there were some indications of risk variation based on community developmental changes. In 1863, the absence of infrastructure such as secure housing, piped water or safe bridges meant that children undertook activities that exposed them to unprotected water hazards. Therefore drownings occurred when children were free to wander away from their residence or were engaged in activities such as to getting drinking water from waterholes or wells, or crossing waterholes or creeks on logs or planks.

By 1969/73, deaths were no longer related to attempting to get drinking water, or crossing water using unsafe means, but there is the appearance of different activities related to new hazard exposures. With the increased availability of bathrooms in homes, the activity of bathing became associated with drowning deaths. Similarly, with the increase of motorised transport, being a passenger in a motor car became associated with drowning.

#### **5-9 years**

Figures 3.1.3 & 3.1.4

Drowning deaths for children in this age group tended to be witnessed more often than for younger children, therefore the inquest records contained considerably more information about activities associated with the deaths. The most notable change of activity patterns for the 5-9 year olds is the strong shift concerning intentional entry into water in 1969/73. While in 1863 only 7% of the cases involved intentionally entering the water for the purpose of swimming, in 1969/73, 40% of cases were associated with swimming activities.

This change has several interpretations. Firstly, it may represent a change in behavioural patterns indicating that participation in recreational swimming increased in the intervening period, leading to an increased proportion of swimming related deaths.

Alternatively, it may be that there was no change in participation, but that the swimming ability of the children in 1969/73 was inferior to that of those in 1863, and therefore they were more likely to drown while engaged in this activity. This interpretation is unlikely. It appears that very few people in the 19<sup>th</sup> century had well developed swimming skills. A survey of schoolteachers at a training camp in 1911 found that only 8% of them knew how to swim [35]. This may even be an overestimation of the swimming ability of the population as the purpose of the training camp was to certify the teachers as swimming instructors, and therefore it would have been likely swimmers would have been overrepresented at the camp. Therefore it would seem unlikely that children in 1863 would be skilled swimmers. In contrast, by the early 1960's, most school-aged children had received some swimming instruction having participated in the state wide Herald Learn to Swim program [36].

Another possible source of the difference is changes in the nature of the swimming locations, such that in 1969/73 children are swimming in more dangerous locations eg. surf beaches. This issue of hazard change is addressed in section 3.3.

As with the 0-4 year olds, the other activity differences were largely associated with the infrastructure developmental changes that reduced or eliminated the need to engage in activities that placed the child at risk, such as drawing water from hazardous locations or crossing bodies of water in an unsafe way.

**10-14 years**

Figures 3.1.5 & 3.1.6

The activity pattern for 10-14 year olds in 1863 showed strong similarities with the younger groups in this year, with most drownings being associated with unintentional submersion, and these often being related to lack of infrastructure.

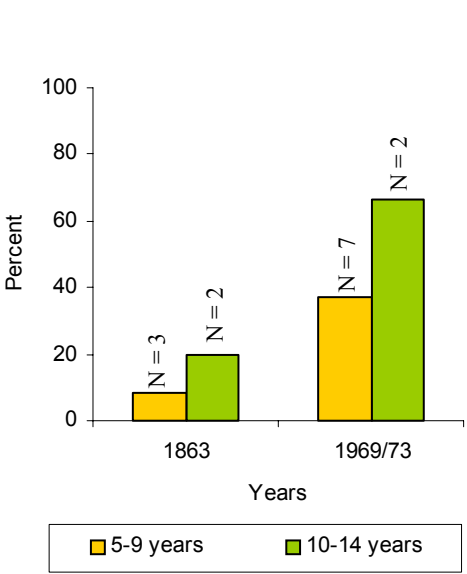
In 1969/73, there were so few drownings that the ability to compare with the earlier era is limited. However, there is some suggestion in the results that this age group has also made a shift towards drownings being associated with intentional water entry.

**3.1.8 Swimming**

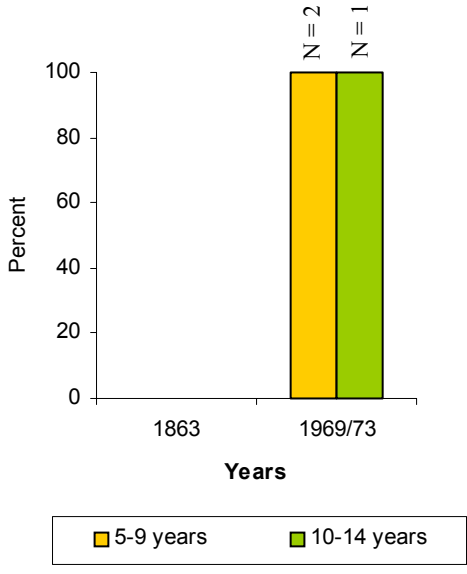
Using a broad interpretation of the term “swimming”, i.e. intentional submersion for recreational or other purposes, the study found 17 cases where the victim was identified as having been engaged in swimming at the time of the incident (Figures 7&8).

There were no 0-4 year olds known to be swimming at the time of death. For the older groups, swimming activity was associated with drownings for both age groups for males in 1863, with 10-14 year olds showing the greater involvement.

In 1863 there were no drownings associated with swimming for females aged 5 to 14 years. By 1969/73, while there were very few drownings, all of these female drownings were associated with swimming.



**Figure 7** Percent of all male drownings engaged in swimming activity at time of death



**Figure 8** Percent of all female drownings engaged in swimming activity at time of death

In 1969/73, the proportion of swimming related deaths increased compared with 1863. This proportional increase is likely to be explained by the reduction of other hazards and increased exposure through behavioural change.

The ability to swim competently has been thought to be protective against drowning [37] while the results of the coronial data suggest that intentionally entering water for the purposes of swimming has an associated risk of drowning. Many of the drowning deaths for 5-14 year olds in 1969/73 occurred while engaged in recreational swimming.

Analysis of these deaths shows a number of factors:

- 73.3% were swimming alone or in the company of peers
- 46.7% got into difficulties when they got out of their depth
- 40% were swimming in crowded locations
- 60% were weak or non-swimmers
- 26.7% were associated with illness

The most hazardous scenario appears to be associated with a weak- or non-swimmer swimming with peers in a crowded location which has marked changes in depth of water.

The issue of the depth of water appears to be critical. While 46.7% of the cases had sufficient information to suggest that a change of depth was an initiating factor, several additional cases appeared to have this factor involved. Excluding three drownings associated with illness, 85.7% of the remaining drownings occurred in locations with variable depths and the likelihood of unpredictable depth changes (river, dam, beach, reservoir, lagoon and waterhole). In the absence of well developed water survival skills, becoming out of depth or getting into difficulties out of depth may be too great a challenge to the task of staying afloat and maintaining respiration.

### **Key points: Activities**

- Drownings in 1863 were largely associated with unintentional water entry and submersion.
- For all ages in 1863, some drownings showed an association with a lack of infrastructure, which resulted in victims being exposed to hazards while performing normal activities.
- For those aged 5 years and older, there was a shift towards drownings being associated with intentional water entry in 1969/73.
- For weak- or non-swimmers intentional entry into water where depth of water is variable and /or unpredictable is associated with risk of drowning

## 3.2 Locations

Sections 3.2.1 to 3.2.6 provide graphical summaries of activities associated with drowning incidents for each age group and each of the sampled years. These sections also include brief summaries and/or excerpts from a sample of incidents.



Watering a horse in a waterhole in 19<sup>th</sup> century Victoria - Source: East Gippsland Historical Society

### 3.2.1

#### Locations: 0-4 years

#### 1863

1863/789

2 years 6 months: male

*Waterhole.* Drowned in a waterhole near father's residence. Earlier seen playing in the bush near the waterhole. Child had been playing with other children but the others left him. The children often played there before.

1863/789

3 years: male

*Waterhole.* Fell into waterhole 5 feet deep in yard of father's residence. Child was playing alone in garden and was in habit of playing at the waterhole, which was usually dry, but it had been filled by rain. Hole used to be fenced off but had been removed for repair.

1863/235

1 year: female

*Water filled hole, mining.* Fell into diggers' (gold miners') old claim. Child was alone in yard. The hole was one of many holes near the house. It was 15 yards from the parents' yard and filled with 2 feet of water.

1863/13

1 year 9 months: male

*River.* Child left house while his mother was doing housework. After half hour his mother looked for him and found him floating in river. Mother – "(deceased was) in habit whenever he had the opportunity of running to the river to the boats."

1863/1050

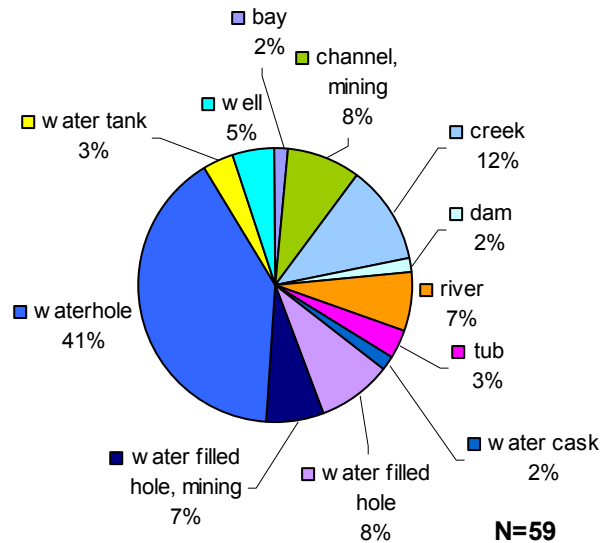
2 years 6 months: male

*Mining channel.* Last seen by mother playing alone on heap of stones in front of house near creek. Mother found him in tailrace (mining water channel) with head down in water and feet on the bank of the race.

1863/343

1 year 4 months: female

*Well.* Was playing with siblings and other children in front of house but others went off leaving deceased behind. Drowned in a hole used as a well. The hole partly covered, and the water was within four feet of surface. There was a small trap door. The hole was in a fenced allotment and the child had got through some of the palings.



### 3.2.2

#### Locations: 0-4 years

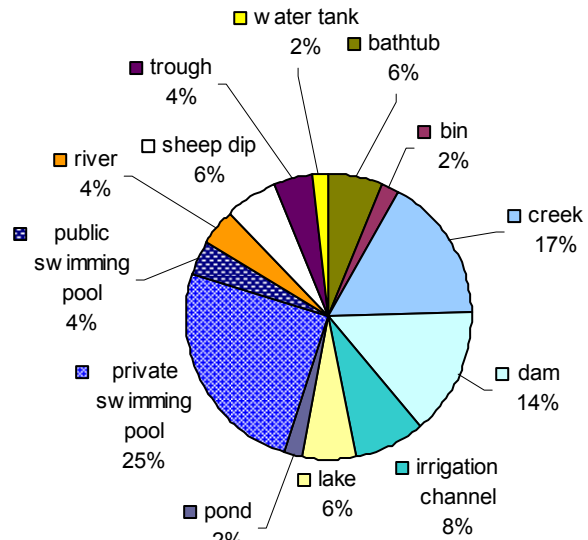
#### 1969/73

1969/1461

3 years: male

4 years: male

*Creek.* Mother allowed the boys to play with other children in the street. Last seen playing in neighbour's driveway. Found in waterhole in creek at rear of residence. Mother – "they had been told many times never to go near the water. I had been to the water many times with them and explained to them not to go near the water. I had no idea the water was as deep as it is." Police – "creek is not fenced off at all. It is about 20 feet from the back of houses...it is my opinion that some thing will have to be done about the creek and fencing it off or this occurrence may well be repeated."



N=52

1969/1311

2 years: male

*Private swimming pool.* Deceased had been wearing a life jacket, but was found floating in backyard pool without it on. There was no adult supervision at pool. There was another child present but deceased wasn't seen as there were a number of toys also floating in pool.

1969/1661

3 years: male

*Sheep dip.* In care of father who was engaged in tidying up when boy went missing. The dip was in the yards near the farmhouse, and its length was covered with corrugated iron sheets held down by pieces of board. The end of dip was uncovered and the run into the dip was steep.

1973/1531

1 year 9 months: male

*Private swimming pool.* Had been playing football with brother (9 years) in backyard and brother returned to house and left him alone in yard in which there was an above ground swimming pool. Deceased found floating in 12 inches of water, ladder was left in place, and child may have been trying to retrieve football from pool.

1973/251

3 years: female

*Private swimming pool.* Rear of neighbour's house. Had been playing in own front yard with other children. Father – "I didn't think possible she could get over the fence ... Pool was in fenced yard with secured side gates. Appears the children gain access to the pool yard by climbing onto the dog kennel and then over the fence..."

### 3.2.3

### Locations: 5-9 years

### 1863

1863/871

9 years: male

*Waterhole.* Went fishing with other children at a creek. Witness (boy 7 years) saw him sitting on bank fishing, then "saw him in the water and struggling and trying to get out... I could not help him as he was too far in the creek.... he was not able to swim"

1863/1164

6 years: male

*Waterhole.* Mother sent him to the store to get some bread. Found in a waterhole. Witness – "...there are numerous holes all round that in which I found the deceased."

1863/583

7 years: male

*Waterhole.* Found in waterhole in paddock at back of farm buildings. Last seen playing alone at end of buildings. Grandfather – "I looked around the edge of the water-hole and I saw where the deceased had apparently slipped. He appeared to have been sailing a sort of boat, which I saw in the water."

1863/1071

5 years: male

*Water tank.* Deceased had been playing out the back of the house with other children. Mother – "tank is uncovered and has about 4 feet of water in it, he has been sailing a little boat about the tank the last few days.... I have often cautioned him to keep away from the tank."

1863/1093

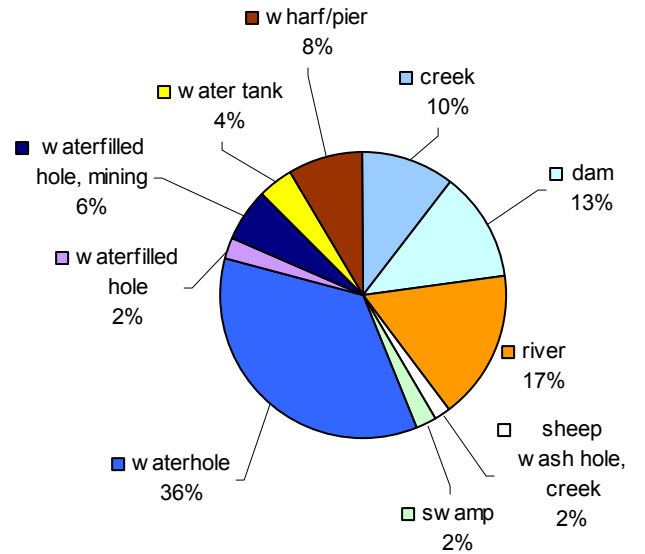
6 years: male

*Water filled hole, mining.* Fell into abandoned hole nine feet deep containing 7 feet of water on his way to school. Father – " he frequently passed by the same places on his way to school...therefore I did not fear his going alone he was so good, so quiet and so sensible a boy for his years."

1863/425

9 years: female

*River.* Child ran down to river from house with vessel in her hand. She stood on stump, which projected into the river and fell in. A neighbour raised the alarm and father "walked into the water and I saw him no more after his head was covered." "He and his family have only lately come to live near this place".



N=48

### 3.2.4

#### Locations: 5-9 years

#### 1969/73

1969/1321

9 years: male

*Bay beach.* Visiting beach with friends and family. Went into water straight after heavy lunch. Poor swimmer. Death by drowning and inhalation of vomitus.

1969/590

6 years: male

*Dam.* Dam on golf links quarter mile from home. Deceased had been warned by father previously

not to swim in dam. Heavy rain had filled the dam. Parents were not at home when deceased and two siblings got home from school and as the weather was hot the children decided to go for swim. Deceased's 9-year-old brother could swim but deceased and his sister (8 years) could not. Deceased walked into water up to his navel. He said, "I can put my head under water". Sister - "He then went under and we saw bubbles coming up. We tried to talk to him but he wouldn't answer".

1969/1751

7 years: male

*Public swimming pool.* Found at bottom of deep end of pool. Witness – "there were quite a few jumping off the edge of the pool and the board...the pool slopes. He could have walked out of his depth." Police – "the bottom is of sand and this makes it impossible to see the bottom of the pool...The depth at the deep end is 5 feet and the edge at this end is a sloping edge of rock and cement for 6 feet. The deceased was found near the diving board just in from the sloping edge."

1973/1780

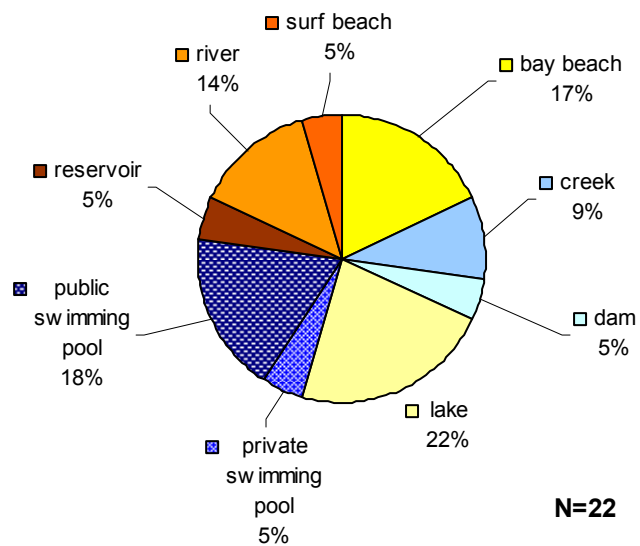
6 years: male

*Creek.* Deceased's mother thought he was playing in the backyard with his school friend (6 years). Water in the creek was high and extremely fast flowing current, the creek bed is concrete lined with steeply sloping sides. Had been trying to retrieve a toy from water. Friend – "(deceased) threw the toy ambulance into the water...he...slid down slowly to the edge of the water. He just about got to the water, when he seemed to slip quickly into the water... the water kept carrying him away"

1973/1041

6 years: male

*Bay beach.* Found floating in water off beach. A group of 17 children from a Children's home were taken to the beach supervised by three adults. Two adults were in the water, one watched from beach. Supervisor - "I saw (deceased) go in the water but did not see him again after this. There was a yacht club meeting at the time we arrived at the beach and there were a lot of yachts on the edge of the water and sand. When the children went into the water, they had to go between the yachts and it was... when we saw these conditions (two adults) went into the water with the children. At the time, the water was fairly rough...the children had been instructed how to behave...I don't think he could swim."



### 3.2.5 Locations: 10-14 years

#### 1863

1863/314

12 years: male

*Creek.* Deceased went to the creek to collect a bucket of water. Witness – “I jumped into the water but the clothes were so heavy that I felt myself sinking and my mate assisted to get me out of the water ...the deceased was my cousin and arrived in the colony three weeks ago.”

1863/102

13 years: female

*Creek.* Deceased left the house to look after her mother’s cows. Assumed to be crossing the creek and went into deep hole.

1863/160

11 years: male

*Dam.* Followed friend into dam - told friend he could not swim. Friend - "was standing at first on the edge just in the water...he slipped in upon a piece of pine into deeper water than I could stand in...he went down and came up again got his arms ... on the piece of wood but dropped off and did not come up again”.

1863/815

11 years: male

*Swamp.* Swamp in front of Immigrants Home where deceased resided as a deserted child. Deceased was playing in boats with his friends. Deceased’s boat was upset and attempts to rescue him by 8-year old friend also ended in the rescuer’s death when his boat sank as others climbed into it.

1863/13

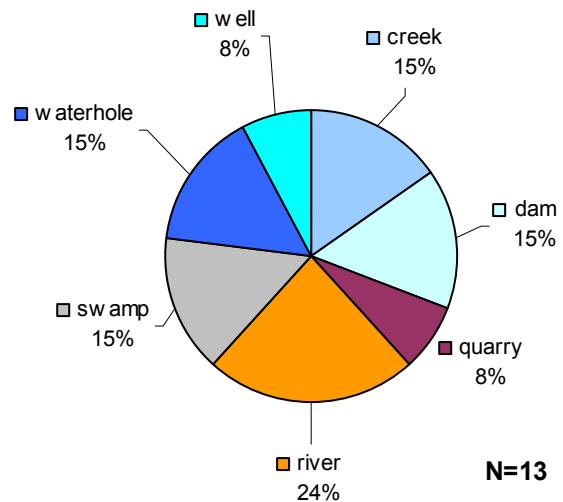
12 years: female

*Well.* Fell into employer’s well attempting to draw water.

1863/120

12 years: male

*River.* Went swimming in a river with another boy. Deceased got into difficulty and pulled companion under, so companion had to leave deceased and save himself. Deceased claimed he could swim, but had difficulty in doing so.



### 3.2.6

#### Locations: 10-14 years

#### 1969/73

1969/263

12 years: female

*Public swimming pool.* Incident occurred during a swimming class with a school group at a public swimming pool. The group was told to swim across width of pool. Deceased appeared to be swimming strongly, but was noticed to be floating in water and was pulled unconscious from water. Mother- "she was a good swimmer and had obtained her junior swimming certificate."

1969/862

12 years: male

*River.* Had been swimming in the river with two other school friends. They had swum at the spot several times before. Survey report – "some current was noticeable between pilings...and numerous branches and twigs were tangled amongst pilings and surrounding area reaching three to five feet above river bed."

1973/938

11 years: male

*River.* Non-swimmer. Went bathing in river with five friends, only one of who could swim. One of the girls floated too far out on a tyre tube and called for help (thought to be in jest) and the deceased walked into the water to cross the river and help her, but he went into deep hole and sank. It was the first time they had swum in this part of river.

1973/2126

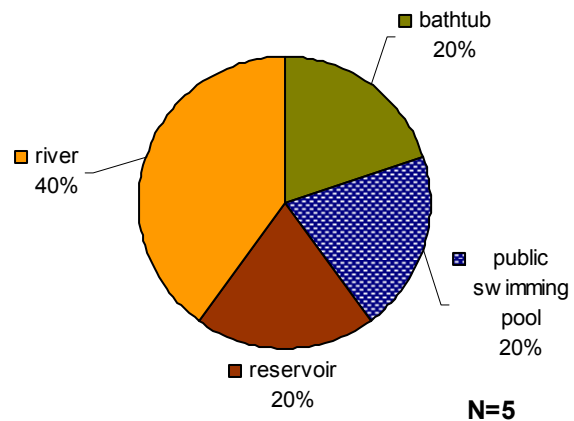
12 years: male

*Reservoir.* Deceased went on a fishing trip with three others (two adults and a 13-year-old). Deceased was in the boat with the 13-year-old companion when he fell overboard. The companion threw him a lifejacket but he wasn't able to get it. The companion jumped into the water and kept his deceased's head above water by holding him under the chin until one of the adults (strong swimmer) could help. The adult held the deceased while the companion swam to get the boat. By time he returned with the boat, both had disappeared.

1973/1964

13 years: female

*Bathtub.* Drowning in bath due to onset of epileptic seizure.



## **3.2.7 Main features of locations results**

### **0-4 years**

Figures 3.2.1 & 3.2.2

Waterholes and water filled holes (56% of incident locations) were the main water hazard for younger children in 1863. Rivers, creeks, water storages (wells, dams and tanks) and mining related hazards also featured in drownings of younger children in this year.

However, while waterholes were the predominant hazard in 1863, in 1969/73, this location was associated with no drownings. The primary sites of drowning deaths for younger children in 1969/73 were private swimming pools and farming related locations (dam, irrigation channel, sheep dip, trough, bin). Although most of the Victorian population resided in urban locations at this time, a relatively large proportion of drownings were still associated with creeks.

### **5-9 years**

Figures 3.2.3 & 3.2.4

As for the younger children, waterholes and water filled holes were the main location of drownings for this age group in 1863. However, this older group also showed an increased proportion of drownings in larger bodies of water: river, dam.

In 1969/73, 5-9 year olds also reflected the pattern observed for their contemporary juniors, with the disappearance of waterholes as a hazard and the appearance of swimming pools as one of the main locations of drowning compared to 1863. However, for these older children, the main risk was associated with public swimming pools, rather than private pools.

This period also saw the appearance of several other new sites of risk (surf and bay beaches and reservoirs) and an increased involvement of rivers and lakes.

### **10-14 years**

Figures 3.2.5 & 3.2.6

In 1863, 10-14 year olds drowned in similar locations to that of their younger contemporaries, but with an increased proportion of larger bodies of water (river, swamp, quarry and dam). By the late 1960's, these types of locations, with the exception of quarries, were usually only encountered in rural locations, and as most of the population at this time lived in urban areas, these hazards were less frequently encountered in 1969/73. This is reflected in the absence of involvement of most of these locations in the later drowning incidents. This group, as did their younger contemporaries, showed a complete absence of waterhole locations, and the appearance of public swimming pool as an incident location.

There were few drownings of 10-14 year olds in 1969/73, with only five cases being investigated by the coroner. One of the two female cases was known to be associated with a medical condition. The three male cases all occurred in open bodies of water (river and reservoir), and were related to hazards present in such locations (underwater obstacles, unpredictable depth changes, deep water).

### 3.3 Hazard changes

Over the course of Victoria's European history, developmental changes produced varying physical, social and economic environments. Of particular relevance to drowning risk were changes in the natural and built physical environment and the population's level of exposure to water hazards in that environment. The coronial data reported here suggests considerable change between 1863 and 1969/73 in both the nature and prevalence of the hazards.

This section discusses the main location changes occurring between the two periods.



From waterholes to swimming pools – a hazard evolution. Source: Latrobe Picture Collection, State Library Victoria

### 3.3.1 Waterholes

In the 1863, the greatest drowning risk for children aged 0-9 years was waterholes. However, waterhole deaths had been markedly reduced by late 20<sup>th</sup> century with no waterhole related deaths being recorded in 1969/73 (Figure 9). The dangers of waterholes were recognised early, and coroner’s inquests in 1863 called for their removal or protection:

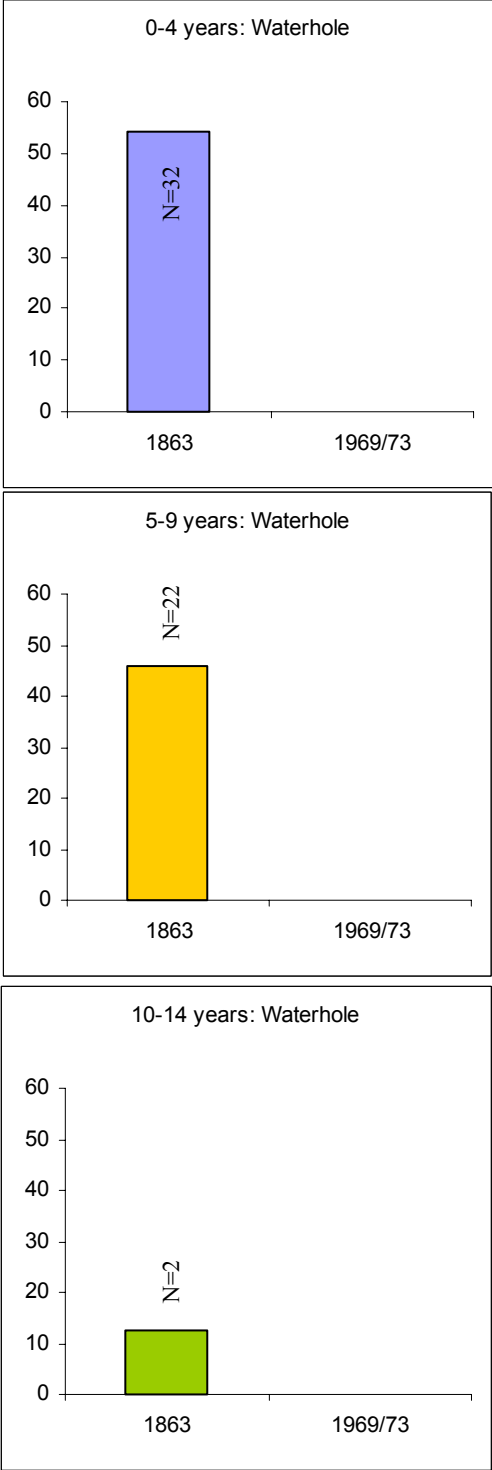
1863/291  
 Re: Waterhole near house  
 “The jury earnestly urge the necessity of fencing in similar waterholes by the occupants of the houses to which they are attached.”

1863/312  
 Re: Wide unprotected hole 40 feet deep on a mining claim.  
 “We are unanimously of the opinion that the Government in granting claims which have been previously worked and left in a dangerous state, should take measures to provide for the proper security of such claims to prevent accidents which are continually occurring from want of such protection.”

1863/94  
 Re: Hole on school reserve.  
 “The jury wish to add - as the said hole is situated on the Church of England school reserve, that in their opinion the Trustees of the said reserve should take care that all hole on it are punctually filled up or guarded.”

1863/479  
 Re: Waterhole used for domestic purposes near his parent’s tents.  
 “We are further of the opinion that waterholes of this kind are more dangerous to children than dams used for mining purposes, and that they ought to be fenced in or otherwise properly protected.”

It is not known whether these recommendations resulted in action, but it is likely that as the population shifted away from rural locations, and as the urban environment became more developed, children would have less exposure to these hazards.



**Figure 9** Proportion of drowning deaths occurring in waterholes for each age group and time period

However, it appears that the problem of unprotected water filled holes was not solved rapidly. Despite the early recognition of the problem, and public demands for a resolution in 1863 (Figure 10), almost one hundred years later, in 1958, the drowning of a boy in water filled disused quarry showed that risk of unprotected water filled holes close to homes still had not been eliminated (Figures 11 & 12).

**Boy, 12, drowns**

TWELVE-YEAR-OLD Robert Hugh Jones of Canterbury-rd., Heathmont, drowned in a water hole at East Ringwood yesterday afternoon when he became entangled in rubbish and sludge.

Robert stepped on a piece of floating wood while searching for water rats. He sank in deep water.

He had been playing by the water hole with two other boys, George Allan Gogerly, 12, and Rodney O'Reagan, 10, both of Stoda - st., Heathmont.

Police and rescuers quickly recovered Robert but he was dead on arrival at Box Hill Hospital.

George and Rodney tried to rescue Robert by throwing a piece of fencing wire, but the wire was in a coil and

snapped back at them.

Robert drowned with in reach of a 30-quar sealed milk can which would have kept him afloat.

Rodney said later: "George and I met Robert who said there were a lot of water rats at the tip.

"We went there and Robert climbed through the fence and down to the water.

"He jumped on to a log and then leapt to what he thought was an island.

"It was only a lot of wood and a few jam tins.

Figure 11 Newspaper report of waterhole drowning. Sun newspaper, 5 November 1958

**UNFENCED WATER-HOLES.**

TO THE EDITOR OF THE ARGUS.  
 Sir,—May I be allowed to call your attention to the fact that in the Municipality of Richmond, just off Hoddle-street, and at the back of Highett-street, there is an enormous "gulf of water" unfenced, and there are a great number of small properties whose back fences run in a straight line, right to the edge of this gulf?

On Friday night one human being fell a victim and lost his life in this gulf. You may judge of the depth, when it was Sunday morning before he was found. The police were dragging all day on Saturday, and could not find him, and yesterday morning he was found floating on the top; and I may add that this is not the first life that has been sacrificed. This is the fourth case that has occurred in this self-same gulf.

Will you use your powerful pen, and try and rouse the municipal authorities to get something done to stop this sacrifice of human life?

AN INHABITANT OF RICHMOND.

Jan. 26.

Figure 10 Letter to the editor highlighting the problem of unprotected waterholes: Argus newspaper, 27 January 1863

Ringwood Council Town Clerk, Mr Alfred Kelly, said the council had, and was still doing, all it could to fence the quarry in and have it filled as soon as possible.

"We've got four notices up there," he said, "but it is very difficult because little boys — just as I was — seldom heed notices. Nevertheless we shall try to fill this tip in ever more rapidly than ever."

Figure 12 Local government response to Robert Jones' drowning, extracted from article in Herald newspaper . 5 November 1958

As most of the population lived in rural locations in 1863, and many were near or on the gold fields, children in this year would have been exposed to a range of water hazards, including many waterholes, manmade and natural, in their daily life. Further, the temporary nature of many of the dwellings would have made it difficult to confine young children and prevent their exposure to the hazardous environment in which they were living. The presence of these hazards in the environment is reflected in the patterns of location of drowning.

### 3.3.2 Public swimming pools

In the latter part of the 19<sup>th</sup> century in Victoria, concerns about the state of hygiene of the poor lead to the establishment of bathhouses. While their initial focus was the provision of washing facilities, they came to be used for more recreational purposes as an interest in recreational bathing and swimming began to develop.

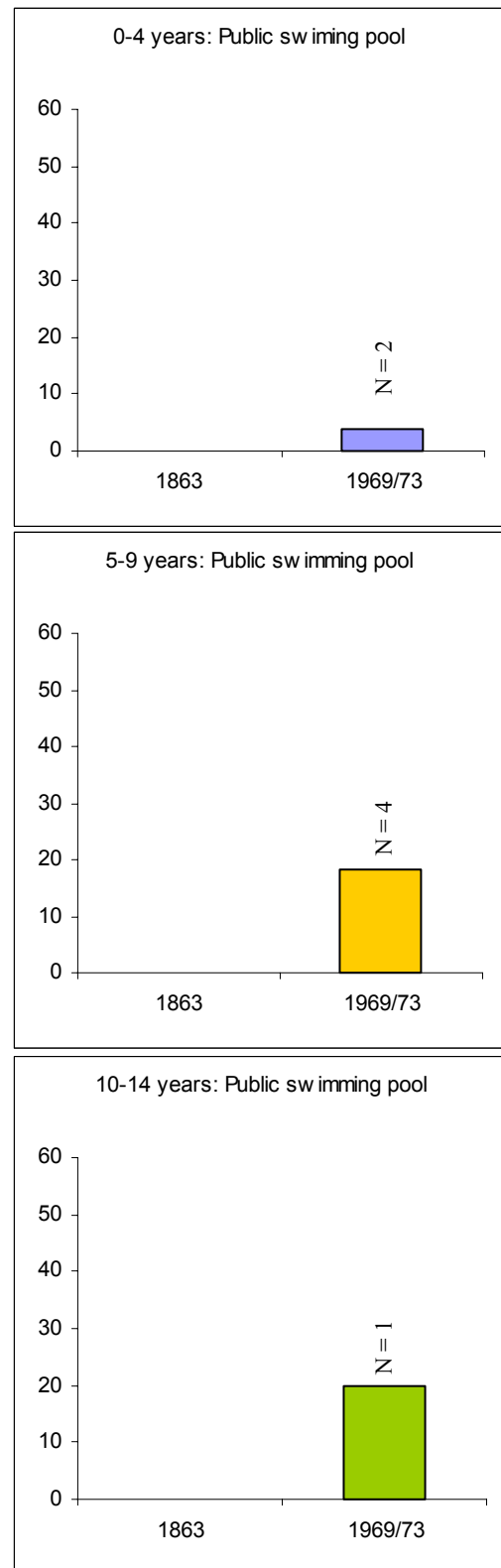
From the late 1920's, with the encouragement of Olympic swimmer Frank Beaurepaire, who was later to become its mayor, the state's capital city, Melbourne, began the construction of a number of additional public pools. Beaurepaire had been influenced by the high quality of pools in the U.S.A. and sought to develop such facilities in Melbourne. [38]

The availability of swimming facilities began to increase when Melbourne hosted the Olympic Games in 1956. In the years surrounding the Games, the construction of swimming pools by local government across the state rose markedly. Almost 50% of Victoria's municipal pools were built in the two decades around the Olympic Games. [2]

While the growth of public pools would have the benefit of providing recreational swimming venues that were relatively safer than natural bodies of water, the coronial records show they were not without risk (Figure 13). The period of public pool growth was found to be associated with drowning in these venues.

The coronial information suggests several explanations for drowning at these pools. Firstly, a number of the earlier public pools were simply enclosed areas within a larger body of water such a river or lake. Therefore the problem of changeable and unpredictable water depth and bed nature persisted in these pools.

Secondly, with large numbers of swimmers confined to a relatively small space, the visual confusion this created made it easier for children in difficulties to be overlooked, and harder for supervisors to keep track of those in their care.



**Figure 13** Proportion of drowning deaths occurring in public swimming pools for each age group and time period

Lastly, some parents mistakenly thought that it was safe to leave children at pools unattended, there being a number of cases where parents either allowed children to go to the pool alone or left the child alone for a period of time when at the pool.

By the end of the 20<sup>th</sup> century, improved operation of public pools appears to have largely resolved these problems. In 1991, the Royal Life Saving Society of Australia developed safety guidelines for the operation of public swimming pools (Guidelines for Safe Pool Operations) [39] and most public swimming pools in Victoria are now operated in accordance with these guidelines [40]. The guidelines relate to all aspects of pool operation: General Operations, Technical Operations, First Aid, Facility Design, Supervision and Programs.

### 3.3.3 Private swimming pools

The latter part of the 20<sup>th</sup> century also saw an increase in the number of swimming pools installed in private residences.

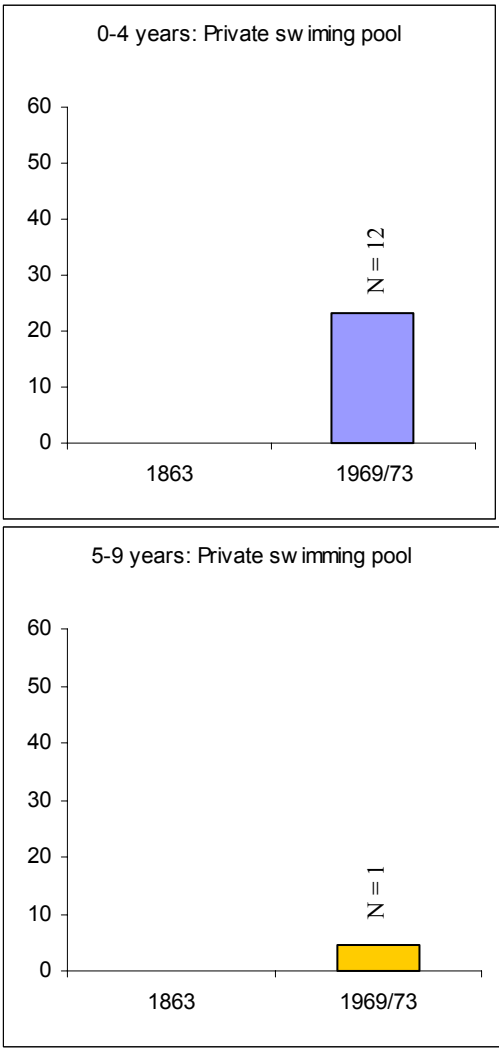
By 1974, there were pools in an estimated 115,000 Victorian households [41]. This new hazard began to result in drownings (Figure 14). By the late 1980’s private pools were identified as the main site of immersion incidents for children in Victoria in [42].

In 1974, the Coroner called for the compulsory fitting of childproof fences or covers on pools [41] and in 1991, following sustained advocacy by the Child Accident Prevention Foundation of Australia and other safety organisations, the Victorian Government introduced legislation requiring the construction of safety barriers around home pools. This legislation was introduced in stages and took full effect for all pools in 1997. In 2002 this was further refined requiring the fitting of self-closing devices to doors and gates.[43] In the intervening period, between problem identification and regulation, the problem received considerable coverage in the media, raising community awareness, and alerting carers to the need to protect young children.

However, despite there being legislative

requirements for fencing of these hazards, private swimming pools and spas have continued to be a problem with 35% of 0-5 year old

drownings in Victoria occurring in these locations during the period of 1998-2003 [44]. The continuance of these drownings appears to be related to failure to install fences of an appropriate standard and failure to maintain the fences and gates [45].



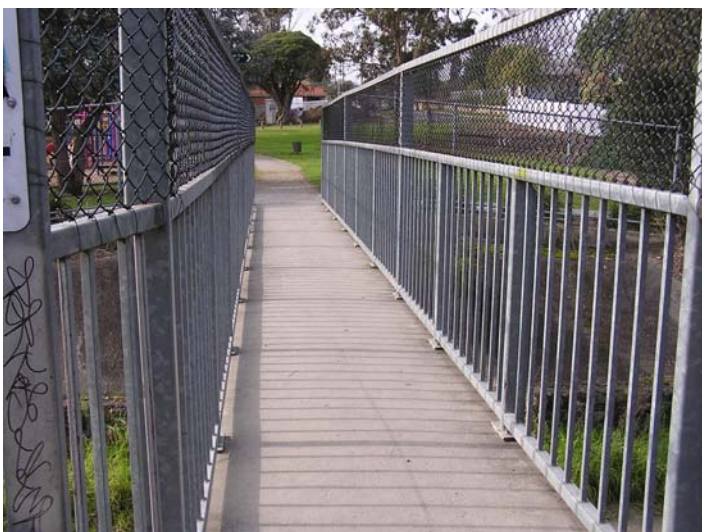
**Figure 14** Proportion of drowning deaths occurring in private swimming pools for each age group and time period

### 3.3.4 Rivers and creeks

Rivers and creeks have continued to be a problem for children throughout the whole period of European settlement (Figures 15 & 16). Unlike smaller bodies of water, where changes over time have led to marked changes in the incidence, size or impact of the hazard (eg the removal or protection of waterholes), rivers and creeks by virtue of their size and length are difficult to protect.

In urban locations, measures were undertaken to reduce the hazards associated with some creeks either by converting them into enclosed, underground drains or providing fencing to prevent easy access (Figure 17). However, in 1969/73 some drownings still occurred in unprotected creeks. This appeared to be in part a consequence of the development of housing estates in outer urban areas, with new houses being located near unprotected creeks.

Creeks also have the additional problem that they can be subject to rapid and dramatic change in level of hazard. While creeks may generally have low water levels and pose a relatively low risk, heavy rain can transform the flow into deep and fast moving water.



**Figure 17** Creek in suburban Melbourne with perimeter fencing and fenced bridge

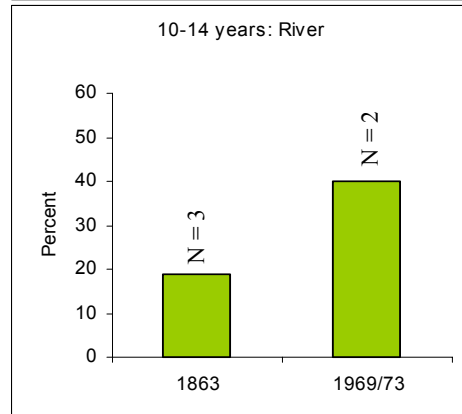
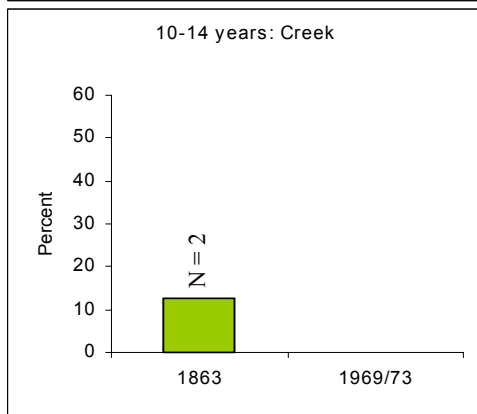
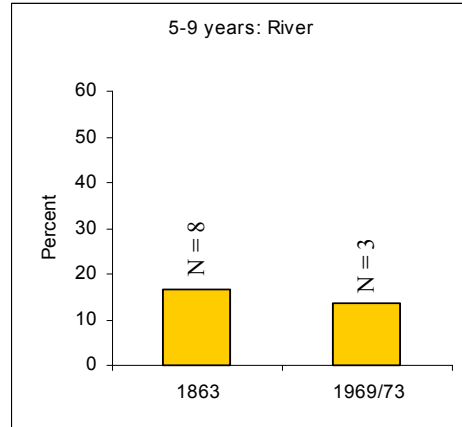
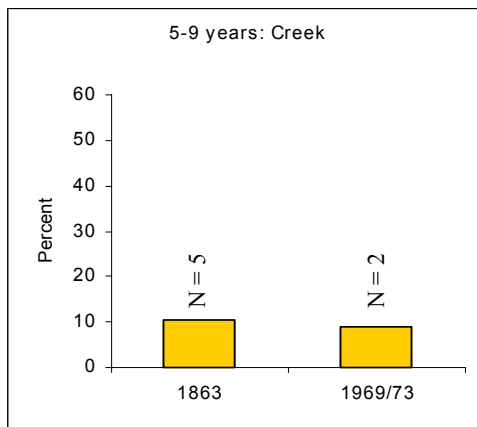
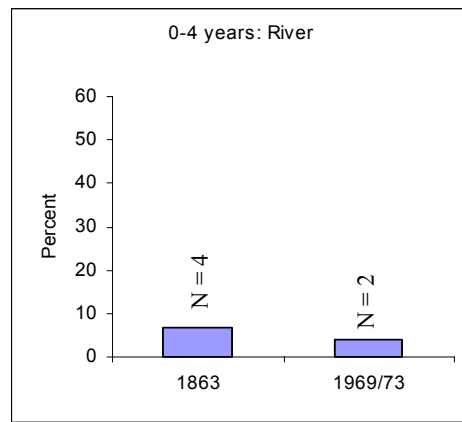
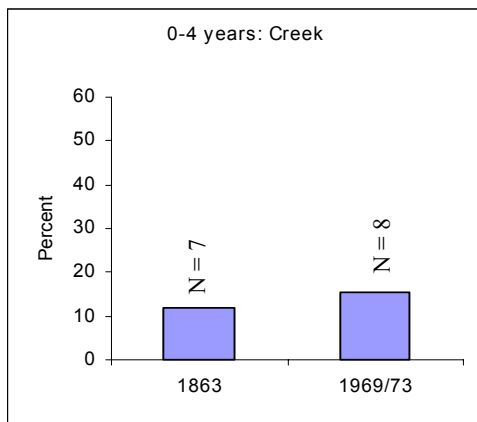
The following death occurred in the outer urban region of Lara, which more than doubled its population between 1954 and 1966 [1], therefore possibly resembling the 19<sup>th</sup> century situation with infrastructure development lagging behind rapid population growth, and therefore creating a hazardous situation

1969/1461

3 years: male

4 years: male

*Creek.* Mother allowed the boys to play with other children in the street. Last seen playing in neighbour's driveway. Found in waterhole at rear of residence. Mother – “they had been told many times never to go near the water. I had been to the water many times with them and explained to them not to go near the water. I had no idea the water was as deep as it is.” Police – “creek is not fenced off at all. It is about 20feet from the back of houses...it is my opinion that some thing will have to be done about the creek and fencing it off or this occurrence may well be repeated.”



**Figure 15** Proportion of drowning deaths occurring in creeks for each age group and time period

**Figure 16** Proportion of drowning deaths occurring in rivers for each age group and time period

### 3.3.5 Water storage

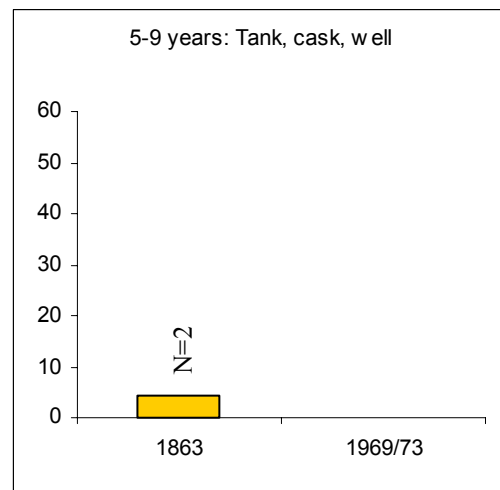
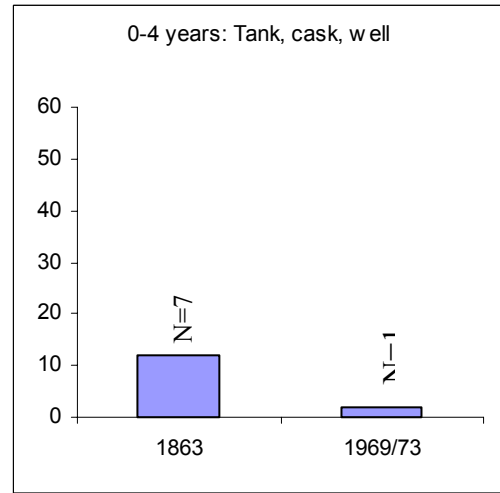
Prior to the widespread provision of piped water supplies, many Victorian residents relied on storing water for domestic uses in dams, water tanks, casks or wells.

A number of child drownings occurred in these bodies of water. By 1969/73 the smaller domestic water storages (tank, cask and well) had ceased to be a problem (Figure 18).

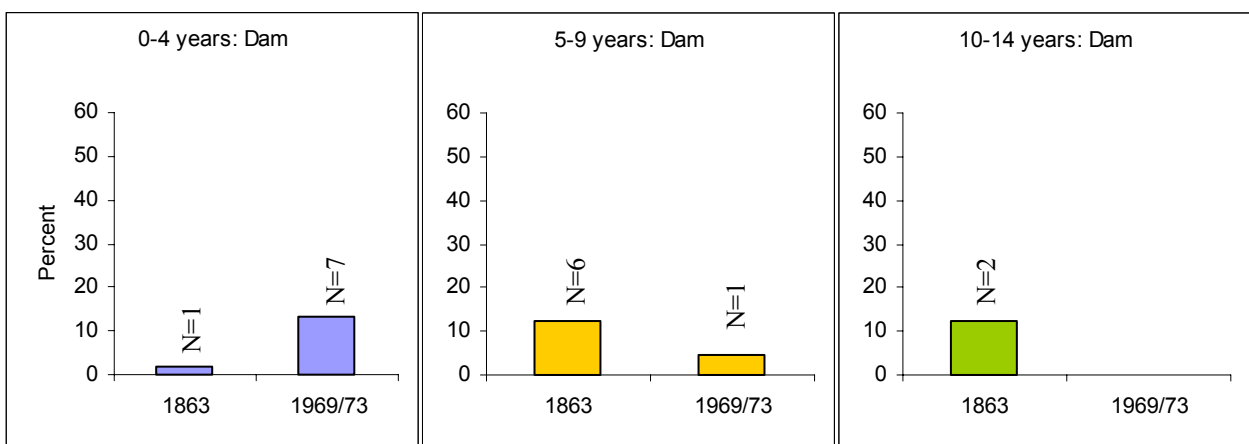
However, for the youngest children dams had become a greater problem by 1969/73 (Figure 19). All of these later dam drownings, with one exception, were located on rural properties.



Victorian farm dam, 1966. Source: Rural Water Corporation, State Library Victoria



**Figure 19** Proportion of drowning deaths occurring in tank, cask or well for age group and time period

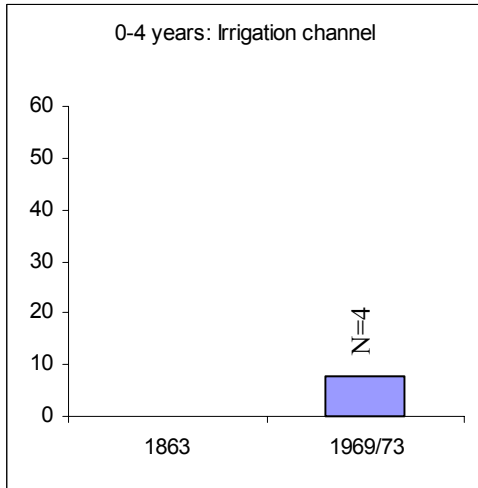


**Figure 19** Proportion of drowning deaths occurring in dam for each age group and time period

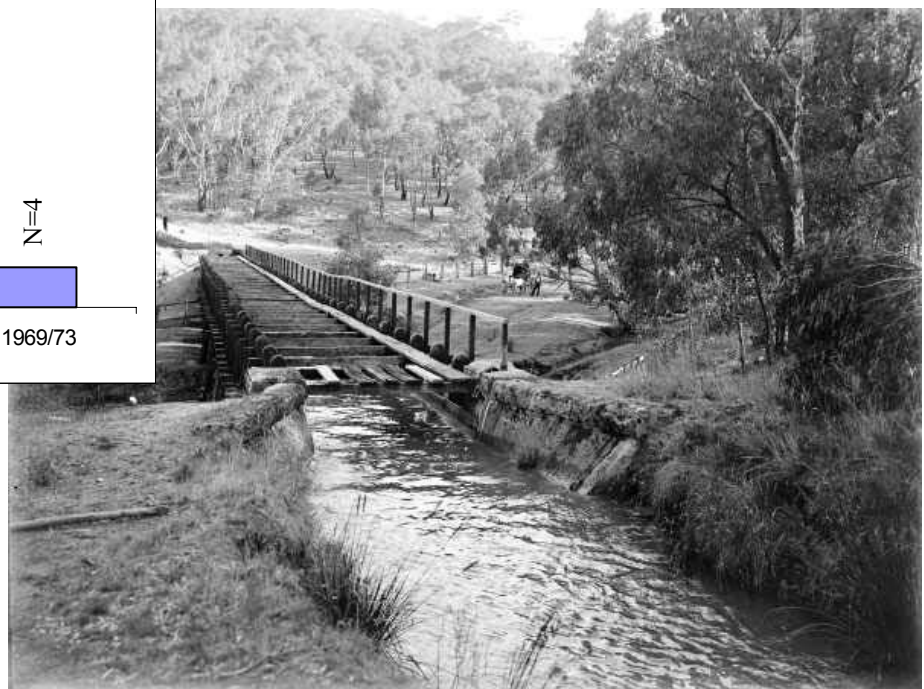
### 3.3.6 Additional hazards

In addition to the appearance of swimming pools as a new hazard by 1969/73, several other locations, not observed in drownings in 1863, were found to be associated with child drownings by 1969/73. For the 0-4 year olds, there were two additional hazards associated with residing in agricultural areas: irrigation channels and sheep dips (Figures 20 & 21).

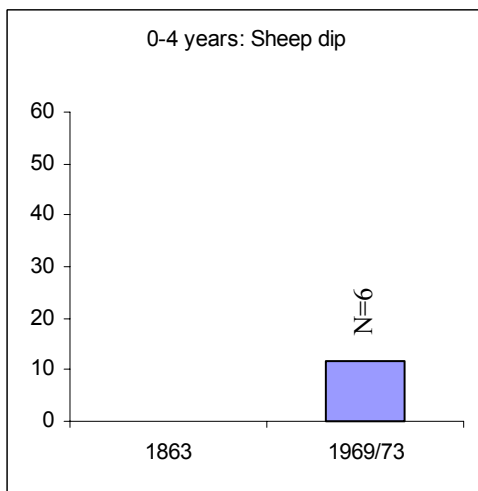
By 1966, 98% of dwellings in Australia were fitted with bathrooms [34], and drownings of younger children in bathtubs also became a problem (Figure 22).



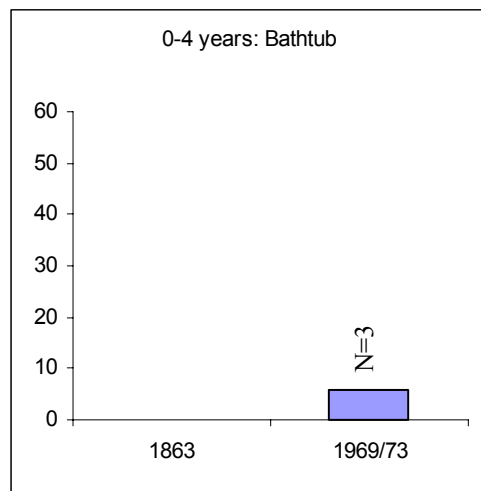
**Figure 20** Proportion of drowning deaths in 1969/73 associated with irrigation channels: 0-4 years



Irrigation channel.  
Source: Rural Water Corporation, State Library Victoria

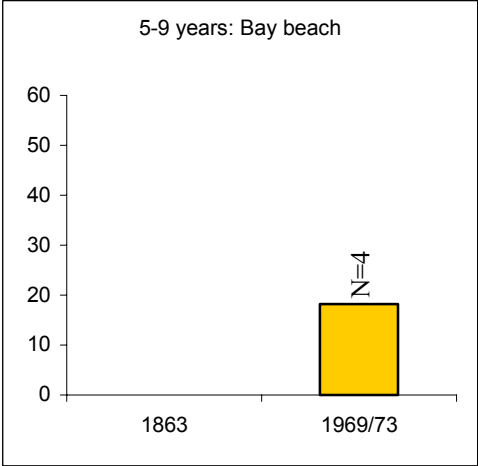


**Figure 21** Proportion of drowning deaths in 1969/73 associated with sheep dips: 0-4 years

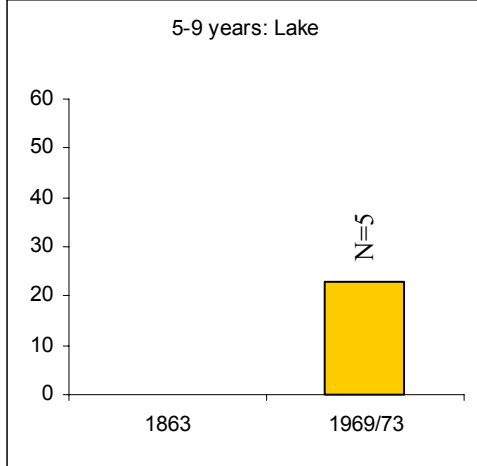


**Figure 22** Proportion of drowning deaths in 1969/73 associated with bathtubs: 0-4 years

For the older children, other open water locations appeared as problems by 1969/73, with substantial proportions of 5-9 year olds drowning in bay beaches and lakes (Figure 23 & 24) and to a lesser extent reservoirs and surf beaches.



**Figure 23** Proportion of drowning deaths in 1969/73 associated with bay beaches: 5-9 years



**Figure 24** Proportion of drowning deaths in 1969/73 associated with lakes: 5-9 years



Typical recreational activity on a suburban Melbourne bay-beach during summer, 2002

The greater involvement of these more remote locations is likely to have been associated with the development of improved private transport and roadway infrastructure. By the late 1960's, ownership of a motorcar was the norm for Victorian families, and a common recreational activity for families was to travel to locations such as beaches, lakes, reservoirs and rivers for a day outing, or more extended vacation. Some of these locations had also become readily accessible by public transport.

These types of outings were associated with a number of factors that made it particularly hazardous for children. Firstly, it put children in an unfamiliar environment that may have contained hazards that they did not recognise and/or did not have the ability to deal with. Secondly, if the outing involved large families or large groupings it could be difficult to maintain supervision of all the children, and there was the potential for misunderstanding about who was performing the task of supervision, it being incorrectly assumed someone else was performing this function. Thirdly, if it were a popular location, with many people in the water it became very difficult for a supervisor to keep track of their charge/s. Further, the presence of many people can lead to the incorrect assumption that because there are a lot of people who could potentially assist, close supervision is not necessary.

1973/1041

6 years: male

*Bay beach.* A group of 17 children from a Children's home were taken to the beach supervised by three adults. Two adults were in the water, one watched from beach. Supervisor - "I saw (deceased) go in the water but did not see him again after this. There was a yacht club meeting at the time we arrived at the beach and there were a lot of yachts on the edge of the water and sand. When the children went into the water, they had to go between the yachts and it was... when we saw these conditions (two adults) went into the water with the children. At the time, the water was fairly rough...the children had been instructed how to behave...I don't think he could swim."

1973/727

7 years: male

*Lake.* Non-swimmer. Last seen wading in water up to his chin. Police – "Very popular swimming and boating area and there was a large number of people of all ages in the water and on the foreshore at the time.... depth of water varies and there are many fairly deep holes amongst the rocks...deceased...apparently allowed to go into the water without proper supervision and subsequently no one took sufficient care over him whilst he was in the water". Had been taken for a motorboat ride by friend and then put ashore into unsupervised situation presumably assuming the presence of others was sufficient protection.

1973/307

6 years: female

*Reservoir.* Child was at the reservoir with her family for Football Club get together of about 100 people. Could swim a little (10 -15 yards). Swimming with 4-year-old sister, mother sat on bank in shade and thought she had the children in her view, but 4-year-old was found floating face down and was rescued, and deceased went missing. Sister – "(deceased) was carrying me into the deep water.... she slipped over in the deep water.... it was very slippery."

1969/677

5 years: male

*Lake.* Child was camping at lake with his family. Father – "my son Garry had been swimming for 12 months and was very careful, he was frightened about going past his depth...previously swam in (public pool)". Parents were on the bank watching the three children (11, 7 & 5 years). The water was crowded with people. Mother noticed he was not with his siblings in the water. Seen floating under the water.

In the case of surf beaches, using these as recreational destinations placed children in a particularly hazardous situation. Strong waves were likely to cause children to lose their footing and rip currents could carry them away from the shore. These factors, added to the difficulties of supervision in such circumstances, leading to several drownings.

1969/514

7 years: male

*Surf beach.* Swimming with other children. Supervised by his father who had six children in his care but was distracted by two of the children going too far away up the beach. Deceased was carried out from shore by currents. Father tried to rescue but was overcome by waves and had to be rescued. Four other children were also rescued.

### Key points: Locations

- Drowning hazards change in the course of development, with some disappearing and some new hazards appearing
- Changes in the involvement of locations in drownings can be based on physical, behavioural or economic changes
- The level of hazard associated with a location is not necessarily fixed but can depend on factors such as age of person, level of supervision, or transient changes

## 3.4 Transient hazards

### 3.4.1 Floods

In 1863, Victoria also experienced the additional hazards associated with high levels of rainfall and floods. The Argus newspaper reported flooding in various regions throughout the year with only the months of May and September being free of reported flooding. There were reports of flooding in many regions during the winter months of June and July, and in the spring month of October, with multiple reports of drowning incidents related to these floods

The level of risk posed by the lack of safe bridges etc., the need to collect water from hazardous water sources and the relatively high numbers of water hazards in the environment would be elevated in times of high rainfall and flood.

1863/680

5 years: male

*Crossing creek.* Used plank (9 inches wide 12feet long) to cross a flooded creek. A miner saw the child using the plank and told him to use the bridge instead. The child fell off plank and the miner jumped into creek but the stream was so strong deceased was carried away.

1863/5887

14 years: male

*Drawing water.* Farm servant. Farmer (employer) – “he was accustomed to go for water to the Deep Creek. I sent him down for water...cautioned him about the manner in which he was to get the water. I expressly told him to turn his horse before going into the water and then back

the cart in. It appears however that he must have driven the horse in and then turned by which means he got into deep water and was carried away by the current." Witness (farm labourer) – "He was turning the horse in the stream. I saw that he was in difficulties and I ran to his assistance but before I could get to his assistance the cart and horse were swept away down the stream.... the deceased was getting a load of water at the regular place when the creek is down but not when it is high...the deceased ought to have known he was going in too far... the creek was high."

1863/734

14 years: male

*Crossing river.* General servant. Deceased's employer asked him to go to ... post letters and collect mail at the Post Office. He left on horseback. Employer – "I had no idea that the ... River was high on that day as I had crossed it in the evening before." Deceased's horse was found on riverbank without its rider and there were signs on the bank of the horse having gone into the river.

It has been shown elsewhere that flood related deaths in Victoria had reduced markedly by mid 20<sup>th</sup> century [46], however, flood related drownings were also observed in the later period in this study.

1973/1780

6 years: male

*Creek.* Deceased's mother thought he was playing in the backyard with his school friend (6 years). Water in the creek was high and extremely fast flowing current, the creek bed is concrete lined with steeply sloping sides. Had been trying to retrieve a toy from water. Friend – "(deceased) threw the toy ambulance into the water...he...slid down slowly to the edge of the water. He just about got to the water, when he seemed to slip quickly into the water... the water kept carrying him away"

### 3.4.2 High temperatures

During summer, Victoria can experience temperatures in excess of 40°C for several days, with most of the state having average maximum temperatures between 24°C - 33°C [47] making it more likely that bodies of water will be entered intentionally for the purposes of providing relief from the heat or for recreational purposes. Periods of higher temperature would therefore be expected to be associated with elevated drowning incidence due to exposure increase. This becomes particularly hazardous for those with no or limited swimming skills.

1969/590

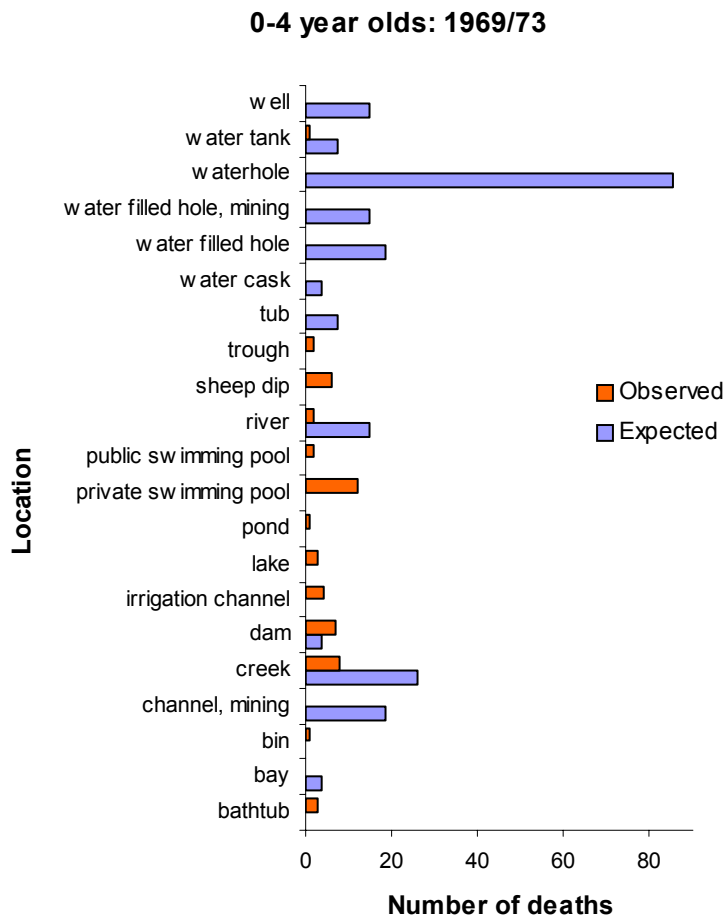
6 years: male

*Dam.* Dam on golf links quarter mile from home. Deceased had been warned by father previously not to swim in dam. Heavy rain had filled the dam. Parents were not at home when deceased and two siblings got home from school and as the weather was hot the children decided to go for swim. Deceased's 9-year-old brother could swim but deceased and his sister (8 years) could not. Deceased walked into water up to his navel. He said, "I can put my head under water". Sister - "He then went under and we saw bubbles coming up. We tried to talk to him but he wouldn't answer".

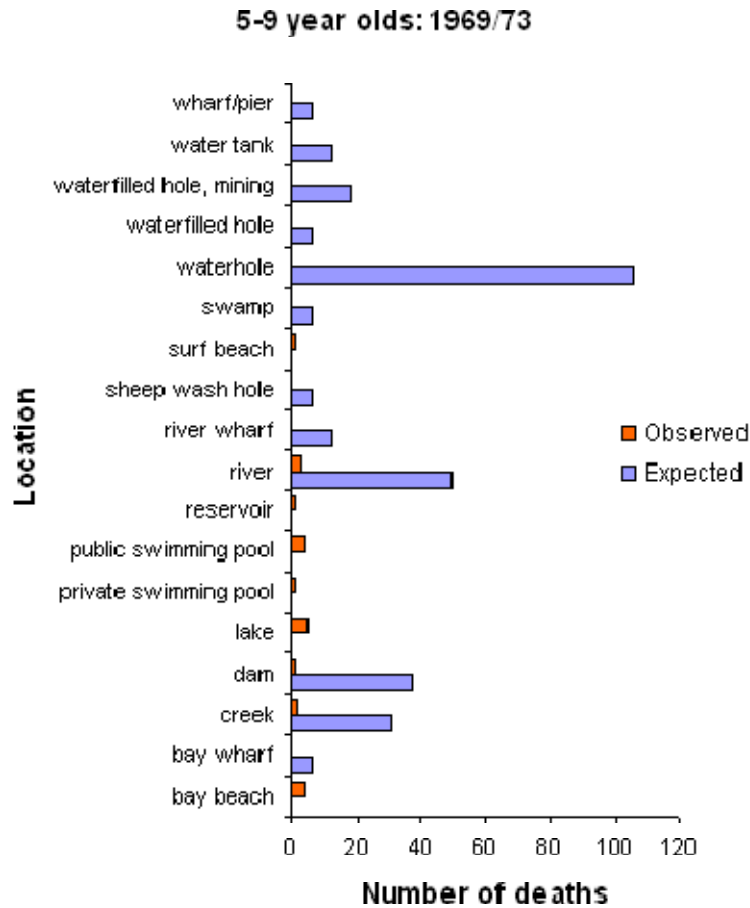
### 3.5 Expected drowning frequencies

Comparison of expected drowning frequencies based on the population increase alone, with those observed in 1969/73 show the marked change in the pattern of risk associated with specific locations. While the lack of population data for two of the years requires that interpretation of the expected frequency magnitude be treated with caution, the overall trends are more clear (Figures 25, 26 & 27). For each age group, many of the locations that gave rise to drownings in 1863, resulted in no drownings in 1969/73. Where locations continued to be associated with deaths in the later era, primarily rivers and creeks, the observed number of deaths was markedly less than would be expected.

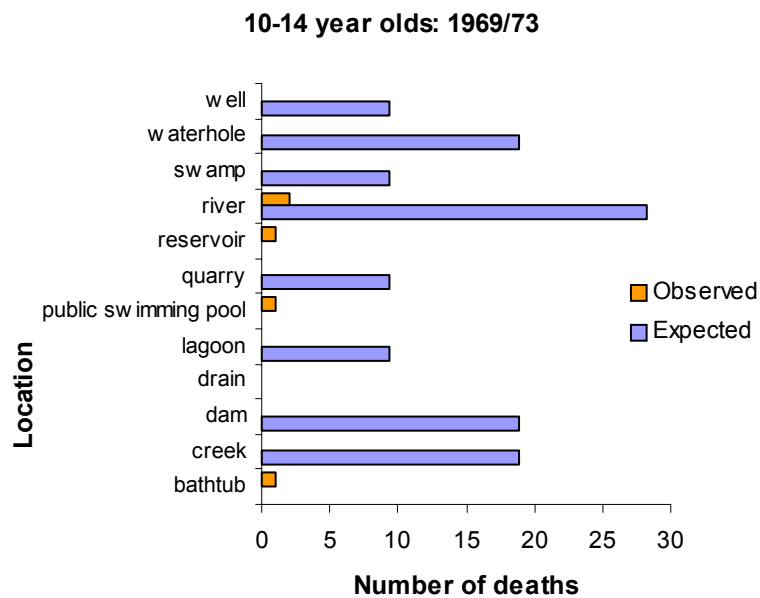
Further, the observed data revealed the emergence of new hazards for each age group, with the 0-4 year olds being most affected by the introduction of new water hazards in their environs.



**Figure 25** Comparison of expected number of drowning deaths, based on population growth, and observed drownings deaths in 1969/73: 0-4, year olds



**Figure 26** Comparison of expected number of drowning deaths, based on population growth alone, and observed drownings deaths in 1969/73: 5-9 year olds



**Figure 27** Comparison of expected number of drowning deaths, based on population growth alone, and observed drownings deaths in 1969/73: 10-14 year olds

The finding that some locations were no longer associated with drownings or were involved at a much reduced level has several interpretations:

It may be that the locations:

- Have ceased to exist or exist in reduced numbers
- Continue to exist but the population has reduced exposure to them
- Continue to exist but are protected
- Continue to exist, and the population is still exposed to them, but now has the awareness and/or skills to reduce impact of these locations

## 3.6 Supervision

The issue of supervision of children is important for injury prevention in general and particularly for drowning prevention. A study of injury deaths in the American states of Alaska and Louisiana found that drowning deaths nearly always involved inadequate supervision [48].

In 2003, an expert workshop was conducted to discuss the role of supervision in injury prevention [49]. The workshop identified the need for further research, and suggested that death reviews could be employed to help understand the antecedents of an injury event. In respect to supervision, they suggested there is a need to identify the hazards and circumstances for which supervision has the strongest relationship to injury outcomes.

While the information accessed from coronial records in the current study is not sufficiently detailed to allow systematic analysis of factors relevant to supervision (attention, proximity and continuity), it is adequate for determination of the level of supervision operating at the time of the drowning in most cases. Therefore the coronial data were analysed to determine the nature of supervision occurring at the time of the incident. Four supervision categories were employed in the analysis.

### 3.6.1 Supervision categories

#### **Supervised**

In these cases a supervisor or other adult, was in close proximity or attending to the victim and witnessed the incident but was unable to prevent the drowning. For example:

1863/1157

6 years: male

The child was running ahead of his mother and brother on a wharf, when he fell through a hole into the water.

1973/315

0 years: female

Infant was a passenger in car, driven by her mother, which skidded on the bend of a wet road and went down an embankment into a creek

## **Inadequately supervised**

Attempts were made to supervise but conditions did not allow this to be performed effectively. The person may have been incapable of effectively performing the task:

1963/147

7 years: female

Attempting to board boat accompanied by possibly drunk male friend of mother. The friend was carrying her onto a ship when they both fell into the water. The child held his leg but let go and sank.

Supervisors may have been too remote, there may have been too many in their care, or the conditions may have made supervision difficult:

1969/677

5 years: male

Family were camping at lake. The parents were on the bank watching the three children (11 years, 7 years & 5 years). The water was crowded with people. Deceased's mother noticed he was not with his siblings in the water.

1973/1041

6 years: male

A group of 17 children from a Children's home were taken to the beach supervised by three adults. Two adults were in the water, one watched from beach. Supervisor - "I saw (deceased) go in the water but did not see him again after this. There was a yacht club meeting at the time we arrived at the beach and there were a lot of yachts on the edge of the water and sand. When the children went into the water, they had to go between the yachts and it was... when we saw these conditions (two adults) went into the water with the children. At the time, the water was fairly rough..."

## **Unsupervised**

Drowning occurred alone or in the presence of others who are not actively attending to the victim. For example:

1863/317

8 years: male

The boy went out with a cart to collect firewood. His cart found at a wharf and the body was found some days later. It was assumed he had fallen from the wharf.

1969/2315

4 years: male

Drowned in bath. His mother was in habit of leaving him in bath to play with toys for 10-15 minutes. On this occasion she had a lot of housework to do so left him in there for 30 minutes, checking occasionally.

1973/107

2 years: male

Father left the child on a jetty while he continued sailing on the lake. There were other people present, but the father did not ask any of them to attend to the child.

## **Peers**

The child was in the company of other children, or was being supervised by an older child.

1863/1086

2 years: male

Last seen by mother playing on bank of creek 300 feet from the house with seven other children - siblings and cousins the eldest being 12 years old. An hour later the children went to get the cows and when they returned the deceased was not with them.

1969/1095

7 years: male

Deceased, who was a non-swimmer, fell in the river while playing on a moored boat with his brother (9 years) and friend (7 years). Brother – “I caught hold of his hand but it slipped. He went under a couple of times.” The boys were supposed to go home for lunch during the school lunch break but instead went in to the city. Mother – “we have had a lot of trouble with them wandering away. Once they disappeared for a week.”

1973/1373

1 year: male

Deceased had been playing in the backyard with a friend (4 years) while their mothers were in the house talking. Drowned in a concrete fishpond. A sheet of steel reinforcing wire usually covered the pond, however, the wire had been moved off quarter of the way. The mothers had warned children not to go near the pond.

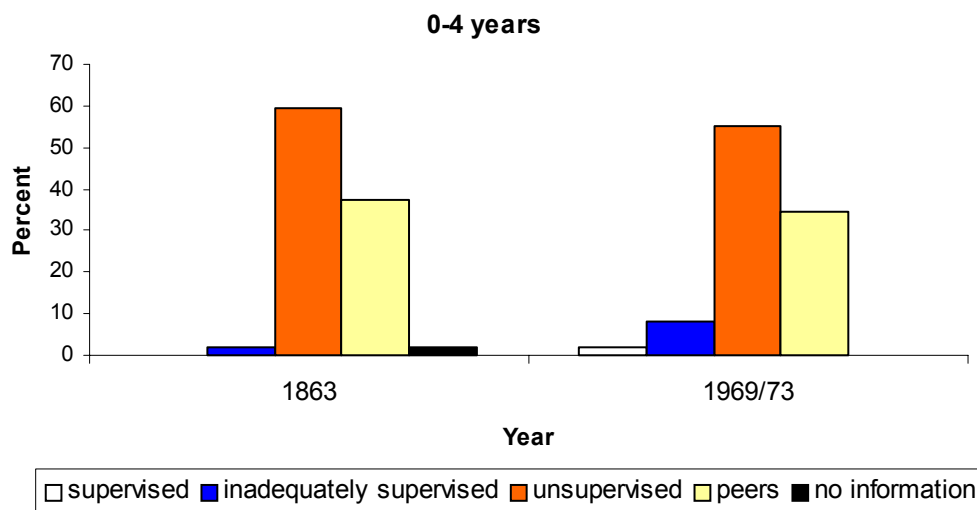
1973/938

11 years: male

Deceased was non-swimmer and went swimming in the river with five young friends, only one of who could swim. One of the girls floated too far out on a tyre tube and called for help (thought to be in jest) and deceased walked to cross river and help her, but he went into deep hole and sank. It was the first time they had swum in this part of river. They usually swim at a place where it is not deep.

### 3.6.2 Supervision results

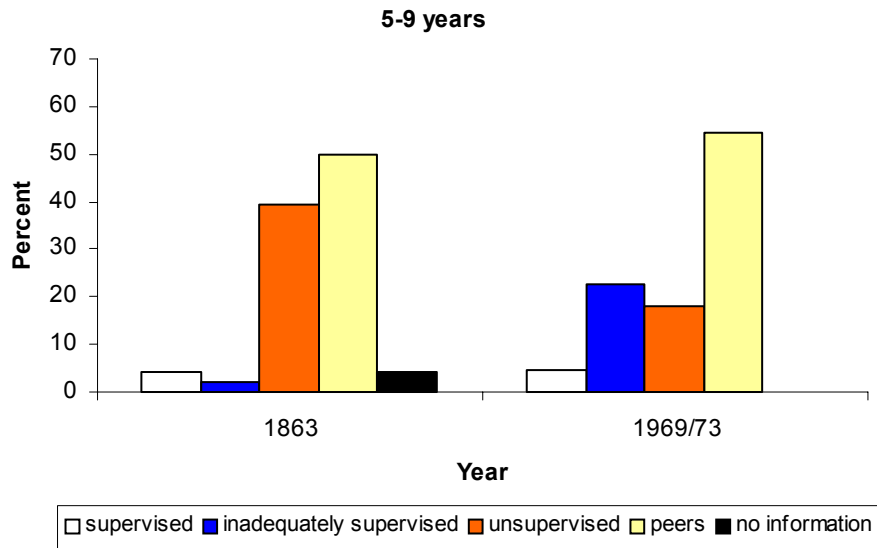
The levels of supervision operating at the time of the incidents for each age group over the time periods are shown in Figures 28 & 29.



**Figure 28** Supervision status associated with drownings aged 0-4 years in 1863 (N=59) and 1969/1973 (N=49)

For 0-4 year olds, with one exception, all drownings occurred when the child had no close supervision and was alone or was in the company of peers. The one child that was under close supervision was involved in the submersion of a motor vehicle, a circumstance in which the supervisor was unable to intervene.

Supervision levels were also very low for 5-9 year olds. These older children most likely to be in the company of other children, or, to a lesser extent, alone. There were several cases where

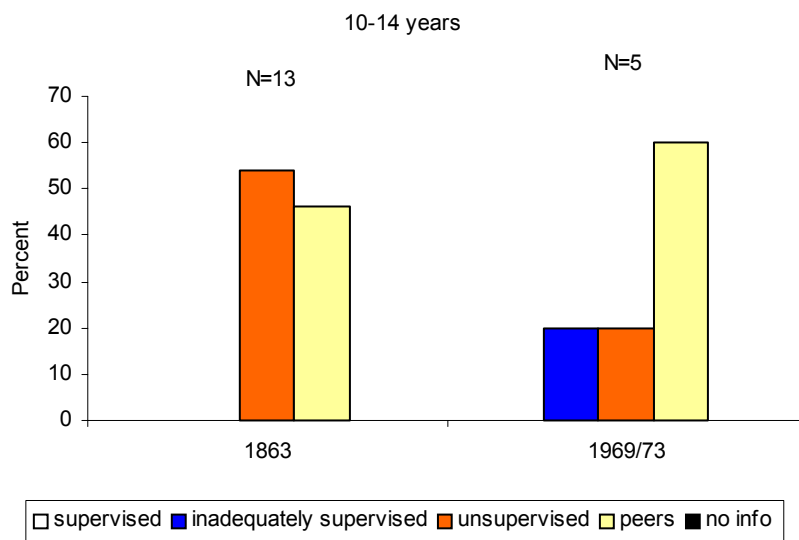


**Figure 29** Supervision status associated with drownings aged 5-9 years in 1863 (N=48) and 1969/1973 (N=22)

supervisors being too remote, having too many children in their care or having been distracted.

In those 5-9 year olds where close supervision was present, the supervisors were unable to give assistance due to the severity of the situation: sinking of boat, falling into flooded creek, falling from wharf.

In 1863, while most 5-9 year old victims were in the company of peers, almost as many were alone at the time of the incident. However, in 1969/73, relatively few children were alone, they being most likely in the company of peers.



**Figure 25** Supervision status associated with drownings aged 10-14 years

Similarly, 10-14 year olds showed a shift away from being alone at the time of the incident in 1863 (Figure 30), to being most often in the company of peers in 1969/73.

## 4. LESSONS FROM HISTORY

In 1863, the majority of Victoria's population was located in areas containing many unprotected water hazards (waterholes, creeks, rivers, dams, wells, mining works), which were in the immediate environment of many children. Daily activities led to the exposure of children to these hazards, and in the absence of adequate supervision this resulted in unintentional immersion and death by drowning on many occasions.

In contrast, by 1969/73 most Victorians lived in urban locations where exposure to such hazards on a daily basis would be considerably less. While drownings continued at a number of these locations, they did so at a markedly reduced rate. However, at this time, children of all ages were affected to some extent by the introduction of new hazards into their environs and changing recreational patterns resulting in additional drowning deaths, with the youngest children being the most vulnerable to these changes.

This suggests the need for a community to be ever vigilant to the introduction of new hazards and guard against their impact. For example, in Victoria there are currently several new trends likely to result in drowning deaths if sufficient care is not taken. One of these is a consequence of an extended period of drought, with the resulting water use restrictions prompting many to store rainwater for later use. While suitably designed rainwater tanks pose little threat, the market has seen the emergence of smaller containers that either have no child proof locking system or have systems that are inconvenient to use, making it likely that they will be bypassed. These containers pose very real threats, and the lessons of history tell us that the presence of these containers in the vicinity of children may lead to drowning deaths.

Similarly, a recent fashion in housing developments has increased the level of hazards in Victoria's outer urban areas. A number of new housing estates have been built around artificial ornamental waterways. This fashion recreates some elements of the hazardous situation present in 1863 and unless precautions are taken this arrangement is likely to be associated with drowning deaths.

The lack of adequate supervision was a common feature of all but a very small number of the drownings in this study. The only circumstances under which competent supervision failed were in extreme conditions which rendered the presence of the supervisor ineffective. The vast majority of drowning deaths occurred when the victim was alone or in the company of someone who was not competent, or in a position, to assist: e.g. another child or a remotely located adult.

The 1863 results demonstrate that the combination of the presence of unprotected bodies of water and lack of adequate supervision is a particularly hazardous combination.

In addition to the creation of new hazards by changed physical conditions, the results indicate that behavioural changes have also been associated with changes in drowning mortality. While most of the 1863 drownings were associated with the victim entering the water unintentionally, by 1969/73 many drownings of those aged 5 and older were associated with having entered the water intentionally. This behavioural change, of using water for recreational purposes, would have increased the level of exposure to hazard for this population. In the absence of strong water survival skills and adequate supervision, this exposure sometimes resulted in drownings.

The results also suggest that the development of infrastructure led to the reduction of hazards and/or reduction of the impact of hazards on the population. These infrastructure changes included physical (e.g. piped water systems, erection of barriers, signage, safe bridges), legislative (e.g. laws requiring erection of barriers and wearing of personal floatation devices, occupational health and safety laws) and organisational developments (e.g. medical and emergency services, safety authorities to monitor hazards and intervene, life saving organisations, swimming programs, hazard awareness campaigns).

The extent to which the findings of this study have relevance to drowning prevention in contemporary developing communities requires some discussion. Victoria in the mid 19<sup>th</sup> century was a rapidly growing community, with much of its population living in highly hazardous mining regions. Do these conditions bear any relationship to the experiences of contemporary communities?

While the creation of the high risk community in Victoria was due to unusual factors, such as the discovery of gold and the resultant gold rush, the population and hazard profiles created by these circumstances resemble those in contemporary developing communities. The age structure of the populations shows clear parallels. In 1861, 37.8% of Victoria's population in was under the age of 15. This age pattern is currently found in number of low- and middle-income countries, (e.g. Cambodia, Philippines, Mongolia, Kiribati, Lao PDR, Bhutan, Bangladesh, Myanmar, Vietnam [50, 51]). There are also strong similarities between 19thC Victorian hazard patterns and those of contemporary developing communities with drowning locations being located close to houses [8, 52] and many occurring in ponds, wells, ditches, canals, rivers, tanks and rain filled holes or diggings [7-9, 52, 53]. The lack of physical and organisational infrastructure would also be common to both the historical and contemporary communities.

Victoria transformed from a community of high drowning risk to one of low drowning risk. This study has identified the associated risk patterns and the ways in which they changed over time. The parallels between the Victorian experience and those of contemporary developing communities suggest the results may usefully inform the prevention of drowning in contemporary high risk communities.

### **Key points: Lessons**

- Children of all ages when exposed to unprotected water hazards are at risk of drowning
- Competent and constant supervision is necessary for children who do not have adequate water survival skills
- If adequate levels of supervision cannot be achieved, it is necessary to prevent exposure
- Intentional entry into water without water survival competence presents a risk of drowning
- There is the need for vigilance in the identification of new hazards or changed behaviours that could lead to the risk of drowning
- In developing communities, lack of infrastructure can lead to the creation of risk and/or risky behaviours

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