

RECENT TREND OF DEATHS FROM UNNATURAL CAUSES (ACCIDENTS, SUICIDES AND HOMICIDES) IN SINGAPORE, 1961—1965

By Chen Ai Ju

(Department of Social Medicine and Public Health, University of Singapore)

With the changing pattern of diseases in Singapore today, non-communicable diseases like cancer, cardiovascular diseases and accidents are becoming relatively more important. Accidents, suicides and homicides not only cause much suffering, pain and grief which are difficult to measure to the family, but the productivity of a nation from the loss in working hours and economic loss in the form of medical care is also affected.

This present study is an effort to collect some information to gain more knowledge and insight into the extent of the problem in Singapore, together with some of its epidemiological features, so that methods of prevention can be evolved.

METHOD

Materials for this study have been collected from the Coroner's records. A death is taken as accidental, suicidal or homicidal according to the verdict of the Coroner. These include cases in which death happened sometime after the injury. Cases where no verdict can be arrived at are excluded. The date of death and not that of the occurrence of the event is recorded, hence, information obtained for this study is that of deaths due to unnatural causes in the years 1961-1965. As long as the events leading to the death occur in Singapore, people of all ethnic groups, whether domiciled locally or not, are included.

The investigation is only limited to those items of information which are available from the Coroner's Court. No attempt has been made to seek information from elsewhere.

I. Deaths from Accidents

The total number of accidental deaths in a year has remained fairly constant in the 5 years under study. Similarly, there is not much change in the rate per 100,000 population, the proportional mortality ratio and the proportion of transport to non-transport accidents (Table I).

In the following analysis, all the accidental deaths occurring in the last 5 years are studied

TABLE I

DEATHS CAUSED BY ACCIDENTS IN RATES/100,000 POPULATION BY SEX, 1961-1965.

	Rates per 100,000 Population		
	All Accidents	Transport	Non-Transport
1961 { Male Female Total	34.3 12.4 23.9	19.7 5.6 13.0	14.6 6.8 10.9
1962 { Male Female Total	33.0 9.3 21.6	18.8 3.9 11.7	14.2 5.4 10.0
1963 { Male Female Total	32.2 11.3 22.1	19.3 5.7 12.8	12.9 5.5 9.4
1964 { Male Female Total	33.2 14.9 24.4	21.3 4.7 13.3	12.0 10.2 11.1
1965 { Male Female Total	34.6 10.8 23.2	20.4 5.1 13.0	14.3 5.7 10.1
TOTAL { Male Female Total	33.5 11.7 23.1	19.9 5.0 12.8	13.6 6.7 10.3

together; and accidents have been classified into 2 main categories:— transport and non-transport accidents.

IMPORTANCE

4% of all deaths in Singapore, 1961-1965, can be attributed to accidents. A study of the principal causes of death, 1961-1965, shows that accidents are the principal killers for those in the ages 5-34 years (Table II).

AGE-SEX DIFFERENTIALS

The accidental death rate for males is much higher than females, 33.5 per 100,000 in the former as compared to 11.7 per 100,000 in the latter (Table I). Except in infants and the very

old, the proportional mortality ratio is consistently higher for males than for females. The peak of this ratio is reached at different ages by the 2 sexes, that for females arising much earlier (5 - 14 years) than for males (15 - 24 years). In males, the largest number of accidental deaths is also in the group 15 - 24 years, where the proportional mortality ratio is 26%. On the whole, transport accidents play a greater role in accidental death than non-transport accidents. This is especially seen in the males, where it constitutes 3/5 of all accidental deaths.

In the under 5 year olds, the most important cause of accidental death is drowning, but in all the other ages, road traffic accident plays a greater part.

ETHNIC GROUP

Amongst the 3 major ethnic groups living in Singapore, the Indians have the highest accidental death rate and the Malays the lowest (Table III). This finding is common for both transport and non-transport accidents. The death rate of 29.1 per 100,000 among the Indians and Pakistanis is significantly higher than among the Chinese (22.0 per 100,000) and that among the Malays (16.6 per 100,000) ($P < 0.01$). Furthermore, the rate for Chinese is also significantly higher than that for the Malays ($p < 0.01$).

Non-transport accident will now be dealt with first.

TABLE II
PRINCIPAL CAUSES OF DEATH 1961 - 65
(AGE 5 - 44 YEARS)

Cause of Death \ Age (Years)	Number of Deaths			
	5-14	15-24	25-34	35-44
Malignant Neoplasm	128	118	235	608
Arteriosclerotic and degenerative heart disease	5	15	53	226
Vascular lesions affecting CNS	29	13	55	179
Pneumonia	204	57	48	101
Tuberculosis	24	54	136	252
Accidents	321	474	247	198
All Causes	2,041	1,778	2,118	3,598

TABLE III
ACCIDENTAL DEATHS BY ETHNIC GROUPS

	Number			Rate/100,000 Population		
	Transport	Non-Transport	Total	Transport	Non-Transport	Total
Chinese	792	677	1,469	11.9	10.2	22.0
Malays	110	99	209	8.8	7.9	16.6
Indians and Pakistanis	107	106	213	14.5	14.4	29.1
Others	62	32	94	28.0	14.4	42.0
Unknown	0	0	0	0	0	0

A. Non-transport Accident

The main types of non-transport accident causing deaths are drowning, falls, fires, burns and scalds, injuries resulting from falling objects and cutting instruments, lightning and electrocution and accidental suffocation.

PLACE OF OCCURRENCE

59.3% of all non-transport accidents happen at home, 13.5% at the place of recreation, 11.7% at the place of work. (The place of work does not include places where household duties are performed; the place of recreation includes seaside, swimming pool, public play ground and parks). The most common causes of home accidents are drowning, falls, burns and fires; at the place of work, they are falls, injuries resulting from falling objects and from cutting instruments and at the place of recreation, drowning in the sea or swimming pool is the most important cause.

Where males are concerned in the 15-24 years, the majority of fatal non-transport accidents occur at the place of recreation, for those 25-34 years, at the place of work, and in the other ages, at home. On the other hand, in females, 80% of all non-transport accidental deaths happen at home.

AGE-SEX DIFFERENTIALS

There are relatively more male deaths than females for all the causes of non-transport accidents (Table IV). The male rate is double that of the female. The largest number of non-transport accidental deaths is in the group 1-4 years where half of them perish from drowning.

ETHNIC GROUP

Accidental drowning claims the most lives in the Chinese and Malays as compared to the other causes. Among the Indians, falls are more important.

HOME ACCIDENTS

Because of the large number of accidents occurring at home, home accidental deaths are treated separately here. Drowning, falls and burns are the 3 major types of "Home Accidents" causing death.

42.8% of these deaths are children 0-4 years. In this group the number of males and females are about the same. However, it is rather sur-

prising that although one would expect more home accidental deaths in females since they spend more time at home, in all the other ages, males outnumber females. The mean 5-year death rate of 6.8 per 100,000 among males is significantly higher than that among females (5.35 per 100,000) ($p < 0.05$).

In the 0-4 years, 95% of accidental deaths happen at home and at the other end of life in the over 65 years about 90% occur in the homes.

Some of the more important accidents will now be dealt with in greater detail.

i. Drowning

Is the most important cause of non-transport accidental death—being responsible for 37.6% of it, and about 57% of the non-transport accidental deaths in children 1-14 years (Table IV). The occurrence of drowning at different sites varies in the different age groups. Drowning in wells and ponds (vegetable, fish and prawn ponds) is mainly in the toddlers. In the young adults (15-24 years) drowning occurs usually in the sea or swimming pool whilst apparently swimming, diving or fishing. (Drowning at sea whilst travelling other than pleasure boating is considered as water transport accident).

If drowning in wells, ponds, and drains near home is included as "home accidents" (because they arise from a domestic activity, although the act has not actually occurred in the home), about 56% of drownings are "domestic". Out of these, 77 occur in ponds, 59 in wells, 35 in drains and 21 in bath tubs or water jars (used for water storage) in the home.

ii. Falls

Falls are a major threat to all ages. In the group 55-74 years, falls are the most important cause of accidental death, being responsible for 58% of deaths in this group. In the males, it accounts for $\frac{1}{4}$ of the total fatal non-transport accidents and $\frac{1}{3}$ in females. The rate is highest in females over the age of 65 years (Table IV).

The most common way of falling is a slip on level ground at home. This mode of falling is more common in females of all ages and in persons over 65 years. Next comes falling from roof, scaffolding or piling frames among workers at building sites or whilst repairing houses. Falls from beds, tables and chairs are found in the very young and old. The other places where falls occur are from trees, stairs and ladders. Falls from windows and verandahs are mainly in those under 5 years.

TABLE IV
NON-TRANSPORT ACCIDENTS — CAUSES BY AGE AND SEX

Age	Drowning		Falls		Fires, Burns and Scalds		Falling Objects		Poisoning		Lightning Electricity		Mechanical Suffocation		Others		Total		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
< 1 year	—	4	1	1	4	1	—	—	—	—	2	1	7	4	0	0	14	11	25
1—4 years	67	52	11	16	29	19	4	2	1	4	—	—	11	1	2	3	125	97	222
5—14 years	87	27	17	10	3	14	11	6	1	—	4	5	1	—	1	—	125	62	187
15—24 years	54	6	30	11	4	6	4	1	1	3	11	3	—	1	12	—	116	31	147
25—34 years	16	2	14	7	2	4	10	—	1	—	11	3	—	1	16	1	70	18	88
35—44 years	8	1	17	6	4	2	8	1	2	—	10	1	1	—	2	1	52	12	64
45—54 years	8	—	21	9	2	2	5	2	1	—	2	—	4	1	3	—	46	14	60
55—64 years	5	2	22	10	1	1	4	—	3	—	1	1	2	—	3	1	41	15	56
65—74 years	2	—	14	10	5	1	—	1	3	2	—	—	1	—	2	—	27	14	41
> 75 years	—	1	7	10	1	1	1	1	—	—	—	—	—	—	—	—	9	13	22
Unknown	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2
TOTAL	249	95	154	90	55	51	47	14	13	9	41	14	27	8	41	6	627	287	914
	344		244		106		61		22		55		35		47		914		

iii. Burns and Scalds

Is third in importance as an external cause of fatal non-transport accident. The majority of it (93%) happened at home, accounting for 18% of all domestic accidents. Males and females are almost equally affected. Burns and scalds tend to be concentrated in the younger age groups; about half of it occurred to the under 5 years. Scalds in this group are mainly caused by hot water or liquid (hot soup, porridge, pig's food). As a cause of accidental death to the toddlers, it is only second to drowning.

The other important causes of burns and scalds besides those caused by hot boiling water and liquid are open fires and explosion of kerosene stoves and lamps. With the decline in the use of these there may be less cases of it in future.

iv. Mechanical Suffocation

Commonly caused by choking of food particles or accidental strangulation. Foods like rambutan seeds, peanut, fish balls, cause choking in children under 2 years. The 5 adults dying from choking by food particles are inmates of Woodbridge Hospital.

Accidental hanging in babies is caused by the string suspending a rubber teat which is hung around the neck. A few cases are designated as suffocation in bed when the baby was found dead in the cot with no other obvious illness.

v. Falling Objects

Objects which cause death either by causing head injury or burying the victims are fruits, trees, stones and bricks, earth and goods on transport. Fruits, e.g. coconuts and trees falling to the ground have killed several people especially the children. Deaths caused by stones and bricks occur in quarries or building sites. 5 deaths were caused by cargoes dropping down from moving motor vehicles onto road users. These would not have occurred at all if the goods had been properly loaded on the vehicles.

vi. Poisoning

Accidental poisoning is not an important cause of death. The common poisons responsible are kerosene (3), caustic soda (3), detergents (2), opium (4), and methyl salicylate (6).

vii. Others

This group consists of a conglomeration of different causes of accidental deaths. There

are 13 cases of injury by machines, 7 cases of hornet and wasp bites, 3 cases of bomb explosion and others including injuries caused by golf balls (3), heatstroke (2), snake bites (4), and accidental dropping of babies whilst being carried (3).

B. Transport Accidents

The 4 main types of transport accidents are road, water, air, and railway accidents, the first of which predominates over all the rest, forming 94.5% of the total.

Only road traffic accidents will be considered here.

ROAD TRAFFIC ACCIDENTS

General

The percentage of deaths due to road traffic accidents to all deaths in males is 2.83 whilst in females it is 1.02. Proportionate mortality ratio has further indicated that road traffic accidents have assumed a leading rôle as a cause of death in children and young adults. This ratio is highest in males 15-24 years accounting for 22% of all deaths, whilst in females it is highest (6.4%) in the school-going age of 5-14 years. The peak of mortality is well marked for males but much less for females (Table V).

Road traffic accidents are responsible for 52% of all accidental deaths.

TABLE V

DEATHS FROM ROAD TRAFFIC ACCIDENTS AS A PERCENTAGE OF TOTAL DEATHS BY AGE AND SEX, 1961 - 65

Age (years)	Percentage of R.T.A. Deaths to Total Deaths	
	Male	Female
0—4	0.35	0.27
5—14	9.99	6.40
15—24	21.75	4.60
25—34	13.44	2.50
35—44	6.12	1.69
45—54	2.22	1.06
55—64	1.39	1.00
65—74	1.10	0.68
>75	0.93	0.29
Unknown	0.93	0.00
TOTAL	2.83	1.02

AGE-SEX DIFFERENTIALS

Taking all ages together, the mortality from Road traffic accidents is about four times higher in males than females. This is evident in all ages even in the 0-4 years (1.8:1); at 5-14 years it is 2:1; at 15-24 it has become 4:1; but at 65+ it has fallen to 2:1 again. Many of the fatalities at the extreme ages occur to pedestrians, and it appears likely that the ratio of male to female pedestrian death is roughly at 2:1 for all ages (Table VI).

ROAD USERS

In males, pedestrian, motor cyclist, scooterist, and pedal cyclist are the 3 main types of people who meet their deaths on the road. (Pedal cyclist includes cyclists of bicycles and trishaws). The peak age is in the group 15-24 years; in females however, it is around 5-14 years with another smaller peak round about 55-64 years. In the latter the great majority are pedestrians, the other types of road users who die on the road are almost negligible comparatively.

PEDESTRIANS

40% of males and over 70% of females who die of road traffic accidents are pedestrians. The age distribution of fatally injured pedestrians is not even. The child pedestrian from the age at which he begins to walk to about 14 years is at special risk, so is the elderly pedestrian from the age of 55 years onwards. This age trend is similar to that of non-transport accident. It is surprising, that there is such a large number of pedestrian deaths in the 0-4 years when one would not expect them to be so often on the highways.

Accidents involving motor-cars running over pedestrians is the most important cause of pedestrian death—accounting for 45% of the total. This is followed by death due to collision with goods vehicles, motorcycles, scooters and buses.

MOTORCYCLIST, SCOOTERIST, AND PILLION RIDERS

The 2nd important category of road user who died in road traffic accident is motorcyclist and scooterist. Over 90% are males. The mortality is highest in the group 15-24 years. In this case deaths are caused mainly by collision with other motor vehicles. However, deaths

due to overturning or running off highway are also considerable.

PEDAL CYCLISTS

Like deaths of pedestrians, deaths involving collision with motor cars make up the highest percentage (43%) followed by collision with goods vehicles, buses, motorcycles and scooters. In addition, second only to pedestrian deaths, there is a relatively high proportion of pedal cyclist deaths among the elderly from age 55 years onwards.

Drivers and occupants of motor cars who die in road traffic accidents are mainly the adults. In the 5 years under review, there are only 120 deaths and out of these $\frac{1}{4}$ occur in accidents in which there is no collision but due to skidding and overturning of the vehicles. Hence, the motor car can be said to be of greater danger to the other road users rather than to its own passengers.

Not an inconsiderable number of deaths (39) occur to passengers whilst boarding or alighting from moving buses. This type of accident happens to both adults and children. (Buses includes motor and trolley buses). The 5 road users in the class "others" are 3 stall-keepers sleeping by their roadside stalls, a man sitting under a lorry and another lying on the road repairing a motorcar.

ETHNIC GROUP

The mortality rate from road traffic accidents is highest in Indians and lowest among the Malays. In all cases, the male rate is about 3-4 times that for female. This sex difference is also highest among the Indians.

The proportion of pedestrian death to total road traffic accidental death is highest in the Indians (70%) while that of the motorcyclist, scooterist and pillion rider is highest in the Chinese (22%) (Table VII).

VEHICLE

About 30% of registered vehicles in Singapore are motor cycles and scooters and yet 77% of all deaths of drivers of vehicles are motorcyclists and scooterists. The rate for motorcyclist and scooterist is 7 times that of drivers of other vehicles. The pedal cyclist relatively has the lowest rate.

A study of the deaths of pedestrians and pedal cyclists caused by the different motor

TABLE VI
DEATHS OF ROAD USERS BY AGE AND SEX

Road User	Age		0—4		5—14		15—		25—		35—		45—		55—		65—		75+		Unknown		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Pedestrian	19	12	69	37	34	9	14	5	28	12	43	17	66	25	46	23	21	9	7	—	347	149	496	
Pedal cyclist	1	—	14	3	33	5	15	2	21	—	26	—	22	—	7	—	—	—	—	—	139	10	149	
Motorcyclist, scooterist, pillion-rider	—	—	2	1	100	5	74	1	32	1	9	1	3	—	—	—	—	—	1	—	221	9	230	
Drivers and passengers of motor car	3	1	5	2	18	3	27	7	29	4	12	—	1	1	3	1	1	—	2	—	101	19	120	
Passenger of lorry falling off vehicle	—	—	1	—	2	—	—	—	1	1	—	—	1	—	—	—	—	—	—	—	5	1	6	
Passenger while boarding or alighting from bus	—	—	5	4	7	2	2	1	2	1	3	4	2	4	—	—	1	1	—	—	22	17	39	
Other accidents to drivers and passengers of buses and goods vehicles	—	—	—	—	7	1	9	2	2	—	1	—	2	1	—	—	—	—	—	—	21	5	26	
Others	—	—	1	—	1	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	4	1	5	
TOTAL	23	13	97	47	202	25	141	18	115	19	95	22	97	32	57	24	23	11	10	—	860	211	1,071	
	36		134		227		159		134		117		129		81		34	10			1,071		1,071	

TABLE VII
DEATHS OF ROAD USERS BY ETHNIC GROUP

Road User	Ethnic Group				Total
	Chinese	Malays	Indians and Pakistanis	Others	
Pedestrian	455	52	74	15	496
Pedal Cyclist	105	26	18	—	149
Motor Cyclist, Scooterist and Pillion Rider	166	28	12	24	230
Driver and Passengers of other Motor Vehicle	122	26	20	23	191
Others	3	1	1	—	5
TOTAL	751	133	115	62	1,071

vehicles shows that motor cars cause 46% of the deaths, goods vehicles 25%, motorcycles and scooters 20% and buses 9%. However, the figures for the percentage of the different vehicles to total motor vehicles registered in Singapore is different, being 59% motor-cars, 29% motorcycles, 12% of goods vehicles and 0.1% buses. Thus, it can be seen that it is the buses and the goods vehicles which are proportionately causing more deaths. However, one must take into consideration the different number of hours that these travel on the road.

II. Deaths from Suicides

During these years under study, suicidal deaths comprise 1.44% of the total deaths in Singapore. A study of the age distribution of suicides shows that children almost never commit it. The youngest case of suicide in those studied was a boy aged 13 years, and there are only 4 cases out of a total of 739 occurring to the under 15 years. Hence, if one is to eliminate the children under 15 years, and assuming that the age composition of the population in 1961-1965, is similar to that of 1957, the suicidal death rate for those over 15 years is 17 per 100,000, the male rate being more than double the female rate (Table VIII). This suicidal death rate is very close to that of 20 per 100,000 for the years 1930-1952 in Murphy's study on suicides in Singapore.

A breakdown of the rate for the 3 main ethnic groups living in Singapore shows that it varies among the different ethnic groups. The Malays are exceptional in their very low rates

TABLE VIII
SUICIDAL DEATH RATES BY
ETHNIC GROUP

Suicidal Death Rate	Suicidal Death Rate Per 100,000 Population >15 Years		
	Male	Female	Total
Ethnic Group			
Chinese	23.30	11.05	16.94
Malays	5.61	1.25	4.16
Indians and Pakistanis	15.57	10.15	13.51
TOTAL	19.60	8.76	17.00

for both sexes, whilst the Chinese have the highest. However, compared to Murphy's figures, the Malay suicidal death rate has increased considerably from 2.55 to 5.61 in males and 0.22 to 1.25 in females; whereas for the Indians and Pakistanis they have fallen.

METHODS USED IN FATAL SUICIDES

The chief methods used are hanging, jumping down from a height, drowning, caustic soda or other drug or chemical poisoning, e.g. barbiturates, insecticides and detergents, etc., and self inflicted wounds by the use of cutting instruments or firearms. There are very few cases of deaths due to gassing, or fires. The first 3 mentioned are the most important methods for males, whereas in females, it is hanging,

jumping down from heights, and the drinking of caustic soda. In general, hanging is the most popular method followed by jumping down from a height. In males, hanging forms about half the total, whereas in females, it is $\frac{1}{3}$. Death due to the ingestion of caustic soda accounts for about $\frac{1}{20}$ the total in males and $\frac{1}{6}$ in females. Thus, it can be seen that the methods used in suicides vary somewhat between the 2 sexes. However, where ethnic differences are concerned, there is not much variation for the methods used. There is considerable variation in the popularity of the various methods when compared to the methods used 10 years before this period of study. Caustic soda, second most popular in the 1950s, (Murphy, 1954) now takes the 4th place. Jumping from heights is increasing in favour, whilst hanging remains the most popular method.

AGE DIFFERENTIALS

Because of the small number of suicides among the Malays, very little conclusion can be drawn from it. However, for the Chinese, the age distribution of suicides varies in the 2 sexes. The largest number of suicides occur among the males in the older age group of above 55 years, whereas among females it is in the young adult age of 15-24 years. In general, for males, half of the total occur in the ages over 45 years, whereas in females, it is in the group below 45 years.

Hanging is the most popular method for all ages except the 15-24 years. In this group more people die from falls from a height. Suicides by drowning occur mainly in the above 45 years.

DEATHS FROM HOMICIDES

In the present study, homicides have been divided into 3 categories:— murder, culpable homicide, and justifiable homicide. Casualties occurring during the Indonesian confrontation on board ships have been classified as murder. There are 199 cases of murder, 13 cases of culpable homicide and 27 cases of justifiable homicide, giving a total of 240. Hence, murder constitutes the majority, forming a rate of 2.25 per 100,000 population.

AGE, SEX, ETHNIC GROUP DIFFERENTIAL

The risk of being killed is differently distributed in the various ages. 50% of homicides

is in the age group 15-29 years. The death rate in males is 6 times greater than in females.

The homicidal rate is highest in the Indians and Pakistanis and lowest in the Malays, (Chinese 2.7 per 100,000, Malays 1.03 per 100,000, Indians and Pakistanis 5.17 per 100,000). Hence, similar to the other causes of unnatural deaths, the Malays have the lowest rate.

METHODS USED IN MURDER

The most popular method used in murder is stabbing. The other important methods are the use of blunt instruments causing blunt injuries and firearm wounds (Table IX). Fatal stab wounds occur most commonly on the chest and abdomen. Many of the deaths due to firearms are victims of the Indonesian confrontation.

TABLE IX

METHODS USED IN MURDER

Method	Number of Murders		
	Male	Female	Total
Stab Wound	103	8	111
Blunt Injury	30	3	33
Firearm Wound	24	4	28
Bomb	1	2	3
Strangulation	4	3	7
Gagging	—	2	2
Burns and Scalds	—	3	3
Drowning	—	1	1
Unknown	9	2	11
TOTAL	171	28	199

DISCUSSION

Like the crude death rate of Singapore (1961-65), the accidental death rate has remained fairly constant. As a cause of death, accidents in Singapore form a smaller percentage of total deaths (4%) when compared to Japan (5.5%), U.S.A. (5.5%), but higher than that of U.K. (3.4%) in 1960. To allow for valid comparisons between Singapore with that of a few countries from which data are available, difficulties caused by differences in age and sex

composition of the populations compared has been eliminated by standardizing the death rates for the various types of deaths using Singapore's population as a standard. The proportion of non-transport and transport accident is found to be different from the other countries—in Singapore non-transport accidents are responsible for a smaller portion of all accidental deaths (44%) as compared with that of Japan (70%) and between 68% (Ireland) and 48% (Netherlands) in the West.

Losses due to accidents are characteristically of the young, about 63% being under 25 years, and it is the principal killer for the group 5-34 years. The distribution of different types of accidents varies in the different age groups; domestic accidents predominate up to school age; from 10-50 years, road traffic accidents are the main determinant of the total rate and thereafter, domestic accidents again dominate.

In all reported countries, the male rate is 2-3 times that of the females for the 2 major types of accidents. However, non-transport accidents cause a higher proportion of deaths due to all accidents for females than for males, although the male rates are higher than those for the females.

Deaths from accidents in the home account for the highest proportion of all deaths due to non-transport accidents in Singapore (59.3%). This proportion ranged between 65% (Netherlands) and 30% (Japan) in 1960. At all ages over 15 years, the risk of death in Home Accidents is 2-5 times higher in the males than in females.

The concentration of home accident deaths at the two extremes of life may be due to a combination of factors. When a child learns to walk, it encounters a new set of hazards. Many objects which are safe for healthy adults are dangerous for the child with his poorer co-ordination of movement, less reach and power, less understanding of the hazard and less capacity to minimize injury. Falls from furniture and elsewhere, scalds from falling into or overturning hot fluid and injuries from sharp objects may be due to a combination of lack of awareness of the danger together with carelessness of parents in exposing their children to these risks. At the other extreme of life, diminished resistance and physical disability probably play a part, causing the high Home Accident death rate. Injuries may be similar to those in younger adults, but the cumulative effects of previous injuries and illness tend to delay and prevent recovery.

The highest proportion of deaths in non-transport accident is due to drowning (37%). This is comparable to that in Japan (38%) but, much higher than some Western countries, being around 15% in England and Wales and U.S.A. Moreover, the majority of places where drowning occurs is different, in Japan, drowning in wells, ponds, open drains, bath tubs and water jars only forms 10.9% of the total, England and Wales 7.3%, U.S.A. 9.3%, but in Singapore about 56% occur in these places. Like most countries, drowning is responsible for a larger proportion of deaths due to non-transport accident for males than for females and the rate is highest for persons in the group 1-24 years.

The second ranking cause of death from non-transport accident is due to "falls". This is also the case in Japan. However, although the proportion of deaths due to falls is not higher in England and Wales (27%) and U.S.A. (20%) when compared to Singapore, falls is the most important cause of non-transport accident deaths in these two countries.

The third most frequent cause of death in non-transport accident is burns and scalds. This is also found in many countries, but the external agent which caused this is mainly scalding by hot water in the toddlers, unlike in some Western countries where open fires is a more important source of burns. In U.K., it has been found that clothes catching fire is very often responsible for burns, and in Ceylon, explosion of kerosene bottle lamps. In Japan, burns is the most important cause of non-transport accidental death.

Poisoning stands fourth in importance as a cause of fatal home accidents in many developed countries. There is no evidence yet in Singapore of such significance. Detergents, insecticides and kerosene which is often stored in bottles normally used for other purposes are the common agents. However, there may be numerous cases of non-fatal poisoning for every case of fatal one.

About half of accidental deaths occur on the road. The predominance of this type of death may be deceptive as to the actual number of road traffic accidents. The increase in speed and ease of travel together with the increase in population density have caused a corresponding increase in road traffic accidents to a scale which would have appalled previous generations.

Characteristic peaks of age distribution are found for each type of road user. The peak of road fatalities being at 15-24 years. This is similar to that of other countries with a high death rate from road traffic accidents. This peak of road deaths sustains the role of accidents as the major single cause of mortality up to 40 years in males. The mortality from road traffic accidents is from 3-5 times higher in males than in females, and even at the age 1-4 years, males have a higher mortality. Accidents to pedestrians account for 48% of the road deaths in Singapore, much more than in U.K. (30%) and U.S.A. (16%), but similar to that of Japan (47%). These are particularly of the very young and the aged. In Singapore, motorcyclist and scooterist form a greater portion of deaths (22%) as compared to U.K. (17% in 1959) and U.S.A. (13% in 1957). The age distribution of the affected motorcyclist is also different, being younger in Singapore (93% under 45 years) whereas in U.K. in 1959, 70% only are in this age group.

The very low rate of accidents, suicides and homicides among the Malays as compared to the other ethnic groups is remarkable. This is in contrast to that of the crude death rate and infant mortality rate which are highest among the Malays. One wonders whether this is due to the inherent character of the Malays, or to a stable state of mind in more rural people, or to the fact that immigrant populations are more susceptible to unnatural deaths.

In all reported countries, the suicidal death rate for males is much higher than females. Compared to some countries, Singapore's rate of 19.6 and 8.8 per 100,000 for male and female respectively is lower than that of Germany (33 and 15.2), England and Wales (19.4 and 11.6) and Japan (44.7 and 28.4). In most Western countries, the rate rises steeply with age especially after 50 years for both males and females. However, in 2 reported Asian countries, Japan

and Ceylon, the female rate like that of Singapore is highest for the group 20-24 years.

The trend of unnatural deaths suggests that the number of fatal accidents among pre-school children could be considerably reduced by better supervision on the part of adults to prevent them from drowning in disused wells and ponds, receiving burns and scalds from hot water or dying on the road as pedestrians. The very large accidental death rate at home among the elderly could also be reduced since many of these fatalities were the result of a fall on level ground. In addition, some measures must be found to reduce the alarming number of young adult motorcyclist casualties on the road.

SUMMARY

Deaths due to unnatural causes (accidents, suicides and homicides) which have occurred in Singapore have been studied with reference to age, sex and ethnic group variations and the mode by which the subject meets his death. The salient epidemiological features have been discussed and comparisons made with other countries.

ACKNOWLEDGEMENT

I wish to thank Professor M.J. Colbourne and Dr. I. Polunin for their encouragement and helpful advice in the preparation of this paper.

REFERENCES

1. Backett, E. Maurice: "Domestic Accidents". W.H.O. Public Health Papers No. 26.
2. Castle, O.M. (1950): "Accidents in the Home". *Lancet* i, 315.
3. Murphy, H.B.M. (1954): "The Mental Health of Singapore". Part I—Suicide. *Medical J. Malaya*. Vol. 9, No. 1., 1-45.
4. World Health Organization (1963): "Epidemiological Vital Statistics Report."