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**ACUTE CEREBROVASCULAR DISEASE
HOSPITALISATION INCIDENCE:
WA Health Zones, 1989 to 1998**

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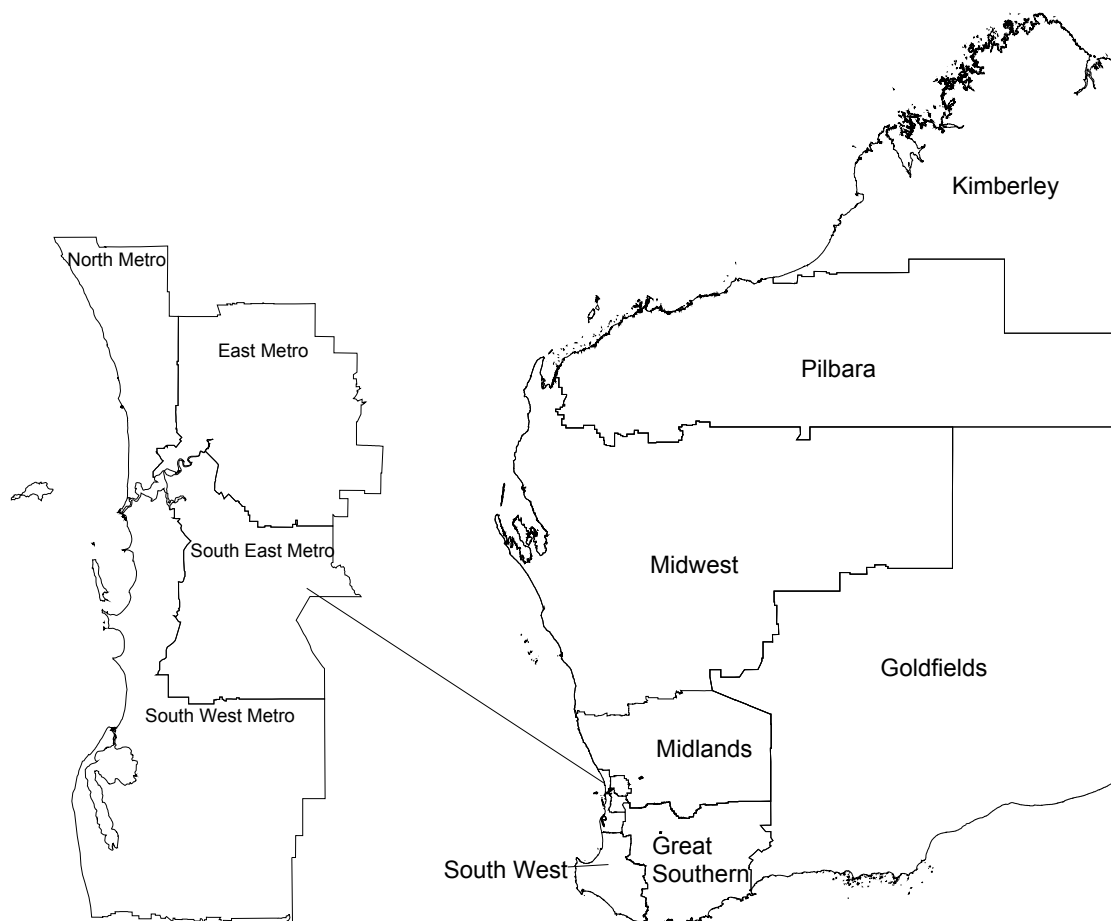
Introduction

The report 'Hospitalisation Incidence for Acute Cerebrovascular Disease in Western Australia 1989 to 1998: Geographical variations' described variation in first-ever hospitalisation for stroke between residents of the Metropolitan and Non-metropolitan areas. Reasons for the variation cited by the report were the differences in health profile of the respective populations, case management of stroke within hospitals and by GPs and access to specialist stroke services.

The factors which affect stroke hospitalisation also apply within the Metropolitan and Non-metropolitan areas, between Health Zones. This supplement to the Statewide report aims to describe the differences in stroke hospitalisation incidence between Health Zones.

All stroke events were only analysed in this supplement as the number of hospitalisations annually for the subtypes was too low to provide a meaningful detailed analysis at the Health Zone geographical level. Stroke events were defined in the same way in this supplement as in the Statewide report. Also, all analyses conducted followed the same methods used in the Statewide report. The definitions of the Health Zones used in this supplement are shown in Map 1.

Map 1: Health Zones of Western Australia



North Metropolitan Health Zone

Numbers and age-standardised rates

In the North Metropolitan Health Zone during 1989 to 1998 there were a total of 2,696 stroke events among males, and 2,830 stroke events among females. This represents an annual average of 270 among males and 283 among females.

Table 1: Annual average number, age-adjusted rates and percent annual change by gender of first-ever stroke hospitalisation, North Metropolitan Health Zone, 1989 to 1998

	Number	AAR ^{1,2}	% Annual Change ³		
Males					
0-44	13	8.6	(7.1-10.0)	-1.9	
45-59	37	102	(91.8-112.7)	1.7	
60-74	101	514	(482.5-545.7)	-1.0	
75+	118	1678	(1582.8-1773.2)	-1.6	
Total	270	154	(147.9-159.5)	-1.0	
Females					
0-44	11	7.1	(5.7-8.4)	-3.6	
45-59	19	55	(47.6-63.1)	-1.9	
60-74	75	323	(299.8-346.1)	-3.3	☆
75+	178	1373	(1309.2-1437.4)	2.7	✱
Total	283	110	(106.0-114.2)	0.5	

- Notes:
1. AAR = age-adjusted rates per 100,000.
 2. Figures in parentheses are 95% confidence intervals of the AAR.
 3. The symbols ✱ and ☆ indicate statistically significant increases or decreases in rates respectively.

A trend analysis indicated no statistically significant rate increases for either males or females over the ten-year period (Table 1). The rate among males remained higher than that among females throughout. In 1998, the age-standardised rate for first-ever stroke hospitalisations in the North Metropolitan Health Zone among males was 162 per 100,000 person-years and among females was 110.

Age-adjusted rates

The incidence of stroke hospitalisation among residents in the North Metropolitan Health Zone increased with age. The annual average rate among males younger than 45 years was 8.6 per 100,000 which increased to 1,678 among males older than 74 years. Among females younger than 45 years the rate was 7.1 per 100,000 which increased to 1,373 among females older than 74 years (Table 1).

A trend analysis of age-adjusted rates indicated that there was a statistically significant decrease by an annual average of 3.3% from 367 per 100,000 in 1989 to 303 in 1998 among females aged between 60 and 74 years. In contrast, there was a statistically significant increase by an annual average of 2.7% in the rate among females older than 74 years from 1,224 per 100,000 in 1989 to 1,491 in 1998.

Comparison with the State rate

Among male residents of the North Metropolitan Health Zone the rate of first-ever stroke hospitalisation was 17% lower than the State male rate for the ten-year period, 1989 to 1998. Male rates were also lower than the State male rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 2).

Similarly, among female residents of the North Metropolitan Health Zone, the rate of first-ever stroke hospitalisation was 16% lower than the State female rate for the ten-year period, 1989 to 1998. Female rates were also lower than the State female rate during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 2).

Table 2: Standardised rate ratio of first-ever stroke hospitalisation for the North Metropolitan Health Zone compared to the State, 1989 to 1998

	Obs ¹	Exp ²	SRR ^{3,4}
Males			
1989-1993	1284	1578	0.81 (0.77-0.86)
1994-1998	1412	1687	0.84 (0.79-0.88)
1989-1998	2696	3265	0.83 (0.80-0.86)
Females			
1989-1993	1289	1594	0.81 (0.77-0.85)
1994-1998	1541	1772	0.87 (0.83-0.91)
1989-1998	2830	3365	0.84 (0.81-0.87)

- Notes: 1. Obs = frequency observed in Health Zone.
2. Exp = frequencies expected if State rates applied.
3. SRR = standardised rate ratio.
4. Figures in parentheses are 95% confidence intervals.

East-Metropolitan Health Zone

Numbers and age-standardised rates

In the East Metropolitan Health Zone during 1989 to 1998 there were a total of 2,006 first-ever stroke hospitalisations among males, and 1,872 strokes among females. This represents an annual average of 201 among males and 187 among females (Table 3).

Table 3: Annual average number, aged-adjusted rates and percent annual change by gender of first-ever stroke hospitalisation, East Metropolitan Health Zone, 1989 to 1998

	Number	AAR ^{1,2}	% Annual Change ³	
Males				
0-44	10	10	(8.0-12.0)	1.2
45-59	24	118	(102.8-132.2)	-1.0
60-74	77	644	(598.9-689.3)	-4.2 ✱
75+	89	2188	(2046.3-2330.1)	-2.0
Total	201	193	(184.9-201.8)	-2.6 ✱
Females				
0-44	7	7.8	(6.0-9.6)	-0.1
45-59	14	73	(61.3-85.3)	-2.5
60-74	48	377	(343.1-410.3)	-2.6
75+	118	1607	(1514.6-1699.3)	-2.5 ✱
Total	187	129	(123.3-135.2)	-2.7 ✱

- Notes: 1. AAR = age-adjusted rates per 100,000.
 2. Figures in parentheses are 95% confidence intervals of the AAR.
 3. The symbols ✱ and ✨ indicate statistically significant increases or decreases in rates respectively.

A trend analysis of annual rates indicated a statistically significant decrease among both sexes in the rate of first-ever hospitalisations for stroke over the ten-year period. Age-standardised rates among males decreased by an annual average of 2.6% from 206 per 100,000 in 1989 to 165 in 1998. Among females the rate decreased by an annual average of 2.7% from 137 per 100,000 in 1989 to 91 in 1998. The rates for first-ever stroke hospitalisations in the East Metropolitan Health Zone were higher among males than among females throughout the ten-year period.

Age-adjusted rates

The incidence of stroke hospitalisation among residents in the East Metropolitan Health Zone increased with age. The annual average rate among males younger than 45 years was 10 per 100,000 increasing to 2,188 per 100,000 among males older than 74 years. Among females younger than 45 years the rate was 7.8 per 100,000 which increased to 1,607 among females older than 74 years (Table 3).

The significant decrease in the rate among males aged between 60 and 74 years accounted for much of the decrease in the overall male rate from 1989 to 1998 (Table 3). From 1989, the rate decreased among males aged between 60 and 74 years by an annual average of 4.2% from 762 per 100,000 to 565 in 1998.

Decreases in rates among elderly females accounted for the decrease in the overall female rate from 1989 to 1998 (Table 3). Rates among females older than 74 years decreased by an annual average of 2.5% from 1,733 per 100,000 in 1989 to 1,306 in 1998.

Comparison with State rates

Among both male and female residents of the East Metropolitan Health Zone the rate of first-ever stroke hospitalisation was similar to that among State males and females, respectively, throughout the ten-year period, 1989 to 1998 (Table 4).

Table 4: Standardised rate ratio of first-ever stroke hospitalisation for the East Metropolitan Health Zone compared to the State, 1989 to 1998

	Obs ¹	Exp ²	SRR ^{3,4}
Males			
1989-1993	996	949	1.05 (0.99-1.12)
1994-1998	1011	996	1.01 (0.95-1.08)
1989-1998	2006	1945	1.03 (0.99-1.08)
Females			
1989-1993	929	898	1.03 (0.97-1.10)
1994-1998	943	1006	0.94 (0.88-1.00)
1989-1998	1872	1904	0.98 (0.94-1.03)

- Notes:
1. Obs = frequency observed in Health Zone.
 2. Exp = frequencies expected if State rates applied.
 3. SRR = standardised rate ratio.
 4. Figures in parentheses are 95% confidence intervals.

South-East Metropolitan Zone

Numbers and age-standardised rates

In the South-East Metropolitan Health Zone during 1989 to 1998 there were a total of 2,024 strokes among males, and 2,048 strokes among females. This represents an annual average of 202 among males and 205 among females (Table 5).

Table 5: Annual average number, age-adjusted rates and percent annual change by gender of first-ever stroke hospitalisation, South-East Metropolitan Health Zone, 1989 to 1998

	Number	AAR ^{1,2}		% Annual Change ³
Males				
0-44	11	10	(8.4-12.3)	0.4
45-59	27	115	(101.1-128.8)	1.2
60-74	84	631	(588.7-674.1)	-1.9
75+	81	1795	(1672.7-1917.3)	-1.0
Total	202	175	(167.1-182.4)	-1.2
Females				
0-44	7	7.0	(5.4-8.6)	-6.1
45-59	15	67	(56.3-77.7)	-3.5
60-74	57	368	(338.1-398.4)	-1.6
75+	125	1446	(1365.8-1526.8)	0.4
Total	205	120	(114.6-125.1)	-0.9

- Notes: 1. AAR = age-adjusted rates per 100,000.
 2. Figures in parentheses are 95% confidence intervals of the AAR.
 3. The symbols ✖ and ☆ indicate statistically significant increases or decreases in rates respectively.

A trend analysis of the South-East Metropolitan Health Zone indicated no statistically significant changes in the rate over the ten-year period among either sex (Table 5). The rate among males was higher than among females throughout, and in 1998 the rate among males was 162 per 100,000 and among females was 107.

Age-adjusted rates

The rate of first-ever stroke hospitalisation among residents in the South-East Metropolitan Health Zone increased with age. The annual average rate among males younger than 45 years was 10 per 100,000 which increased to 1,795 per 100,000 among males older than 74 years. Among females younger than 45 years the rate was 7.0 per 100,000 which increased to 1,446 per 100,000 among females older than 74 years (Table 5).

A trend analysis of age-adjusted rates over the ten-year period indicated that there was no statistically significant change in the rate among any age groups of either sex (Table 5). The rate for the oldest age group remained much higher than the rates among the younger age groups over the ten-year period.

Comparison with the State rates

Among male residents of the South-East Metropolitan Health Zone the rate of first-ever stroke hospitalisation was 6% lower than the State male rate for the ten-year period, 1989 to 1998. Male rates were lower, but not significantly different to the State male rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998.

Among female residents, the rate of first-ever stroke hospitalisations was 9% lower than the State rate for the ten-year period, 1989 to 1998. Female rates were also lower than the State rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 6).

Table 6: Standardised rate ratio of first-ever stroke hospitalisation for the South-East Metropolitan Health Zone compared to the State, 1989 to 1998

	Obs ¹	Exp ²	SRR ^{3,4}
Males			
1989-1993	991	1,054	0.94 (0.88-1.00)
1994-1998	1034	1093	0.95 (0.89-1.01)
1989-1998	2025	2146	0.94 (0.90-0.99)
Females			
1989-1993	982	1078	0.91 (0.85-0.97)
1994-1998	1066	1183	0.90 (0.85-0.96)
1989-1998	2048	2261	0.91 (0.87-0.95)

Notes: 1. Obs = frequency observed in Health Zone.
2. Exp = frequencies expected if State rates applied.
3. SRR = standardised rate ratio.
4. Figures in parentheses are 95% confidence intervals.

South-West Metropolitan Health Zone

Numbers and age-standardised rates

In the South-West Metropolitan Health Zone during 1989 to 1998 there were a total of 2,417 first-ever stroke hospitalisations among males, and 2,247 among females. This represents an annual average of 242 among males and 225 among females (Table 7).

Table 7: Annual average number, age-adjusted rates and percent annual change by gender of first-ever stroke hospitalisation, South-West Metropolitan Health Zone, 1989 to 1998

	Number	AAR ^{1,2}	% Annual Change ³
Males			
0-44	10	9.6 (7.7-11.5)	4.6
45-59	29	119 (105.7-133.0)	-0.3
60-74	103	603 (566.4-639.7)	-2.1
75+	100	1935 (1814.5-2054.6)	-0.4
Total	242	178 (170.6-184.9)	-1.1
Females			
0-44	6	6.3 (4.8-7.8)	0.5
45-59	17	71 (60.2-81.3)	4.0
60-74	66	361 (333.9-388.9)	-1.0
75+	135	1648 (1560.7-1735.4)	0.1
Total	225	129 (123.2-133.8)	-0.1

- Notes:
1. AAR = age-adjusted rates per 100,000.
 2. Figures in parentheses are 95% confidence intervals of the AAR.
 3. The symbols ✕ and ✖ indicate statistically significant increases or decreases in rates respectively

A trend analysis indicated no statistically significant rate changes over the ten-year period among both sexes (Table 7). Age-standardised rates for first-ever stroke hospitalisations in the South-West Metropolitan Health Zone among males were higher than among females throughout the ten-year period. The rate in 1998 was 162 per 100,000 person-years among males and 125 among females.

Age-adjusted rates

The rate of first-ever stroke hospitalisation among residents in the South-West Metropolitan Health Zone increased with age. The rate among males younger than 45 years was 9.6 per 100,000 which increased to 1,935 among males older than 74 years. Among females younger than 45 years the rate was 6.3 per 100,000 which increased to 1,648 among females older than 74 years (Table 7).

A trend analysis of age-adjusted rates over the ten-year period indicated that there were no statistically significant rate changes among the age groups of either sex. The rate among the oldest age group remained much higher than the rates among the younger age groups throughout the ten-year period.

Comparison with the State rates

Among male residents of the South-West Metropolitan Health Zone the rate of first-ever stroke hospitalisations was 5% lower than the State male rate for the period, 1989 to 1998. Male rates were lower than, but not statistically different from the State male rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 8).

Similarly, among female residents of the South-West Metropolitan Health Zone, the rate of first-ever stroke hospitalisations was similar to the State male rate for the ten-year period, 1989 to 1998 and for both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 8).

Table 8: Standardised rate ratio of first-ever stroke hospitalisation for the South-West Metropolitan Health Zone compared to the State, 1989 to 1998

	Obs ¹	Exp ²	SRR ^{3,4}
Males			
1989-1993	1127	1191	0.95 (0.89-1.00)
1994-1998	1290	1339	0.96 (0.91-1.02)
1989-1998	2417	2533	0.95 (0.92-0.99)
Females			
1989-1993	1010	1039	0.97 (0.91-1.03)
1994-1998	1237	1245	0.99 (0.94-1.05)
1989-1998	2247	2285	0.98 (0.94-1.02)

- Notes:
1. Obs = frequency observed in Health Zone.
 2. Exp = frequencies expected if State rates applied.
 3. SRR = standardised rate ratio.
 4. Figures in parentheses are 95% confidence intervals.

Goldfields Health Zone

Numbers and age-standardised rates

In the Goldfields Health Zone during 1989 to 1998 there were a total of 373 strokes among males, and 281 strokes among females. This represents an annual average of 37 among males and 28 among females (Table 9).

Table 9: Annual average number, age-adjusted rates and percent annual change by gender of first-ever stroke hospitalisation, Goldfields Health Zone, 1989 to 1998

	Number	AAR ^{1,2}	% Annual Change ³	
Males				
0-44	3	12 (7.3-16.3)	-0.1	
45-59	9	216 (169.9-262.0)	0.3	
60-74	12	863 (709.1-1016.3)	5.3	
75+	14	2643 (2208.2-3077.9)	-5.5	
Total	37	254 (199.5-367.1)	-0.3	
Females				
0-44	3	15 (9.2-19.8)	20.4	✱
45-59	4	133 (90.5-176.4)	-2.7	
60-74	8	561 (436.2-686.6)	-3.4	
75+	14	1835 (1528.4-2141.4)	-3.8	
Total	28	175 (153.6-195.4)	-2.9	

- Notes:
1. AAR = age-adjusted rates per 100,000.
 2. Figures in parentheses are 95% confidence intervals of the AAR.
 3. The symbols ✱ and ✷ indicate statistically significant increases or decreases in rates respectively.

A trend analysis indicated no statistically significant changes over the ten-year period among either sex of residents in the Goldfields Health Zone. Age-standardised rates for first-ever stroke hospitalisations in the Goldfields Health Zone were higher among males than among females over the ten-year period. The rate in 1998 was 283 per 100,000 person-years among males and 112 among females.

Age-adjusted rates

The incidence of stroke hospitalisation among residents in the Goldfields Health Zone increased with age. The annual average rate among males younger than 45 was 12 per 100,000 which increased to 2,643 per 100,000 among males older than 74. Among females younger than 45 the rate was 15 per 100,000 which increased to 1,835 per 100,000 among females older than 74 (Table 9).

A trend analysis of age-adjusted rates over the ten-year period indicated that there was a statistically significant increase by an annual average of 20.4% among females younger than 45 years. Although the number of first-ever hospitalisations was low, with an annual average of 3, the rate among females younger than 45 years increased from 4.1 per 100,000 in 1989 to 28 in 1998.

Comparison with the State rates

Among male residents of the Goldfields Health Zone, the rate of first-ever stroke hospitalisations was 39% higher than the State male rates for the ten-year period, 1989 to 1998. Male rates were also higher than the State male rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 10).

Similarly, among female residents of the Goldfields Health Zone the rate of first-ever stroke hospitalisations was 32% higher than the State female rate for the ten-year period, 1989 to 1998. Female rates were also higher than the State female rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 10).

Table 10: Standardised rate ratio of first-ever stroke hospitalisation for the Goldfields Health Zone compared to the State, 1989 to 1998

	Obs ¹	Exp ²	SRR ^{3,4}
Males			
1989-1993	183	135	1.36 (1.17-1.57)
1994-1998	190	135	1.41 (1.22-1.63)
1989-1998	373	269	1.39 (1.25-1.54)
Females			
1989-1993	141	102	1.39 (1.17-1.64)
1994-1998	140	112	1.25 (1.05-1.48)
1989-1998	281	213	1.32 (1.17-1.48)

Notes: 1. Obs = frequency observed in Health Zone.
2. Exp = frequencies expected if State rates applied.
3. SRR = standardised rate ratio.
4. Figures in parentheses are 95% confidence intervals.

Great Southern Health Zone

Numbers and age-standardised rates

In the Great Southern Health Zone during 1989 to 1998 there were a total of 750 strokes among males, and 679 strokes among females. This represents an annual average of 75 among males and 68 among females (Table 11).

Table 11: Annual average number, age-adjusted rates and percent annual change by gender of first-ever stroke hospitalisation, Great Southern Health Zone, 1989 to 1998

	Number	AAR ^{1,2}	% Annual Change ³
Males			
0-44	2	10 (6.0-14.0)	-6.8
45-59	8	137 (107.5-167.4)	-2.3
60-74	33	862 (768.6-954.4)	-3.4
75+	32	2448 (2183.0-2713.0)	-0.1
Total	75	231 (214.7-247.7)	-2.2
Females			
0-44	2	11 (6.7-15.6)	3.9
45-59	6	119 (90.3-148.5)	3.7
60-74	19	511 (439.9-582.1)	-2.6
75+	40	2240 (2022.1-2458.4)	-1.0
Total	68	181 (167.0-194.1)	-1.0

- Notes:
1. AAR = age-adjusted rates per 100,000.
 2. Figures in parentheses are 95% confidence intervals of the AAR.
 3. The symbols ✕ and ☆ indicate statistically significant increases or decreases in rates respectively.

A trend analysis indicated no statistically significant rate changes over the ten-year period among either sex of residents in the Great Southern Health Zone. Age-standardised first-ever hospitalisation rates for all stroke events in the Great Southern Health Zone were higher among males than among females over the ten-year period. The rate in 1998 was 194 per 100,000 person-years among males and 133 among females.

Age-adjusted rates

The incidence of stroke hospitalisations among residents in the Great Southern Health Zone increased with age. The annual average rate among males younger than 45 was 10 per 100,000 which increased to 2,448 among males older than 74 years. Among females younger than 45 years the rate was 11 per 100,000 which increased to 2,240 among females older than 74 years (Table 11).

There were no significant changes in the age-adjusted rates over the ten-year period among both males and females. The rate among the oldest age group remained much higher than the rates among the younger age groups over the ten-year period.

Comparison with the State rates

Among male residents of the Great Southern Health Zone the rate of first-ever stroke hospitalisation was 24% higher than the State male rate for the ten-year period, 1989 to 1998. Male rates were also higher than the State male rates during both of the five-year periods, 1989 to 1993 and 1994 to 1998 (Table 12).

Similarly, among female residents of the Great Southern Health Zone, the rate of first-ever stroke hospitalisation was 38% higher than the State female rate for the ten-year period, 1989 to 1998. Female rates were also higher than the State female rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 12).

Table 12: Standardised rate ratio of first-ever stroke hospitalisations for the Great Southern Health Zone compared to the State, 1989 to 1998

	Obs ¹	Exp ²	SRR ^{3,4}
Males			
1989-1993	366	296	1.24 (1.12-1.37)
1994-1998	384	308	1.25 (1.13-1.38)
1989-1998	750	603	1.24 (1.16-1.34)
Females			
1989-1993	308	229	1.34 (1.20-1.50)
1994-1998	371	264	1.40 (1.27-1.56)
1989-1998	679	493	1.38 (1.28-1.49)

- Notes:
1. Obs = frequency observed in Health Zone.
 2. Exp = frequencies expected if State rates applied.
 3. SRR = standardised rate ratio.
 4. Figures in parentheses are 95% confidence intervals.

Kimberley Health Zone

Numbers and age-standardised rates

In the Kimberley Health Zone during 1989 to 1998 there were a total of 182 strokes among males, and 149 strokes among females. The annual numbers of first-ever hospitalisations were low, with an annual average of 18 among males and 15 among females (Table 13).

Table 13: Annual average number, age-adjusted rates and percent annual change by gender of first-ever stroke hospitalisation, Kimberley Health Zone, 1989 to 1998

	Number	AAR ^{1,2}	% Annual Change ³
Males			
0-44	2	22 (12.5-31.8)	-5.1
45-59	5	321 (233.0-409.5)	0.5
60-74	7	1269 (971.8-1565.8)	-7.7 ✱
75+	4	2748 (1877.6-3618.5)	-6.4
Total	18	328 (274.8-380.8)	-5.2
Females			
0-44	2	24 (13.4-34.8)	9.2
45-59	3	242 (152.3-332.5)	-9.7
60-74	6	1359 (1025.0-1692.9)	-12.0 ✱
75+	4	2612 (1744.3-3479.6)	3.3
Total	15	265 (116.3-412.7)	-5.4

- Notes:
1. AAR = age-adjusted rates per 100,000.
 2. Figures in parentheses are 95% confidence intervals of the AAR.
 3. The symbols ✱ and ☆ indicate statistically significant increases or decreases in rates respectively.

Age-standardised rates fluctuated over the ten-year period due to the low numbers of first-ever hospitalisations annually and consequently the estimates of the annual rates were imprecise. Rates among males and females were similar over the ten-year period, with a rate among males in 1998 of 223 per 100,000 and 264 among females. An annual trend analysis indicated that there was no statistically significant change in rates over the ten-year period, among both sexes (Table 13). Interpretation of the annual trend analysis should be treated with caution due to the low number of first-ever hospitalisations for stroke annually. A trend analysis based on an aggregation of five years of data follows.

Trend Analysis

Aggregation of first-ever hospitalisation over two five-year periods indicated that the observed numbers of first-ever hospitalisations in 1994 to 1998 were 25% and 26% less than expected based on the rate in 1989 to 1993 for males and females respectively. The confidence intervals of the standardised rate ratios for the 1994 to 1998 period compared to the 1989 to 1993 period indicate that the rates for both males and females were significantly lower in the latter five-year period (Table 14).

Table 14: Standardised rate ratio of first-ever stroke hospitalisation for the Kimberley Health Zone in 1989 to 1993 compared to 1994 to 1998

	Obs ¹ 94-98	Exp ² 94-98	SRR per 100 000 ^{3,4}	
Males	88	118	0.75	(0.61-0.93)
Females	74	100	0.74	(0.58-0.93)

- Notes:
1. Obs = frequency observed during 94–98.
 2. Exp = frequencies expected in 94–98 if 89–93 rates applied.
 3. SRR = standardised rate ratio.
 4. Figures in parentheses are 95% confidence intervals of the SRR.

Age-adjusted rates

The incidence of stroke hospitalisation among residents in the Kimberley Health Zone increased with age. The annual average rate among males younger than 45 years was 22 per 100,000 which increased to 2,748 among males older than 74 years. Among females younger than 45 years the rate was 24 per 100,000 which increased to 2,612 among females older than 74 years (Table 13).

Analysis of the trend of age-adjusted rates over the ten-year period was complicated by the low number of first-ever hospitalisations within each age group for each sex and consequently should be interpreted with caution. Over the ten-year period, there was a decline among both males and females aged between 60 and 74 years. The rate among males aged between 60 and 74 years decreased by an annual average of 7.7% from 1,110 in 1989 to 840 in 1998. Among females of the same age group the rate decreased by an annual average of 12.0% from 1,592 in 1989 to 553 in 1998.

Comparison with the State rates

Among male residents of the Kimberley Health Zone the rate of first-ever stroke hospitalisation was 91% higher than the State male rate for the ten-year period, 1989 to 1998. Male rates were also higher than the State male rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 15).

Similarly, among female residents of the Kimberley Health Zone, the rate of first-ever stroke hospitalisation was 152% higher than the State female rate for the ten-year period, 1989 to 1998. Female rates were also higher than the State female rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 15).

Table 15: Standardised rate ratio of first-ever stroke hospitalisation for the Kimberley Health Zone compared to the State, 1989 to 1998

	Obs ¹	Exp ²	SRR ^{3,4}
Males			
1989-1993	94	44	2.15 (1.74-2.64)
1994-1998	88	51	1.72 (1.39-2.13)
1989-1998	182	95	1.91 (1.65-2.22)
Females			
1989-1993	75	26	2.95 (2.33-3.71)
1994-1998	74	33	2.21 (1.75-2.79)
1989-1998	149	59	2.52 (2.14-2.97)

- Notes:
1. Obs = frequency observed in Health Zone.
 2. Exp = frequencies expected if State rates applied.
 3. SRR = standardised rate ratio.
 4. Figures in parentheses are 95% confidence intervals.

Midlands Health Zone

Numbers and age-standardised rates

In the Midlands Health Zone during 1989 to 1998 there were a total of 533 first-ever stroke hospitalisations among males, and 474 among females. This represents an annual average of 53 among males and 47 among females (Table 16).

Table 16: Annual average number, age-adjusted rate and percent annual change by gender of first-ever stroke hospitalisation, Midlands Health Zone, 1989 to 1998

	Number	AAR ^{1,2}	% Annual Change ³	
Males				
0-44	2	11 (6.0-15.3)	4.5	
45-59	6	140 (106.4-173.8)	-3.8	
60-74	20	719 (620.0-818.4)	-4.4	
75+	25	2788 (2446-3130.6)	-3.9	
Total	53	231 (211.2-250.6)	-3.9	✱
Females				
0-44	2	14 (8.4-20.0)	0.1	
45-59	5	124 (90.4-157.8)	-8.4	
60-74	12	467 (381.2-552)	-4.5	
75+	28	2561 (2265.4-2855.6)	-1.2	
Total	47	194 (176.4-211.3)	-2.6	

- Notes:
1. AAR = age-adjusted rates per 100,000.
 2. Figures in parentheses are 95% confidence intervals of the AAR.
 3. The symbols ✱ and ✱ indicate statistically significant increases or decreases in rates respectively.

A trend analysis of the Midlands Health Zone indicated a statistically significant decrease in the rate of first-ever stroke hospitalisations over time among males (Table 16). Age-standardised rates among males decreased by an annual average of 3.9% from 259 per 100,000 in 1989 to 180 in 1998. Although the rate among females decreased from 1989 to 1998, no statistically significant change was indicated by a trend analysis (Table 16). However, the age-standardised rate among males remained higher than that among females over the ten-year period. In 1998, the rate among females was 151 per 100,000.

Age-adjusted rates

The rate of first-ever stroke hospitalisation among residents in the Midlands Health Zone increased with age. The annual average rate among males younger than 45 was 11 per 100,000 which increased to 2,788 among males older than 74 years. Among females younger than 45 years the rate was 14 per 100,000 which increased to 2,561 among females older than 74 years (Table 16).

Although the overall male rate decreased from 1989 to 1998 there were no significant changes in the age-adjusted rates over the ten-year period among males of any age group. Similarly, among females there were no significant changes over the ten-year period to the rate in any age group.

Although a trend analysis indicated no change in the rate among females older than 74 years, the rate for this age group peaked at a maximum of 3,394 per 100,000 in 1993 only to return to previous levels by 1998 of 1,811.

Comparison with the State rates

Among male residents of the Midlands Health Zone, the rate of first-ever stroke hospitalisation was 22% higher than the State rate for the ten-year period, from 1989 to 1998. Male rates were also higher than the State male rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 17).

Similarly, among female residents of the Midlands Health Zone, the rate of first-ever stroke hospitalisation was 50% higher than the State female rate for the ten-year period, 1989 to 1998. Female rates were also higher than the State female rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 17).

Table 17: Standardised rate ratio of first-ever stroke hospitalisation for the Midlands Health Zone compared to the State, 1989 to 1998

	Obs ¹	Exp ²	SRR ^{3,4}
Males			
1989-1993	269	213	1.26 (1.12-1.42)
1994-1998	264	225	1.17 (1.04-1.32)
1989-1998	533	438	1.22 (1.12-1.32)
Females			
1989-1993	230	146	1.57 (1.38-1.79)
1994-1998	244	171	1.43 (1.26-1.62)
1989-1998	474	317	1.50 (1.37-1.64)

- Notes:
1. Obs = frequency observed in Health Zone.
 2. Exp = frequencies expected if State rates applied.
 3. SRR = standardised rate ratio.
 4. Figures in parentheses are 95% confidence intervals.

Midwest Health Zone

Numbers and age-standardised rates

In the Midwest Health Zone during 1989 to 1998 there were a total of 486 first-ever stroke hospitalisations among males, and 350 strokes among females. This represents an annual average of 49 among males and 35 among females (Table 18).

Table 18: Annual average number, age-adjusted rates and percent annual change by gender of first-ever stroke hospitalisation, Midwest Health Zone, 1989 to 1998

	Number	AAR ^{1,2}	% Annual Change ³	
Males				
0-44	4	19	(13.4-24.7)	8.2
45-59	9	174	(136.8-210.5)	-5.5
60-74	21	809	(699.3-917.9)	-4.8 ✱
75+	15	2009	(1687.3-2330.1)	-1.5
Total	49	218	(198.2-238)	-2.8
Females				
0-44	3	17	(10.9-22.2)	9.6
45-59	5	112	(79.7-144.6)	-2.3
60-74	12	535	(439.0-630.2)	-8.8 ✱
75+	15	1757	(1479.5-2034.4)	-1.4
Total	35	166	(148.2-183.0)	-3.7 ✱

- Notes: 1. AAR = age-adjusted rates per 100,000.
 2. Figures in parentheses are 95% confidence intervals of the AAR.
 3. The symbols ✱ and ✱ indicate statistically significant increases or decreases in rates respectively.

A trend analysis indicated a statistically significant decrease in the rate over time among females (Table 18). Age-standardised rates among females decreased by an annual average of 3.7% from 197 per 100,000 in 1989 to 119 in 1998. Although the male rate decreased, no statistically significant change was indicated by a trend analysis. Rates for first-ever stroke hospitalisations in the Midwest Health Zone were higher among males than those among females over the ten-year period. The male rate in 1998 was 198 per 100,000 person-years.

Age-adjusted rates

The rate of first-ever stroke hospitalisations among residents in the Midwest Health Zone increased with age. The annual average rate among males younger than 45 was 19 per 100,000 which increased to 2,009 among males older than 74 years. Among females younger than 45 years the rate was 17 per 100,000 which increased to 1,757 among females older than 74 years.

Among both males and females aged between 60 and 74 years there was a statistically significant decrease in the age-adjusted rates over the ten-year period (Table 18). The male rate decreased by an annual average of 4.8% from 931 per 100,000 in 1989 to 680

in 1998, while the rate among females decreased by an annual average of 8.8% from 734 per 100,000 in 1989 to 361 in 1998.

Although a trend analysis of the rate among females older than 74 years indicated no statistically significant change, the rate peaked at a maximum of 2,364 per 100,000 in 1994 only to return to previous levels by 1998 of 1,526.

Comparison with the State rates

Among male residents of the Midwest Health Zone the rate of first-ever stroke hospitalisation was 22% higher than the State rate for the ten-year period, 1989 to 1998. The excess above that expected, of first-ever hospitalisations based on the State rate during the five-year period, 1989 to 1993, accounted for the higher male rate over the ten-year period (Table 19).

Among female residents of the Midwest Health Zone, the rate of first-ever stroke hospitalisation was 27% higher than the State female rate for the ten-year period, 1989 to 1998. The excess above that expected, of first-ever hospitalisations based on the State rate during the five-year period, 1989 to 1993 accounted for the higher female rate over the ten-year period (Table 19).

Table 19: Standardised rate ratio of first-ever stroke hospitalisation for the Midwest Health Zone, compared to the State, 1989 to 1998

	Obs ¹	Exp ²	SRR ^{3,4}
Males			
1989-1993	248	191	1.30 (1.14-1.47)
1994-1998	238	208	1.14 (1.01-1.30)
1989-1998	486	399	1.22 (1.11-1.33)
Females			
1989-1993	173	123	1.40 (1.20-1.63)
1994-1998	177	151	1.17 (1.00-1.36)
1989-1998	350	275	1.27 (1.14-1.42)

- Notes:
1. Obs = frequency observed in Health Zone.
 2. Exp = frequencies expected if State rates applied.
 3. SRR = standardised rate ratio.
 4. Figures in parentheses are 95% confidence intervals.

Pilbara Health Zone

Numbers and age-standardised rates

In the Pilbara Health Zone during 1989 to 1998 there were a total of 142 first-ever stroke hospitalisations among males, and 103 among females. The annual numbers of first-ever stroke hospitalisations were low, with an annual average of 14 among males and 10 among females (Table 20).

Table 20: Annual average number, age-adjusted rates and percent annual change by gender of first-ever stroke hospitalisation, Pilbara Health Zone, 1989 to 1998

	Number	AAR ^{1,2}		% Annual Change ³
Males				
0-44	2	9.7	(5.5-13.9)	1.3
45-59	5	156	(111.3-200.7)	-7.5
60-74	6	1184	(869.2-1498.5)	-3.3
75+	1	978	(381.0-1575.6)	2.7
Total	14	205	(160.7-249.6)	-3.6
Females				
0-44	3	18	(11.3-24.1)	3.5
45-59	4	237	(158.2-315.9)	16.7 ✖
60-74	2	613	(336.6-889.8)	-10.5
75+	2	1400	(699.1-2101.2)	4.3
Total	10	176	(130.6-220.7)	4.4

- Notes: 1. AAR = age-adjusted rates per 100,000.
 2. Figures in parentheses are 95% confidence intervals of the AAR.
 3. The symbols ✖ and ✕ indicate statistically significant increases or decreases in rates respectively.

Age-standardised rates fluctuated over the ten-year period due to the low numbers of first-ever stroke hospitalisations annually and consequently the estimates of the annual rates were imprecise. Rates for first-ever stroke hospitalisations in the Pilbara Health Zone were similar among males and females over the ten-year period, with the rates in 1998 among males of 244 per 100,000 person-years and 155 among females. An annual trend analysis showed no statistically significant rate changes over the ten-year period for either sex. Interpretation of the annual trend analysis should be treated with caution due to the low numbers of first-ever hospitalisations for stroke. A trend analysis based on an aggregation of five years of data follows.

Trend analysis

Aggregation of first-ever stroke hospitalisation over two five-year periods indicated that the observed number of first-ever hospitalisations in 1994 to 1998 was similar to that expected based on the rate for the five-year period 1989 to 1993. Consequently there was no evidence of rate changes over the study period within the Pilbara Health Zone among both sexes (Table 21).

Table 21: Standardised rate ratio of first-ever stroke hospitalisation for the Pilbara Health Zone in 1989 to 1993 compared to 1994 to 1998

	Obs ¹ 94-98	Exp ² 94-98	SRR per 100 000 ^{3,4}
Males	69	82	0.84 (0.66-1.07)
Females	57	49	1.15 (0.88-1.50)

- Note:
1. Obs = frequency observed during 94–98.
 2. Exp = frequencies expected in 94–98 if 89–93 rates applied.
 3. SRR = standardised rate ratio.
 4. Figures in parentheses are 95% confidence intervals.

Age-adjusted rates

The rate of first-ever stroke hospitalisation among male residents in the Pilbara Health Zone was highest for those aged between 60 and 74 years. Among females, the rate increased with age, with the rate among those younger than 45 years of 18 per 100,000 increasing to 1,400 among females older than 74 years (Table 20).

Analysis of the trend of age-adjusted rates over the ten-year period was complicated by the low number of first-ever hospitalisations within each age group for each sex and consequently should be interpreted with caution. A trend analysis of age-adjusted rates over the ten-year period indicated that there was a statistically significant increase by an annual average of 16.7% from 219 per 100,000 to 535 among females aged between 45 and 59 years.

Comparison with the State rates

Among male residents of the Pilbara Health Zone the rate of first-ever stroke hospitalisation was 24% higher than the State male rate for the ten-year period, 1989 to 1998. The excess above that expected, of first-ever hospitalisations based on the State rate during the five-year period, 1989 to 1993, accounted for the higher male rate over the ten-year period (Table 22).

Among female residents of the Pilbara Health Zone the rate of first-ever stroke hospitalisation was 70% higher than the State female rate for the ten-year period, 1989 to 1998. Female rates were also higher than the State female rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 22).

Table 22: Standardised rate ratio of first-ever stroke hospitalisation for the Pilbara Health Zone compared to the State, 1989 to 1998

	Obs ¹	Exp ²	SRR ^{3,4}
Males			
1989-1993	73	56	1.31 (1.04-1.66)
1994-1998	69	59	1.16 (0.91-1.48)
1989-1998	142	115	1.24 (1.04-1.46)
Females			
1989-1993	46	29	1.57 (1.12-2.06)
1994-1998	57	31	1.83 (1.40-2.39)
1989-1998	103	60	1.70 (1.40-2.07)

- Notes:
1. Obs = frequency observed in Health Zone.
 2. Exp = frequencies expected if State rates applied.
 3. SRR = standardised rate ratio.
 4. Figures in parentheses are 95% confidence intervals.

South-West Health Zone

Numbers and age-standardised rates

In the South-West Health Zone during 1989 to 1998 there were a total of 1,099 first-ever stroke hospitalisations among males, and 964 among females. This represents an annual average of 110 among males and 96 among females (Table 23).

Table 23: Annual average number, age-adjusted rates and percent annual change by gender of first-ever stroke hospitalisation, South-West Health Zone, 1989 to 1998

	Number	AAR ^{1,2}	% Annual Change ³
Males			
0-44	5	12 (8.3-15.1)	-1.5
45-59	13	154 (127.1-180.3)	-5.4
60-74	42	745 (674.3-816.0)	1.1
75+	51	2565 (2344.6-2785.9)	-0.9
Total	110	228 (214.3-241.1)	-0.8
Females			
0-44	3	9.8 (6.5-13.1)	1.9
45-59	8	103 (81.1-125.5)	-4.2
60-74	28	481 (424.3-537.5)	2.6
75+	57	2028 (1861.6-2194.1)	-0.7
Total	96	167 (156.0-177.1)	-0.1

- Notes:
1. AAR = age-adjusted rates per 100,000.
 2. Figures in parentheses are 95% confidence intervals of the AAR.
 3. The symbols ✕ and ✖ indicate statistically significant increases or decreases in rates respectively.

A trend analysis showed no statistically significant changes in rates over the ten-year period for either sex (Table 23). Age-standardised rates for first-ever stroke hospitalisations the South-West Health Zone among males were higher than among females, throughout the ten-year period. The rate in 1998 was 206 per 100,000 person-years among males and 154 among females.

Age-adjusted rates

The rate of first-ever stroke hospitalisations among residents in the South-West Health Zone increased with age. The rate among males younger than 45 years was 12 per 100,000 which increased to 2,565 per 100,000 among males older than 74 years. Among females younger than 45 years the rate was 9.8 per 100,000 which increased to 2,028 per 100,000 among females older than 74 years.

A trend analysis of age-adjusted rates over the ten-year period indicated that there were no statistically significant changes among age groups of either sex. The rate for the oldest age group remained much higher than the rates among the younger age groups over the ten-year period.

Comparison with the State rates

Among male residents of the South-West Health Zone the rate of first-ever stroke hospitalisation was 22% higher than the State male rate for the ten-year period, 1989 to 1998. Male rates were also higher than the State male rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 24).

Similarly, among female residents of the South-West Health Zone, the rate of first-ever stroke hospitalisation was 26% higher than the State female rate for the ten-year period, 1989 to 1998. Female rates were also higher than the State female rates during both of the two five-year periods, 1989 to 1993 and 1994 to 1998 (Table 24).

Table 24: Standardised rate ratio of first-ever stroke hospitalisation for the South-West Health Zone compared to the State, 1989 to 1998

	Obs¹	Exp²	SRR^{3,4}	
Males				
1989-1993	510	434	1.17	(1.08-1.28)
1994-1998	590	469	1.26	(1.16-1.36)
1989-1998	1099	903	1.22	(1.15-1.29)
Females				
1989-1993	437	355	1.23	(1.12-1.35)
1994-1998	527	408	1.29	(1.18-1.41)
1989-1998	964	764	1.26	(1.18-1.34)

Notes: 1. Obs = frequency observed in Health Zone.
2. Exp = frequencies expected if State rates applied.
3. SRR = standardised rate ratio.
4. Figures in parentheses are 95% confidence intervals.