Inequality in health: socioeconomic differentials in mortality in Rome, 1990–95

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Abstract

***Study objective*—Population groups with a lower socioeconomic status (SES) have a greater risk of disease and mortality. The aim of this study was to investigate the relation between SES and mortality in the metropolitan area of Rome during the six year period 1990–1995, and to examine variations in mortality differentials between 1990–92 and 1993–95.**

***Design*—Rome has a population of approximately 2 800 000, with 6100 census tracts (CTs). During the study period, 149 002 deaths occurred among residents. The cause-specific mortality rates were compared among four socioeconomic categories defined by a socioeconomic index, derived from characteristics of the CT of residence.**

***Main results*—Among men, total mortality and mortality for the major causes of death showed an inverse association with SES. Among 15–44 year old men, the strong positive association between total mortality and low SES was attributable to AIDS and overdose mortality. Among women, a positive association with lower SES was observed for stomach cancer, uterus cancer and cardiovascular disease, whereas mortality for lung and breast cancers was higher in the groups with higher SES. Comparing the periods 1990–92 and 1993–95, differences in total mortality between socioeconomic groups widened in both sexes. Increasing differences were observed for tuberculosis and lung cancer among men, and for uterus cancer, traffic accidents, and overdose mortality among women.**

***Conclusions*—The use of an area-based indicator of SES limits the interpretations of the findings. However, despite the possible limitations, these results suggest that social class differences in mortality in Rome are increasing. Time changes in lifestyle and in the prevalence of risk behaviours may produce differences in disease incidence. Moreover, inequalities in the access to medical care and in the quality of care may contribute to an increasing differentials in mortality.**

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The inverse association between socioeconomic status (SES) and health is well known, with persons of a lower SES being at greater risk of disease and mortality than more affluent people.[1–5] Furthermore, the magnitude of socioeconomic differentials in mortality seems to have been increasing in the past several decades in various countries.[6–13]

In recent years, the Italian National Health Service has been undergoing changes because of limited resources for health expenditures.[14] These changes, however, have been taking place without a systematic evaluation of socioeconomic differentials in health. In fact, evidence of socioeconomic heterogeneity in health is still limited in Italy because of the lack of individual data on SES at the national level.

A national study conducted during the early 1980s indicated that total mortality among men aged 45–59 years was 35% higher for those in manual occupations compared with those with non-manual occupations; cancer and gastrointestinal disease accounted for most of the difference.[15] A longitudinal study on the risk of cancer and socioeconomic characteristics of the general population in the city of Turin showed a negative correlation between incidence of most types of cancer and various social class indicators in 1985–87.[16]

Several studies have indicated that measures of SES at the small area level (that is, postal code or census tract (CT)) are a powerful tool in analysing social class differences in health.[17–20] This study describes social differentials in mortality in the metropolitan area of Rome using an indicator of SES based on the characteristics of the CT of residence (that is, the smallest territorial unit for which population data were available). Differentials in mortality in the period 1990–95 were evaluated, and changes during this period were assessed.

Methods

POPULATION DATA AND THE SOCIOECONOMIC INDEX

Rome has a population of 2 775 250 inhabitants (1991 census) and is divided into 6108 CTs; for this analysis, CTs with less than 50 residents were aggregated with the nearest largest tracts, resulting in a total of 5736 areas with an average of 480 inhabitants each. A socioeconomic index was derived from the following census variables for each CT: percentage of people by educational level, percentage of people employed by occupational category, percentage of unemployed men of working age, percentage of one person families, percentage of families with five or more persons, crowding index (persons/room), and percentage of dwellings rented or owned. The choice of these variables was based on similar works conducted in USA[21] and in UK.[22] The value of each variable for each CT was standardised to have a mean of zero and a standard deviation of one by subtracting the mean value for the population and then dividing by its respective standard deviation. A factor analysis with varimax rotation on all standardised variables was performed. The first factor was strongly characterised by variables related to education and occupation (factor loadings of 0.85 and 0.72, respectively, for primary school education and unemployment rate). The second factor was influenced by dwelling variables (factor loading of 0.95 for rented dwellings). The third factor was characterised by sociodemographic variables (factor loading of 0.75 for families consisting of five or more persons). These three factors explained 70% of the overall variance.

We used the sum of these three factors as an overall measure of SES in each CT. The resulting distribution was divided on the basis of the 20th, 50th, and 80th percentiles into four categories of SES, ranging from very well off (level I) to very underprivileged (level IV). As a result of the classification adopted, the percentage of people with a university degree was 19% in the group with the highest SES (I), whereas it was 2.2% in the group with the lowest SES (IV); the prevalence of unemployed was 12.8% and 27.3%, respectively; the prevalence of dwellings owned was 70.6% and 36.5% in the two groups; and the prevalence of families consisting of five or more persons was 4.6% and 13.4%, respectively. These categories provided a characterisation of the population of Rome, with most residents being allocated to the middle categories and smaller, roughly equal numbers, at the extremes. On the basis of census data (1991), the number of residents (and number of CTs) in the four SES were as follows: level I=480 239 (1020); level II=872 858 (1524); level III=840 901 (1528); level IV=557 289 (1016). The General Registry Office of Rome provided the gender-age specific population data for each CT in 1995. Using the SES defined in 1991 for each CT, we calculated the resident population for the four categories in 1995: level I=469 635 (per cent change 1995 *v* 1991, (−2.3%); level II=845 241 (−3.3%); level III=815 425 (−3.1%); level IV=526 306 (−5.9%).

Regression analyses were performed to estimate the linear population trends for each SES category between 1991 and 1995, and gender-age specific population data for the years 1990, 1992, 1993, and 1994 were estimated.

MORTALITY DATA

Mortality data for all the residents in Rome were available from the Regional Registry of Causes of Death. Individual records include demographic data, underlying cause of death (coded according to the International Classification of Diseases, 9th revision, ICD-9), and the CT of residence. During the period 1990–1995, 149 002 deaths were recorded (approximately 25 000 per year). A total of 5076 deceased were excluded because the CT of residence was not reported, thus 143 926 deaths were considered in the analysis. The mortality rate among the CTs excluded was within the range of the rates estimated for SES I and SES IV. The small proportion of missing data, and the mortality rates observed indicated that their exclusion did not bias our analysis.

Table 1 Cases observed and mortality rates (×100 000) for all causes and for selected causes of death in the highest socioeconomic level I (reference group). Rate ratio (RR) and 95% confidence intervals (95% CI) for socioeconomic levels II, III and IV. The last column shows the p value for the test of trend. Rome, 1990–95. Men.

		Socioeconomic status								
		I		*II*		*III*		*IV*		
Cause of death	*(ICD-9 code)*	*deaths*	*rate**	*RR*	*(95%) CI*	*RR*	*(95%) CI*	*RR*	*(95%) CI*	*p value trend*
Total mortality	(001-999)	15150	763.1	1.04	1.02, 1.06	1.10	1.07, 1.12	1.19	1.16, 1.22	0.010
Age group (y)										
15–44		628	104.4	1.14	1.04, 1.25	1.31	1.19, 1.44	1.72	1.57, 1.89	0.018
45–64		2331	636.8	1.02	0.97, 1.07	1.11	1.05, 1.16	1.26	1.19, 1.33	0.051
65+		12103	4976.8	1.04	1.02, 1.07	1.08	1.06, 1.11	1.12	1.09, 1.16	0.000
Infectious diseases	(001-139)	48	2.5	1.22	0.84, 1.76	1.45	1.00, 2.08	1.96	1.34, 2.85	0.008
Tuberculosis	(010, 018)	17	0.9	1.58	0.92, 2.73	2.34	1.38, 3.98	2.96	1.70, 5.15	0.010
All cancers	(140-239)	4526	234.3	1.10	1.06, 1.14	1.17	1.13, 1.22	1.20	1.15, 1.26	0.028
Stomach cancer	(151)	271	13.7	1.31	1.13, 1.52	1.48	1.27, 1.72	1.60	1.36, 1.89	0.039
Colon-rectum cancer	(152-154)	514	25.9	1.05	0.94, 1.18	1.02	0.91, 1.15	0.89	0.77, 1.03	0.330
Larynx cancer	(161)	77	4.0	1.16	0.87, 1.54	1.37	1.03, 1.83	1.69	1.25, 2.29	0.003
Lung cancer	(162)	1346	71.1	1.12	1.05, 1.20	1.24	1.15, 1.32	1.38	1.28, 1.49	0.001
Melanoma	(172)	46	2.7	0.86	0.59, 1.26	0.71	0.47, 1.07	0.58	0.35, 0.96	0.002
Prostate cancer	(185)	394	18.2	1.00	0.88, 1.14	1.09	0.95, 1.25	1.03	0.88, 1.22	0.414
Bladder cancer	(188)	212	10.6	1.19	1.00, 1.41	1.24	1.04, 1.49	1.40	1.15, 1.70	0.022
Lymphomas-leukaemias	(200-208)	361	19.3	1.00	0.87, 1.14	1.09	0.95, 1.25	0.98	0.83, 1.15	0.951
Cardiovascular diseases	(390-459)	5822	278.1	1.01	0.98, 1.04	1.06	1.02, 1.10	1.13	1.09, 1.18	0.045
Hypertensive diseases	(401-405)	450	21.1	1.05	0.93, 1.19	1.05	0.93, 1.20	1.14	0.99, 1.32	0.063
Ischaemic heart diseases	(410-414)	2589	126.9	1.03	0.98, 1.08	1.05	1.00, 1.11	1.14	1.07, 1.21	0.048
Cerebrovascular diseases	(430-438)	1237	57.4	0.99	0.92, 1.06	1.08	1.00, 1.16	1.11	1.02, 1.21	0.090
Respiratory diseases	(460-519)	886	40.4	1.10	1.01, 1.20	1.19	1.08, 1.30	1.42	1.29, 1.57	0.020
Digestive diseases	(520-579)	744	37.7	1.08	0.99, 1.19	1.16	1.06, 1.28	1.41	1.27, 1.56	0.033
Genitourinary diseases	(580-599)	179	8.2	1.06	0.87, 1.28	0.94	0.76, 1.15	0.90	0.71, 1.15	0.214
Injuries and other external causes	(800-999)	656	36.6	1.02	0.93, 1.13	1.16	1.05, 1.28	1.24	1.11, 1.38	0.028
Traffic accidents	(E810-E825)	184	11.7	1.03	0.85, 1.23	1.40	1.17, 1.67	1.52	1.26, 1.84	0.051
AIDS†	(279)	114	18.7	1.32	1.06, 1.64	1.48	1.19, 1.83	2.54	2.05, 3.14	0.039
Overdose†	(304)	35	5.7	1.80	1.23, 2.63	1.86	1.27, 2.71	3.48	2.41, 5.03	0.044
Medical care indicators‡	(540-543, 550-553, 574-575,576.1)	6	0.5	1.35	0.52, 3.51	1.25	0.47, 3.36	2.22	0.85, 5.80	0.109

*Total number of deaths during the study period and annual rate per 100 000, SES I as reference. †Age group 15–44 years. ‡Age group 5–64 years.

Table 2 Cases observed and mortality rates (×100 000) for all causes and for selected causes of death in the highest socioeconomic level I (reference group). Rate ratio (RR) and 95% confidence intervals (95% CI) for socioeconomic levels II, III and IV. The last column shows the p value for the test of trend. Rome, 1990–95. Women

		Socioeconomic status								
		I		*II*		*III*		*IV*		
Cause of death	*(ICD-9 code)*	*deaths*	*rate**	*RR*	*(95%) CI*	*RR*	*(95%) CI*	*RR*	*(95%) CI*	*p value trend*
Total mortality	(001-999)	17196	478.0	1.00	0.98, 1.03	1.02	0.99, 1.04	1.07	1.04, 1.09	0.100
Age group (y)										
15–44		339	54.6	0.98	0.86, 1.12	1.07	0.94, 1.22	1.32	1.15, 1.51	0.123
45–64		1534	343.4	0.99	0.93, 1.06	1.03	0.97, 1.10	1.05	0.98, 1.13	0.103
65+		15259	3268.0	1.00	0.98, 1.03	1.01	0.99, 1.04	1.05	1.03, 1.08	0.103
Infectious diseases	(001-139)	62	2.0	0.85	0.58, 1.25	1.00	0.68, 1.47	1.21	0.79, 1.85	0.345
Tuberculosis	(010-018)	18	0.8	0.96	0.57, 1.63	0.76	0.42, 1.36	0.75	0.38, 1.51	0.070
All cancers	(140-239)	4462	147.7	1.01	0.97, 1.05	0.97	0.93, 1.02	0.98	0.93, 1.03	0.250
Stomach cancer	(151)	252	7.2	1.30	1.10, 1.54	1.53	1.29, 1.81	1.34	1.10, 1.63	0.250
Colon-rectum cancer	(152-154)	603	18.3	0.92	0.82, 1.03	0.92	0.82, 1.04	0.97	0.85, 1.12	0.784
Larynx cancer	(161)	12	0.4	1.04	0.47, 2.30	1.10	0.48, 2.53	1.25	0.51, 3.05	0.036
Lung cancer	(162)	527	17.6	1.01	0.89, 1.13	0.84	0.74, 0.95	0.93	0.81, 1.07	0.397
Melanoma	(172)	42	1.8	0.70	0.45, 1.09	0.80	0.51, 1.26	0.84	0.51, 1.38	0.656
Breast cancer	(174)	807	30.8	1.02	0.92, 1.12	0.85	0.76, 0.94	0.81	0.72, 0.91	0.089
Uterus	(179,180,182)	170	6.0	1.02	0.83, 1.26	1.10	0.89, 1.36	1.18	0.93, 1.49	0.023
Bladder cancer	(188)	79	2.3	0.83	0.61, 1.14	1.00	0.72, 1.38	0.99	0.69, 1.43	0.779
Lymphomas-leukaemias	(200-208)	393	13.2	0.98	0.85, 1.14	0.93	0.80, 1.08	0.95	0.80, 1.13	0.191
Cardiovascular diseases	(390-459)	7647	183.3	0.99	0.96, 1.02	1.06	1.02, 1.09	1.10	1.06, 1.14	0.093
Hypertensive diseases	(401-405)	845	19.8	1.04	0.95, 1.14	1.10	1.00, 1.22	1.14	1.02, 1.28	0.003
Ischaemic heart diseases	(410-414)	2456	59.9	0.99	0.94, 1.05	1.06	1.00, 1.13	1.13	1.06, 1.21	0.074
Cerebrovascular diseases	(430-438)	1897	45.2	1.01	0.95, 1.07	1.10	1.03, 1.17	1.10	1.02, 1.19	0.090
Respiratory diseases	(460-519)	869	21.1	0.94	0.86, 1.04	0.94	0.84, 1.04	1.03	0.92, 1.16	0.744
Digestive diseases	(520-579)	818	22.7	1.02	0.93, 1.13	1.12	1.01, 1.24	1.21	1.08, 1.35	0.024
Genitourinary diseases	(580-599)	179	4.6	1.00	0.81, 1.22	0.91	0.72, 1.14	0.91	0.70, 1.18	0.108
Injuries and other external causes	(800-999)	852	24.7	0.88	0.80, 0.97	0.94	0.85, 1.04	0.97	0.87, 1.10	0.961
Traffic accidents	(E810-E825)	87	3.8	1.04	0.77, 1.40	1.43	1.07, 1.90	1.44	1.06, 1.97	0.078
AIDS†	(279)	25	3.8	1.84	1.18, 2.88	1.83	1.17, 2.85	3.96	2.57, 6.09	0.057
Overdose†	(304)	9	1.4	0.96	0.42, 2.18	0.87	0.38, 1.98	1.62	0.73, 3.62	0.377
Medical care indicators‡	(540-543, 550-553, 574-575,576.1)	3	0.2	1.20	0.30, 4.82	2.41	0.67, 8.66	2.91	0.79, 10.77	0.033

*Total number of deaths during the study period and annual rate per 100 000, SES I as reference. †Age group 15–44 years. ‡Age group 5–64 years.

DATA ANALYSIS

We analysed overall mortality and the following major causes of death: infectious diseases, cancer, cardiovascular diseases, respiratory diseases, digestive system diseases, genitourinary system diseases, and injuries. We also considered specific cancer sites (lung, larynx, stomach, colon-rectum, melanoma, prostate, bladder, uterus, and breast), tuberculosis, traffic accidents, and certain surgical conditions in

Table 3 Mortality rates (×100 000) in 1990–92 and in 1993–95 in the highest SES level (I) and in the lowest level (IV). For each period, rate ratio (RR) of mortality in level IV to that in level I. Per cent change in mortality in each SES group between the two periods. Men

		1990–1992				*1993–1995*				*%change*	
		*rate**		*RR*	*(95 %) CI*	*rate**		*RR*	*(95 %) CI*	*93–95 vs 90–92*	
Cause of death	*(ICD-9 code)*	*I*	*IV*			*I*	*IV*			*I*	*IV*
Total mortality	(001-999)	793.2	899.5	1.13	1.10, 1.17	733.0	911.0	1.24	1.20, 1.29	−8.2	1.3
Age group (y)											
15–44		104.7	169.7	1.62	1.42, 1.85	104.1	189.6	1.82	1.59, 2.08	−0.6	10.5
45–64		672.2	805.7	1.20	1.11, 1.29	601.5	796.9	1.32	1.23, 1.43	−11.7	−1.1
65+		5168.5	5544.1	1.07	1.03, 1.12	4785.1	5645.5	1.18	1.13, 1.23	−8.0	1.8
Infectious diseases	(001-139)	2.1	3.8	1.80	0.97, 3.32	2.8	5.9	2.07	1.29, 3.34	25.0	35.0
Tuberculosis	(010-018)	0.8	1.9	2.50	1.05, 5.95	1.0	3.3	3.30	1.60, 6.80	23.4	42.0
All cancers	(140-239)	247.3	275.0	1.11	1.05, 1.18	221.2	289.1	1.31	1.23, 1.39	−11.8	4.9
Stomach cancer	(151)	15.1	23.9	1.59	1.27, 2.00	12.4	20.0	1.61	1.27, 2.06	−21.2	−19.3
Colon-rectum cancer	(152-154)	28.2	20.7	0.73	0.60, 0.90	23.5	25.3	1.08	0.89, 1.31	−19.9	18.3
Larynx cancer	(161)	4.2	7.8	1.87	1.23, 2.85	3.9	5.8	1.50	0.97, 2.32	−6.4	−32.7
Lung cancer	(162)	76.7	93.6	1.22	1.10, 1.36	65.5	102.7	1.57	1.41, 1.75	−17.2	8.8
Melanoma	(172)	2.5	1.2	0.46	0.21, 1.01	2.8	2.0	0.70	0.36, 1.33	10.9	41.2
Prostate cancer	(185)	18.6	18.0	0.97	0.76, 1.22	17.8	19.7	1.11	0.89, 1.38	−4.7	8.8
Bladder cancer	(188)	11.3	15.0	1.32	1.01, 1.74	9.8	14.6	1.49	1.13, 1.97	−15.2	−2.1
Lymphomas-leukaemias	(200-208)	19.6	16.8	0.86	0.68, 1.09	19.0	20.9	1.10	0.88, 1.37	−2.9	19.4
Cardiovascular diseases	(390-459)	284.2	315.8	1.11	1.05, 1.18	272.0	314.1	1.16	1.09, 1.22	−4.5	−0.5
Hypertensive diseases	(401-405)	22.2	24.8	1.12	0.91, 1.37	20.1	23.4	1.17	0.95, 1.43	−10.6	−6.0
Ischaemic heart diseases	(410-414)	132.6	151.2	1.14	1.05, 1.24	121.3	137.7	1.14	1.04, 1.24	−9.3	−9.8
Cerebrovascular diseases	(430-438)	56.6	58.1	1.03	0.90, 1.17	58.1	69.3	1.19	1.06, 1.35	2.5	16.2
Respiratory diseases	(460-519)	40.7	56.0	1.38	1.19, 1.59	40.2	58.7	1.46	1.28, 1.68	−1.2	4.6
Digestive diseases	(520-579)	40.1	55.6	1.39	1.20, 1.60	35.4	50.8	1.44	1.24, 1.67	−13.2	−9.4
Genitourinary diseases	(580-599)	9.3	7.3	0.79	0.55, 1.11	7.1	7.5	1.06	0.75, 1.50	−31.6	2.2
Injuries and other external causes	(800-999)	38.0	45.7	1.20	1.03, 1.40	35.2	45.1	1.28	1.10, 1.50	−8.0	−1.2
Traffic accidents	(E810-E825)	12.2	19.1	1.56	1.21, 2.02	11.3	16.7	1.48	1.13, 1.95	−8.6	−14.3
AIDS†	(279)	14.0	32.7	2.35	1.66, 3.32	23.4	62.0	2.65	2.03, 3.47	40.3	47.2
Overdose†	(304)	6.3	22.5	3.57	2.19, 5.80	5.0	16.9	3.38	1.93, 5.93	−26.0	−32.9
Medical care indicators‡	(540-543, 550-553, 574-575,576.1)	0.8	1.4	1.72	0.57, 5.15	0.2	0.7	4.77	0.56, 40.9	−406. 9	−82.6

*Annual rate per 100 000, SES I as reference. †Age group 15–44 yrs. ‡Age group 5–64 yrs.

the age group of 5–64 years (appendicitis, abdominal hernia, cholelithiasis, and cholecystitis), considered as sentinel events of medical care. Moreover, in the age group 15–44 years, deaths attributable to AIDS, drug overdose, and traffic accidents were analysed.

Mortality rates and their standard errors (SE) were computed by SES level. All rates were directly standardised for age (five years age classes, the last one being over 75) to the European standard population and expressed as the number of deaths per 100 000. Direct age adjusted rate ratio (RR) was used to compare rates. Confidence intervals were calculated at the 95% level of significance. A regression analysis was performed to test the linear trend of the association between SES and mortality.[23 24]

KEY POINTS

- An inverse association between socioeconomic status and mortality was observed in Rome, Italy, in both genders.
- The highest differences were observed in the age class 15–44 years, primarily attributable to AIDS and overdose mortality
- Comparing the periods 1990–92 and 1993–95, increasing differences were observed for total mortality in both genders, tuberculosis and lung cancer among men, and uterus cancer, traffic accident and overdose mortality among women.
- Changes in the health care system to improve effectiveness of medical care and to reduce inequality in health are needed.

Results

AGE SPECIFIC AND CAUSE SPECIFIC MORTALITY RATES BY SES

Tables 1 and 2 show results for men and women in the entire period 1990–95. The number of cases observed and the mortality rate (per 100 000) are indicated for level I; the size of social class differences has been expressed in terms of the ratio of mortality in the other SES group to that in level I (RR and 95% confidence intervals, (95% CI)).

Among men (table 1), an inverse association between SES and mortality was observed (p value for trend < 0.001); the overall mortality rate was 19% higher in level IV compared with level I. This association was strongest in the age group of 15–44 years, with an excess of 72% in the lowest SES compared with the highest. Men in the lowest SES showed a 20% excess of mortality for all cancers compared with level I. Regarding specific cancer sites, mortality from stomach, respiratory, and bladder cancer increased with decreasing SES, whereas melanoma was positively associated with high social class. Mortality from infectious, cardiovascular, digestive, and respiratory diseases, and injuries also showed a positive association with low SES. The strongest association was observed for tuberculosis (RR=2.96 level IV *v* level I) and, in the age group of 15–44 years, for AIDS (RR=2.54) and overdose (RR=3.48). Mortality for surgical conditions considered as an indicator of medical care increased with low SES (RR=2.22), although not significantly.

Table 4 Mortality rates (×100,000) in 1990–92 and in 1993–95 in the highest SES level (I) and in the lowest level (IV). For each period, rate ratio (RR) of mortality in level IV to that in level I. Per cent change in mortality in each SES group between the two periods. Women.

		1990–1992				*1993–1995*				*% change*	
		*rate**		*RR*	*(95%) CI*	*rate**		*RR*	*(95%) CI*	*93–95 vs 90–92*	
Cause of death	*(ICD-9 code)*	*I*	*IV*			*I*	*IV*			*I*	*IV*
Total mortality	(001-999)	485.2	503.3	1.04	1.00, 1.08	470.7	516.7	1.10	1.06, 1.14	−3.1	2.6
Age group (y)											
15–44		52.7	70.2	1.33	1.10, 1.61	56.5	73.9	1.31	1.08, 1.58	6.7	5.1
45–64		367.0	360.6	0.98	0.89, 1.08	319.8	359.8	1.13	1.02, 1.25	−14.8	−0.2
65+		3294.8	3370.1	1.02	0.98, 1.06	3241.2	3513.8	1.08	1.04, 1.13	−1.7	4.1
Infectious diseases	(001-139)	2.0	2.7	1.37	0.73, 2.57	2.0	2.2	1.06	0.59, 1.89	4.4	−23.8
Tuberculosis	(010-018)	0.8	0.2	0.25	0.06, 1.11	0.7	1.0	1.34	0.57, 3.16	−18.0	77.8
All cancers	(140-239)	146.9	140.9	0.96	0.89, 1.03	148.5	148.0	1.00	0.93, 1.07	1.1	4.8
Stomach cancer	(151)	7.0	9.6	1.37	1.03, 1.82	7.4	9.7	1.30	0.99, 1.71	6.3	1.5
Colon-rectum cancer	(152-154)	18.9	16.7	0.88	0.72, 1.08	17.6	18.9	1.07	0.89, 1.29	−7.0	11.7
Larynx cancer	(161)	0.4	0.4	1.06	0.30, 3.76	0.4	0.5	1.46	0.41, 5.28	−10.0	20.6
Lung cancer	(162)	16.0	14.2	0.89	0.71, 1.11	19.2	18.6	0.97	0.80, 1.17	16.9	23.5
Melanoma	(172)	1.7	1.8	1.07	0.54, 2.12	2.0	1.3	0.64	0.30, 1.35	14.3	−43.1
Breast cancer	(174)	31.3	25.4	0.81	0.68, 0.96	30.2	24.6	0.82	0.69, 0.96	−3.7	−3.0
Uterus	(179,180,182)	6.6	7.0	1.06	0.76, 1.48	5.4	7.1	1.31	0.93, 1.85	−22.2	1.1
Bladder cancer	(188)	2.5	2.3	0.93	0.56, 1.56	2.2	2.3	1.06	0.63, 1.79	−13.7	0.1
Lymphomas-leukaemias	(200-208)	12.6	11.8	0.94	0.74, 1.19	13.8	13.4	0.97	0.76, 1.23	8.7	11.9
Cardiovascular diseases	(390-459)	186.6	198.4	1.06	1.01, 1.12	179.9	203.6	1.13	1.07, 1.19	−3.7	2.6
Hypertensive diseases	(401-405)	20.1	21.5	1.07	0.91, 1.26	19.5	23.5	1.21	1.03, 1.41	−3.0	8.5
Ischaemic heart diseases	(410-414)	61.6	69.1	1.12	1.02, 1.23	58.2	66.8	1.15	1.04, 1.26	−5.8	−3.4
Cerebrovascular diseases	(430-438)	43.3	46.5	1.07	0.96, 1.20	47.0	52.7	1.12	1.01, 1.24	7.8	11.6
Respiratory diseases	(460-519)	20.8	20.4	0.98	0.83, 1.16	21.5	23.4	1.09	0.93, 1.28	2.9	12.8
Digestive diseases	(520-579)	24.7	28.6	1.16	0.99, 1.35	20.7	26.4	1.28	1.09, 1.50	−19.4	−8.2
Genitourinary diseases	(580-599)	4.5	3.3	0.74	0.49, 1.12	4.7	5.0	1.06	0.75, 1.50	3.8	32.7
Injuries and other external causes	(800-999)	24.2	23.0	0.95	0.80, 1.13	25.2	25.1	1.00	0.85, 1.18	3.9	8.7
Traffic accidents	(E810-E825)	4.7	5.7	1.22	0.81, 1.84	2.9	5.2	1.79	1.11, 2.91	−59.6	−8.6
AIDS†	(279)	1.8	9.8	5.35	2.26, 12.65	5.9	20.7	3.53	2.14, 5.82	69.0	52.9
Overdose†	(304)	1.8	2.2	1.25	0.44, 3.53	1.0	2.3	2.29	0.62, 8.51	−81.2	0.9
Medical care indicators‡	(540-543, 550-553, 574-575,576.1)	0.0	0.9			0.4	0.3	0.6	0.11, 3.89	100.0	−247.8

*Annual rate per 100 000, SES I as reference. †Age group 15–44 years. ‡Age group 5–64 years.

Among women (table 2), total mortality was 7% higher in the lowest SES level compared with the highest level, but the p value for trend was not significant. The highest difference was observed among those aged 15–44 years, for whom the mortality rate was 32% higher in the fourth SES. Differentials in mortality were stronger when considering specific age groups or specific causes of death. Stomach, laryngeal, and uterus cancer were all inversely related with SES, while an opposite trend was observed for breast cancer, with a statistically significant lower mortality rate in SES IV (RR=0.81). A higher mortality in the lowest SES group was observed also for all cardiovascular conditions, diseases of the digestive system, and traffic accidents. In the age group 15–44 years, a strong positive association with low SES was observed for AIDS mortality (RR=3.96), whereas for overdose the difference was not significant. An inverse association between SES and mortality from the surgical conditions (RR=2.91) was observed (p value for trend 0.033).

TIME TREND OF MORTALITY RATES BY SES

A comparison of mortality between the periods 1990–92 and 1993–95 is shown in tables 3 and 4 for men and women, respectively. For each period, the tables provide the mortality rates (per 100 000) in the highest SES level (I) and in the lowest level (IV), the RR of mortality in level IV to that in level I, and the per cent change in mortality in each SES group between the two periods.

Inequalities in total mortality increased in the more recent period because of a decrease in the mortality rate in the more affluent SES group(−8.2% among men and −3.1% among women) and to an increase among the less well off (+1.3% among men and +2.6% among women). The RR comparing level IV with level I increased in the second period from 1.13 to 1.24 in men (p value=0.0002), and from 1.04 to 1.10 in women (p value=0.03). Among men (table 3), increasing inequalities were observed for most of the conditions investigated, including cancer (a statistically significant reduction in mortality in the highest SES for lung cancer (−7.2%) and colon cancer (−19.9%) was observed). In the age group 15–44 years, inequalities in overall mortality had widened (RR from 1.62 to 1.82) and AIDS mortality showed the greatest increase in the lowest socioeconomic group.

Among women (table 4), the differences between the two periods were less striking than among men. Uterus cancer decreased in the highest SES (−22.2%), while it remained stable in level IV (RR from 1.06 to 1.31). The RR for traffic accidents increased from 1.22 in the first period to 1.79 in the second period. In the age group 15–44 years, inequalities increased for drug overdose because of a significant reduction in mortality in the highest social class (−81.2%).

Discussion

This study shows an inverse relation between socioeconomic conditions and mortality in Rome, especially in men. Although inequalities affected all ages, mortality differentials were higher in the younger age group (that is, 15–44 years). The causes of death that showed the strongest association with a low SES were, among men, stomach, respiratory, and bladder cancers, tuberculosis, AIDS and overdose, and, among women, AIDS, overdose, traffic accidents, and surgical conditions.

The nature of the association between low SES and risk of disease and mortality has not been fully clarified. Smoking, diet, excessive alcohol intake, sedentary lifestyle, and reproductive behaviour have been shown to be behavioural risk factors related to social classes for several causes of morbidity and mortality. Additional biological and psychosocial factors have been shown to predict the increased risk of mortality in the lower social classes.[25] In addition to individual socioeconomic conditions, neighbourhood characteristics (that is, unsafe environment, housing conditions, transport, and access to health services) may modify the individual risk.[26]

Widening social class differentials in mortality have been reported in several studies performed in Europe and in the United States.[6 7] In Rome, though time variations refer to a relatively brief period, differentials in total mortality between high and low SES increased in both sexes. Men in the lowest socioeconomic level showed an excess of total mortality of 13% compared with the highest level in the 1990–92 period, and this excess increased significantly to 24% in 1993–95; among women, the excess increased significantly from 4% to 10%.

Causes of death for which a greater widening of differences was observed were tuberculosis and lung cancer in men, and uterus cancer, traffic accidents, and overdose in women.

Concerning lung cancer mortality, a survey showed that in Italy smoking prevalence is inversely related to educational level in men and directly related to education among women, and since the early 1980s, smoking prevalence has declined with educational level in both genders.[27] This change may be important in explaining the time variations observed in our study.

Uterus cancer death rates decreased in Rome during the study period (from 7.1 × 100 000 in 1991 to 5.4 × 100 000 in 1995),[28] but the benefits were not shared equally; in fact, the observed reduction was attributable to a decrease in mortality in the upper classes. Social class differences in cancer survival have been reported in Italy, particularly for those cancers for which effective treatment is available.[29] Vineis *et al* [30] demonstrated that early diagnosis is one of the factors contributing to the prognostic advantages of the upper social class. Data from the National Health Survey in 1986–87 showed that in the absence of a screening programme, women with a lower SES have a significantly lower rate of PAP tests than women with a higher SES.[31 32] The overuse of screening by the lower risk women and the under use by the higher risk women have been also observed in Rome.[33]

An extremely high mortality from AIDS, overdose, has been found among injecting drug users in Rome.[34] We observed a widening of differences in mortality from these causes of death, as observed in a recent study in Barcelona.[12] An increase in illicit drug use in lower socioeconomic levels and/or an increase in susceptibility of extremely poor drug users may account for these findings.

Several studies have reported socioeconomic differences for a variety of diseases for which a substantial proportion of deaths are potentially avoidable by medical intervention.[35–37] Results from our study show that mortality from several surgical procedures was higher in the more deprived groups. Differences in social classes in terms of access to health care or specific medical intervention are possible explanations for time variations of SES differences; for those causes of death for which effective interventions exist (that is, colon-rectum cancer, melanoma, haematopoietic cancers) poor management of patients in the lower socioeconomic group may produce higher inequalities in mortality.

As in our study we used an area-based socioeconomic indicator, the possibility of misclassification cannot be completely excluded and our results, especially time changes, should be interpreted with caution. Empirical evidences, however, suggest that underestimation rather than overestimation is the more probable bias, as, for example, a change over time in composition of neighbourhood could tend to dilute estimates of effects.[17 38 39]

We retain that a small area based social class indicator represents a valid and useful approach to overcoming absence of individual data on SES; it also allows household and neighbourhood markers of social class to be taken into account. A study comparing area based and individual based indicators of social class in the US showed that mortality remained significantly associated with residence in low income areas even after adjusting for the level of personal income.[40]

Finally, the possibility of artefacts because of time variations of the social class structure or to a time dependent misclassification of social class should be considered. These problems have been recently reviewed, and it has been concluded that they should produce a small effect.[26] However, we cannot exclude the possibility of a differential migration according to SES and health status.

In conclusion, although Italy offers a National Health Service and an extensive welfare system, the disparity in mortality rates between people of different social classes in Rome has been increasing. Interventions to promote equal availability and improve effectiveness of medical care together with specific education and prevention programmes targeting social groups at greater risk will be indispensable to improve health and to reduce inequalities in life expectancy among social groups. The allocation of resources for extra health care to lower social groups should be considered. The extent of variation in mortality between social classes warrants further investigation to clarify which changes in the health care system may improve efficiency and effectiveness of medical care and reduce inequalities in health.

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