The future burden of cancer in London compared with England

Victoria H. Coupland[1], Catherine Okello[1], Elizabeth A. Davies[1], Freddie Bray[2], Henrik Møller[1]

[1]King's College London, Thames Cancer Registry, 42 Weston Street, London SE1 3QD, UK
[2]Cancer Registry of Norway, Montebello, N-0310 Oslo, Norway
Address correspondence to Victoria H. Coupland, E-mail: victoria.coupland@kcl.ac.uk

ABSTRACT

Background The future burden of cancer in England is predicted to increase by 33% by 2020. Those planning health services are often interested in predictions at a local level. This study aimed to estimate the future burden of cancer in London and compare this with estimates for England.

Methods Predictions for London were based on cancer registration data (1985–2003) and population projections up until 2024. The number of future cases and age-standardized incidence rates (ASRs) were projected using an age–period–cohort model developed for the analysis of cancer trends and projections in the Nordic countries. Estimates for England were taken from an earlier publication.

Results In London, ASRs for all cancers (excluding non-melanoma skin cancer) decreased for both sexes, whereas in England, ASRs decreased in males and increased slightly in females. In London, the number of cases for both sexes is predicted to increase from ∼27 000 in 2002 to ∼28 500 in 2022, an increase of 5%. In England, a greater increase is predicted, from ∼224 000 in 2001 to ∼299 000 in 2020, an increase of 33%.

Conclusions Projections of the future burden of cancer are particularly sensitive to demographic population trends. They are likely to be different for cities compared with rural areas or entire countries.

Keywords cancer burden, England, epidemiology, incidence, London, predictions

Introduction

Møller *et al.*[1] estimated the future burden of cancer in England using a method that was developed and validated in the Nordic countries.[2,3] The study found that the age-standardized incidence rates (ASRs) for all cancers combined (excluding non-melanoma skin cancer) were not predicted to change substantially by 2020. However, for all cancers combined, the number of cases was predicted to increase from ∼224 000 in 2001 to ∼299 000 in 2020, an increase of 33%. The predicted increase in the number of new cases was greater in males than females, rising in men from ∼111 600 to 152 400 (36%) and in women, from ∼112 500 to 146 500 (30%) in 2020. The study found that these increases were primarily a result of population growth and ageing.

Commissioners and providers of services for cancer diagnosis and treatment are interested in the future burden of the disease in terms of the predicted number of new cases. Information on these numbers is important in order to plan the future provision of such services. Those involved in providing cancer care are also increasingly interested in the future burden in smaller geographical areas to help them organize and tailor their services to local needs. Large cities such as London tend to differ in demographic composition and population dynamics relative to rural areas or whole countries.

Victoria H. Coupland, Information Analyst
Catherine Okello, Information Analyst
Elizabeth A. Davies, Medical Director and Senior Lecturer in Cancer and Public Health
Freddie Bray, Epidemiologist
Henrik Møller, Director and Professor of Cancer Epidemiology

This study aims to predict the future ASRs and numbers of new cases of cancer within London (the London Government Office Region) up until 2024. A second objective is to determine whether the increase in the future burden of cancer in the capital is similar to that predicted in England.

Methods

In the UK, cancer registries record the occurrence of new cases of cancer in their residential populations. Between 1985 and 2004, the Thames Cancer Registry (TCR) covered a population of 14 million people living in an area of South East England including London, Essex, Hertfordshire, Kent, Surrey and Sussex. Cancer registrations at the TCR are initiated by pathology and clinical information received from hospitals. Information about death is provided by the National Health Service Register through the Office for National Statistics. Trained data collection officers seek information from the medical records on demographic details and disease characteristics. Data are added to a central database that is quality-assured and updated continuously.

Data on cancer cases diagnosed between 1985 and 2003 within the London Government Office Region were extracted from the TCR database. Data were aggregated into 5-year age groups and 5-year periods of diagnosis (1985–89, 1990–94, 1995–99 and 2000–03), the last period being only 4 years due to a lower ascertainment of cases in 2004 at the time of extraction. Cancer sites were identified on the basis of ICD-10 diagnosis codes and combined into 21 groups. The remaining cancer sites were grouped into an 'other' category. Population figures between 1985 and 2003 were obtained from the Office for National Statistics. Future population projections from 2005 to 2024 were obtained from the Greater London Authority.[4] Data were grouped into four quintiles of future populations (2005–09, 2010–14, 2015–19 and 2020–24) and into 5-year age groups by sex. The 5-year periods were represented by their mid-year: 2007, 2012, 2017 and 2022.

The future cancer rates and numbers of cases in London were estimated using a method that was developed in a comprehensive and systematic analysis of cancer trends in the Nordic countries.[2,3] Møller *et al.* used the long data series in the Nordic countries to develop a large number of predictions of present rates as would have been forecast 20 years ago, and compared the predicted rates with those actually observed. The authors identified a set of analysis options that tended to give the most accurate predictions. The London analysis adopts the Nordic method of estimation and the standard set of recommendations with very few modifications. It makes no assumption about changes in exposure to risk factors, but relies entirely on the extrapolation of the recorded rates in the past. The extrapolation of trends of cancer rates into the future can be considered a necessary proxy for the changing prevalence and distribution of risk factors, given that the determinants of most cancers, where established, are neither singularly powerful enough to model directly nor available at the prerequisite level of detail required.

The same method was used to predict the future burden of cancer in England and is described in more detail elsewhere.[1] Briefly, the predicted burden of cancer was measured by the numbers of cancer cases in future calendar periods and calculated by first projecting the observed cancer incidence trends, then multiplying these predicted incidence rates by the population forecasts in the prediction periods.

Similar to the England study,[1] cancers of the prostate and bladder were not based on extrapolation of past incidence trends, but on assuming that the rates observed in the most recent period, 2000–03, would remain unchanged in future periods. Extrapolation of trends could not be justified given the recent artefactual changes in these sites that would indicate the observed trends were not likely to continue into the future.

Prior to 1985, the TCR did not register cases for the whole of London and consequently it was not possible to cover the same 5-year periods as used in the national analysis. Therefore, although both the England and London results are displayed in 5-year periods, they are set 1 year apart and hence the differences in dates between the latest empirical period and the latest prediction period.

Results

The number of cases of all cancers combined (excluding non-melanoma skin cancer) increased in both London and England, although to a greater extent nationally. In London, the number of cases was predicted to rise from ∼27 000 in 2002 to ∼28 500 in 2022. This was an overall increase of 5% for both sexes combined; an increase of 8% for males and 2% for females (Table 1). In England, cases were estimated to increase from ∼224 000 in 2001 to ∼299 000 in 2020, an overall increase of 33%, representing an increase of 36% among males and 30% among females (Table 1).[1]

For the majority of cancer sites, an increase in the number of cases from the latest empirical period to the latest future period is predicted in both London and England. For a few sites—including cancers of the cervix, stomach and brain—a decrease in the number of cases in females is predicted. For cancer of the stomach in males,

Table 1 Current and future cancer incidence in males and females in England and London with their corresponding percentage change in incidence

ICD-10 code	*Cancer type*	*Males*						*Females*					
		England			*London*			*England*			*London*		
		Number of cancer cases in 2001[a]	*Number of cancer cases in 2020*[b]	*Change overall (%)*[c]	*Number of cancer cases in 2002*[a]	*Number of cancer cases in 2022*[b]	*Change overall (%)*[c]	*Number of cancer cases in 2001*[a]	*Number of cancer cases in 2020*[b]	*Change overall (%)*[c]	*Number of cancer cases in 2002*[a]	*Number of cancer cases in 2022*[b]	*Change overall (%)*[c]
C00–C14	Lip, mouth, pharynx	2624	4584	75	359	573	60	1458	2290	57	195	276	41
C15	Oesophagus	3771	5974	58	419	575	37	2293	2770	21	249	259	4
C16	Stomach	4780	5046	6	524	473	−10	2649	2468	−7	311	250	−20
C18	Colon	8872	11 692	32	945	1008	7	8746	9786	12	962	896	−7
C19–C21	Rectum	6468	9842	52	656	841	28	4503	6090	35	511	656	28
C25	Pancreas	2852	4198	47	369	457	24	3022	3683	22	385	390	1
C33, C34	Lung	18 495	18 519	0	2264	2016	−11	12 004	13 600	13	1480	1310	−11
C43	Melanoma	2629	4942	88	244	350	44	3377	5608	66	297	355	19
C50	Breast							34 636	49 743	44	4151	4412	6
C53	Cervix uteri							2420	2123	−12	294	235	−20
C54	Corpus uteri							4684	7149	53	535	674	26
C56, C57	Ovary							5612	6933	24	641	634	−1
C61	Prostate[d]	24 717	36 703	48	3004	3495	16						
C62	Testis	1600	2332	46	199	221	11						
C64–C66	Kidney	3199	4790	50	349	404	16	1967	2955	50	205	257	25
C67	Bladder[d]	6394	9547	49	673	796	18	2582	3266	26	261	275	6
C71	Brain	2033	2414	19	254	263	4	1501	1448	−4	175	143	−18
C81	Hodgkin lymphoma	690	939	36	107	123	15	497	636	28	77	89	15
C82–C85	NHL	4237	6748	59	538	573	7	3681	5757	56	472	561	19
C88, C90	Myeloma	1701	2954	74	227	291	28	1480	2006	36	182	192	5
C91–C95	Leukaemia	3084	4687	52	430	549	28	2409	3080	28	315	308	−2
	Other sites	13 493	16 470	22	2170	1780	−18	12 956	15 107	17	1916	1647	−14
C00–C97 (excl C44)	All excluding NMSC[e]	111 639	152 381	36	13 729	14 789	8	112 477	146 500	30	13 613	13 819	2

England figures are taken from Møller *et al.*[1]

[a]Average annual incidence as recorded 2000–03 in London and 1999–2003 in England.

[b]Average annual incidence as predicted 2020–24 in London and 2019–23 in England.

[c]% change in the number of new cases predicted for 2020–24 compared with 2000–03 in London and 2019–23 compared with 1999–2003 in England.

[d]Incidence rates were assumed to remain constant for prostate and bladder cancer.

[e]All cancers excluding non-melanoma cancers of the skin; numbers and proportional changes based on specific cancer sites.

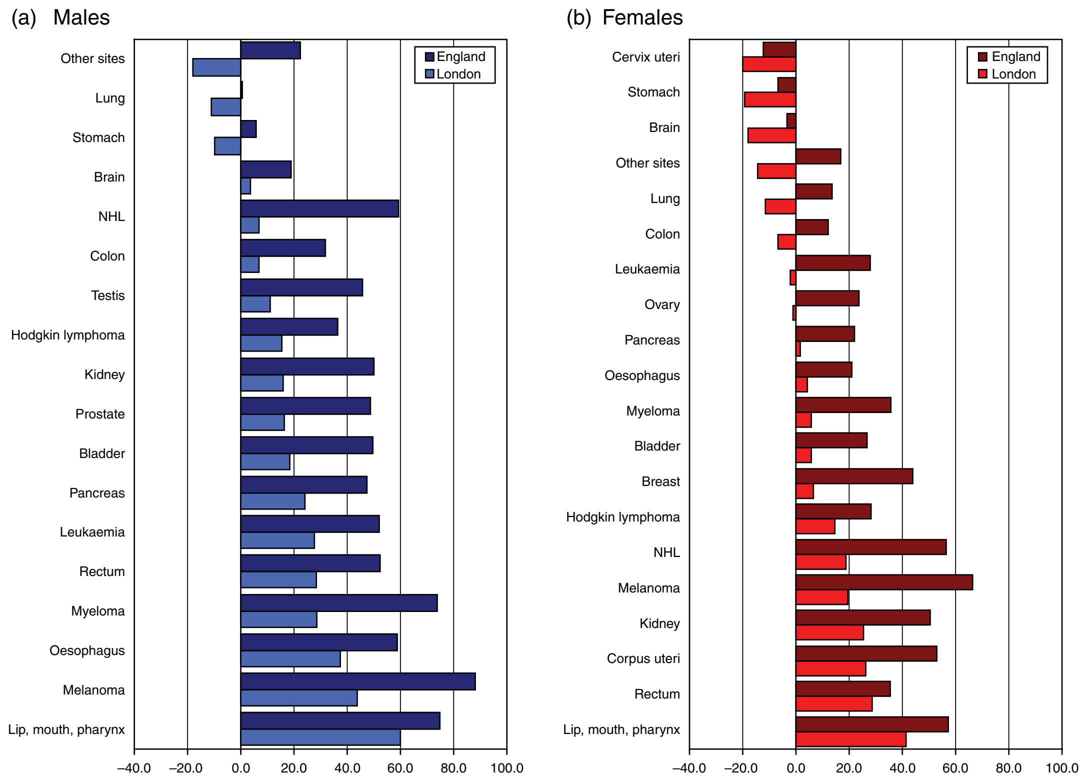

Fig. 1 Percentage change in the number of cases for males and females in London and England. England figures are taken from Møller *et al.*[1] This figure appears in colour in the online version of the Journal of Public Health.

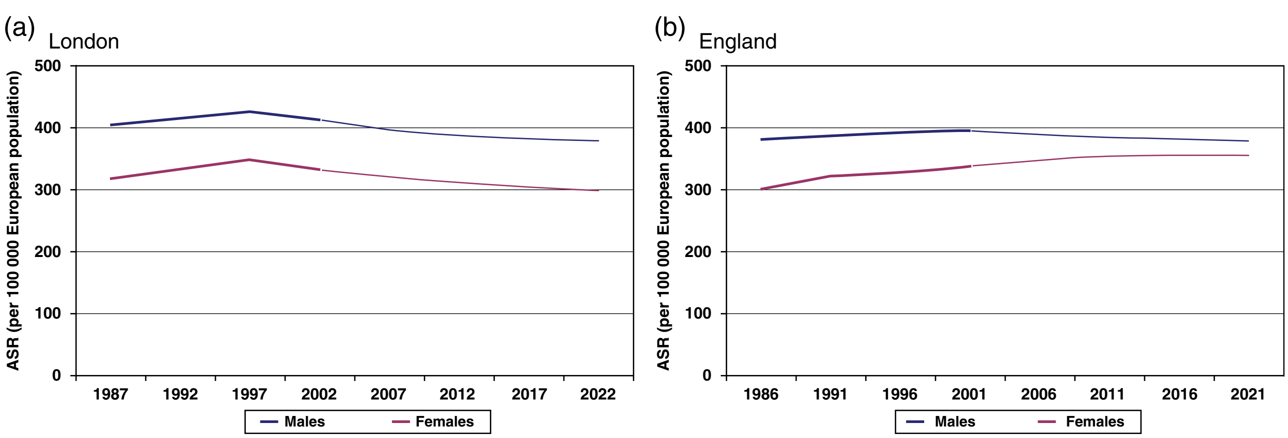

Fig. 2 Age-standardized rates for males and females in London and England. England figures are taken from Møller *et al.*[1] This figure appears in colour in the online version of the Journal of Public Health.

and cancer of the ovary, colon, lung and leukaemia in females, the number of cases is predicted to decrease in London, but increase in England (Fig. 1).

For all cancers combined (excluding non-melanoma skin cancer), ASRs were not predicted to change substantially. However, in London, the ASRs are predicted to decrease in both sexes (Fig. 2), whereas in England, age-standardized rates are predicted to decrease in males but increase slightly in females. Age-standardized rates for individual cancer sites followed similar trends in both England and London (data not shown).

Figure 3 shows the size and age composition of the actual and the forecasted populations for both London and England. The London population is estimated to increase in

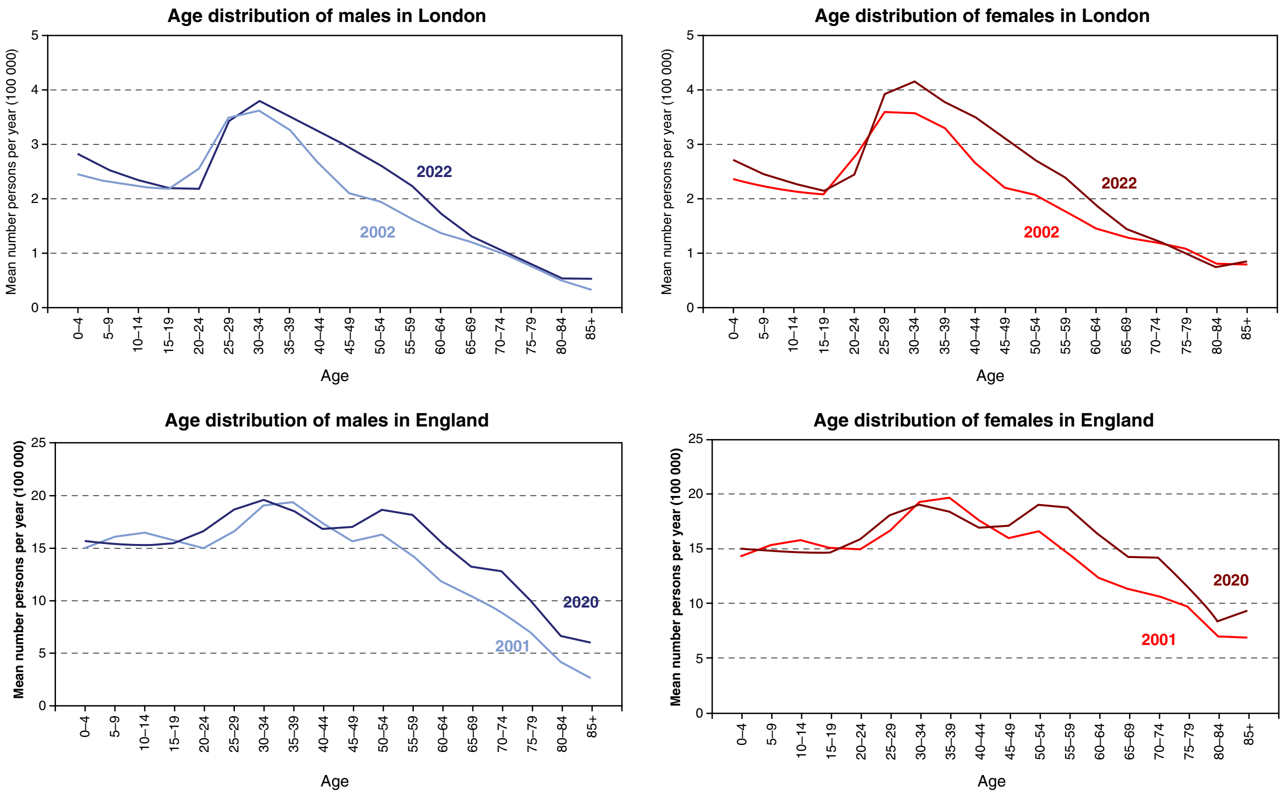

Fig. 3 Age distribution of current and forecasted population for males and females in London and England. England figures are taken from Møller *et al.*[1] This figure appears in colour in the online version of the Journal of Public Health.

the middle-aged (30–69) groups between 2002 and 2022, whereas the proportion of those aged over 65 in 2022 is predicted to remain at similar levels to that observed in 2002. In England, an increase in the middle to older age groups from 40 years onwards is forecasted in both males and females (Fig. 3).

Discussion

Main findings of this study

This study shows that the future burden of cancer within London is different from that predicted for the country as a whole. The number of cases was predicted to increase in London from ∼27 000 in 2002 to ∼28 500 in 2022, an increase of 5% (8% in males and 2% in females). At the national level, the number of cancer cases was also predicted to increase, but to a greater extent, increasing from ∼224 000 in 2001 to ∼299 000 in 2020, an overall increase in England of 33% (36% in males and 30% in females). The contrasting levels of increase in incidence points primarily to a differential in the underlying demographics between the capital and the nation. The proportion of older people (aged over 65) in 2022 within London is predicted to be at similar levels to those observed in 2002, whereas in England, the population in these older age groups is predicted to increase. Cancer predominately affects older people; ∼74% of new cases each year occur in people aged over 60.[5] Thus, projections of the future burden of cancer are particularly sensitive to differing demographic population profiles and trends.

The ASRs for all cancers combined in both London and England were not predicted to change substantially in the next 20 years. In London, however, the age-standardized rates were predicted to decrease in both sexes, whereas in England, they were predicted to decrease in males but increase in females. Trends by cancer site were similar in both study populations.

For the majority of cancer sites, an increase in the number of cases is predicted in both London and England, whereas for a few sites, decreases are predicted in both study areas. For leukaemia as well as colon, lung and ovarian cancer, in females, and stomach cancer among males, however, the number of cases is predicted to decline in London but increase in England.

What is already known on this topic

Most of the research in this area predicts the future burden of cancer in terms of ASRs and the number of new cases at a national level. Many such studies have predicted an increase in the number of new cases of cancer in the future.[1,6,7] Very little has been previously published on cancer predictions specifically in urban populations.

What this study adds

This study suggests that commissioners and providers of cancer services in London will have to plan for a modest increase in terms of the number of new patients compared with the country as a whole. This may indicate less demand and pressure on screening, diagnostic and treatment services. However, the predictions are only based on London residents and do not take into account individuals who live elsewhere, but who receive treatment in London. This factor will have an important impact on the demand for London-based services.

The population composition of London is very different from that of England as a whole. London is the most ethnically diverse part of the UK.[8] Higher proportions of some groups, for example, 78% of Black African, 61% of Black Caribbean and 54% of Bangladeshi people lived in the city in 2001.[8] This is likely to have important implications for the future provision of cancer services. Even though services may not require great increases in capacity, they will have to be responsive to the needs of different populations accessing services as they age.

London has over a quarter (28.4%) of its statistical 'lower super output areas' in the most deprived quintile in England.[9] Some cancers such as cancer of the cervix, lung, stomach and oesophagus are associated with deprivation and have higher rates in the most deprived areas, whereas others have higher rates in the more affluent areas such as cancer of the breast, and melanoma of the skin.[10] Thus, tackling inequalities in cancer incidence as well as cancer outcomes is likely to be an important issue as highlighted by the recent Cancer Reform Strategy.[11]

Uptake of both cervical and breast screening in London is lower than many areas in England as a whole.[12,13] Additionally, in 2004, a survey of patients with breast, lung, bowel or prostate cancer found that patients in London reported a poorer experience of cancer services compared with those in other regions within England. Patients in London were less positive in their response to over 75% of the questions, and this persisted after adjustment for age, gender and cancer type.[14] Patients living in London were more likely to state that their GP care was poor (12% in London versus 6% elsewhere), felt that they received less written information at diagnosis (57% versus 64%), had less confidence and trust in their outpatient doctor (78% versus 85%), and felt that their condition got worse while waiting to see a specialist (27% versus 19%).[14] Thus, more effort could be put on prevention, screening and improving diagnostic, treatment and supportive and palliative care services within the city than on greatly increasing the capacity of existing services.

Limitations of this study

Trends-based predictions always carry with them some uncertainty as they depend on the assumption that the past time trends will continue into the future. Predicted ASRs and numbers of new cases may be too high or too low compared with the recorded figures observed in future periods. However, the model used in this paper has been tested and validated in the Nordic countries and a set of conditions found to produce the most accurate predictions has been applied.[2,3]

Trends in incidence rates tend to be fairly constant over time, although occasionally large step changes may occur. Sudden changes in rates from year to year most likely arise from artefacts in the data resulting, for example, from a change in coding of a particular cancer, past problems of incomplete cancer registration or the introduction of new diagnostic tests leading to increased frequency of diagnosis. This can make projections of some specific cancer sites, such as prostate and bladder cancer, very difficult. The former is very strongly influenced by the increased use of prostate-specific antigen testing and the latter is sensitive to the changing classification of bladder neoplasms. Projections for these cancers were therefore based on the assumption that the rates in the latest calendar period would remain constant into the future. Consequently, a main limitation of this study is the difficulty in predicting the future burden for these two cancer sites, particularly that of prostate cancer.

The number of new cancer cases in the future will be influenced by screening. Cancer screening advances the time of cancer diagnosis and hereby transiently increases the incidence rate in the population. More permanently, cancer screening also leads to the diagnosis of slow growing tumours that would never have become symptomatic or resulted in death in the patient's lifetime. A Swedish study suggested that there was a 10% over-diagnosis rate of breast cancer 15 years after the end of a screening trial in Malmö.[15] Other studies have suggested that the rate of over-diagnosis could be between 5% and 54%.[16,17] With respect to prostate cancer, modelling studies in the USA and the UK have suggested potential rates of over-diagnosis between 15% and 56%.[18,19] Therefore, the future cancer burden will be affected by changes in the intensity of screening, and its uptake in the general population, and if such changes occur, the estimates presented in this paper could be either too high or too low.

Finally, both the London and England predictions[1] make the strong assumption that past trends will continue into the future along the dimensions of calendar period and birth cohort. Additionally they depend on the size and age composition of the forecast population. In London, this is dependent on estimated rates of births, deaths, migration and housing projections, and consequently is also based on its own set of specific and local assumptions.[4] Whether these assumptions are justified can only be decided at a later time when the projections of today are compared with the future reality.

Conclusions

In summary, this study suggests that in both London and England, the number of cases of cancer will increase, but to a greater extent nationally. This finding points primarily to differences in the underlying demographics between the capital and the nation. Commissioners and providers of cancer services in the city may therefore have to plan for a more modest increase in the number of new cases. However, the population composition in London is very different from the whole nation and although services may not require great increases in capacity, they will have to be responsive to the needs of different populations accessing their services as they age.

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