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Technical Reports

Worldwide pattern of mortality from motor vehicle accidents, 1950–1990

Summary

Trends in age-specific and age-standardized death certification rates from motor vehicle accidents over the period 1950–1990 were analyzed for 48 countries from four continents (2 from North America, 10 from Latin America, 8 from Asia, 26 from Europe, Australia and New Zealand) on the basis of data produced by the World Health Organization mortality database. In most developed western and Asiatic countries, mortality rates increased until the late 1960's or early 1970's, and declined thereafter to reach values often lower than those of the early 1950's, although the number of circulating vehicles has substantially increased over the same calendar period. The extent of the decline was, however, different in various countries, as well as in the two sexes and in various age groups, thus leading to complex cohort and period patterns. In general, countries (like the U. S. A. or U. K.), where the number of motor vehicles had increased earlier, have now comparatively higher rates at younger than at middle and older age, while the opposite is observed in countries with later spread of motor vehicles. Further, there were a few countries, including Kuwait, Venezuela and several other Latin American countries, Australia and New Zealand, and several southern and eastern European countries, with exceedingly high rates from motor vehicle accidents, and where comprehensive interventions on this important cause of death are therefore a public health priority.

In several developed countries, the rise and subsequent fall in death rates from motor vehicle accidents has been one of the major changes in mortality from any cause over the current century, and in several aspects one of the major successes on a public health scale¹. The recent declines in mortality, in fact, have been achieved against a generalized background increase

in the number of circulating vehicles, and reflect a large number of advancements in the adoption of safety measures, improvements in the structure of vehicles and road organization, besides the adoption of selected legislation measures and better treatment of casualties^{2–16}.

Information on mortality from road traffic accidents is easily avail-

able for the United States^{2,5,10,11,13,14} and a few western European countries^{6,8,9,12,14,17}, in the absence, however, of an overall summary figure of pattern and trends in mortality in other countries of the world. There are, in fact, substantial differences in traffic accident mortality in various areas of the world. We decided, therefore, to include in a single report a summary overview of main trends in mortality from motor vehicle accidents over the last four decades, using data for 48 countries from four continents available from the World Health Organization (WHO) database.

Materials and methods

Death certification numbers from road traffic accidents over the period 1950–1990 and estimates of the resident population, stratified for sex and five-year age group, were derived from copies of the original computer tapes of the WHO database, which includes data for the following 48 countries:

Americas. The WHO database contains some data on mortality and population for 49 American countries or territories. Excluded were all countries with less than 2 million population. Out of the

24 countries left, only those with age-stratified mortality and population figures of sufficient detail were retained: 12 countries were excluded at this stage. The analysis is based on data from Canada, the United States, and the remaining 10 Latin American countries: Argentina, Chile, Costa Rica, Dominican Republic, Ecuador, Mexico, Panama, Puerto Rico, Uruguay and Venezuela.

Asia. Eight countries provided sufficient detail of data on road traffic accident mortality from Asia: Hong Kong (not an independent country, but a self-governing Commonwealth), Israel, Japan, Kuwait, Philippines, Singapore, Sri Lanka and Thailand.

Europe. Data were available for the 26 major European countries, excluding Albania, Romania, the former Soviet Union and a few small countries like Andorra, Liechtenstein, Malta, etc.

Oceania. Data were available for Australia and New Zealand.

During the calendar period considered (1950–1990), four different Revisions of the International Classification of Diseases (ICD) were used (from the Sixth to the Ninth Revision)^{18–21}. No major change was introduced in the procedure of coding of road traffic accidents, which had the ICD codes E810–835 for Sixth and Seventh, E810–823 for Eighth, and E810–819 for the Ninth Revision. Classification of road accidents deaths was thus recoded, for all calendar periods and countries considered, according to the Ninth Revision of the ICD²¹.

From the matrices of certified deaths and resident populations, age-specific rates for each five-year age group and calendar period were computed. Besides overall age-standardized rates, based on the world standard population²², truncated ones at age 15–64 (and further subdivided in younger, 15 to 34, and middle age, 35 to 64

years) were chosen for presentation.

Truncated rates are of interest for at least two reasons, since: i) they provide information specifically on trends in young and middle age and ii) death certification in the elderly is generally less reliable, and may, therefore, introduce spurious trends.

In a few countries, data were missing for part of one or more calendar periods. When a single year was missing within a quinquennium, numerators and denominators were interpolated linearly from the previous and subsequent calendar year. No extrapolation was made for missing data at the beginning or the end of the calendar period considered, or when data on one or more quinquennia were not available.

Presentation of results. For each country one table and three figures are presented.

The table includes, for each calendar year and sex, the absolute number of deaths and the overall age-standardized and truncated 15–64 years mortality rates.

The first figure includes world-standardized rates (all age and truncated 15–34 and 35–64) for each five-year calendar period in both sexes.

Age-specific rates from 15–19 to 65–69 years were plotted against the central year of birth cohort in the second figure for males and in the third for females. The points corresponding to the same age group were joined to provide more clearly spaced graphs. Thus, in this graph, the cohort effect can be read in the ordinate.

To provide graphical representation of the range of variation in mortality from road traffic accidents, histograms of overall age-standardized death rates in the most recent calendar quinquennium (1985–89, whenever available) are given.

Results

North America. In North America, mortality from road vehicles accidents increased for both sexes until the late 1960's, to reach 38.8/100000 males in Canada and 39.4/100000 in the United States, and approximately 14/100000 females in both countries. A reversal of trends followed, with steady and substantial declines for males to reach 21/100000 in Canada and 25/100000 in the United States. Some decline was observed for females, too, although a levelling of rates was evident over the last few years. Overall death rates in 1985–1989 were 8.5/100000 females in Canada and 10.2 in the United States. The downward trends were generally greater in middle age as compared to both younger and older age. For both sexes, however, mortality was still comparatively high on a worldwide scale, particularly in the United States.

Latin America. The pattern of trends was heterogeneous in various Latin American countries. Thus, after earlier rises, substantial declines were observed in Argentina from 1970–1974 onwards (from 27.8 to 13.8/100000 males, from 8.3 to 4.3/100000 females), in Chile (from 30.8 to 11.5/100000 males, from 5.7 to 2.3/100000 females), in Puerto Rico, Costa Rica, Mexico and Venezuela starting from the late 1970's, and in Ecuador starting from the mid-1980's. Mortality from motor vehicle accident, however, remained exceedingly high in Venezuela in the late 1980's (42.2/100000 males, 10.3/100000 females), and also, particularly for males, in Ecuador, Panama, Mexico and Puerto Rico.

In Panama, after earlier rises, from the mid-1970's onwards rates have remained stable and showed little evidence to decline. In most Latin American countries considered, excluding Venezuela and Ecuador, rates for females were lower than

in North America, but showed similar trends.

Asia. Among the eight Asian countries providing meaningful data to the WHO database, Hong Kong, Singapore and, mostly, Japan, showed earlier increase up to the late 1960's or early 1970's, and appreciable decreases afterwards. The peak rate for males in Japan was 28.5/100000 in 1965–1969, as compared to 14.9 in 1985–1989. The fall, however, was sharp in the late 1970's, but motor vehicle mortality rates flattened off around 15/100000 males in the 1980's. The pattern of trends was similar for females, with a peak rate of 8.1/100000 in 1970–1974, and a subsequent fall around 4.5/100000 in the 1980's. Some recent fall in rates was observed over recent years also in Thailand (13.1/100000 males, 3.9/100000 females in 1985–1989), Israel (13.5/100000 males, 5.7/100000 females), and

Kuwait, whose rates, particularly for males, remained, however, exceedingly high (45.2/100000). This was essentially due to extremely high mortality rates in middle age and elderly males. All other Asian countries providing data had comparatively low rates of motor vehicle accident mortality on a worldwide scale.

Europe. Substantial heterogeneities were evident among the 26 European countries considered. Over the most recent calendar period, the lowest rates (around 10–13/100000 males and 5–6/100000 females) were in Britain, Nordic countries, the Netherlands and also Germany, whose recent decline was particularly large (from 41.4/100000 in 1970–1974). The highest rates (around 20–30/100000 males) were in Portugal, Belgium, France and several other southern and central European countries. The trends over time

were, however, similar in most countries, with a peak for both sexes between the late 1960's and the early 1970's, and a clear decline thereafter. For some countries (e.g. the Netherlands, Germany or Italy), this decline is still in progress, whereas for others (e.g. France or Finland) a levelling off has been registered over the last few years. There are, however, a few outliers, including Portugal (whose rates were around 40/100000 males in 1985–1989, although declining from 50.9 in 1975–1979), Greece, Poland and Hungary (with rates between 23 and 27/100000), whose mortality from motor vehicle accidents has shown no evidence of decline over the last few years and Belgium (27.2/100000 males, 9.0/100000 females), whose rates, although somewhat downwards, have remained exceedingly high.

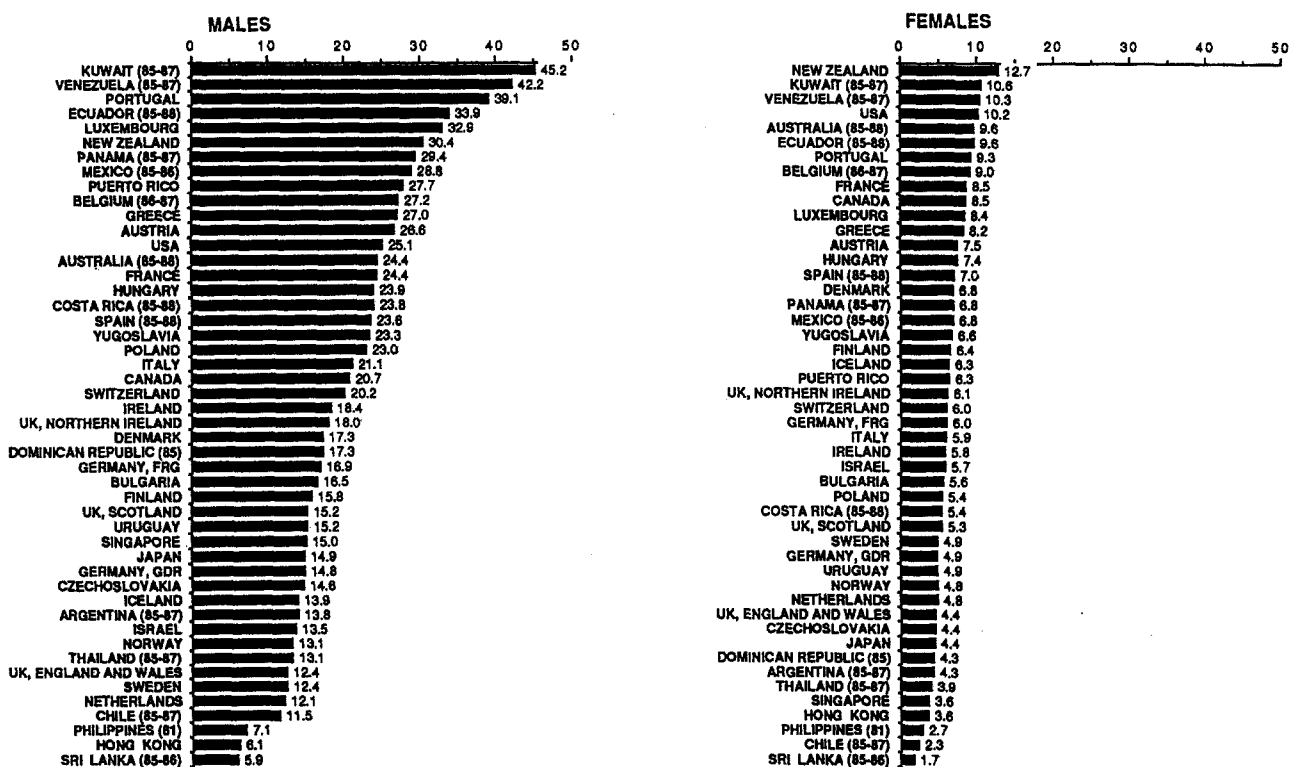


Figure 1. Overall age-standardized (world standard) mortality rates per 100000 from motor vehicle traffic accidents in various countries providing data to the WHO database, 1985–1989 (or in the most recent calendar period available).

MOTOR VEHICLE TRAFFIC ACCIDENTS CANADA

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	13210	31.41	37.90	4284	10.28	9.77
60-64	15794	34.38	42.69	5426	11.68	12.17
65-69	19880	38.78	49.22	7285	14.03	15.22
70-74	21960	38.17	49.27	8197	14.28	15.73
75-79	19802	31.25	40.92	7455	11.87	13.36
80-84	16624	24.50	33.04	6270	9.24	10.92
85-89	14367	20.66	27.77	6015	8.47	10.07

MOTOR VEHICLE TRAFFIC ACCIDENTS UNITES STATES OF AMERICA

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	143063	34.58	45.30	48584	10.82	12.21
60-64	151215	33.57	43.95	56311	11.44	13.12
65-69	192034	39.39	52.22	73747	13.85	16.08
70-74	192389	35.97	47.34	74816	13.13	15.00
75-79	179933	30.72	41.10	67132	11.03	12.88
80-84	170246	27.15	37.20	65229	9.97	12.25
85-89	163471	25.08	34.19	70125	10.20	12.56

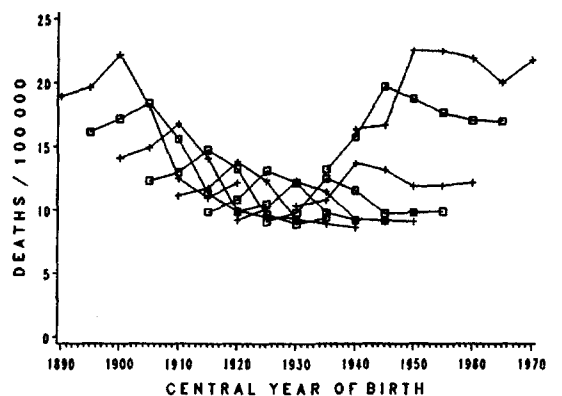
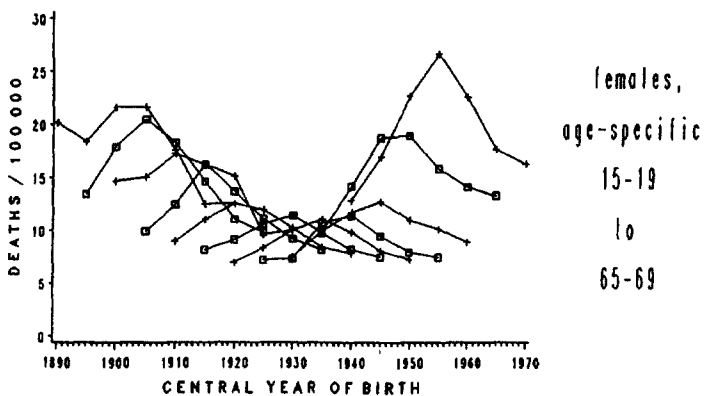
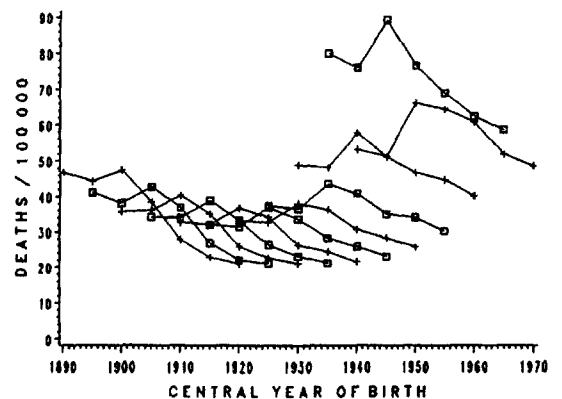
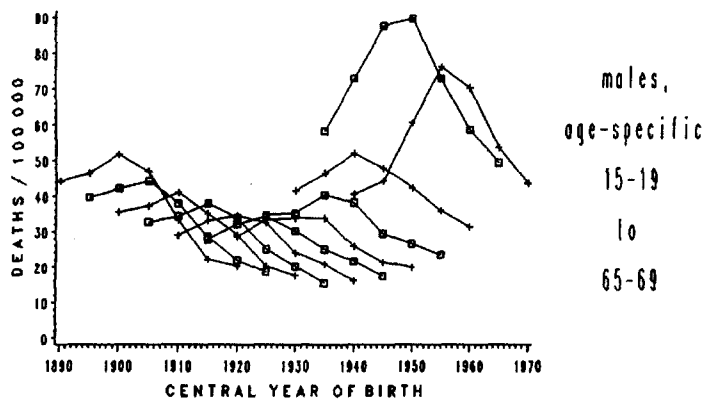
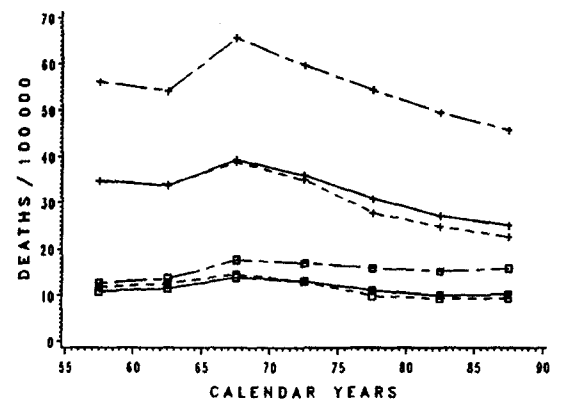
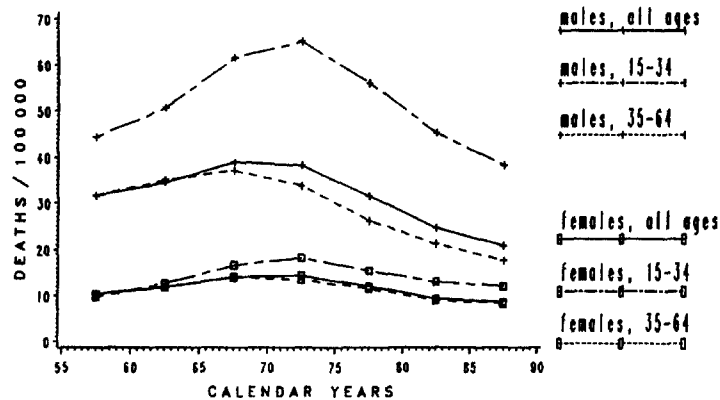


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS ARGENTINA

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59						
60-64						
65-69*	11261	23.36	29.47	3035	6.35	6.51
70-74*	3458	27.80	35.38	1043	8.27	8.59
75-79*	9058	20.63	25.59	2915	6.54	6.70
80-84	13482	17.76	22.27	4428	5.55	5.78
85-89*	6576	13.80	17.31	2181	4.32	4.66

* Information is missing for one or more years

MOTOR VEHICLE TRAFFIC ACCIDENTS CHILE

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	1822	11.45	14.72	355	1.94	1.83
60-64	2322	13.08	16.19	510	2.50	2.16
65-69	5141	27.02	33.72	1076	4.88	4.42
70-74	6359	30.78	39.06	1365	5.74	5.67
75-79	4201	17.62	21.48	927	3.51	3.51
80-84	4756	17.47	21.76	1133	3.91	3.81
85-89*	2015	11.47	14.85	439	2.30	2.30

* Information is missing for one or more years

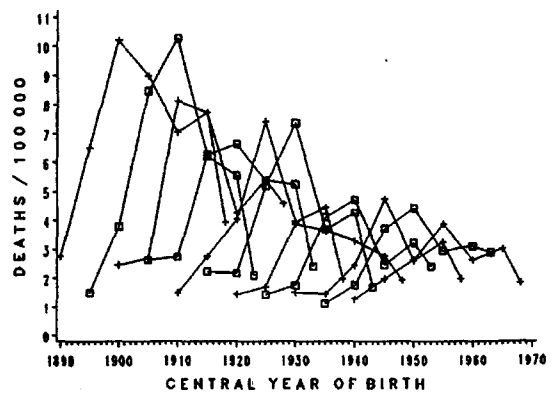
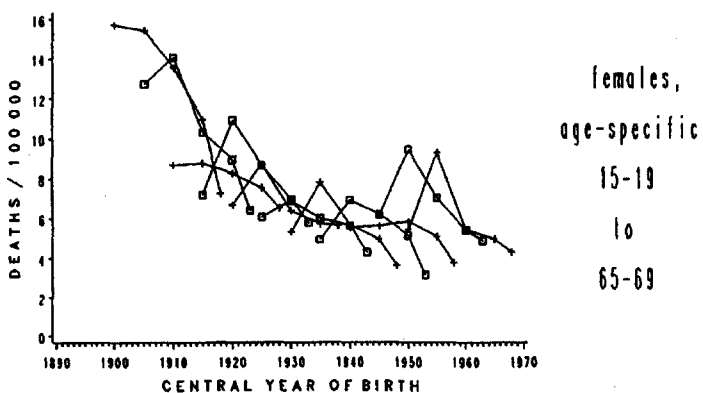
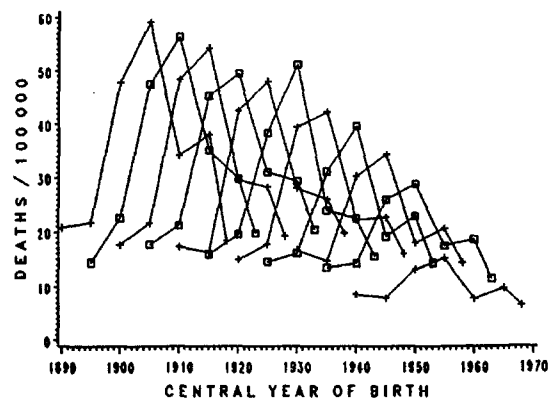
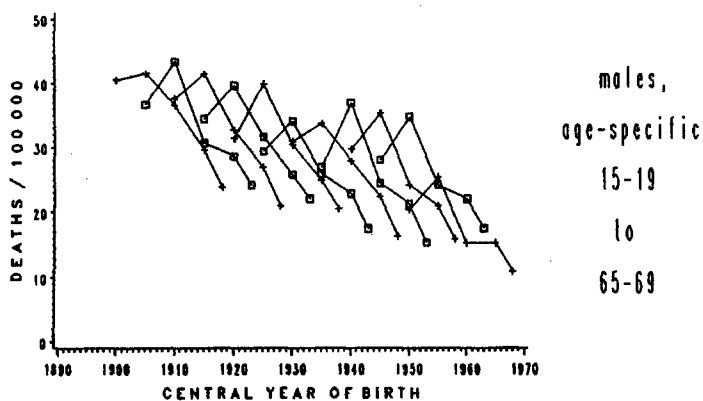
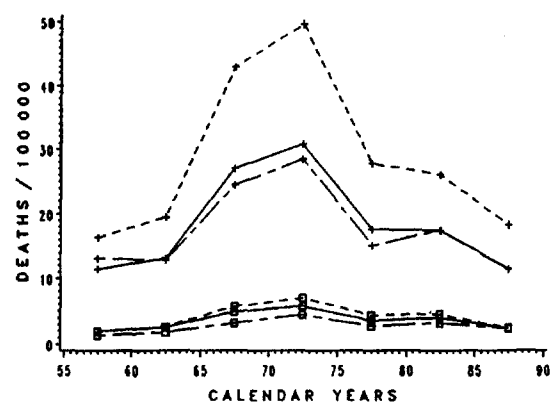
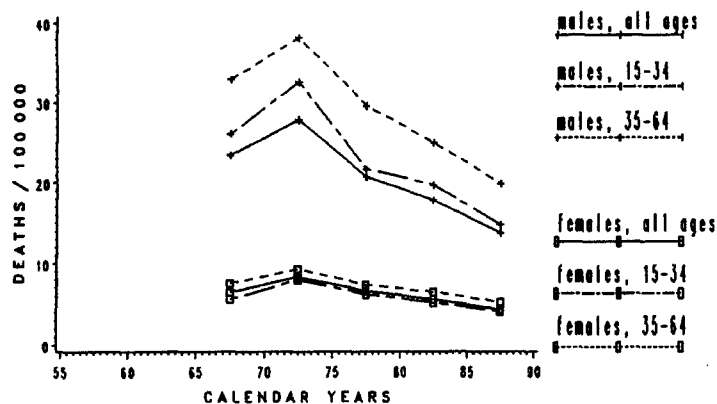


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS COSTA RICA

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59						
60-64*	322	14.05	17.73	49	2.08	1.82
65-69	738	23.12	29.01	162	4.84	3.98
70-74	1150	30.92	40.64	268	6.69	7.43
75-79	1603	36.66	45.94	416	8.69	7.99
80-84	1214	23.32	29.50	293	5.41	5.79
85-89*	1174	23.83	29.95	278	5.42	5.39

* Information is missing for one or more years

MOTOR VEHICLE TRAFFIC ACCIDENTS DOMINICAN REPUBLIC

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59						
60-64						
65-69	817	9.90	12.36	223	2.69	2.67
70-74	1418	15.75	20.41	395	4.23	4.77
75-79	1583	15.20	18.97	496	4.57	4.77
80-84	2084	17.33	22.04	540	4.58	4.72
85-89*	453	17.28	21.90	104	4.34	4.19

* Information is missing for one or more years

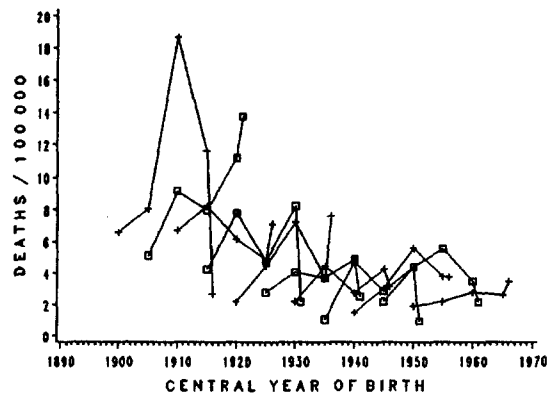
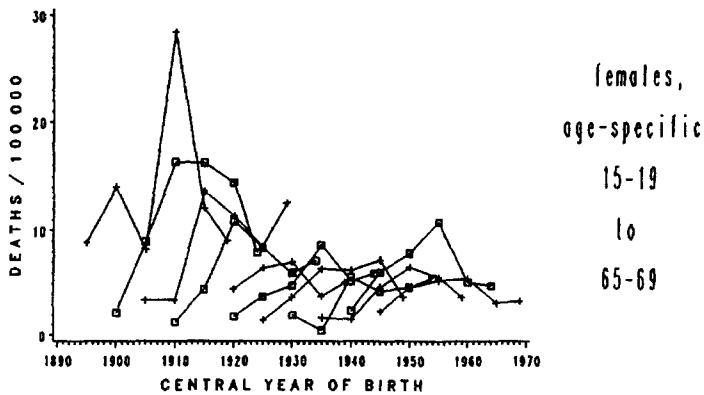
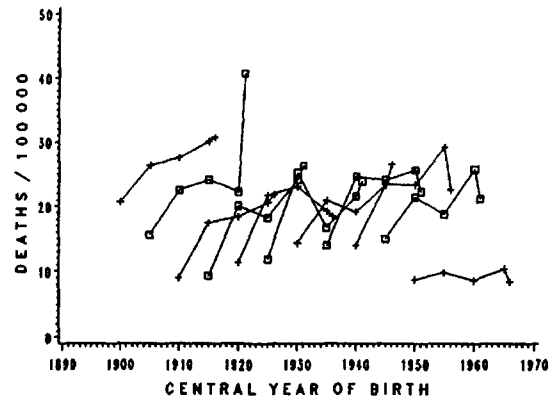
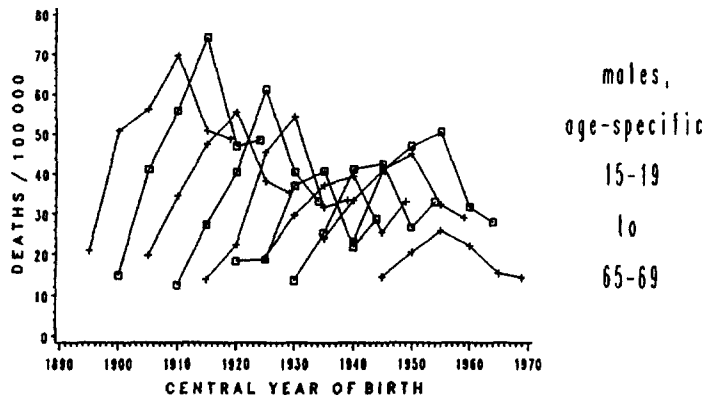
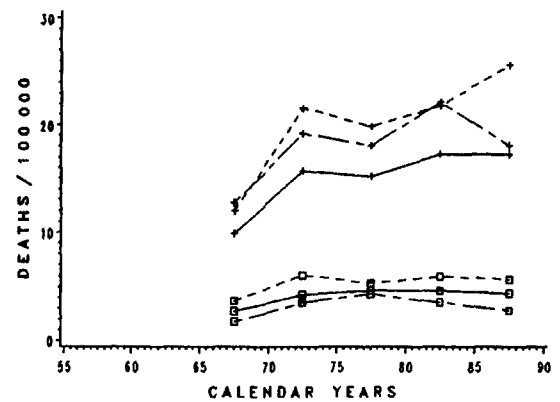
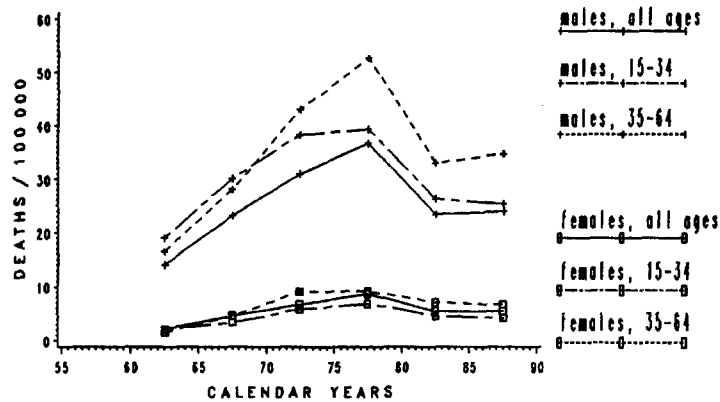


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS ECUADOR

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59						
60-64*	1022	16.94	19.56	320	5.38	4.88
65-69	2257	19.90	23.77	724	6.20	5.77
70-74	3973	31.61	37.32	1356	10.20	9.78
75-79*	5088	40.81	49.16	1631	12.43	12.50
80-84*	4433	41.57	52.00	1347	11.95	11.53
85-89*	5553	33.94	42.10	1638	9.61	9.65

* Information is missing for one or more years

MOTOR VEHICLE TRAFFIC ACCIDENTS MEXICO

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59*	1527	5.05	6.27	431	1.36	1.32
60-64	6638	8.53	10.72	1749	2.14	2.13
65-69	12005	13.75	17.58	3166	3.40	3.31
70-74	19956	18.28	23.36	5849	4.80	4.79
75-79*	26946	34.13	42.98	7491	9.12	9.27
80-84*	37081	40.68	52.42	10145	10.42	11.02
85-89*	19644	28.80	36.56	4964	6.84	7.03

* Information is missing for one or more years

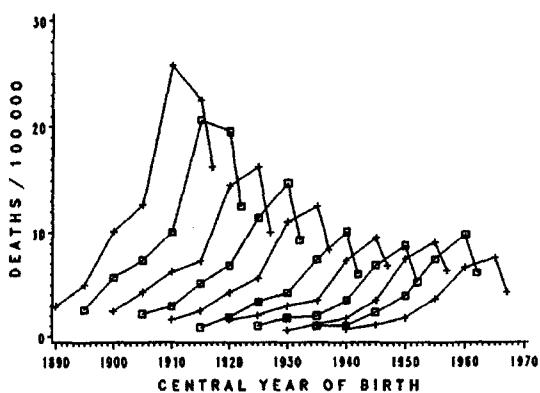
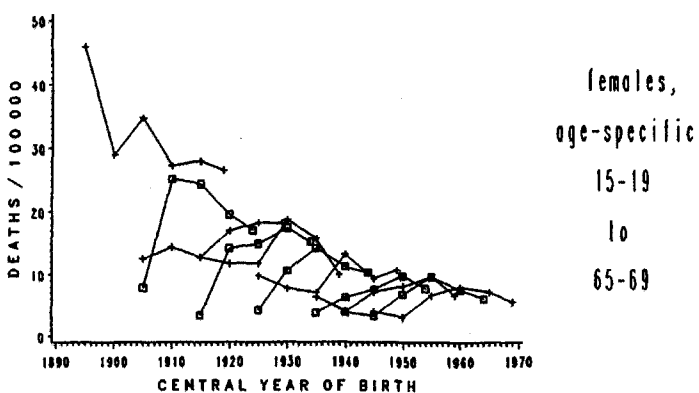
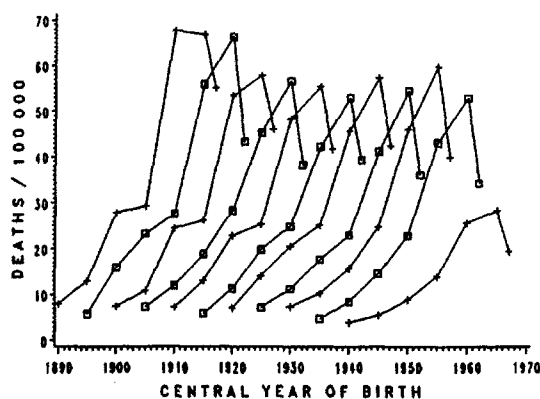
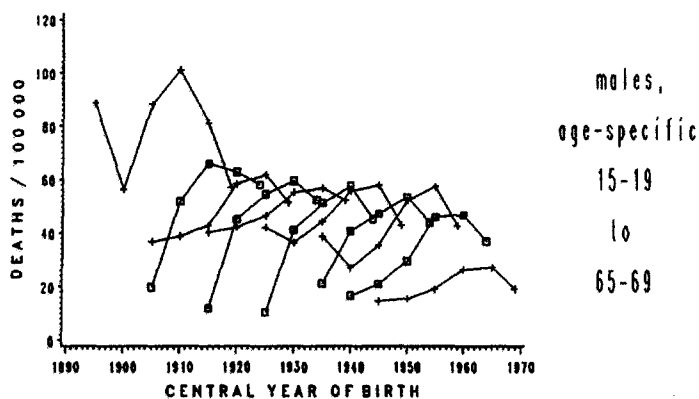
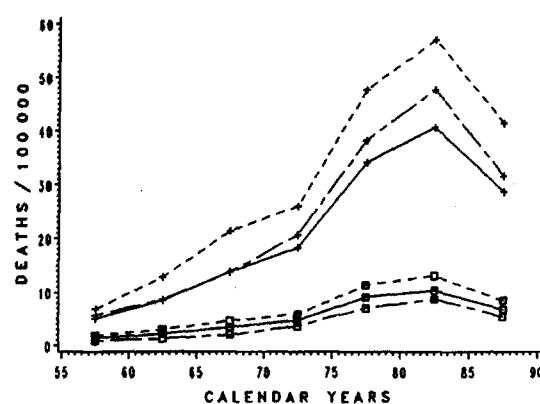
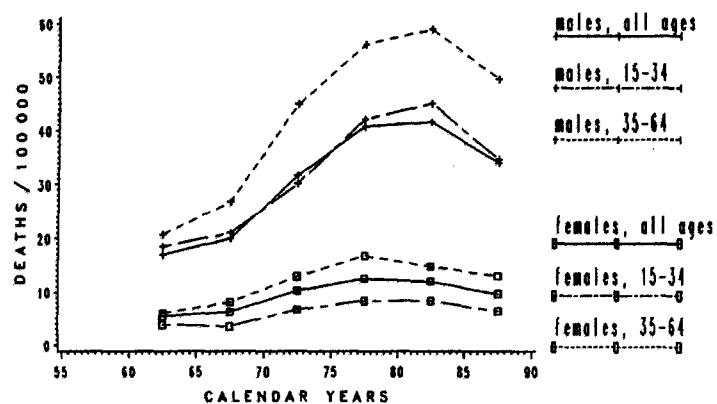


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MOTOR VEHICLE TRAFFIC ACCIDENTS PANAMA

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59	201	8.28	10.46	55	2.64	2.46
60-64	389	15.20	19.72	103	4.43	4.65
65-69	523	17.68	21.74	158	5.51	5.04
70-74	865	24.82	32.21	217	6.43	6.50
75-79	1161	29.23	37.81	313	7.86	8.43
80-84	1379	29.46	38.55	394	8.32	8.52
85-89*	899	29.36	37.98	201	6.79	7.10

* Information is missing for one or more years

MOTOR VEHICLE TRAFFIC ACCIDENTS PUERTO RICO

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59						
60-64*	1160	26.60	34.57	230	4.64	4.56
65-69*	778	32.17	43.45	168	6.53	6.99
70-74	2322	34.86	46.33	561	7.61	8.27
75-79*	1720	29.82	39.75	361	5.52	5.50
80-84	2104	25.98	35.36	541	6.17	7.07
85-89	2453	27.70	37.55	617	6.32	7.64

* Information is missing for one or more years

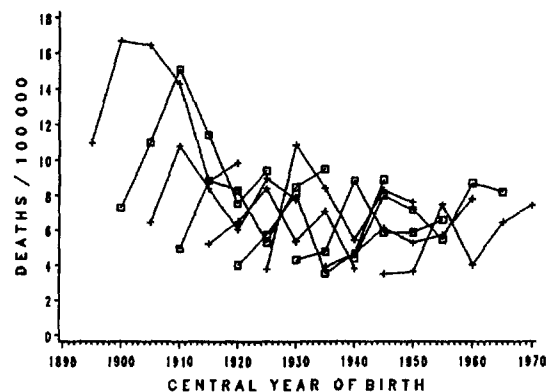
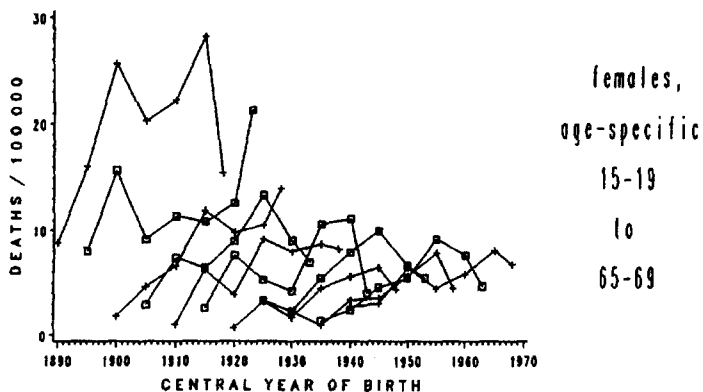
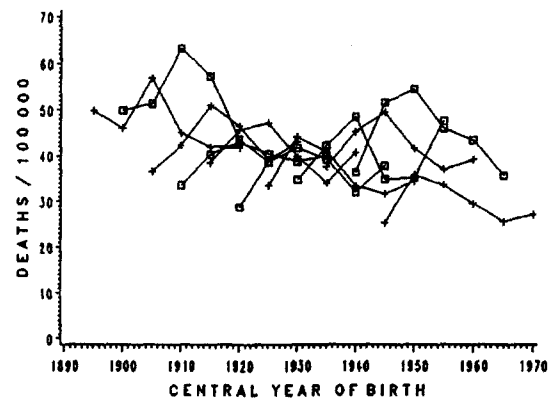
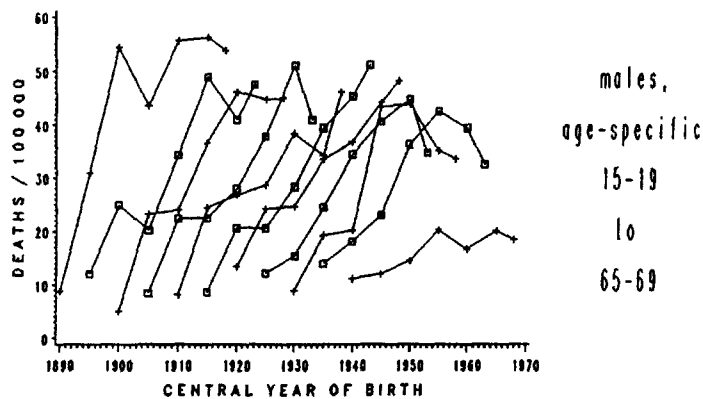
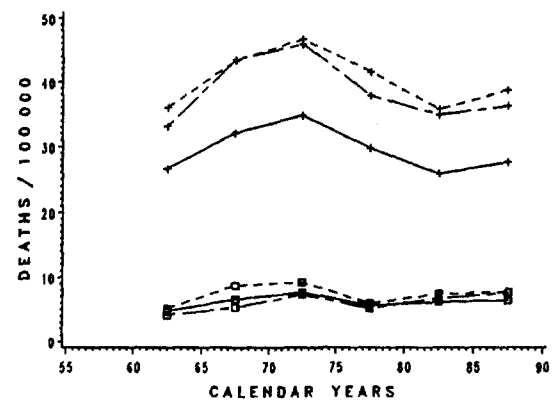
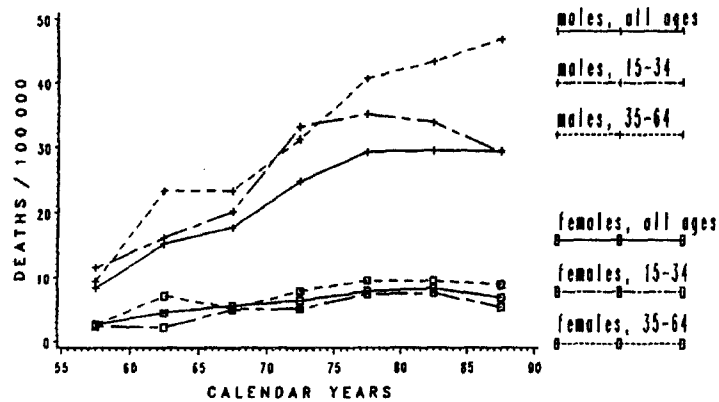


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS URUGUAY

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	639	9.76	12.07	125	1.91	2.04
60-64*	373	8.92	11.35	104	2.36	2.31
65-69	725	9.84	12.61	182	2.47	2.51
70-74	777	10.10	12.66	209	2.70	2.70
75-79*	541	9.10	11.46	156	2.44	2.49
80-84	1219	15.64	21.02	397	4.60	5.27
85-89	1247	15.19	19.68	434	4.89	5.26

* Information is missing for one or more years

MOTOR VEHICLE TRAFFIC ACCIDENTS VENEZUELA

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	3954	26.27	33.90	847	5.76	5.85
60-64	5718	33.06	42.57	1230	6.95	7.05
65-69	8515	42.45	54.18	2026	9.72	9.87
70-74	12063	53.88	70.06	2902	12.21	13.08
75-79	18071	65.50	87.23	4309	14.91	16.43
80-84*	16402	57.31	76.14	3707	12.97	14.04
85-89*	10143	42.17	55.14	2518	10.25	11.12

* Information is missing for one or more years

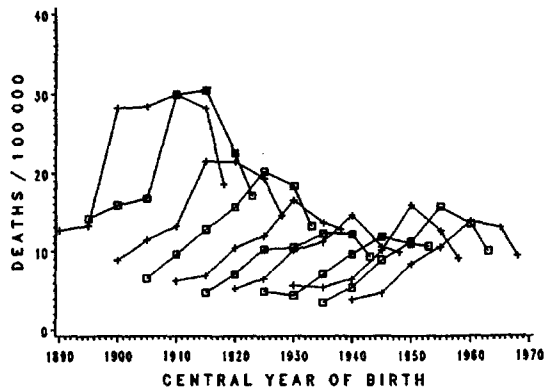
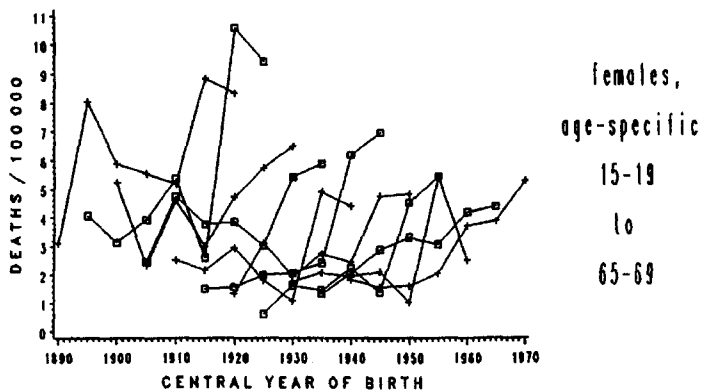
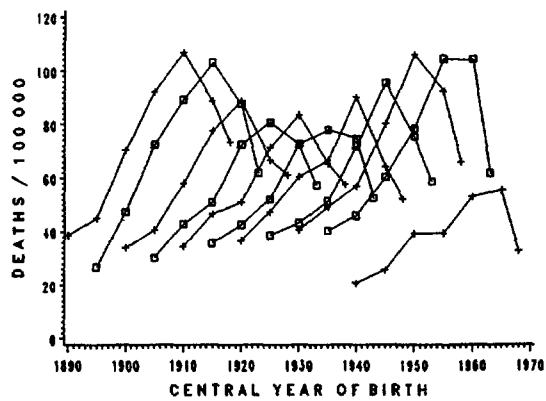
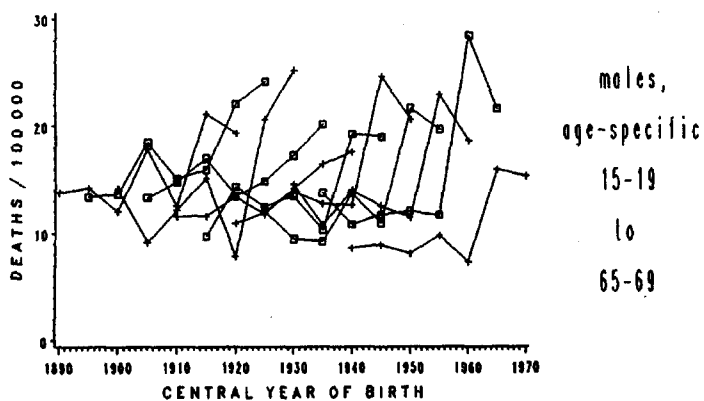
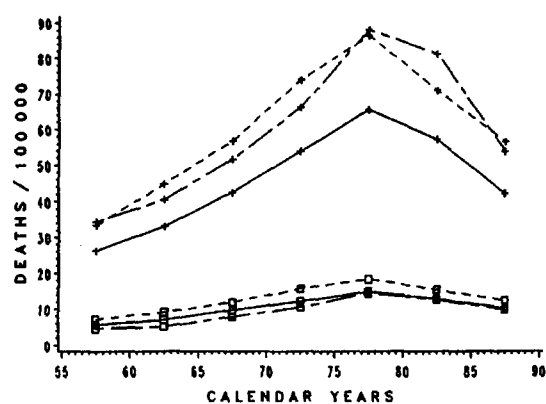
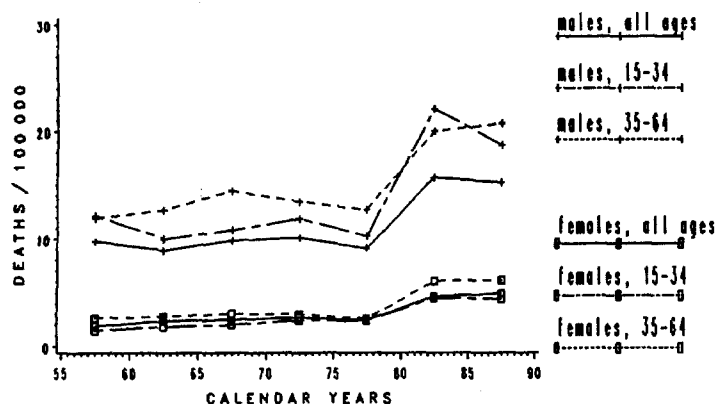


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS HONG KONG

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59						
60-64	702	10.68	10.65	374	5.08	4.02
65-69	758	10.32	9.71	447	5.28	4.57
70-74	1327	15.08	15.45	721	7.44	6.75
75-79	1186	10.84	11.16	652	5.73	4.76
80-84	1329	9.85	9.99	753	5.51	4.45
85-89	913	6.12	5.99	570	3.61	2.88

MOTOR VEHICLE TRAFFIC ACCIDENTS ISRAEL

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59						
60-64						
65-69						
70-74						
75-79	1818	20.48	22.91	903	9.66	9.44
80-84	1418	14.15	16.48	616	5.67	4.73
85-89	1493	13.47	15.63	667	5.65	5.29

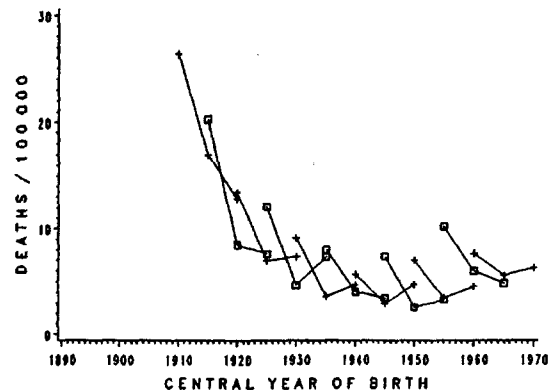
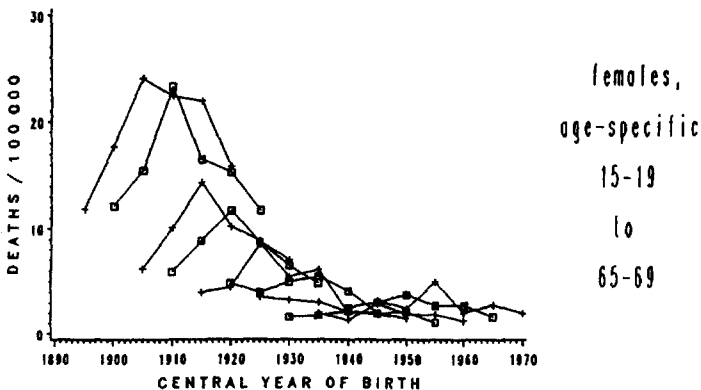
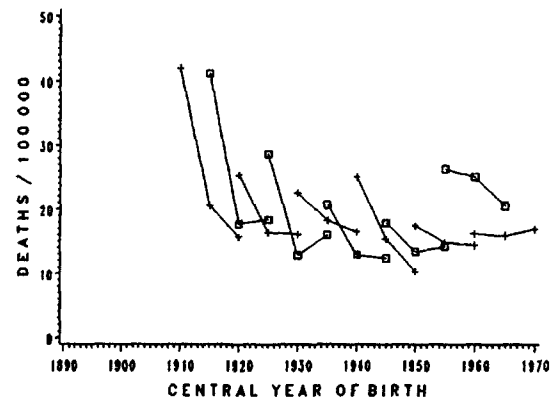
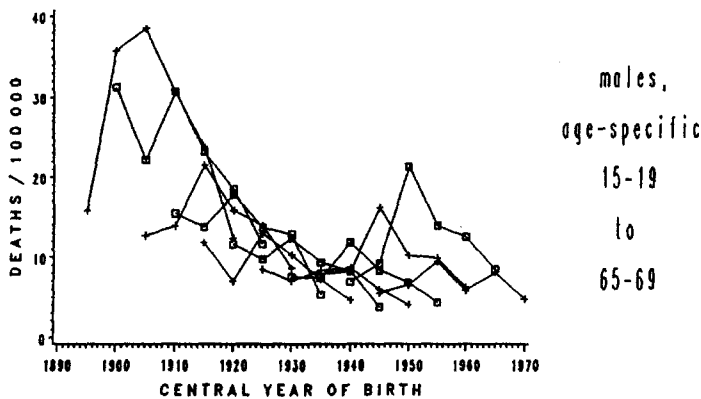
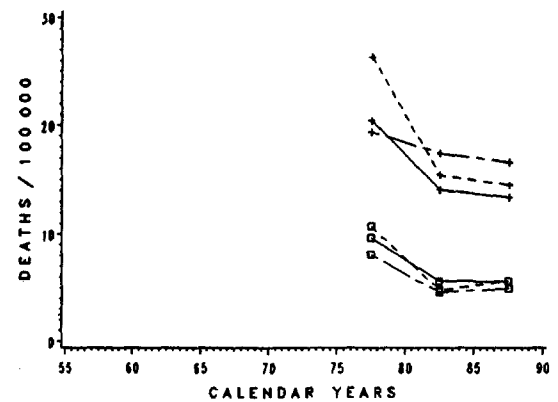
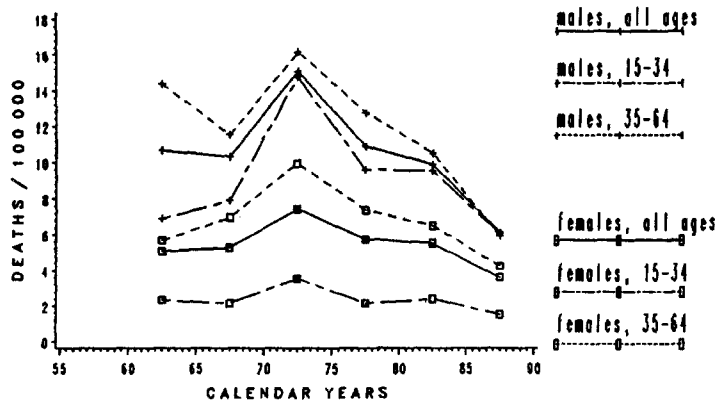
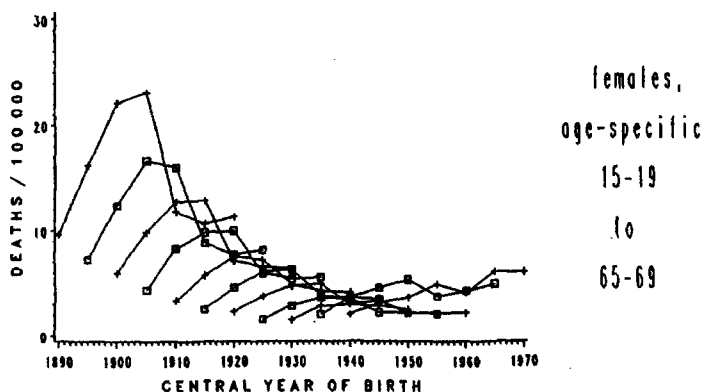
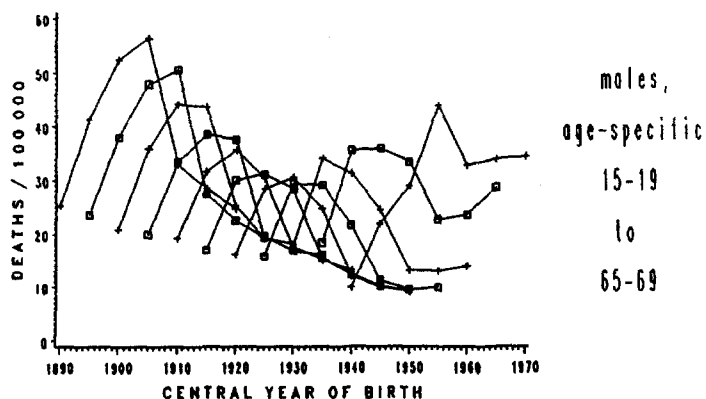
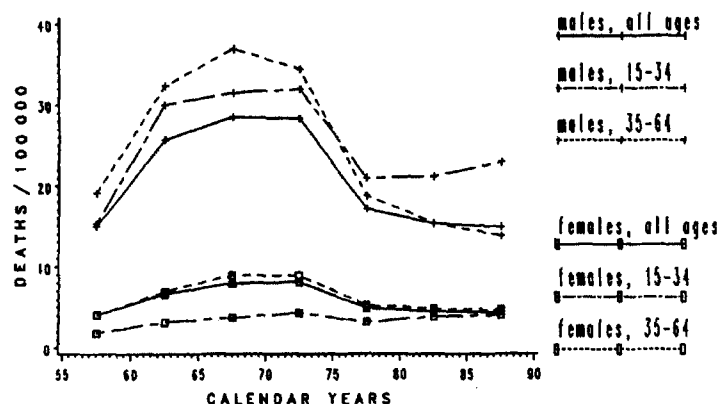


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS JAPAN

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59	31771	14.92	17.18	8591	4.05	2.88
60-64	59151	25.66	31.19	14738	6.57	5.03
65-69	71257	28.51	34.18	19549	7.87	6.30
70-74	74910	28.22	33.12	22736	8.06	6.59
75-79	47794	17.10	19.82	15105	4.92	4.19
80-84	45172	15.22	18.25	15114	4.45	4.29
85-89	47774	14.89	18.31	16997	4.40	4.35



MOTOR VEHICLE TRAFFIC ACCIDENTS KUWAIT

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59						
60-64						
65-69						
70-74						
75-79	1677	67.55	73.00	353	16.46	15.20
80-84	1895	59.78	53.17	400	14.44	14.08
85-89*	974	45.15	44.66	183	10.56	10.83

* Information is missing for one or more years

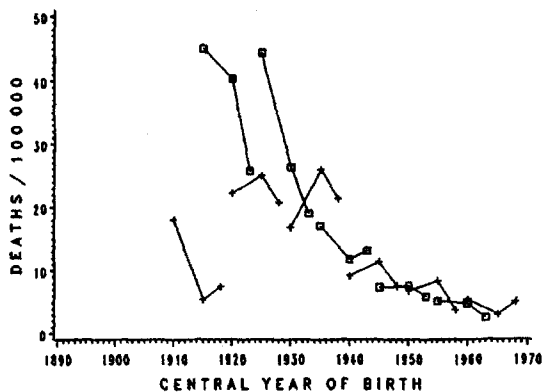
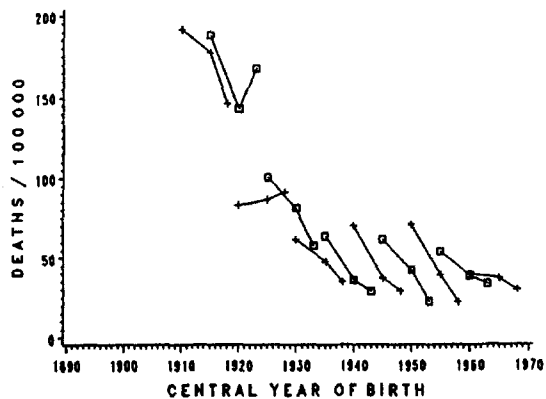
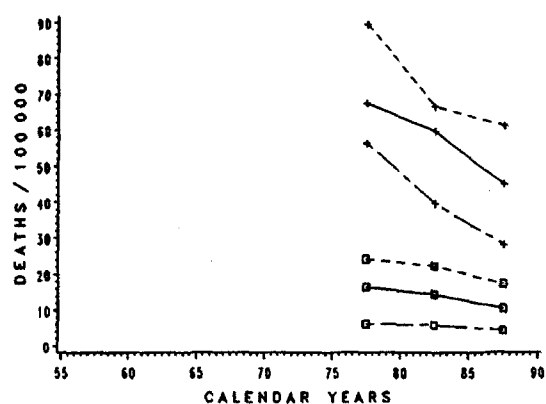


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS PHILIPPINES

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59						
60-64*	1058	3.96	4.85	370	1.48	1.51
65-69	3139	4.37	5.08	1128	1.58	1.48
70-74	3859	4.47	5.35	1585	1.85	1.69
75-79*	3928	6.87	8.13	1582	2.83	2.66
80-84*	1491	7.09	8.04	553	2.74	2.38
85-89						

* Information is missing for one or more years

MOTOR VEHICLE TRAFFIC ACCIDENTS SINGAPORE

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59						
60-64*	336	24.25	28.10	77	5.76	5.94
65-69	1053	29.35	29.22	256	7.18	5.58
70-74	1306	28.47	28.89	337	7.68	6.89
75-79	1025	20.05	20.11	281	5.58	4.79
80-84	1232	19.81	22.75	291	5.22	4.51
85-89	1022	15.00	17.99	236	3.59	3.60

* Information is missing for one or more years

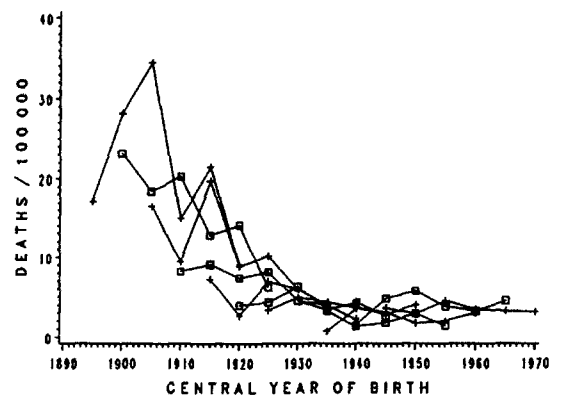
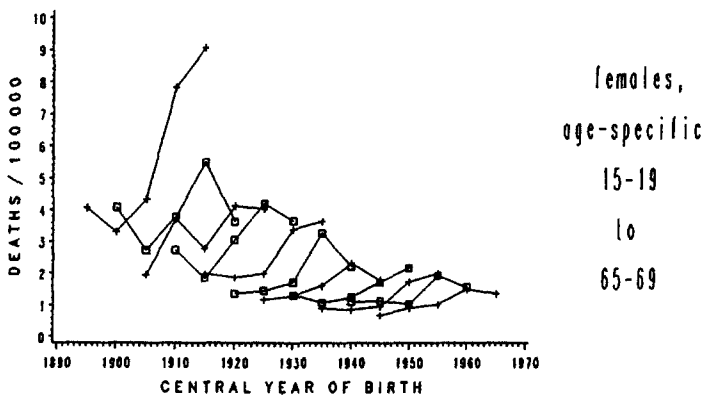
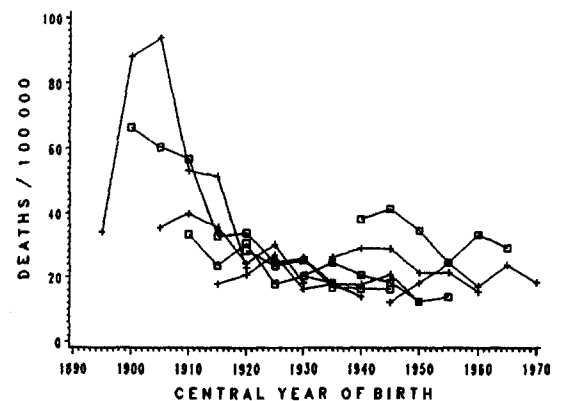
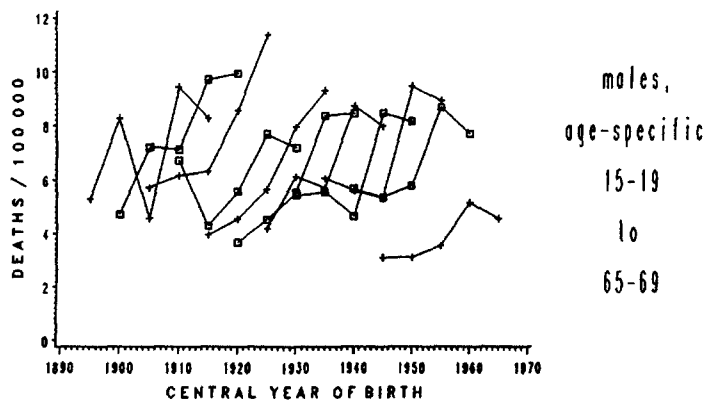
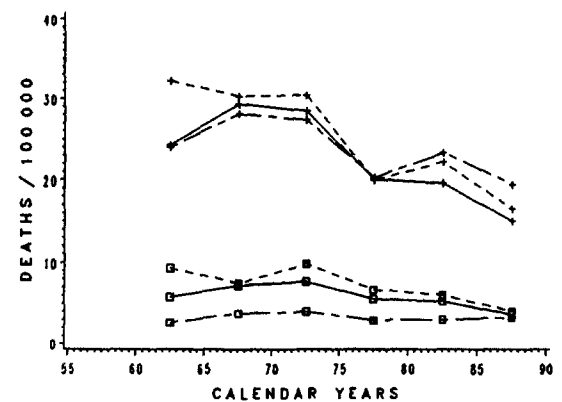
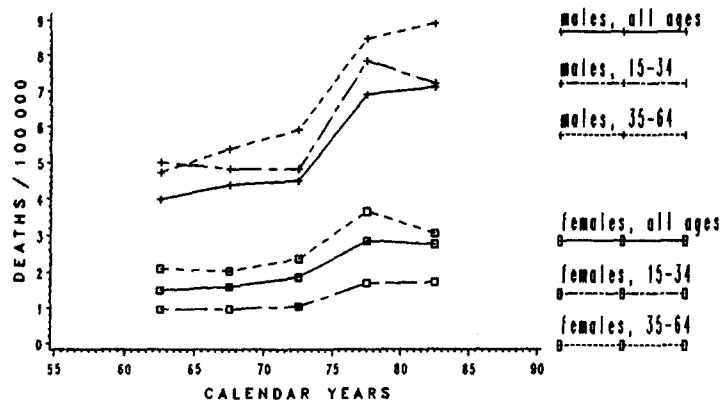


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS SRI LANKA

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	992	5.11	5.49	220	1.48	1.12
60-64	874	3.93	4.39	201	1.16	0.93
65-69*	610	3.11	3.51	105	0.87	0.50
70-74						
75-79*	348	5.45	6.44	84	1.53	1.16
80-84*	1942	9.66	11.79	467	2.67	2.31
85-89*	842	5.88	6.90	218	1.71	1.64

* Information is missing for one or more years

MOTOR VEHICLE TRAFFIC ACCIDENTS THAILAND

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59*	1837	5.28	6.98	511	1.53	1.67
60-64	4193	6.28	8.23	1317	1.98	2.19
65-69	10240	13.52	18.01	3334	4.43	5.06
70-74	15532	17.56	23.64	5140	5.63	6.55
75-79*	16349	21.02	28.27	5576	7.07	8.34
80-84	23996	21.26	29.02	7263	6.49	7.79
85-89*	10071	13.12	18.00	2893	3.89	4.69

* Information is missing for one or more years

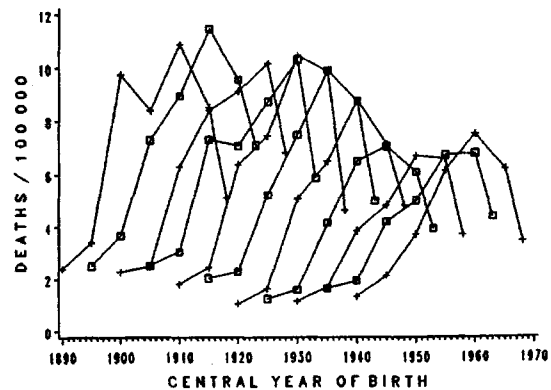
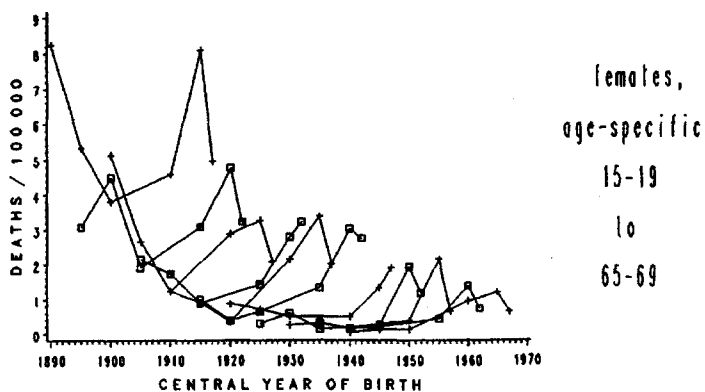
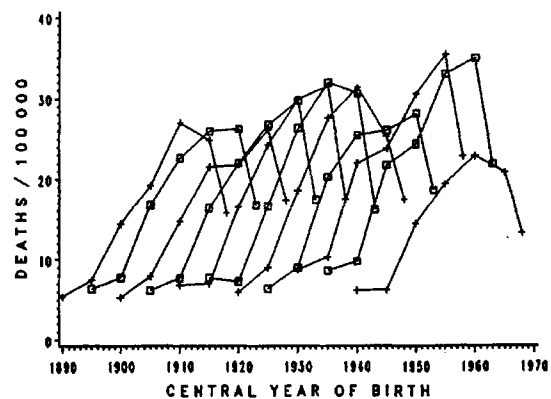
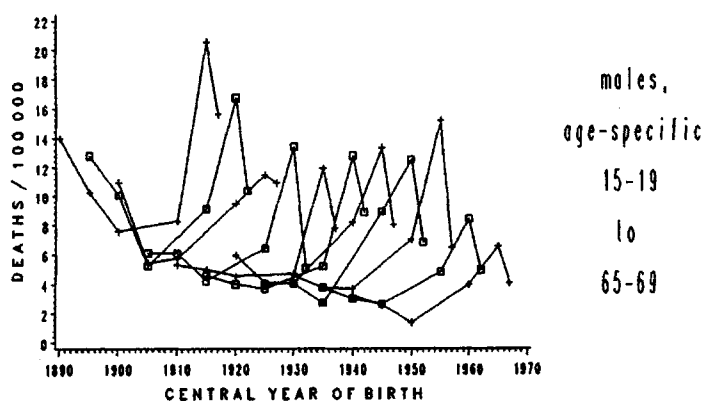
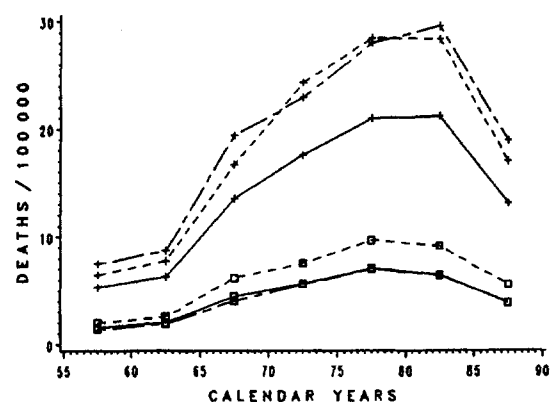
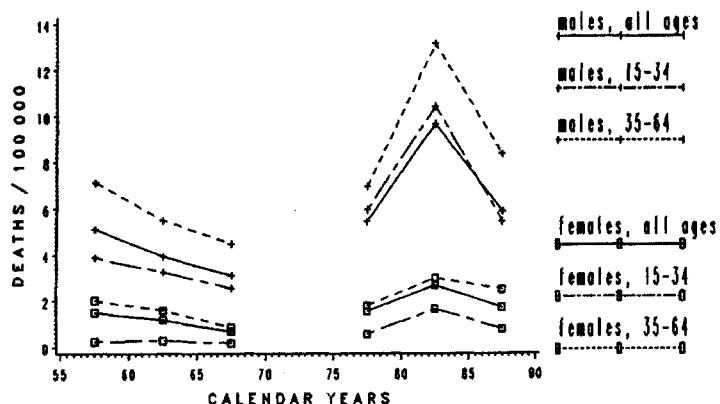


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS AUSTRIA

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59	6413	38.11	51.49	1800	7.36	7.19
60-64	6714	37.40	47.81	2015	8.84	7.66
65-69	8141	44.25	56.20	2722	11.37	10.89
70-74	9875	53.20	68.79	3349	13.98	14.37
75-79	8236	42.93	56.33	2837	11.63	12.60
80-84	7092	35.61	48.01	2269	9.30	10.30
85-89	5403	26.56	35.88	1888	7.51	8.28

MOTOR VEHICLE TRAFFIC ACCIDENTS BELGIUM

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59	5049	21.07	28.17	1378	5.29	4.76
60-64	6972	29.39	37.46	1968	7.45	7.39
65-69	9035	36.05	44.29	3194	11.55	11.46
70-74	10142	39.97	49.95	3888	13.50	13.75
75-79	8712	33.33	42.51	3288	11.45	11.81
80-84	8163	30.81	40.17	3010	10.23	11.28
85-89*	2906	27.18	35.99	1088	9.00	10.09

* Information is missing for one or more years

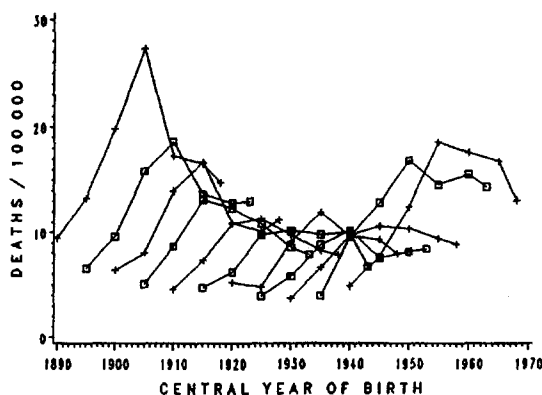
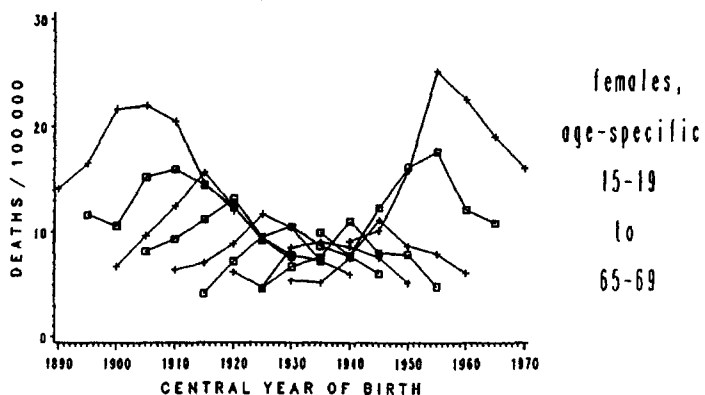
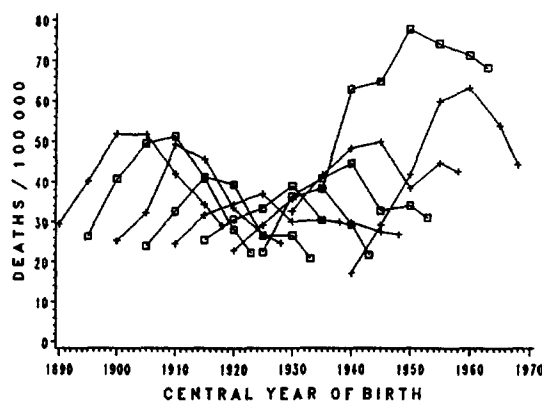
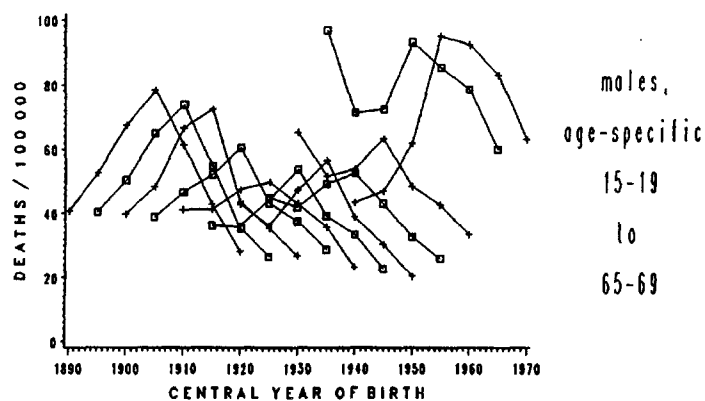
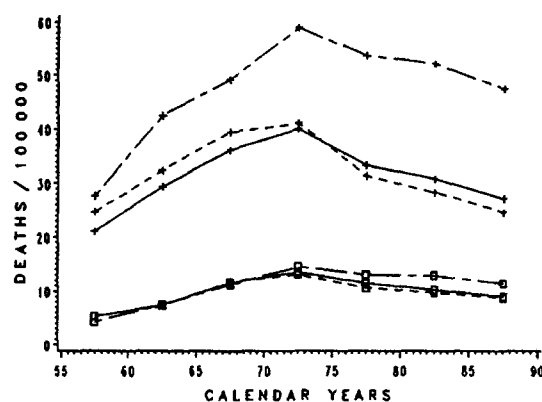
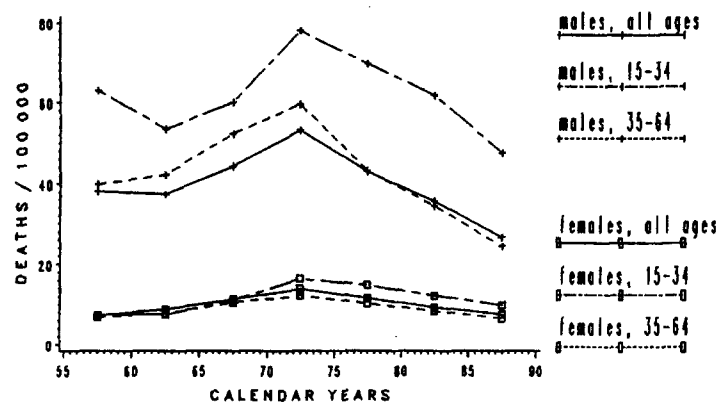


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS BULGARIA

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59						
60-64*	413	9.69	11.68	116	2.79	2.54
65-69	3986	18.11	22.85	988	4.57	4.11
70-74	4370	18.81	23.77	1168	5.10	4.80
75-79	4504	18.70	22.94	1447	6.03	6.16
80-84	4192	17.31	21.47	1433	5.84	5.93
85-89	4060	16.46	20.80	1421	5.57	5.87

* Information is missing for one or more years

MOTOR VEHICLE TRAFFIC ACCIDENTS CZECHOSLOVAKIA

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	5737	17.86	23.50	1213	3.41	2.81
60-64	7617	22.48	29.26	1893	4.92	4.24
65-69	10662	29.29	37.37	2913	6.98	6.35
70-74	11303	29.53	36.87	3620	8.17	7.58
75-79	9906	24.96	30.20	3546	7.45	6.90
80-84	6673	16.60	20.47	2308	4.79	4.46
85-89	5956	14.58	17.95	2124	4.44	4.57

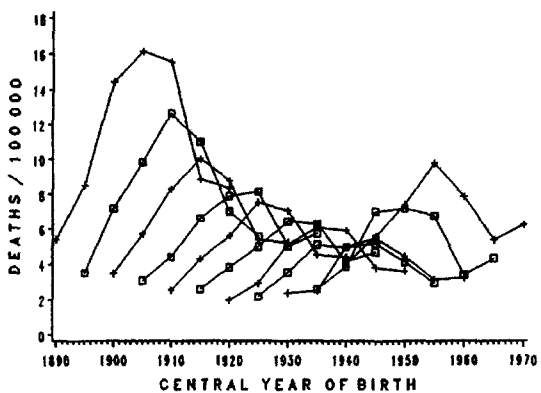
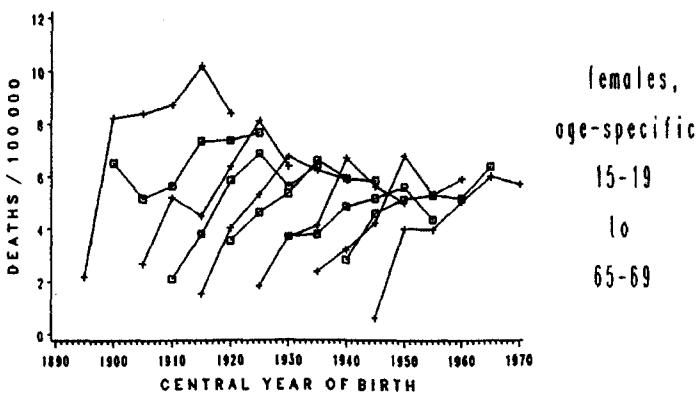
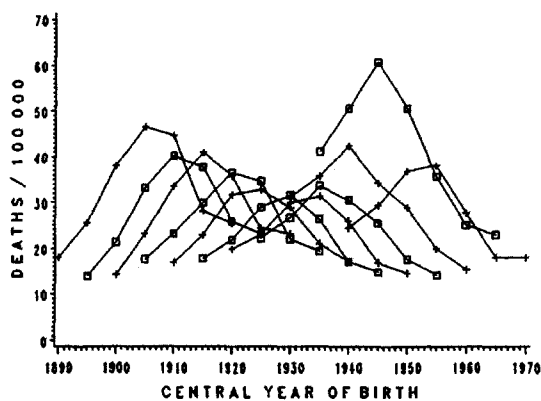
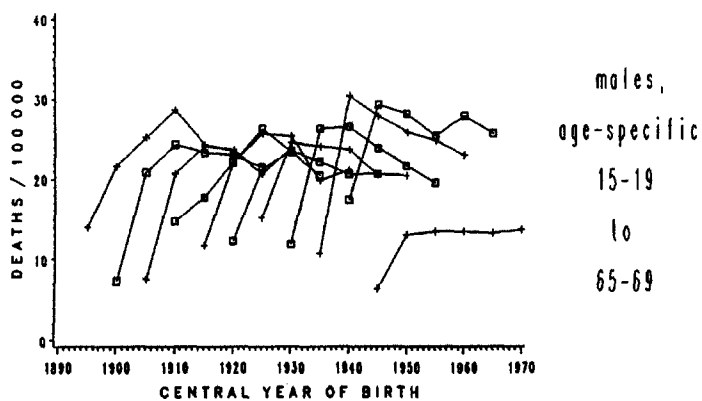
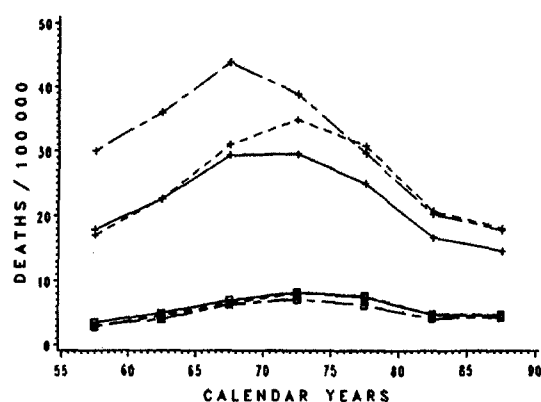
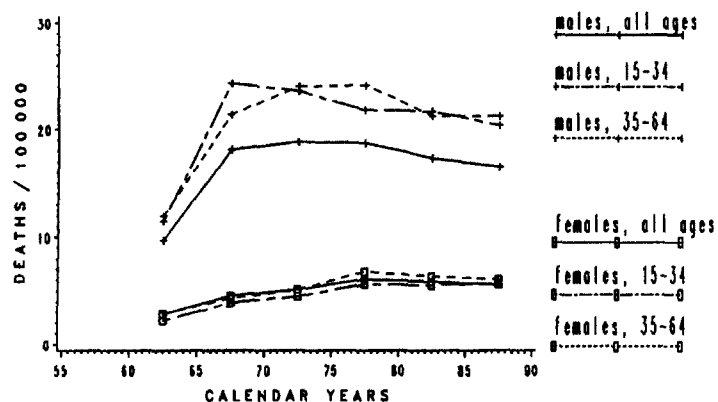


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS DENMARK

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	2637	22.38	24.60	792	6.29	5.20
60-64	3152	24.92	25.79	1117	8.44	7.06
65-69	4104	30.92	31.95	1619	11.59	9.70
70-74	3973	29.04	31.04	1703	11.71	10.72
75-79	2906	21.35	24.27	1245	8.25	7.67
80-84	2333	16.76	20.38	1048	6.82	7.06
85-89	2490	17.33	21.10	1058	6.75	6.95

MOTOR VEHICLE TRAFFIC ACCIDENTS FINLAND

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	2027	19.96	22.91	627	5.42	4.05
60-64	3310	30.81	36.00	1004	8.31	7.26
65-69	3881	34.43	38.58	1462	11.45	10.27
70-74	3896	33.15	37.10	1503	11.43	11.22
75-79	2636	21.50	24.39	1078	7.72	7.94
80-84	1977	15.45	17.39	857	5.76	5.92
85-89	2061	15.81	18.62	964	6.35	6.87

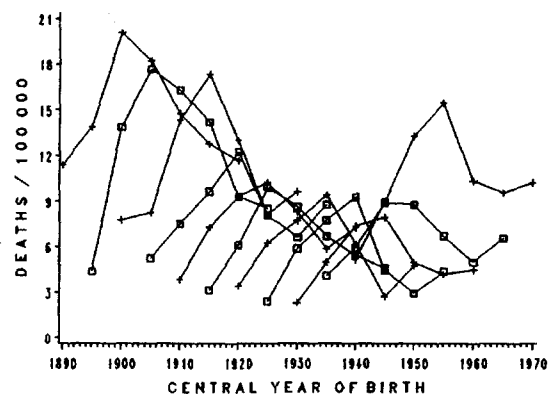
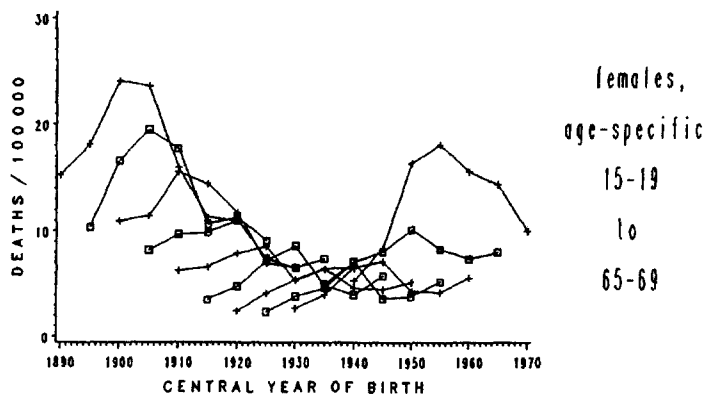
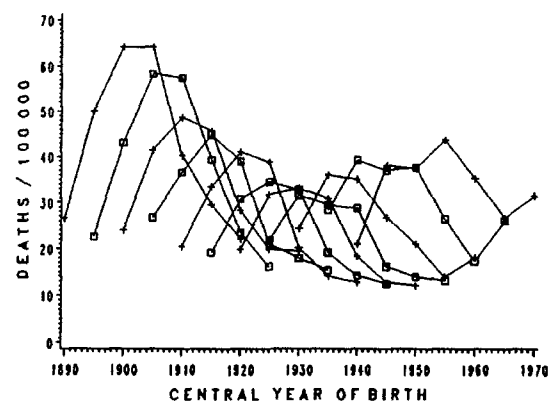
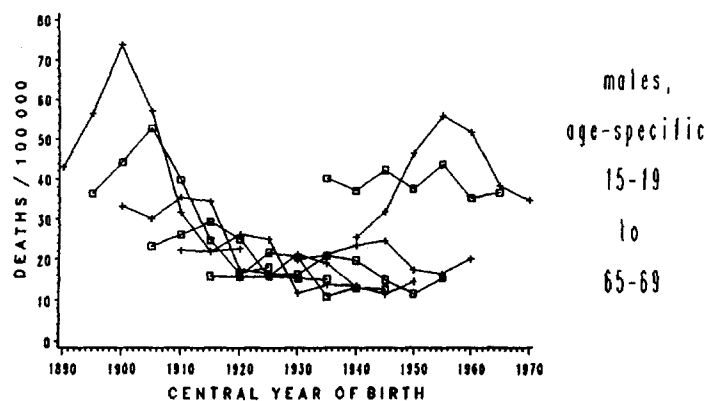
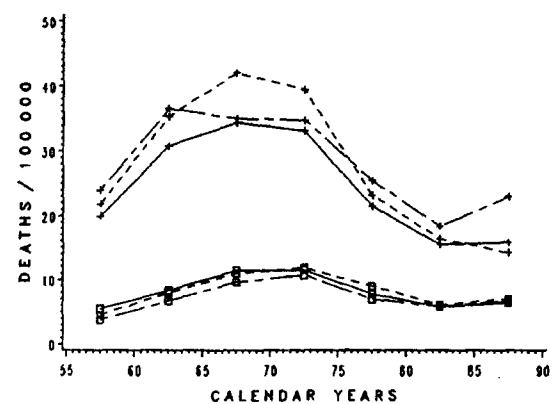
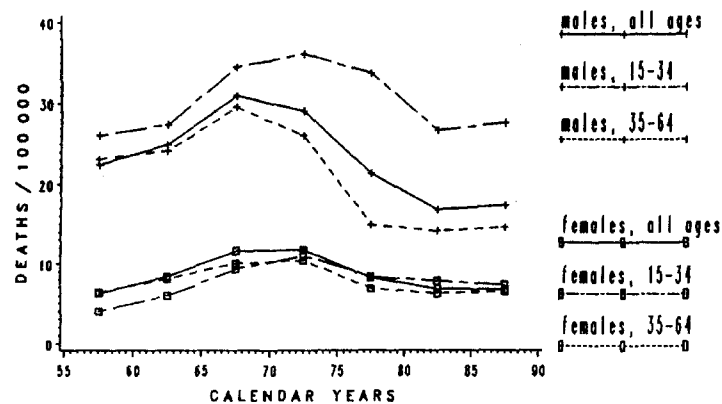


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS FRANCE

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	32584	28.64	38.60	8503	6.76	7.75
60-64	36163	30.19	39.87	11766	8.98	10.22
65-69	46989	36.95	48.38	16346	11.94	13.74
70-74	47050	34.50	45.16	17188	11.64	13.44
75-79	42422	30.16	39.85	15043	9.91	11.48
80-84	40191	27.83	37.36	14842	9.50	11.18
85-89	36267	24.41	32.95	13805	8.45	10.06

MOTOR VEHICLE TRAFFIC ACCIDENTS GERMANY, GDR

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59						
60-64						
65-69						
70-74*	3595	21.43	27.32	1369	5.92	5.52
75-79*	2072	24.18	31.61	852	7.64	8.08
80-84	7069	18.30	21.22	3097	5.54	5.86
85-89	6389	14.76	19.21	2727	4.90	5.11

* Information is missing for one or more years

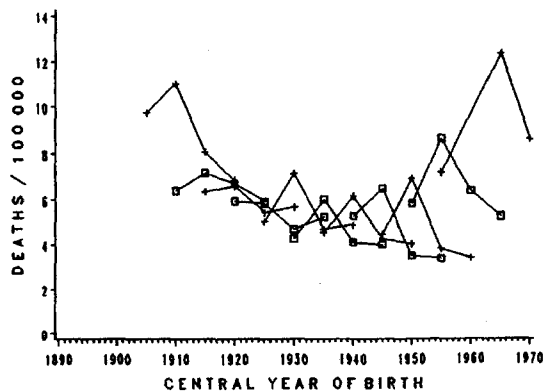
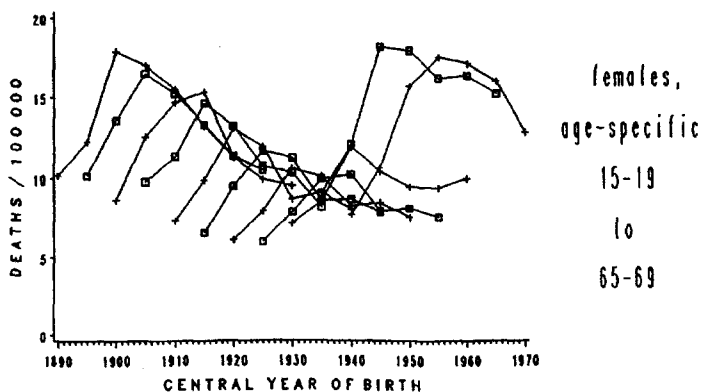
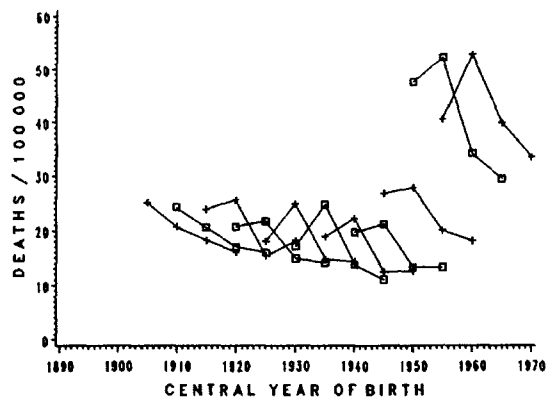
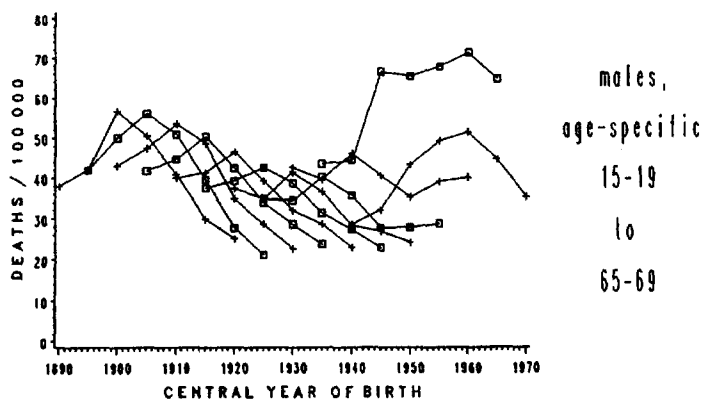
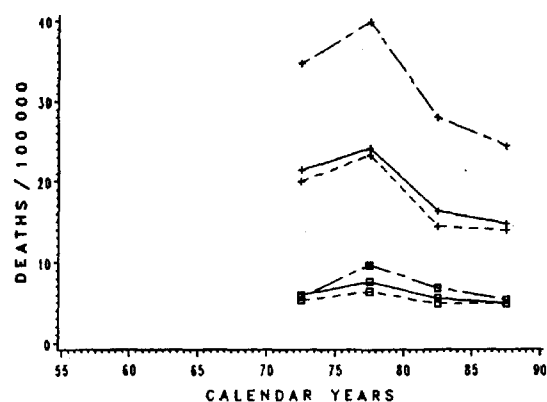
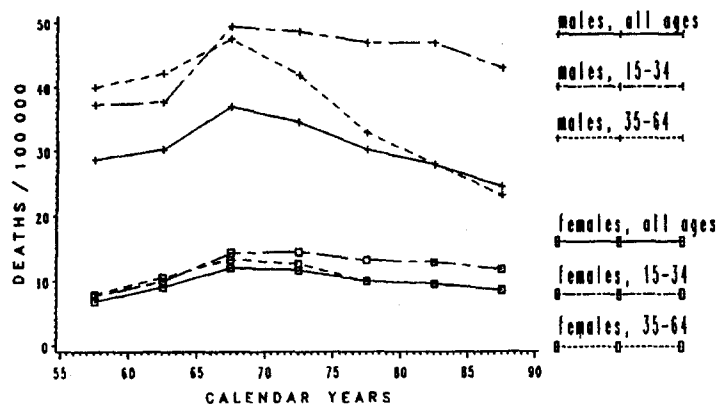


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS GERMANY

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59	48416	37.47	46.72	11697	7.99	6.81
60-64	55961	39.06	47.44	16326	9.84	8.66
65-69	60339	40.44	48.70	21616	12.15	11.21
70-74	62410	41.06	50.49	24082	13.46	13.07
75-79	49756	32.10	39.93	20718	11.24	11.53
80-84	39618	24.30	31.18	15985	8.46	9.02
85-89	28040	16.91	22.10	11535	5.95	6.54

MOTOR VEHICLE TRAFFIC ACCIDENTS GREECE

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59						
60-64*	2168	12.58	16.25	564	3.07	2.78
65-69	3887	17.69	22.37	1086	4.54	4.40
70-74	4361	19.08	24.45	1475	5.87	6.01
75-79	6450	26.70	34.84	2271	8.46	8.70
80-84	6979	28.81	35.17	2224	7.84	8.40
85-89	7351	26.95	35.63	2423	8.24	9.10

* Information is missing for one or more years

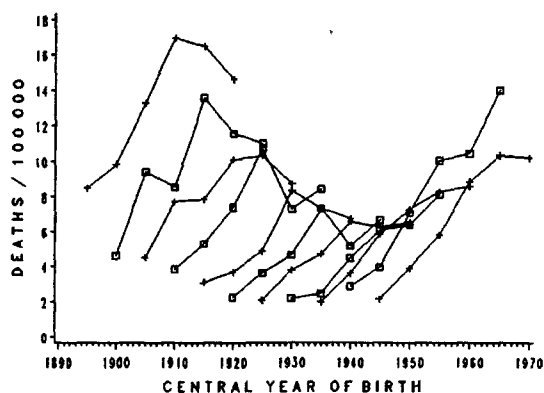
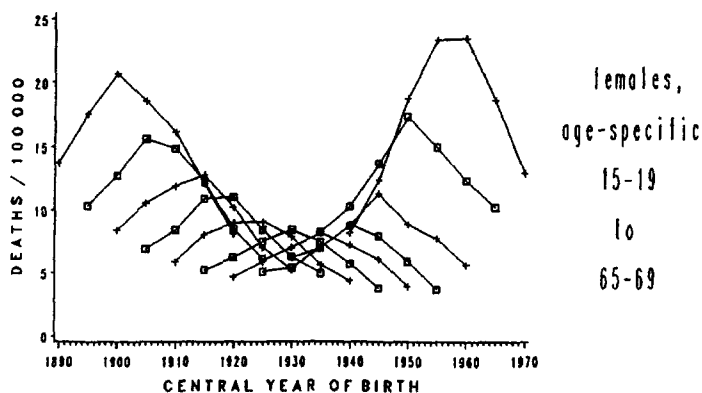
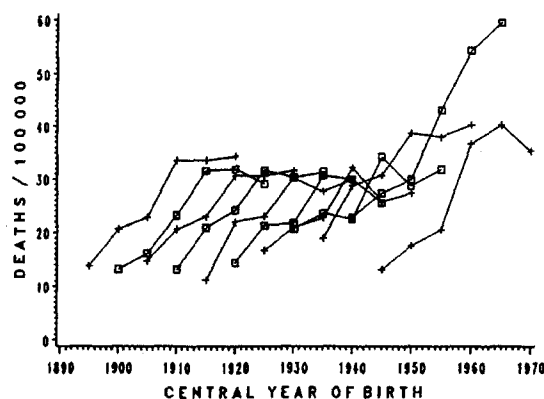
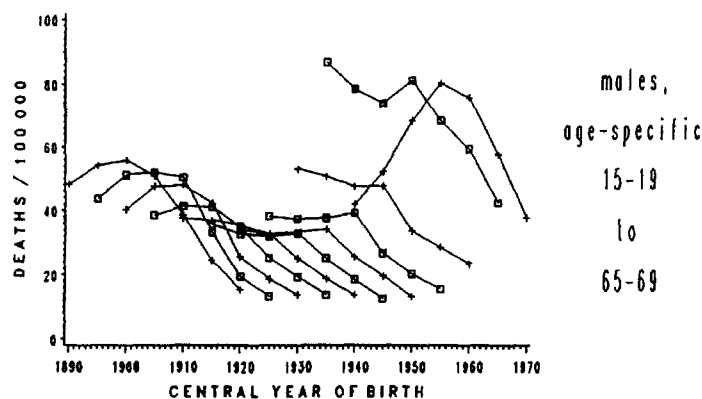
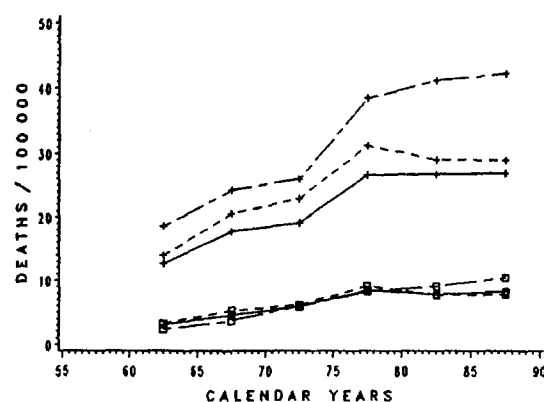
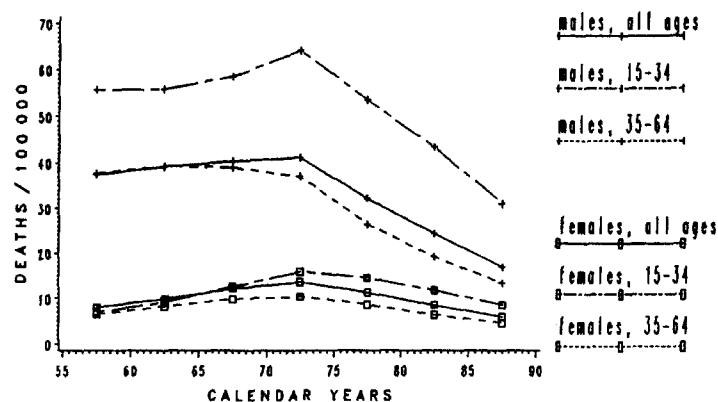


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS HUNGARY

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	2695	10.97	14.72	491	1.81	1.73
60-64	3324	13.16	17.73	694	2.42	2.09
65-69	4333	16.29	20.84	1133	3.65	3.31
70-74	7113	25.26	32.14	2101	6.46	5.90
75-79	7062	24.12	29.96	2345	6.78	6.57
80-84	6264	21.80	27.45	2051	5.86	5.87
85-89	6803	23.88	30.28	2528	7.38	7.92

MOTOR VEHICLE TRAFFIC ACCIDENTS ICELAND

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	52	12.47	11.12	23	5.01	2.44
60-64	62	13.58	12.11	28	5.77	4.39
65-69	89	17.56	19.28	24	4.69	4.04
70-74	89	16.32	17.07	41	7.81	7.18
75-79	108	18.16	20.56	45	7.67	7.73
80-84	84	13.48	17.64	34	4.94	4.32
85-89	88	13.90	15.40	41	6.33	7.65

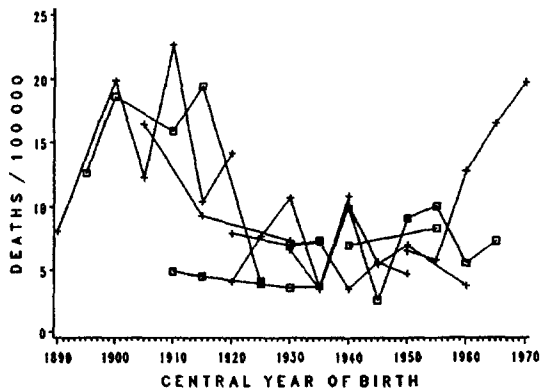
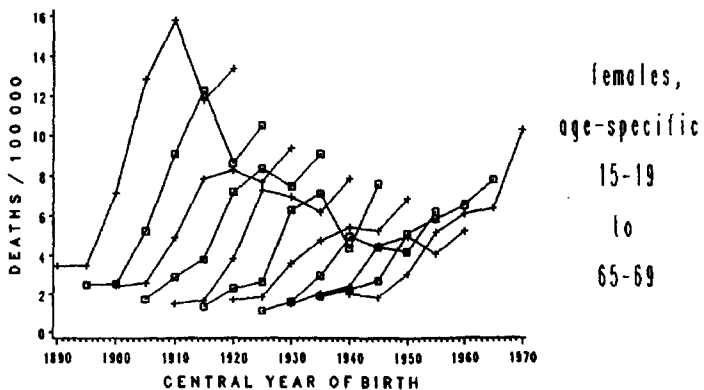
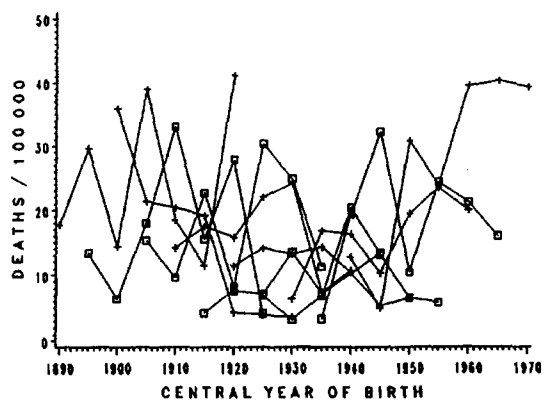
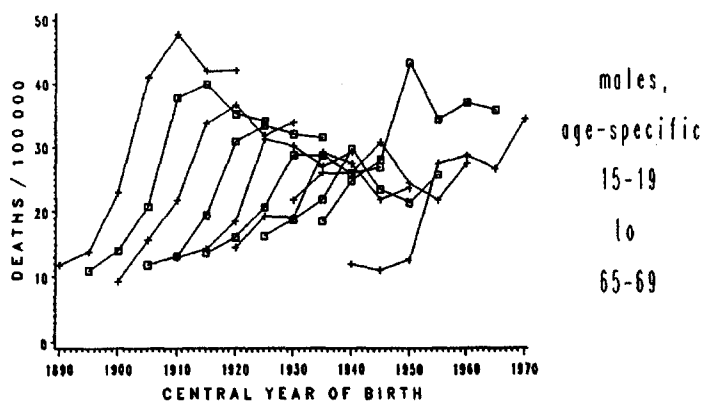
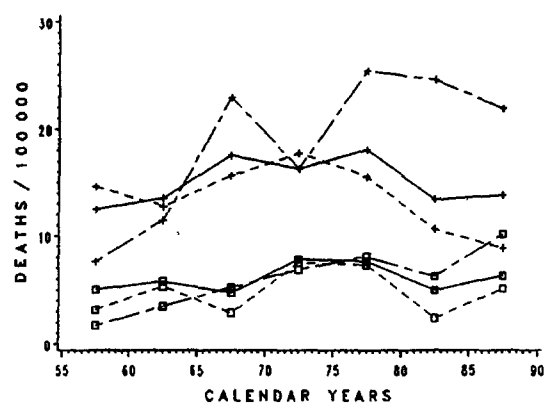
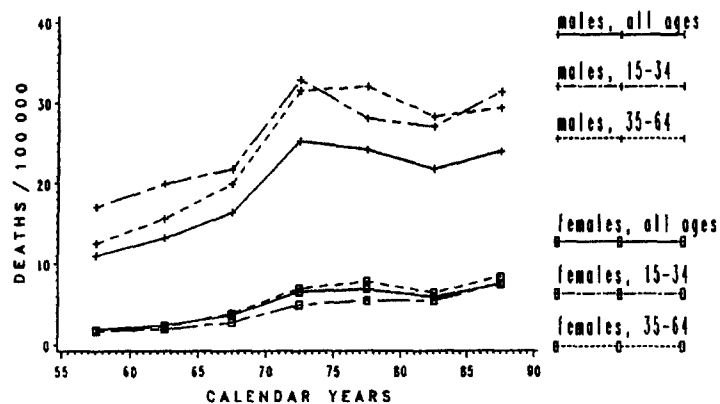


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS IRELAND

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	900	12.31	14.65	245	3.23	2.81
60-64	1069	14.96	17.90	320	4.21	3.88
65-69	1464	19.69	23.47	427	5.44	5.30
70-74	2178	28.04	33.71	665	8.21	8.56
75-79	2244	26.71	32.78	716	8.11	8.43
80-84	2037	22.46	27.45	722	7.69	8.22
85-89	1691	18.42	22.96	560	5.84	6.04

MOTOR VEHICLE TRAFFIC ACCIDENTS ITALY

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	34030	26.69	34.00	6339	4.64	4.21
60-64	42912	32.34	41.10	9149	6.29	5.85
65-69	46290	33.56	41.27	11195	7.35	7.09
70-74	51892	36.17	43.73	14296	9.09	9.20
75-79	42462	28.22	34.54	12210	7.43	7.68
80-84	38482	24.68	30.56	11702	6.77	7.38
85-89	34390	21.05	26.65	10603	5.86	6.64

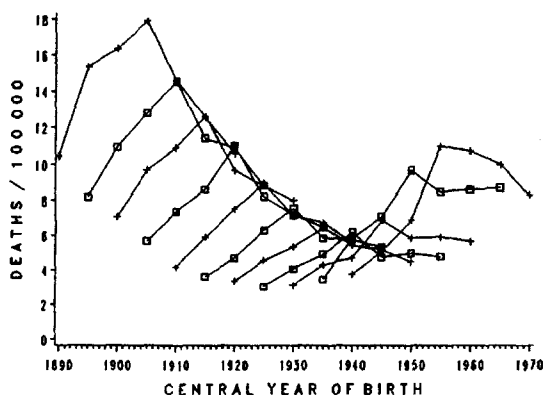
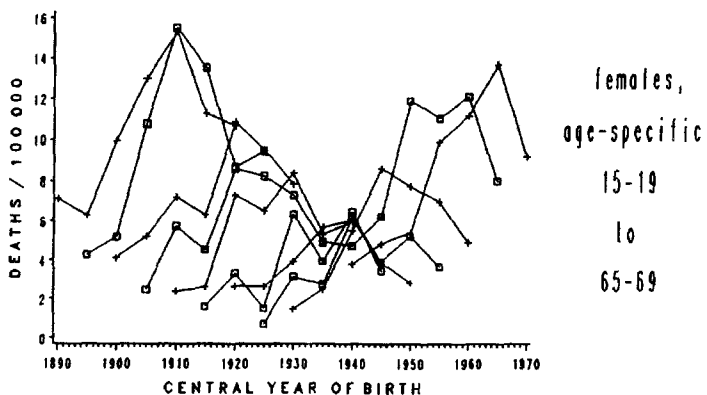
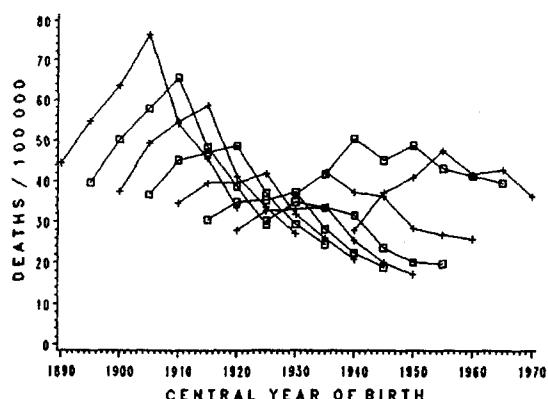
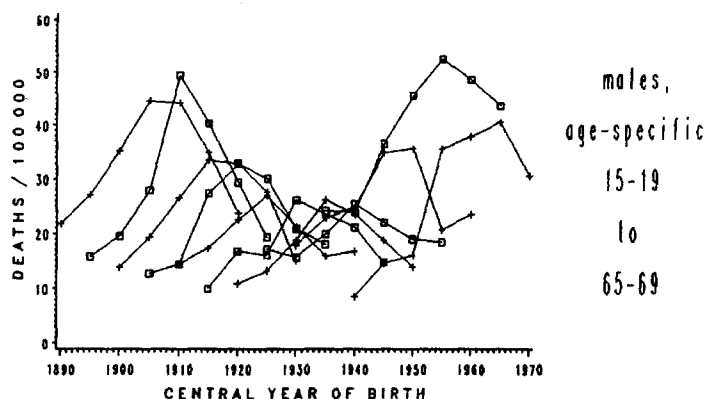
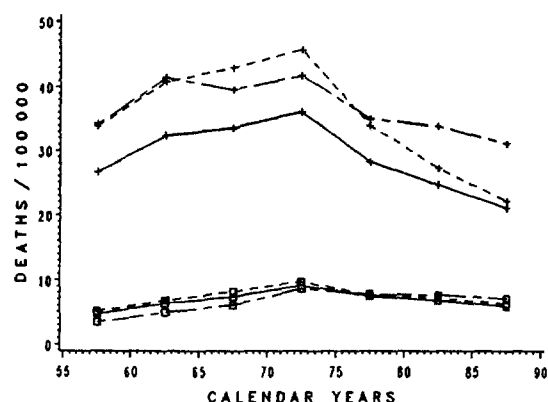
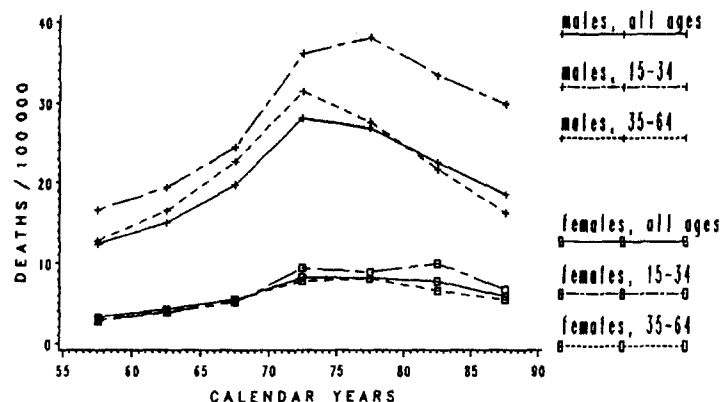


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS LUXEMBOURG

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59						
60-64						
65-69*	234	45.24	59.17	74	13.88	13.06
70-74	450	50.36	63.19	127	13.81	15.32
75-79	402	43.33	57.33	126	12.74	13.94
80-84	337	34.79	46.70	115	10.69	11.49
85-89	310	32.92	45.21	87	8.39	10.61

* Information is missing for one or more years

MOTOR VEHICLE TRAFFIC ACCIDENTS NETHERLANDS

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	6192	21.92	23.23	1681	5.95	5.05
60-64	8053	26.58	29.25	2223	7.24	6.42
65-69	10341	31.25	34.80	3361	10.10	9.40
70-74	11217	31.82	36.16	3898	10.91	11.14
75-79	8438	22.67	25.97	3166	8.32	8.45
80-84	6206	15.79	18.15	2406	5.81	5.85
85-89	4953	12.09	14.43	2075	4.79	5.06

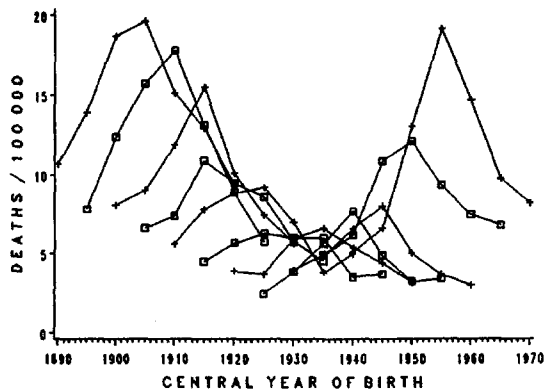
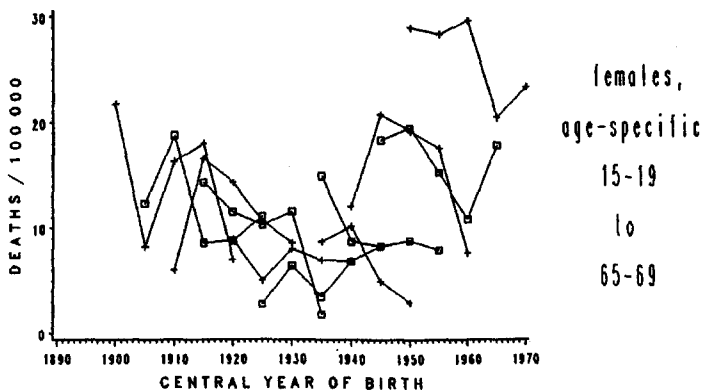
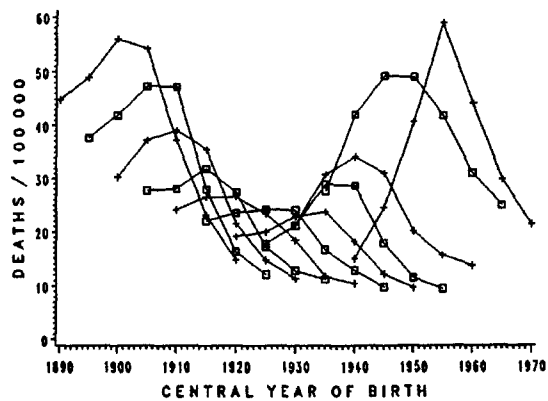
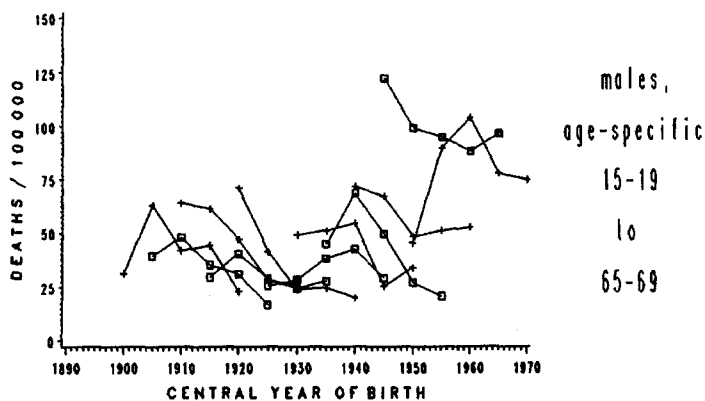
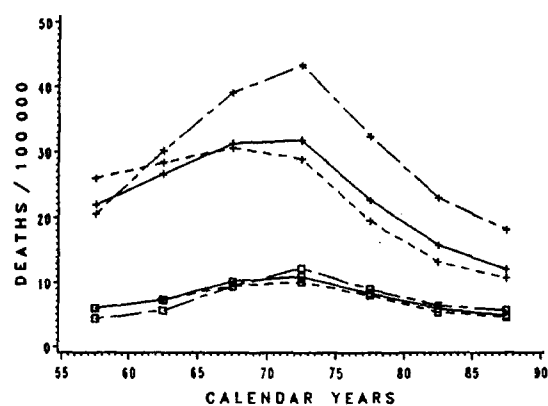
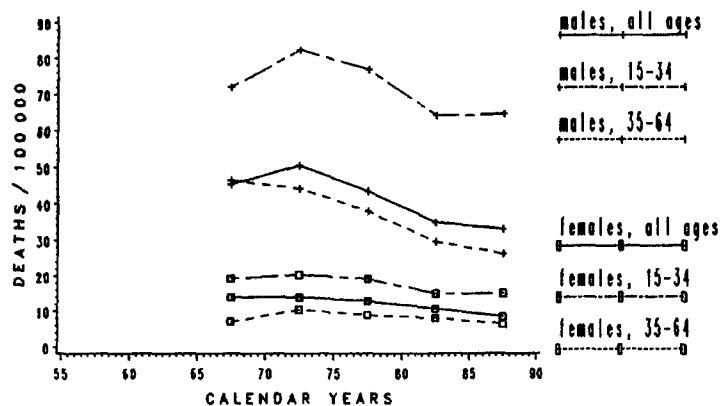


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS NORWAY

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	1113	13.04	13.66	319	3.75	2.58
60-64	1418	15.12	16.68	437	4.63	3.14
65-69	1761	17.76	19.10	698	8.85	5.16
70-74	2061	19.91	22.09	705	6.12	5.04
75-79	1759	16.45	18.25	701	6.04	5.55
80-84	1510	13.81	16.83	559	4.84	4.71
85-89	1469	13.06	16.66	588	4.75	5.18

MOTOR VEHICLE TRAFFIC ACCIDENTS POLAND

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59*	1096	7.89	10.39	216	1.42	1.14
60-64	7839	10.96	14.29	1777	2.25	1.78
65-69	12142	15.96	20.17	3339	3.88	3.07
70-74*	5899	18.43	22.86	1720	4.78	3.84
75-79						
80-84*	8968	23.62	30.34	2380	5.46	5.01
85-89	22195	23.03	29.75	6120	5.39	5.04

* Information is missing for one or more years

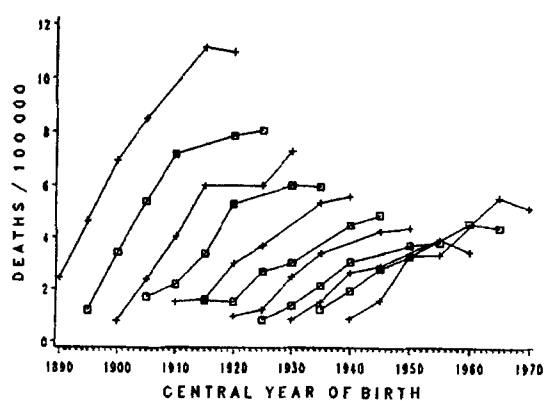
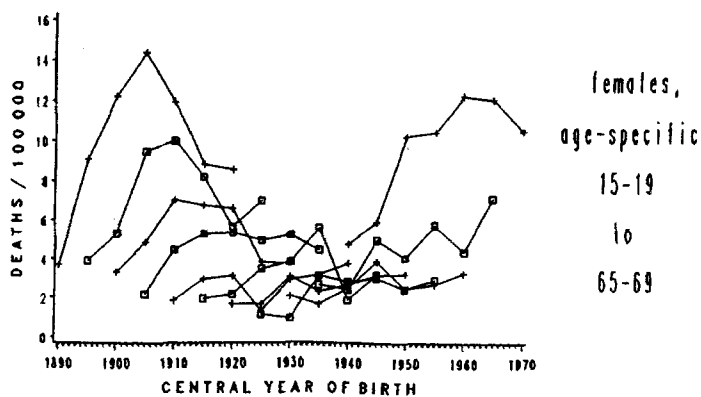
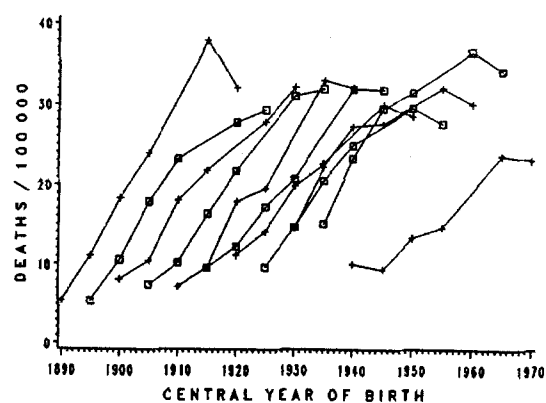
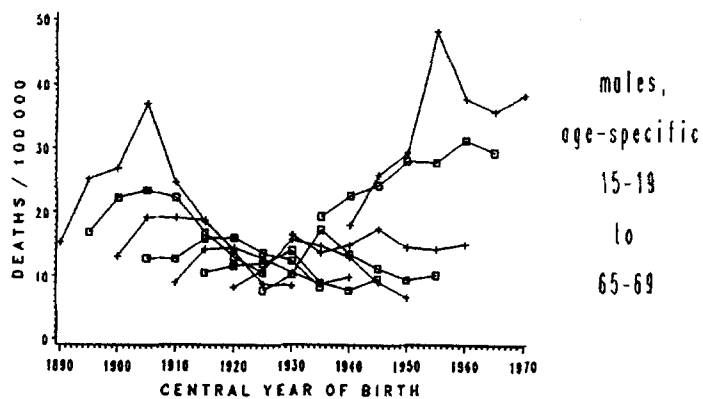
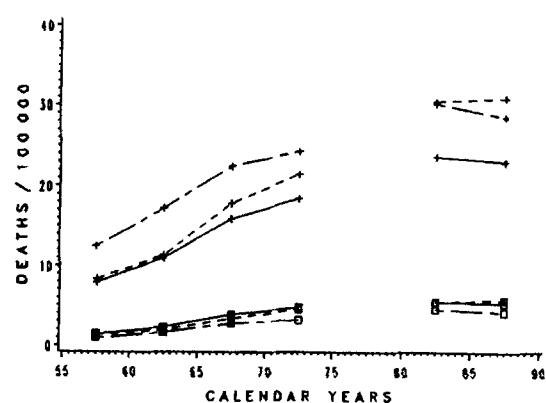
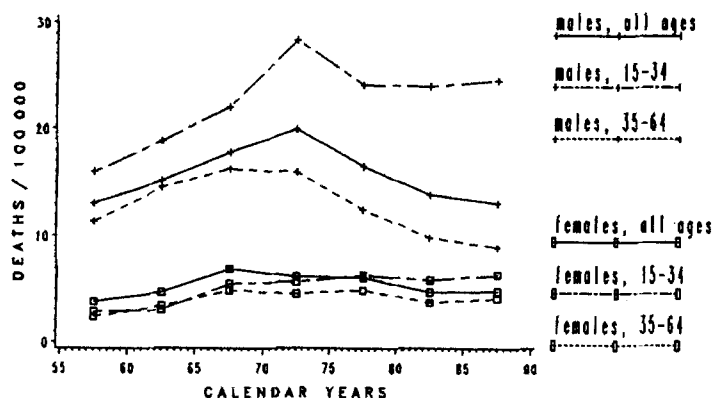


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS PORTUGAL

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59	2647	12.36	14.40	723	3.07	2.21
60-64	3968	18.27	22.00	1052	4.24	3.12
65-69	6084	28.08	34.60	1578	6.19	5.03
70-74	9075	44.03	54.95	2376	9.55	7.89
75-79	11871	50.91	64.58	2974	10.63	9.08
80-84	12018	47.59	60.86	3029	10.46	9.67
85-89	10554	39.05	50.09	2857	9.25	9.10

MOTOR VEHICLE TRAFFIC ACCIDENTS SPAIN

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59	6672	8.93	12.34	1661	2.08	2.49
60-64	11010	14.28	19.29	2834	3.36	4.08
65-69	14286	17.71	22.17	4032	4.47	4.70
70-74	18284	21.15	27.40	5860	6.12	6.64
75-79	23094	25.00	31.20	7891	7.61	7.58
80-84	20487	20.66	26.62	6850	6.27	6.75
85-89*	19672	23.56	31.21	6289	7.04	7.94

* Information is missing for one or more years

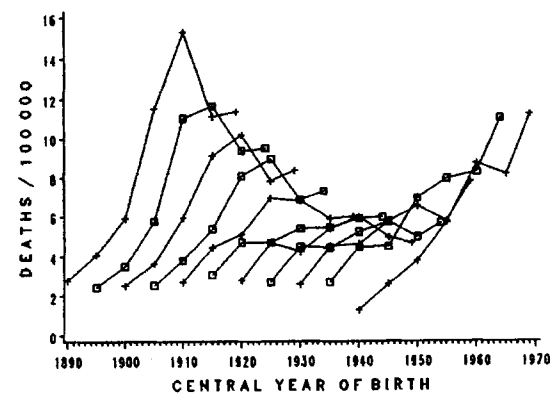
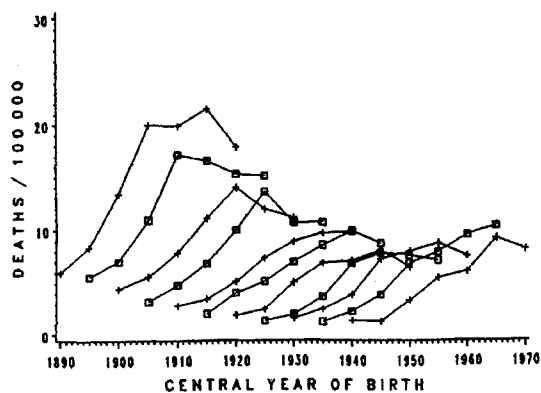
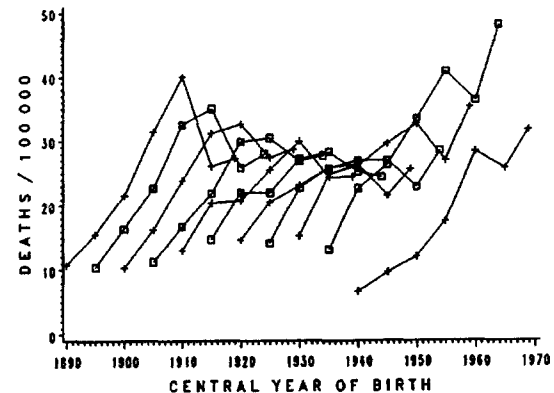
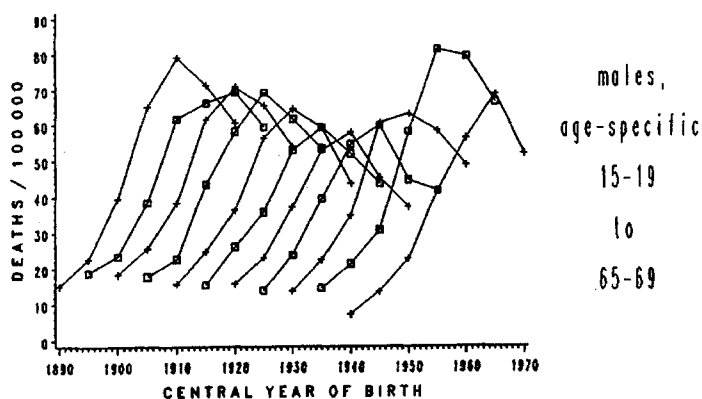
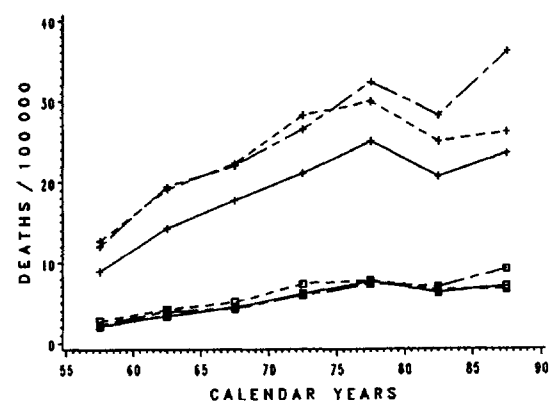
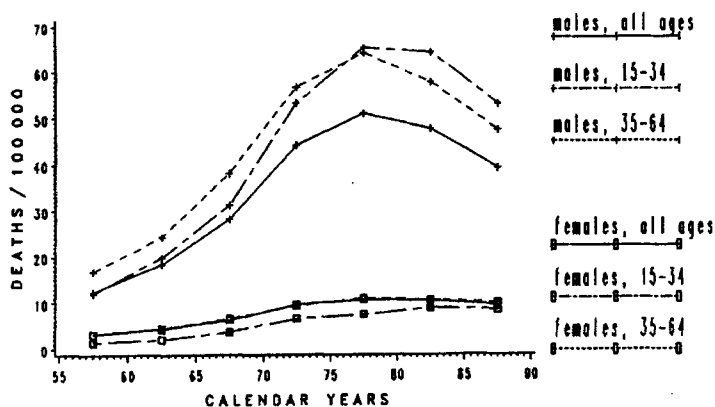


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS SWEDEN

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59	3786	19.72	22.04	1068	5.59	5.26
60-64	4525	21.51	24.37	1509	7.23	6.88
65-69	4776	21.39	24.97	1856	8.38	8.79
70-74	4511	19.85	23.83	1920	8.27	8.90
75-79	3895	16.90	20.08	1743	7.14	7.75
80-84	2968	12.92	16.20	1219	4.89	5.35
85-89	2889	12.44	16.05	1235	4.93	5.53

MOTOR VEHICLE TRAFFIC ACCIDENTS SWITZERLAND

Years of Death	MALES			FEMALES		
	Deaths	World	Trunc	Deaths	World	Trunc
	Number	Stand	15-64	Number	Stand	15-64
55-59	4107	31.46	36.69	1032	7.22	6.42
60-64	5087	35.26	40.24	1410	8.88	7.24
65-69	5177	33.04	38.19	1682	9.88	8.54
70-74	5984	36.30	41.22	2051	11.22	10.35
75-79	4575	27.55	31.89	1667	8.93	8.53
80-84	4326	24.96	30.65	1536	8.01	8.49
85-89	3612	20.19	25.20	1211	5.96	6.63

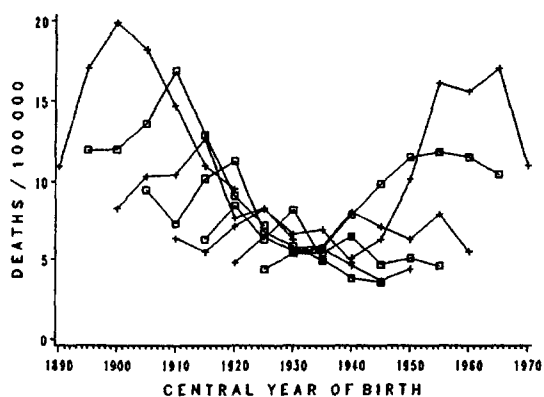
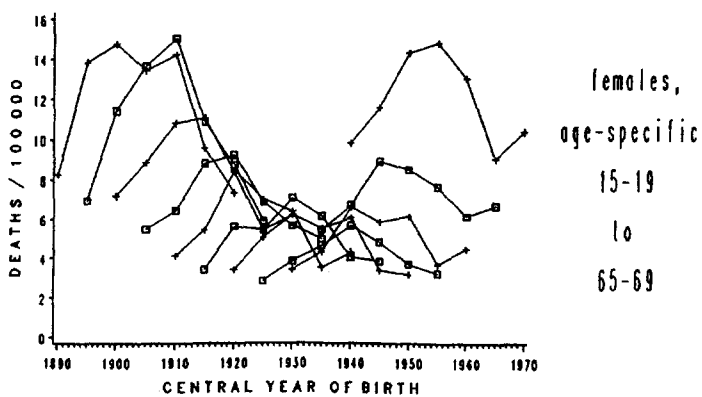
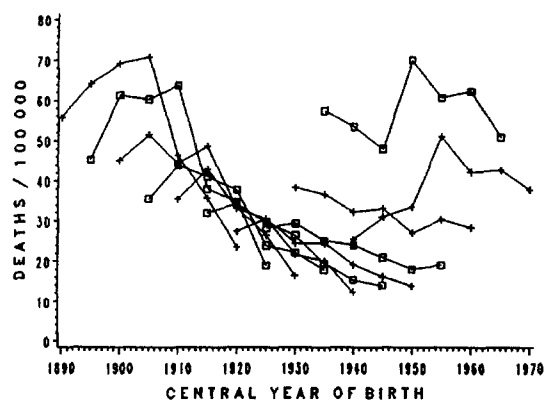
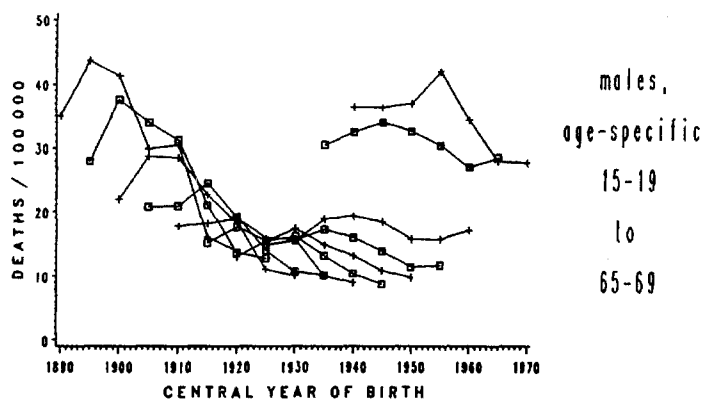
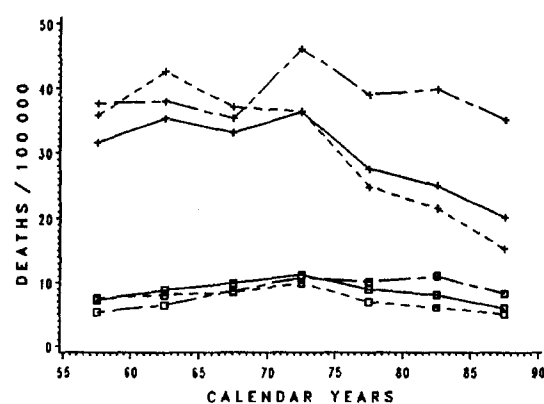
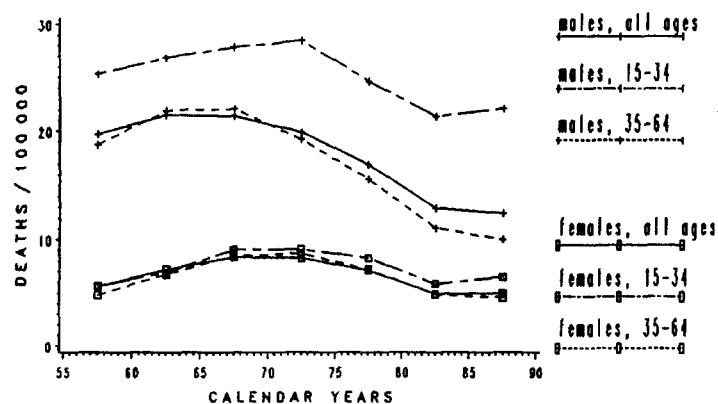


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS UK, ENGLAND AND WALES

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	19516	17.74	20.62	6806	4.88	4.02
60-64	23856	20.55	24.42	9349	6.26	5.59
65-69	24436	20.11	23.50	10670	6.89	6.39
70-74	23175	18.72	22.25	10891	6.97	6.77
75-79	21095	16.90	21.08	9182	5.77	5.83
80-84	17699	13.65	17.19	7415	4.66	4.83
85-89	16621	12.44	15.59	7072	4.36	4.47

MOTOR VEHICLE TRAFFIC ACCIDENTS UK, NORTHERN IRELAND

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	586	16.91	18.58	166	4.22	3.24
60-64	662	18.53	21.00	263	6.33	4.72
65-69	848	22.81	25.65	287	6.85	5.80
70-74	1193	30.48	33.38	427	9.73	9.41
75-79	1150	29.12	34.57	426	9.54	9.49
80-84	798	19.76	23.58	301	6.80	6.76
85-89	737	17.97	22.03	275	6.14	6.44

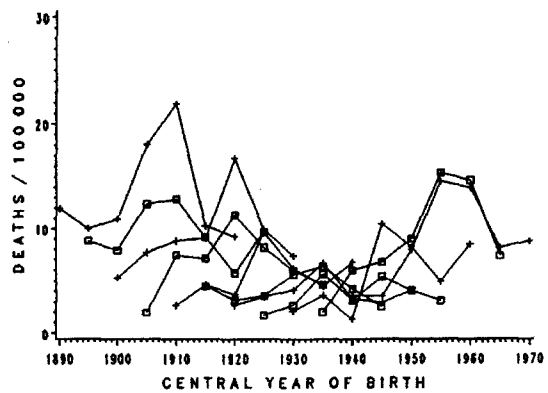
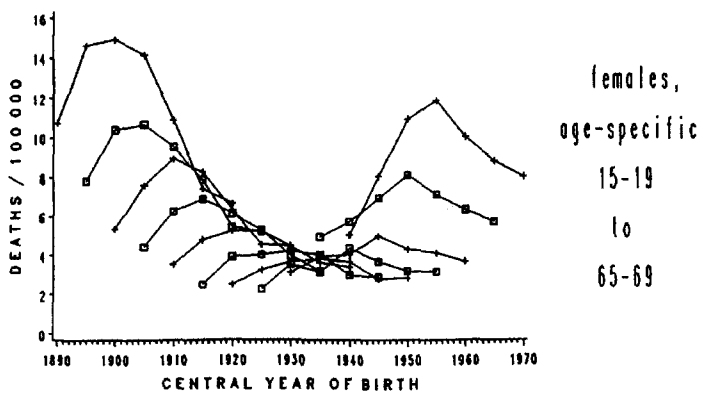
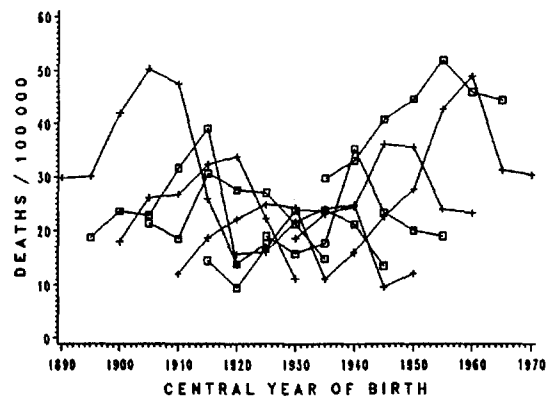
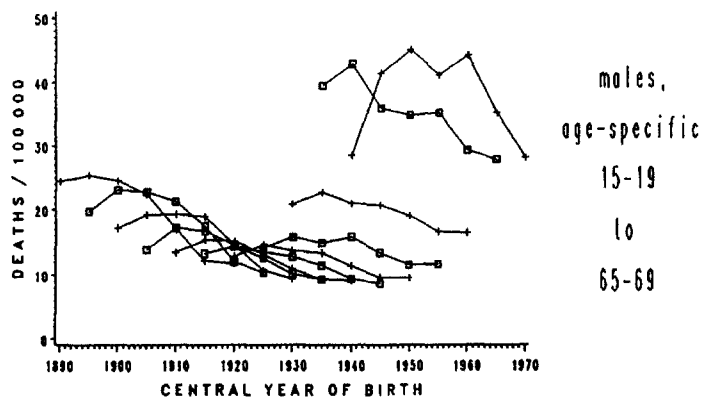
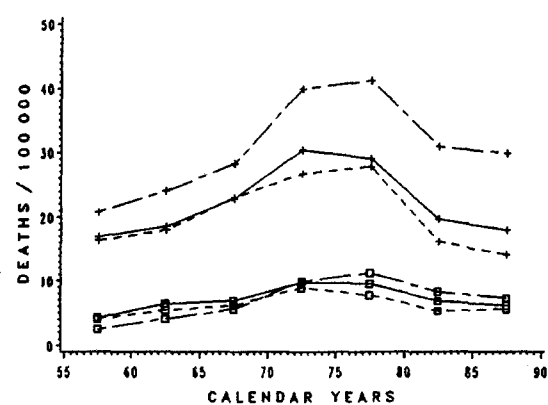
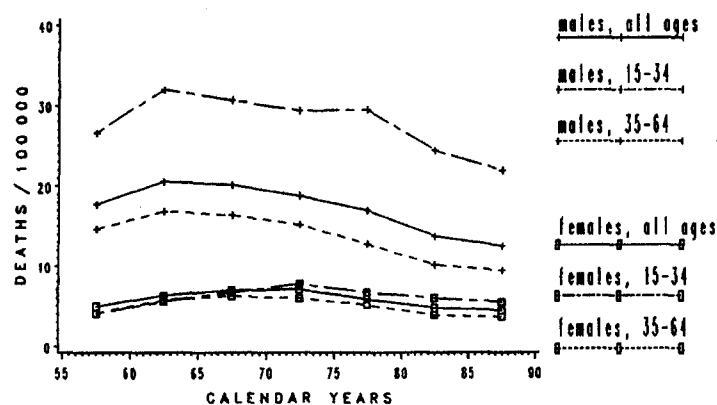


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS UK, SCOTLAND

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	2212	17.69	18.88	716	4.96	3.46
60-64	2630	20.71	22.60	976	6.45	5.03
65-69	2908	22.74	26.09	1178	7.45	6.62
70-74	3040	23.56	27.83	1276	8.05	7.44
75-79	2927	22.30	26.97	1234	7.62	7.65
80-84	2486	18.44	22.99	949	5.82	5.78
85-89	2055	15.19	18.60	858	5.31	5.39

MOTOR VEHICLE TRAFFIC ACCIDENTS YUGOSLAVIA

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59						
60-64						
65-69*	4443	21.99	27.58	1295	6.07	6.06
70-74						
75-79*	8373	36.23	45.40	2405	9.81	9.58
80-84	18270	30.39	38.17	5115	8.06	8.05
85-89	14725	23.34	29.69	4291	6.62	6.88

* Information is missing for one or more years

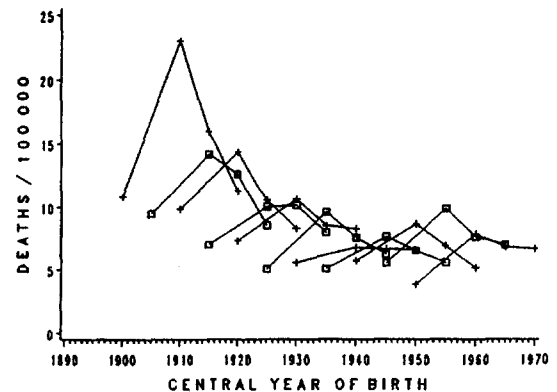
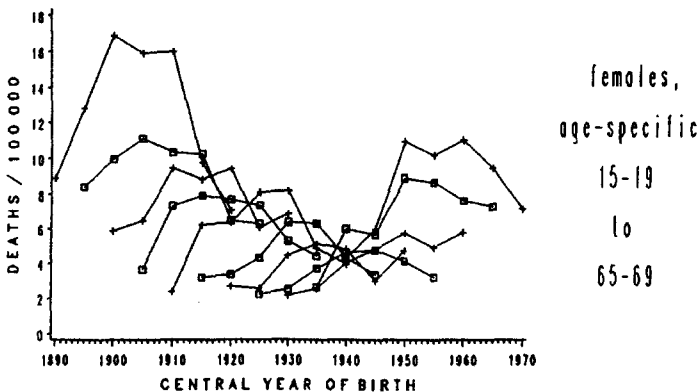
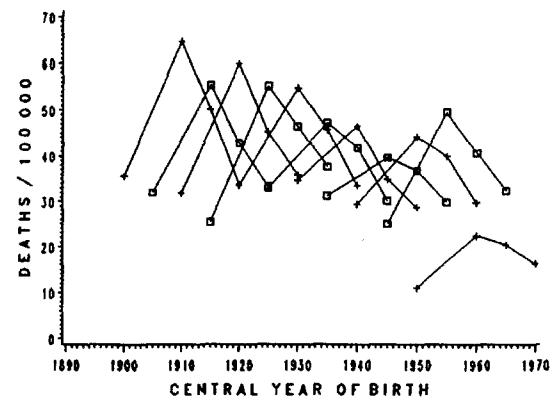
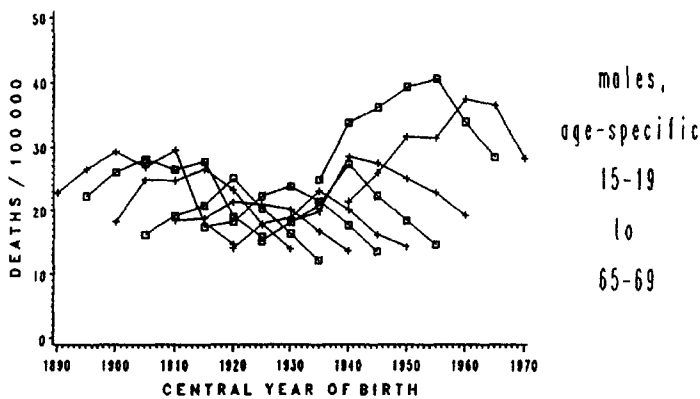
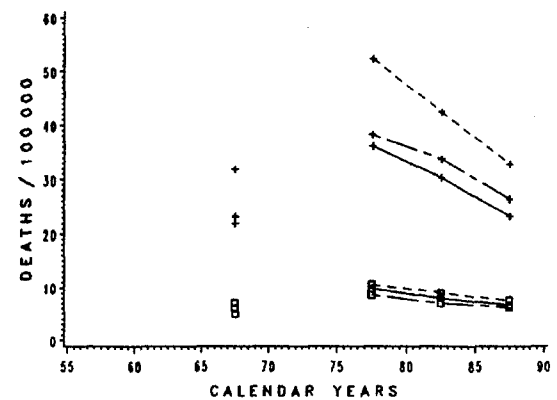
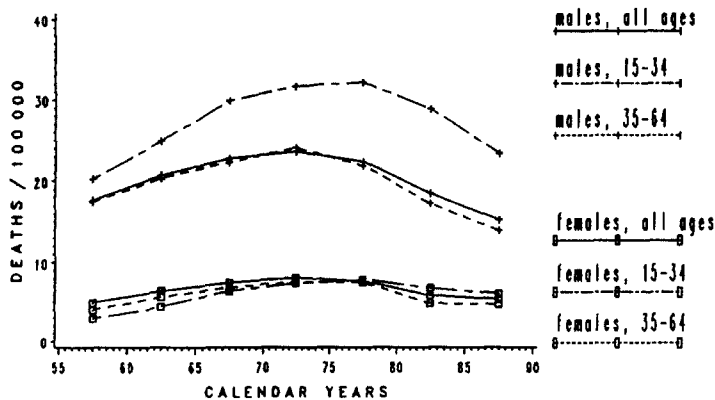


Figure 1 (continued).

MOTOR VEHICLE TRAFFIC ACCIDENTS AUSTRALIA

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	8987	37.75	47.82	2443	9.81	9.43
60-64	10174	38.17	48.00	3316	11.82	11.87
65-69	12550	42.00	53.86	4357	14.09	15.21
70-74	14043	42.29	54.78	4968	14.70	15.85
75-79	13705	37.46	48.80	4939	13.24	14.75
80-84	11464	28.87	37.72	4210	10.39	11.68
85-89*	8364	24.43	32.00	3355	9.57	11.02

* Information is missing for one or more years

MOTOR VEHICLE TRAFFIC ACCIDENTS NEW ZEALAND

Years of Death	MALES			FEMALES		
	Deaths Number	World Stand	Trunc 15-64	Deaths Number	World Stand	Trunc 15-64
55-59	1456	26.92	34.50	416	7.03	6.19
60-64	1522	25.12	30.39	524	8.10	7.85
65-69	2112	31.47	39.37	756	10.76	11.55
70-74	2584	34.88	45.40	1025	13.47	14.57
75-79	2508	31.15	40.66	993	12.09	12.92
80-84	2337	27.65	36.83	960	11.18	12.45
85-89	2670	30.36	41.71	1135	12.69	14.90

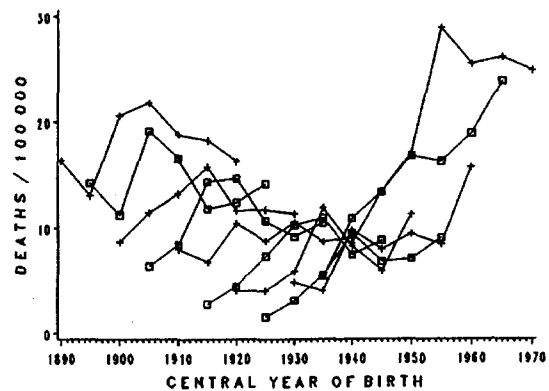
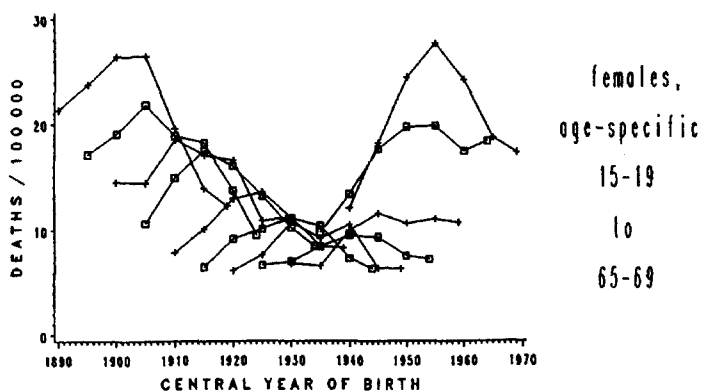
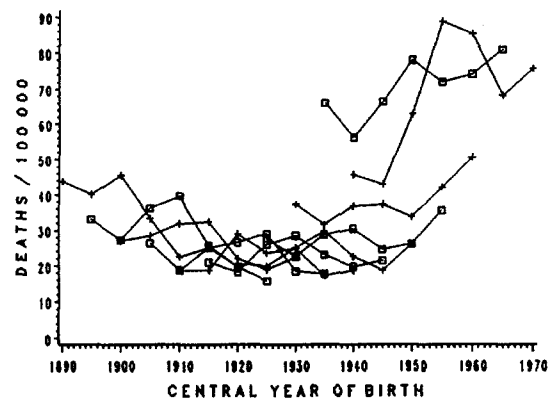
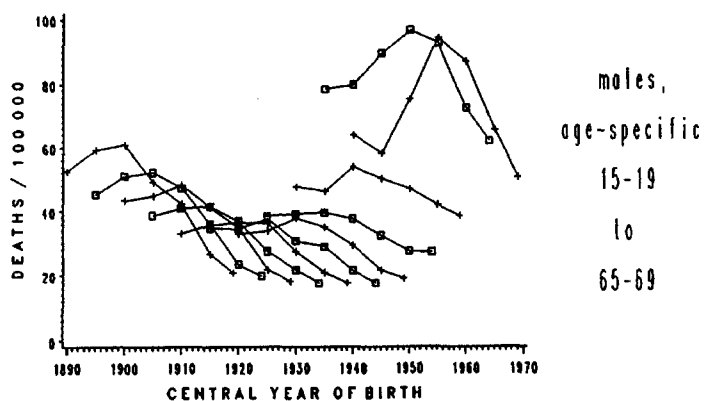
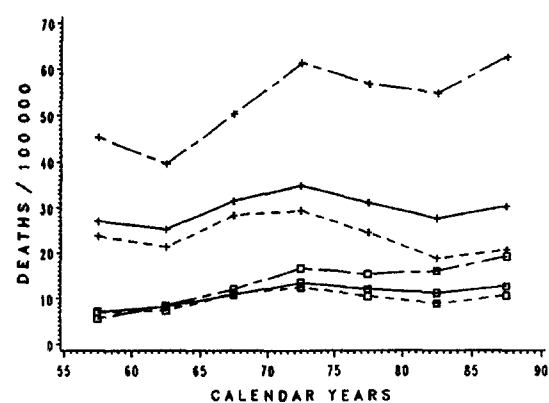
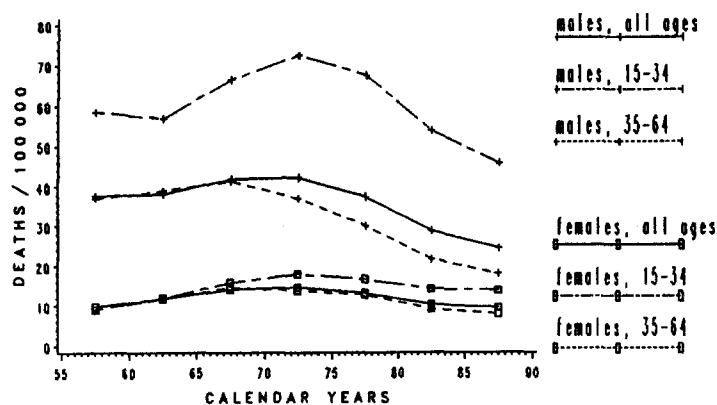


Figure 1 (continued).

Within various countries, the pattern of trend was generally consistent in various age groups, although noticeable differences are apparent across various countries. For instance, in Eastern Europe, the highest rates were in elderly males, whereas in most western countries, mortality rates were high in the younger age groups, thus reflecting different mortality patterns in various areas of the continent.

Oceania. Mortality from motor vehicle accidents was relatively high in Australia (24.4/100000 males, 9.6/100000 females in 1985–1989) and even higher in New Zealand (30.4/100000 males, 12.7/100000 females, i.e., the highest rate in women on a worldwide scale), although some decline was observed in these countries, too, over the last two decades.

The overall variation in mortality from motor vehicle accidents in the two sexes over the most recent available calendar period is also presented in histogram form (Figure 1).

Discussion

The trends in mortality from motor vehicle accidents, here reviewed with an essentially descriptive approach for 48 countries over the last four decades, can be somewhat influenced by changes in criteria and death certification accuracy, both within and between countries²³, but it is unlikely that any such potential bias can explain more than a small proportion of the substantial changes observed, since deaths from motor vehicle accidents should be relatively easy to identify and certify.

Any more precise inference on the underlying causes of these trends should include, however, some information on the number of motor vehicles, on the average mileage per year, and of changes in road design and legislation in

various countries and calendar years^{24,25}. Such a detailed inference is, however, beyond the scope of this work, which has essentially a descriptive interest, in terms of providing easy access to comparative data for several different areas of the world.

It is difficult to identify a single pattern in various countries and areas of the world. Still, it is clear that mortality from motor vehicle accidents increased in most developed western and Asiatic countries until the late 1960's or early 1970's (at least in terms of rates per population, although the increased number of motor vehicles had largely exceeded the rise in mortality rates), and declined thereafter. The extent and pattern of decline was, however, different in various countries, as well as for the two sexes (with relatively high death rates for females in Oceania and North America, as compared to other developed and, mostly, developing countries), and in different age groups, thus stressing the need for careful inspection not only of age-standardized, but also of age-specific rates²⁶.

This indicates, in fact, that in countries like the United States and the United Kingdom, where the number of motor vehicles had increased earlier, mortality rates are now higher in younger than in middle or elderly age²⁶. By contrast, countries showing later increases in motor vehicles, rates are high in middle or older ages, suggesting complex cohort-period components in mortality rates. Some of these countries, including Venezuela and most other Latin American countries, Kuwait and several southern and eastern European countries have now exceedingly high death rates from motor vehicle accidents, and represent, therefore, clear priority areas for comprehensive intervention on this important cause of death.

Further, progress is, however, possible and is indeed observed also

in areas where trends have been favourable for a long time now, thus confirming that there is scope for future improvements – as indicated by achievements in active and passive safety measure in vehicles, stricter legislation, etc. – in these countries, too²³.

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