AN EXPERIMENTAL FACTOR ANALYSIS OF CANCER MORTALITY IN ENGLAND AND WALES 1921–30

By JOHN BUCKATZSCH and RICHARD DOLL

Oxford University, Institute of Statistics and the Statistical Research Unit of the Medical Research Council, London School of Hygiene and Tropical Medicine

Mortality rates from cancer of different parts of the body vary from one locality to another. Stocks (1947) discussed some of these geographical differences and showed that the mortality rates for different body sites varied, to some extent, independently. He reported statistically significant correlations between some of the site mortality rates recorded in a group of thirty large towns; between some of these site mortality rates and rates of mortality from other diseases; and between some of the cancer mortality rates and various indicators of 'social conditions' in these towns. The results suggested that a study of the correlations between all possible pairs of specific body site mortality rates for which data were available might lead to interesting results. It was thought that some method of Factor Analysis could be used for this purpose, in order to discover how far the geographical incidences of the site mortalities were statistically independent.

The data available are reproduced in the Appendix. They consist of estimated average rates of mortality from cancer of ten body sites per 1,000,000 male inhabitants aged 45 to 64, in thirty large towns from 1921 to 1930; and of similar rates for eight body sites among females. The two groups of site mortality rates were treated independently throughout the study. Each group contains a number of specific rates and one residual rate of mortality from cancer of 'all other sites'. The residual rate accounted, on the average, for 29 % of the male and 21 % of the female cancer mortality in the thirty towns.

Table 1 shows the correlation coefficients observed between all possible pairs of mortality rates in each group. Those coefficients which may be regarded as statistically significant are printed in heavy type.

The two correlation matrices were subjected to a process of Factor Analysis. The aims and methods of Factor Analysis are described in a number of works, including Thomson (1939), Holzinger & Harman (1941) and Thurstone (1947). The general aim is to determine whether the co-variation observed in a fairly large number of series of observations can be plausibly represented as reflecting the operation of a smaller number of 'Factors'. In this case, the Factors would be interpreted as independent 'causes' of cancer. The method of analysis used here is Hotelling's method of Principal Components (Hotelling, 1933). It was found that, in both matrices, the first four Principal Components accounted for about three-quarters of the variance of the matrix (unit correlation coefficients being inserted in the leading diagonal); the combined share of the remaining latent roots in the total variance is 30 % for the male matrix and 23 % for the female matrix. The fourth latent root accounted for about 10 % of the variance in each case, and no one of the six latent roots in the male matrix which remained uncalculated, or

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Table 1. *Correlation coefficients among site mortality rates*

(*a*) Male

Site	Stomach	Oesophagus	Colon	Rectum	Tongue	Lung	Larynx	Bladder	Prostate	Other sites
Stomach	1·000	0·163	−0·011	**−0·413**	0·277	−0·026	0·273	**−0·394**	0·006	**0·478**
Oesophagus	—	1·000	0·029	0·289	0·274	0·180	**0·477**	0·154	−0·231	**0·581**
Colon	—	—	1·000	−0·221	0·136	0·322	0·032	0·264	0·317	0·192
Rectum	—	—	—	1·000	−0·221	0·208	0·100	0·235	−0·095	−0·217
Tongue	—	—	—	—	1·000	−0·090	0·205	−0·094	0·186	**0·443**
Lung	—	—	—	—	—	1·000	0·304	0·076	0·075	0·287
Larynx	—	—	—	—	—	—	1·000	0·014	−0·140	**0·419**
Bladder	—	—	—	—	—	—	—	1·000	−0·069	−0·206
Prostate	—	—	—	—	—	—	—	—	1·000	0·034
Other sites	—	—	—	—	—	—	—	—	—	1·000

(*b*) Female

Site	Stomach	Oesophagus	Colon	Rectum	Breast	Uterus	Ovaries	Other sites
Stomach	1·000	0·239	0·278	**−0·483**	**−0·439**	0·193	**−0·441**	0·015
Oesophagus	—	1·000	−0·191	0·066	−0·272	0·278	**−0·398**	0·017
Colon	—	—	1·000	−0·150	−0·039	0·015	−0·070	0·164
Rectum	—	—	—	1·000	0·103	0·019	0·022	0·100
Breast	—	—	—	—	1·000	**−0·397**	**0·544**	0·078
Uterus	—	—	—	—	—	1·000	−0·042	−0·128
Ovaries	—	—	—	—	—	—	1·000	−0·100
Other sites	—	—	—	—	—	—	—	1·000

P	*r*
0·01	0·463
0·05	0·361

the four uncalculated latent roots of the female matrix, can be as large. For this reason, it was not thought worth while continuing the Factor Analysis beyond the fourth Principal Component. The analysis appeared to show that while the

Table 2. *Factor loadings in specified mortality rates and latent roots of correlation matrices*

(*a*) Male

Site	Factor M_1	M_2	M_3	M_4
Stomach	0·638	−0·497	−0·158	0·217
Oesophagus	0·643	0·514	−0·300	−0·249
Colon	0·237	0·124	0·896	−0·038
Rectum	−0·230	0·739	−0·262	0·033
Tongue	0·588	−0·217	0·123	−0·592
Lung	0·317	0·505	0·358	0·610
Larynx	0·645	0·367	−0·218	0·130
Bladder	−0·216	0·610	0·288	−0·376
Prostate	0·025	−0·162	0·418	−0·010
All other sites	0·886	−0·081	−0·012	0·094
Latent roots	2·624	1·914	1·435	1·000
Percentage of variance (10·0)	26·2	19·1	14·4	10·0

(*b*) Female

Site	Factor F_1	F_2	F_3	F_4
Stomach	0·795	0·269	0·005	−0·128
Oesophagus	0·505	−0·524	0·131	−0·021
Colon	0·290	0·768	0·080	0·282
Rectum	−0·409	−0·738	0·236	0·139
Breast	−0·771	0·240	0·089	−0·027
Uterus	0·439	−0·309	−0·468	0·668
Ovary	−0·711	0·215	−0·404	0·309
All other sites	−0·013	0·121	0·839	0·461
Latent roots	2·431	1·695	1·173	0·871
Percentage of variance (8·0)	30·4	21·2	14·4	10·9

correlation matrices were generated by ten and eight mortality rates respectively, the greater part of the variance of these matrices could be represented as the contribution of only four 'Factors'.* At the same time, the fact that the first Principal Component accounts for only 26 % of the variance in the male correlation matrix and 30 % in the female matrix, suggests a high degree of independence among the original death-rates. We are, in other words, not confronted with a situation like that which appears to arise frequently in psychological investigations, in which the observed scores in very large batteries of tests can be closely reproduced by a very small number of Factors.

Table 2 shows the loadings of the four Factors in the various mortality rates for the two sexes. The loadings represent the correlation between each mortality

* The terms 'Principal Components' and 'Factors' are used here interchangeably.

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rate and each Factor. The estimated numerical value of each Factor, expressed in standard units, in the thirty towns is shown in Table 3.

Table 3. *Numerical value (in standard units) of each Factor in thirty towns*

	Male Factors				Female Factors			
Town	M_1	M_2	M_3	M_4	F_1	F_2	F_3	F_4
Birkenhead	+3·32	+1·11	−1·66	−0·46	+1·67	+2·20	+2·28	+0·32
Birmingham	−0·11	+3·88	−0·16	−0·04	−2·62	+0·52	+0·96	−0·30
Blackburn	−0·31	−1·07	+1·80	−1·54	+2·07	+2·38	−1·60	−0·16
Bolton	+1·51	−3·42	+2·22	−1·15	−1·65	+0·02	−0·06	−0·76
Bradford	−1·53	−1·36	+0·18	+1·05	−0·76	−1·90	+0·08	+0·23
Brighton	−1·23	+2·02	−0·09	−1·11	−4·90	+0·65	+0·39	+0·71
Bristol	−2·41	−1·61	+0·31	−0·28	−1·83	−1·34	+0·40	−1·30
Croydon	−3·66	+0·88	+0·17	+0·73	−3·65	+2·13	−0·72	−1·26
Derby	−3·29	+0·64	−2·21	−0·41	−5·52	−1·32	−1·08	+0·36
Huddersfield	+0·20	+1·56	+3·40	+1·73	+0·08	+3·40	+3·16	+0·82
Kingston-on-Hull	+0·42	−2·84	+1·03	+0·19	+5·20	−3·67	+0·84	+2·10
Leeds	−1·70	+1·34	+2·87	+1·27	−1·35	+0·81	+1·02	+1·05
Leicester	−2·94	+0·36	−0·53	−0·61	−2·55	+2·16	−0·16	−0·22
Liverpool	+2·26	−0·04	−1·21	−0·36	+1·75	−2·04	+0·56	−0·82
Manchester	+6·37	+2·65	+0·19	+0·35	+0·66	−0·04	+0·40	+0·17
Newcastle-on-Tyne	+1·77	−1·63	+0·16	−0·99	+2·03	+1·76	−1·33	+0·66
Norwich	−4·09	+3·45	+1·65	−2·47	+1·86	−1·23	+0·67	−0·37
Nottingham	−0·20	+2·64	+0·28	+1·63	−2·66	+0·50	+0·14	+1·29
Oldham	+0·54	−2·74	−0·50	+1·19	+2·24	+2·23	−1·16	+0·62
Plymouth	−0·51	−3·01	+0·73	−0·59	−1·41	−1·95	−1·00	+0·32
Portsmouth	−0·49	+0·17	−1·66	+1·19	−1·59	−0·58	−1·15	−0·18
Salford	+7·19	−1·28	−0·01	−0·66	+1·12	+0·27	−0·58	−0·45
Sheffield	+2·22	−0·01	−0·38	+1·80	+0·39	−0·12	+0·50	−0·54
Southampton	+0·88	+1·71	−1·89	+0·39	−0·11	−1·76	+0·10	+1·09
Stockport	+0·76	−0·71	+0·49	+0·29	+0·19	+3·12	−0·45	−0·70
Stoke-on-Trent	+1·39	−0·51	−1·88	−0·14	+2·04	−0·37	−0·24	+0·45
Sunderland	−1·39	−0·25	+1·86	−0·35	+3·11	+1·12	−2·60	−0·57
West Ham	+0·96	+1·43	−0·89	+0·47	+0·88	−1·99	+0·92	−0·39
Cardiff	−2·37	−1·19	−2·29	+0·51	+3·09	−2·35	−0·35	−1·08
Swansea	−3·57	−2·14	−1·97	+0·74	+2·25	−2·60	+0·07	−0·78

The next step should be to identify the Factors with some other series of figures representing the strength of relevant influences in the thirty towns. Inspection of Table 2(*a*) shows that the operation of the first male Factor (M_1) is manifested in high rates of mortality from cancer of the larynx, oesophagus, stomach and tongue. (The very high loading for 'all other sites' is not meaningful in the absence of a precise definition of the contents of this residual.) Small negative correlations with the rectum and bladder mortality rates are shown. The second male Factor (M_2) may be identified as a 'bladder-rectum' Factor. A rather large *negative* correlation with the stomach mortality rate is noticeable. M_1 and M_2 are in this respect clearly distinguishable. The third male Factor (M_3) has even more clearly a specifically 'colon' manifestation, while M_4 has rather less clearly a 'lung' effect and is negatively correlated with the tongue mortality rate. Among the female Factors, the first (F_1) shows itself very clearly in the stomach mortality rate, and

is almost equally strongly, but *negatively*, correlated with the breast and ovary rates. The second Factor (F_2) shows a strong positive correlation with the colon rate and a negative correlation of comparable size with the rectum rate. The third female Factor (F_3) is of limited interest, as it appears to operate mainly through the indefinite 'other sites' rate. The fourth female Factor (F_4) is identifiable mainly with the uterus mortality rate.

Table 4. *Correlation between male and female normalized Factors, and index of social conditions* (G')

Factor	M_1	M_2	M_3	M_4	G'
F_1	0·3000	−0·3542	0·0277	0·0028	**0·6475**
F_2	0·1305	0·1917	**0·3812**	0·0486	−0·1998
F_3	0·1460	**0·4091**	0·1405	0·3200	−0·0617
F_4	0·1364	0·1037	0·1692	0·2094	0·0452
G'	**0·3916**	**−0·4109**	−0·0521	0·0808	—

P	r
0·01	0·463
0·05	0·361

The relations between the strength of the various male and female Factors in the thirty towns were investigated, by estimating the correlations between them. The results are shown in Table 4. It will be seen that most of the correlation coefficients in this table are statistically insignificant. Significant values were found for the correlations between F_2 (the female 'colon-*rectum*'* Factor) and M_3 (the male 'colon' Factor); and between F_3 (the female 'other sites' Factor) and M_2 (the male 'rectum-bladder' Factor). A near significant negative value was found for the correlation between F_1 (female 'stomach-*breast-ovary*' Factor) and M_2, and a positive value for the correlation between F_1 and M_1 (male 'larynx-oesophagus-stomach-tongue' Factor).

Finally, the values of the eight Factors were correlated with an 'index of social conditions' in the thirty towns, the numerical value of which increases as 'social conditions' become increasingly adverse. The index used was described by Buckatzsch (1946), and reasons have been suggested for preferring it to alternative measures of 'social conditions' (Buckatzsch, 1947). The values of the correlation coefficients are shown in Table 4. Significant positive correlations were found between the index of social conditions and both M_1 and F_1; a significant *negative* correlation was found between the index and M_2.

The results of this experimental Factor Analysis of cancer mortality are not conclusive. They do, however, suggest lines of further research. In the first place, additional information as to the inter-local variations in the site mortality rates might be sought by increasing the number of towns included in the analysis, and by making a similar study of more recent experience. In the second place, the male and female residual rates should be further analysed, since they show high correlations with one or other of the first four Principal Components of their

* The mortality rates for the sites named in italics are negatively correlated with the Factors concerned.

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respective correlation matrices. Thirdly, a more thorough attempt might be made to identify the Factors (by correlation methods) with other relevant influences.

The high correlation between the index of social conditions and the first female Factor and the appreciably lower, but still significant, correlation between the index and the first male Factor, may be regarded as establishing such an identification for these Factors. The association of the mortality rates from cancer of the larynx, oesophagus, stomach and tongue with 'adverse social conditions' and the association of cancer of the breast and ovaries with 'good' conditions has long been recognized (Registrar-General, 1936). The analysis serves only as confirmation. It is still, however, not possible to distinguish statistically between the respective influences exerted on mortality rates by the various components of the 'adverse social conditions' of the inter-war period (Buckatzsch, 1947).

The indication of a specific 'colon' Factor (F_2, M_3) in both the female and male matrices is good evidence of its real existence; from Table 3 it would appear that the aetiological agents concerned were strongly present in Huddersfield, Blackburn, Leeds, Stockport and Sunderland and were deficient in Cardiff, Swansea, Southampton, Derby and Liverpool.

The divergence between the Factor loadings for the mortality rates from cancer of the colon and from cancer of the rectum could be considered to indicate that there was diagnostic confusion between the diseases, and that the 'colon' Factor was nothing more than a greater tendency to classify cancers of the large bowel as cancers of the colon. It is, however, not unreasonable to believe that the aetiological agents concerned in the production of cancer of the colon and of cancer of the rectum are different, and supporting evidence for this is found in their different sex ratios.

It is tempting to suggest that the fourth male Factor, with a positive loading in the lung mortality rate and a negative loading in the tongue rate, might be identified with the proportion of tobacco smoked as cigarettes against that smoked in pipes. It is notable that the analysis confirmed the lack of aetiological association between cancer of the lung and cancer of the larynx (Kennaway & Kennaway, 1951), an association which it would be natural to expect. In this case it is not reasonable to postulate any diagnostic confusion between the sites.

SUMMARY

A Factor Analysis has been made of the co-variation between the mortality rates from cancer of ten male body sites and of eight female body sites, in thirty large towns in England and Wales from 1921 to 1930. The method of analysis adopted is Hotelling's method of Principal Components.

Four male and four female Factors are obtained, which together account for approximately three-quarters of the total variance.

A Factor is found to be associated with cancer of the larynx, oesophagus, stomach and tongue in men and with cancer of the stomach and negatively with cancer of the breast and ovaries in women. In both sexes, the Factors are associated with an index of adverse social conditions.

Another Factor is found to be associated with cancer of the rectum and bladder in men and this Factor is associated with good social conditions.

A special Factor associated with cancer of the colon is unrelated to the mortality from cancer of other sites, save that in women it is negatively associated with cancer of the rectum.

A Factor for cancer of the lung in men is unrelated to cancer of the larynx, and is inversely related to cancer of the tongue.

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REFERENCES

BUCKATZSCH, E. J. (1946). An index of social conditions in the county boroughs in 1931. *Bull. Inst. Statist., Oxford*, **8**, 565.

BUCKATZSCH, E. J. (1947). The influence of social conditions in mortality rates. *Population Studies*, **1**, 229.

HOLZINGER, K. J. & HARMAN, H. H. (1941). *Factor Analysis*. Chicago: University of Chicago Press.

HOTELLING, H. (1933). Analysis of a complex of statistical variables into Principal Components. *J. Educ. Psychol.* **24**, 417, 498.

KENNAWAY, E. L. & KENNAWAY, N. M. (1951). Studies of the incidence of cancer of the lung and larynx. *Brit. J. Cancer*. **5**, 153.

REGISTRAR-GENERAL (1936). *The Registrar-General's Decennial Supplement, England and Wales*, 1931. *Part* II*a*. *Occupational Mortality*. London: H.M.S.O.

STOCKS, P. (1947). *Regional and Local Differences in Cancer Death Rates. General Register Office: Studies on Medical and Population Subjects, No.* 1. London: H.M.S.O.

THOMSON, G. H. (1939). *The Factorial Analysis of Human Ability*. London: University of London Press.

THURSTONE, L. L. (1947). *Multiple Factor Analysis*. Chicago: University of Chicago Press.

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APPENDIX

Death-rates from cancer of different sites per 1,000,000 *estimated average population at ages* 45–64, *for the decade* 1921–30, *for thirty county boroughs. Figures provided by the General Register Office*

County borough ...	Birken-head	Birming-ham	Blackburn	Bolton	Bradford	Brighton	Bristol	Croydon	Derby	Hudders-field
Men										
Average population 1921–30, ages 45–64	13,398	89,050	12,765	17,943	31,360	14,706	36,608	19,961	13,729	12,541
Site Stomach	8,957	5,760	8,539	8,416	8,099	5,712	7,348	6,162	5,536	6,618
Oesophagus	4,030	3,548	2,899	2,006	1,786	2,992	1,939	2,304	2,695	2,631
Colon*	3,508	3,537	4,465	3,734	3,571	3,604	3,223	3,557	2,331	4,864
Rectum†	3,359	3,840	2,507	2,452	2,934	3,468	2,622	3,607	3,496	3,190
Tongue	2,388	2,044	2,429	3,177	1,818	2,176	2,131	1,503	1,894	1,754
Lung‡	746	1,639	548	446	1,116	612	656	1,052	510	2,711
Larynx	1,791	1,583	548	1,282	1,275	1,496	1,284	1,252	1,093	718
Bladder	746	1,033	1,253	780	542	1,088	819	551	656	797
Prostate	746	910	783	1,449	829	884	956	1,052	801	1,037
Other sites	11,345	9,724	9,557	10,979	8,609	9,316	7,539	6,863	8,231	10,844
Women										
Average population 1921–30, ages 45–64	15,110	97,700	15,891	20,995	37,031	19,477	43,083	24,307	14,095	14,355
Site Stomach	6,684	3,982	6,104	3,906	4,240	2,516	3,458	3,826	2,554	5,643
Oesophagus	662	358	503	619	729	565	812	453	568	488
Colon*	4,567	3,153	3,524	2,763	3,376	4,056	2,994	3,374	2,696	3,971
Rectum†	1,655	1,873	1,007	1,334	1,998	2,105	1,602	1,440	1,916	1,324
Breast	7,677	7,226	5,852	7,430	7,129	7,137	7,544	7,817	8,514	6,897
Uterus	6,023	5,896	7,300	6,192	7,210	5,186	5,431	4,937	6,953	5,503
Ovaries	794	1,331	1,573	1,477	1,296	2,413	1,346	1,934	2,199	1,393
Other sites	7,412	7,001	6,230	6,668	6,400	6,777	6,313	5,965	6,243	8,917

* Including all intestine other than duodenum and rectum. † Including anus. ‡ Including pleura.

Appendix (*cont.*)

County borough ...	Kingston-on-Hull	Leeds	Leicester	Liverpool	Man-chester	Newcastle-on-Tyne	Norwich	Notting-ham	Oldham	Plymouth
Men										
Average population 1921–30, ages 45–64	27,601	47,176	23,772	74,900	71,618	26,390	11,631	25,498	15,011	20,483
Site Stomach	8,550	6,274	5,595	9,346	9,480	8,223	4,385	6,942	10,725	6,835
Oesophagus	2,536	1,950	2,356	3,071	4,063	3,107	2,579	2,314	2,132	1,709
Colon*	3,949	4,388	3,239	3,017	4,105	4,168	3,869	3,647	3,531	3,515
Rectum†	2,029	3,095	2,818	3,124	3,016	2,577	3,439	3,177	2,731	2,246
Tongue	2,065	1,675	1,809	3,044	2,681	2,956	2,321	1,490	1,332	2,588
Lung‡	870	2,247	589	1,255	2,039	644	688	2,039	466	391
Larynx	1,159	954	1,262	1,669	2,667	1,175	946	2,432	1,266	1,416
Bladder	616	1,039	1,010	788	1,103	568	1,891	1,020	600	635
Prostate	870	975	631	761	810	644	860	784	866	928
Other sites	9,347	9,539	8,287	9,826	12,204	10,042	7,910	8,707	10,792	9,813
Women										
Average population 1921–30, ages 45–64	28,707	52,872	27,329	81,840	86,760	27,048	13,903	29,886	16,948	22,111
Site Stomach	5,295	3,556	4,245	6,048	5,584	5,546	3,668	3,011	7,021	4,432
Oesophagus	1,150	378	403	660	632	518	719	268	590	678
Colon*	3,762	3,650	3,952	3,079	3,727	4,437	4,028	3,513	4,130	2,985
Rectum†	1,672	1,816	1,720	1,992	1,808	1,553	1,870	1,974	1,357	1,900
Breast	6,061	6,658	7,831	5,633	6,649	6,285	5,466	7,361	6,195	7,688
Uterus	9,998	7,093	6,001	6,488	6,872	8,060	6,545	7,897	7,553	7,960
Ovaries	592	1,286	1,573	904	1,251	1,220	647	1,305	1,711	1,492
Other sites	7,455	7,452	6,257	6,415	6,687	5,878	6,258	6,960	6,372	6,060

* Including all intestine other than duodenum and rectum. † Including anus. ‡ Including pleura.

County borough ...	Ports-mouth	Salford	Sheffield	South-ampton	Stock-port	Stoke-on-Trent	Sunder-land	West Ham	Cardiff	Swansea
Men										
Average population 1921–30, ages 45–64	22,997	21,409	51,732	17,322	12,751	24,143	15,039	25,936	20,147	15,315
Site Stomach	6,305	10,043	7,326	7,736	9,019	8,822	8,179	9,176	7,842	9,076
Oesophagus	2,566	3,550	2,532	3,810	2,274	3,065	1,729	2,776	2,085	1,828
Colon*	2,870	3,643	3,286	3,002	4,235	2,899	4,588	2,892	2,482	1,894
Rectum†	3,218	2,849	2,706	2,944	3,059	3,231	2,926	3,007	3,127	3,134
Tongue	2,826	4,064	2,068	924	2,117	2,527	2,194	2,198	1,638	1,698
Lung‡	522	1,448	2,146	750	706	704	798	1,735	546	849
Larynx	1,305	1,915	1,740	1,732	1,804	1,698	1,463	1,928	993	457
Bladder	826	514	503	1,097	706	538	1,130	1,234	596	653
Prostate	565	981	657	693	863	828	798	694	596	849
Other sites	10,219	13,312	11,734	11,257	9,568	9,817	8,245	9,138	9,232	8,031
Women										
Average population 1921–30, ages 45–64	26,527	24,914	52,429	17,679	15,270	25,362	15,411	28,220	21,015	14,997
Site Stomach	2,714	4,897	4,749	3,903	6,614	5,796	6,035	5,599	6,091	6,268
Oesophagus	565	602	629	622	524	552	454	638	809	1,000
Colon*	3,544	3,492	3,071	3,281	4,126	3,391	3,634	3,083	2,808	3,067
Rectum†	1,772	1,485	1,431	1,923	1,375	1,695	1,298	2,055	1,570	1,667
Breast	6,597	5,740	6,752	6,448	7,793	5,205	5,905	5,882	5,710	6,201
Uterus	6,899	6,623	6,542	8,145	6,090	7,531	8,371	6,520	7,185	6,601
Ovaries	1,433	1,325	1,087	1,244	1,441	1,301	908	1,028	809	1,267
Other sites	5,692	6,222	6,866	6,901	6,090	6,742	5,061	6,768	6,091	6,335

* Including all intestine other than duodenum and rectum. † Including anus. ‡ Including pleura.