Office for National Statistics

Statistical bulletin

Cancer survival in England: Patients diagnosed between 2010 and 2014 and followed up to 2015

1-year, 5-year and 10-year net survival for adults in England diagnosed with 1 of 24 common cancers between 2010 and 2014 and followed up to 2015.

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1 . Main points

Among the 24 cancers examined here, 1- and 5-year survival was highest for testicular cancer in men and melanoma of the skin in women. Survival for pancreatic cancer was the lowest at 1 and 5 years for men and women.

10-year survival predicted for patients who would be diagnosed in 2015 was highest for melanoma of the skin and lowest for leukaemia in both sexes.

The largest difference in 1-year survival between men and women was for bladder cancer, where 78.0% of men were expected to survive at least 1 year, compared with 66.9% of women.

5-year survival remains below 25% for cancers of the brain, liver, lung, mesothelioma, oesophagus, pancreas and stomach.

5-year survival is above 80% for breast cancer (women), testis and prostate cancer, and for thyroid cancer, Hodgkin lymphoma and melanoma of the skin in both sexes.

For 16 of the 24 cancers, 1-year survival for patients diagnosed between 2010 and 2014 was slightly higher than for the overlapping period 2009 to 2013 in at least 1 of the sexes. Differences in survival are mostly small, because many patients are included in both analyses.

Cancer survival is usually higher for younger patients. Two well-known exceptions are breast cancer in women, and prostate cancer, for which 1-year and 5-year survival are higher among some of the older age groups than the youngest age groups. This pattern was consistent for predicted 10-year survival.

2 . Summary

This bulletin presents estimates of 1-year and 5-year net survival (%) for all adults (aged 15 to 99 years) diagnosed between 2010 and 2014 and followed up to 31 December 2015. Predicted estimates of 10-year net survival are also presented for patients who would be diagnosed in 2015. The estimates of 1-, 5- and 10-year survival are based on patients diagnosed with 1 of 24 common cancers in England. Taken together, these cancers comprise 91.1% of all newly diagnosed cancers (based on the number of cancer diagnoses in England [1]).

Data are presented for men, women and both sexes combined. Five of the cancers only occur in 1 sex (cervix, ovary, uterus, testis and prostate). We present survival for cancer of the larynx only in men, and for breast cancer only in women, because those 2 cancers are rare in the opposite sex. We report survival by age group and for all ages combined. To allow the comparison of survival between cancers with a different age profile, all-ages survival estimates are age-standardised. Confidence intervals are provided, to indicate the precision of the survival estimates.

We have published 1-year and 5-year survival in this bulletin for many years, but this is the first time that 10-year survival estimates have been presented, using the hybrid approach [2]. Results are only presented if sufficient data were available to make robust estimates of survival. Further information on the methods can be found in the Background notes [1].

3 . Collaboration

This publication is produced in partnership with the Cancer Research UK Cancer Survival Group at the London School of Hygiene & Tropical Medicine.

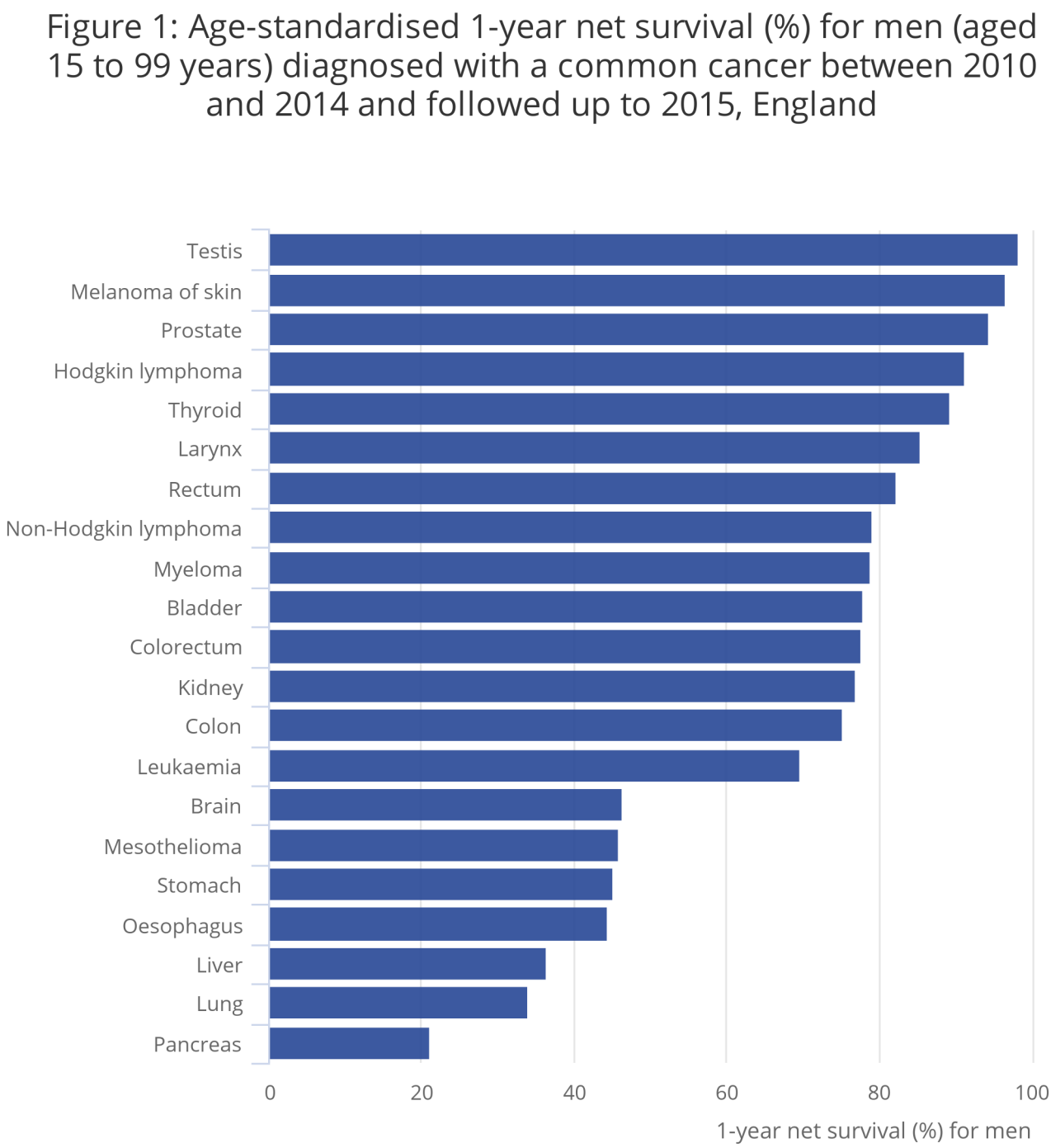
London School of Hygiene & Tropical Medicine

4 . 1-year survival

Age-standardised estimates of 1-year net survival are presented below for men (Figure 1) and women (Figure 2). 1-year survival was lowest for pancreatic cancer in both sexes, at 21.1% for men and 22.9% for women. The highest 1-year survival estimates were for testicular cancer and melanoma of the skin (women) at 98.4% for both.

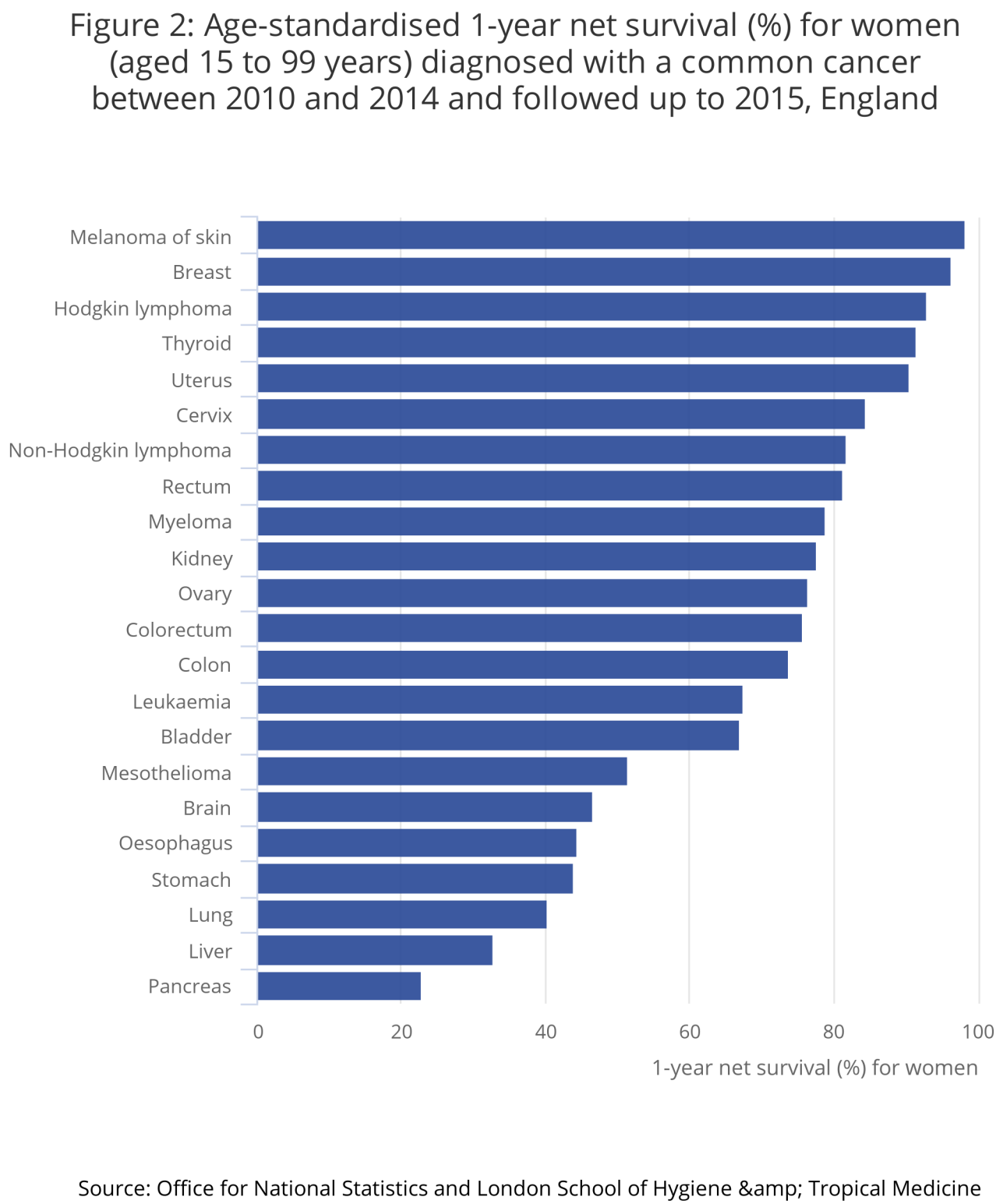
The largest difference[1] in 1-year survival between men and women is for bladder cancer (11.1%): 78.0% for men and 66.9% for women. This sex difference in bladder cancer survival has been reported worldwide, and a number of reasons such as tumour biology, sex hormones and earlier diagnosis in men have been suggested to explain the difference [3, 4].

Figure 1: Age-standardised 1-year net survival (%) for men (aged 15 to 99 years) diagnosed with a common cancer between 2010 and 2014 and followed up to 2015, England



Source: Office for National Statistics and London School of Hygiene & Tropical Medicine

Figure 2: Age-standardised 1-year net survival (%) for women (aged 15 to 99 years) diagnosed with a common cancer between 2010 and 2014 and followed up to 2015, England



Source: Office for National Statistics and London School of Hygiene & Tropical Medicine

1-year survival estimates for 2010 to 2014 were up to 2.2% higher than the corresponding figure for 2009 to 2013 in men (liver cancer increasing from 34.1% to 36.3%) and up to 1.5% higher for women (lung cancer increasing from 38.9% to 40.3%, and kidney cancer increasing from 76.2% to 77.6%) (dataset table 1).

Notes for 1-year survival

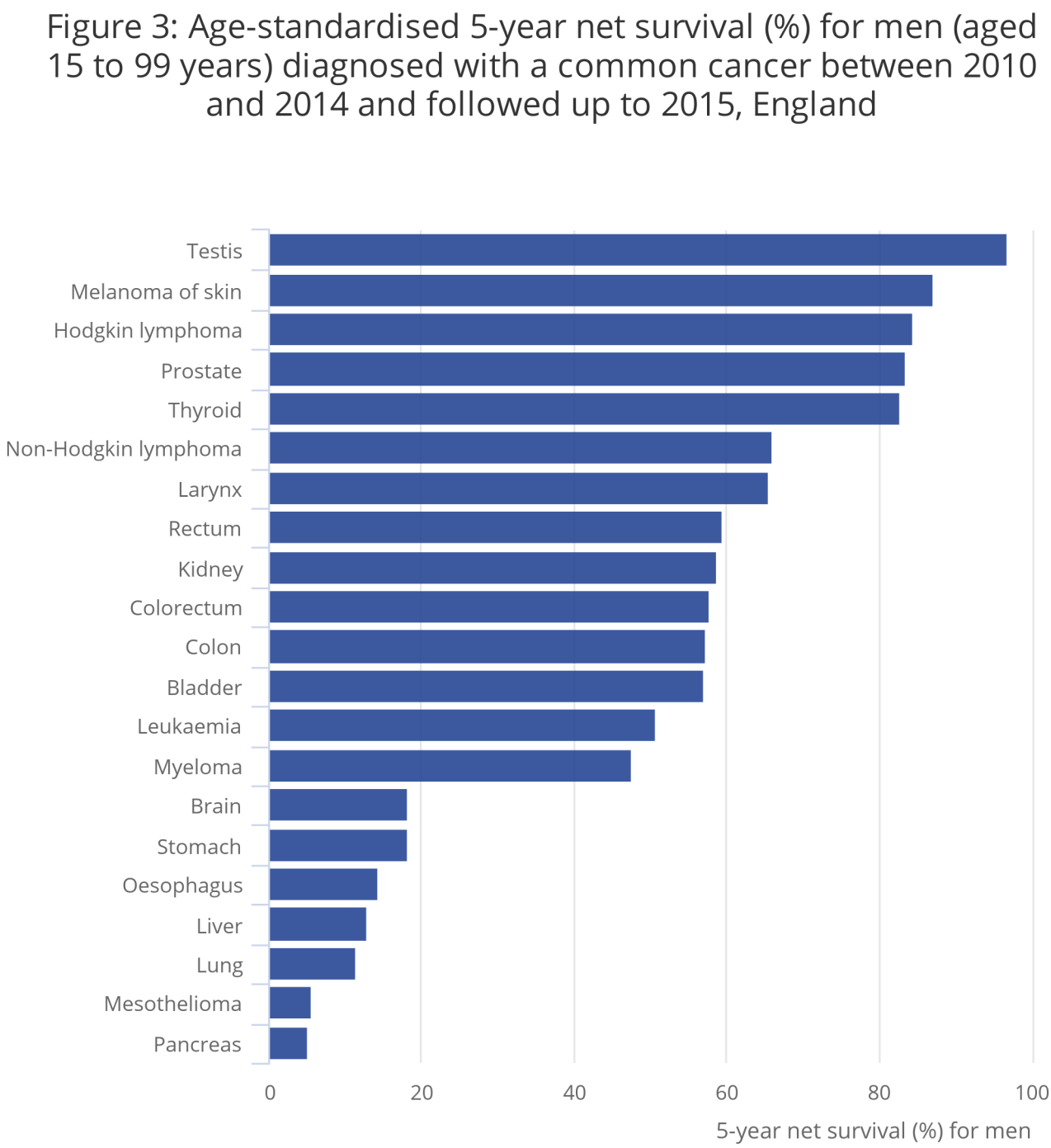
1. Differences are based on the exact survival estimates (see background note 9).

5 . 5-year survival

Figure 3 (men) and Figure 4 (women) show age-standardised 5-year net survival estimates, for adults diagnosed with 1 of the most common cancers between 2010 and 2014. Survival is below 25% for cancers of the brain, lung, oesophagus, liver, stomach, mesothelioma and pancreas in men and women. Survival estimates are above 80% for adults diagnosed with Hodgkin lymphoma, thyroid cancer and melanoma of the skin, and for breast cancer in women and testicular and prostate cancer in men.

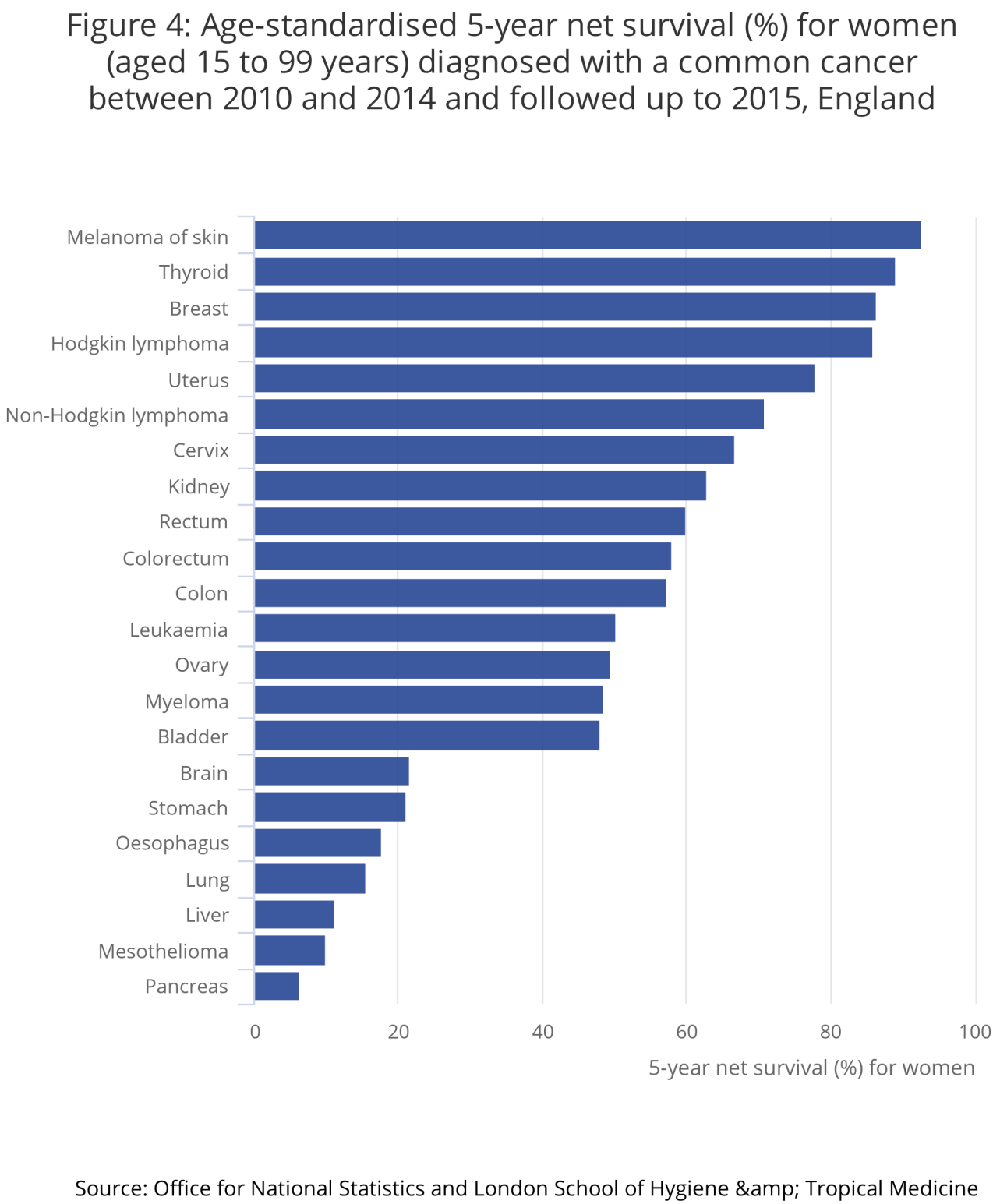
The lowest estimate of 5-year survival was for men (5.2%) and women (6.2%) diagnosed with pancreatic cancer. The highest 5-year survival estimate among men was testis (96.8%) and for women was melanoma of the skin (92.6%). In general, 5-year survival was higher for women than men – with the notable exception of bladder cancer, which has a 9.1% difference between men (57.1%) and women (48.0%).

Figure 3: Age-standardised 5-year net survival (%) for men (aged 15 to 99 years) diagnosed with a common cancer between 2010 and 2014 and followed up to 2015, England



Source: Office for National Statistics and London School of Hygiene & Tropical Medicine

Figure 4: Age-standardised 5-year net survival (%) for women (aged 15 to 99 years) diagnosed with a common cancer between 2010 and 2014 and followed up to 2015, England



Source: Office for National Statistics and London School of Hygiene & Tropical Medicine

5-year net survival estimates for 2010 to 2014 were up to 2.3% higher [1] than the corresponding figure for 2009 to 2013 in men (thyroid cancer increasing from 80.5% to 82.8%) and up to 2.1% higher for women (kidney cancer increasing from 60.8% to 62.9%) (dataset table 2).

For some cancers, 5-year survival estimates for 2010 to 2014 were slightly lower than for 2009 to 2013 (dataset table 2). For men, the largest decrease (1.4%) was for bladder cancer, from 58.6% down to 57.1%. For women, the largest decrease (1.7%) was for mesothelioma, from 11.7% to 10.0%.

Notes for 5-year survival

1. Differences are calculated using unrounded survival estimates (see background note 9).

6 . 10-year survival

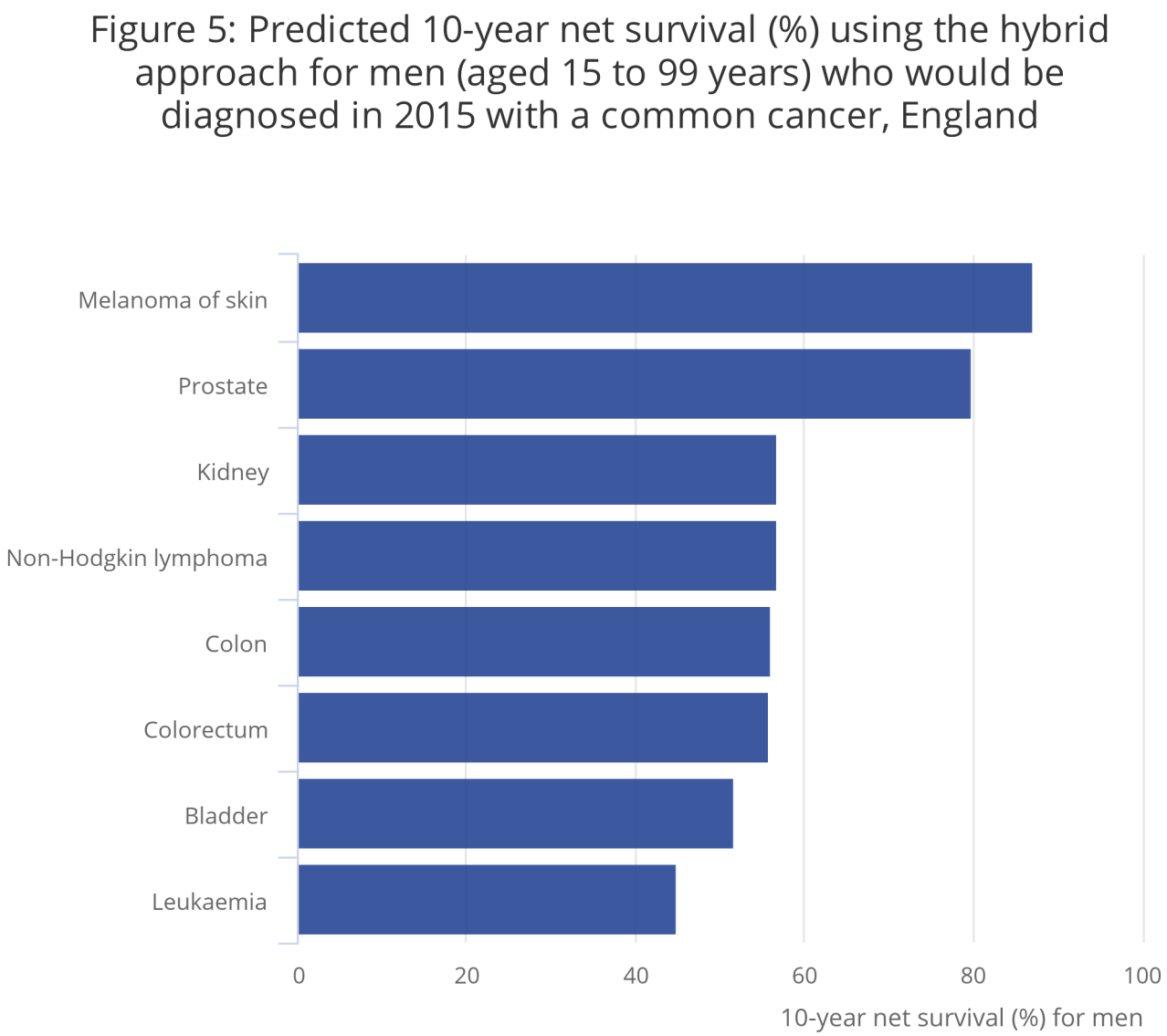
To respond to policy needs for estimates of long-term survival, 10-year survival estimates have been produced for the first time. To ensure that the 10-year estimates are timely they have been calculated using a predictive survival method. To complement and provide context for the 10-year estimates we have also provided 1- and 5-year survival estimates using the same method. Due to the predicted nature of these estimates, only cancer sites that produce robust results are included.

Figures 5 and 6 show predicted age-standardised net survival at 10-years for men and women who would be diagnosed in 2015. Survival is predicted for these patients because cancer incidence data for 2015 were not available at the time of the analysis. This is done using the hybrid approach [2]. 10-year survival can be predicted, assuming that the conditional probabilities of surviving for patients diagnosed in 2015 are equal to those diagnosed between 2005 and 2014 (the most recent data available). The predicted estimate is conservative in a situation where survival is improving.

For men, survival is above 50% for 7 of the 8 cancers (melanoma of the skin, prostate, kidney, non-Hodgkin lymphoma, colon, colorectal and bladder) for which sufficient data are available. Consistent with 5-year survival figures, we observe the highest survival for melanoma of the skin (87.2%). Leukaemia has the lowest 10-year survival estimates at 44.8%. In women, we see a similar pattern to men for 5 of the 6 cancers for which sufficient data were available. Melanoma of the skin, breast, cervix, kidney and colorectal cancer have a survival estimate that is greater than 50%, except leukaemia, where 10-year survival is 44.7%.

The greatest difference between men and women is observed for melanoma of the skin, with 10-year survival 4.3% lower for men (87.2% versus 91.5%).

Figure 5: Predicted 10-year net survival (%) using the hybrid approach for men (aged 15 to 99 years) who would be diagnosed in 2015 with a common cancer, England

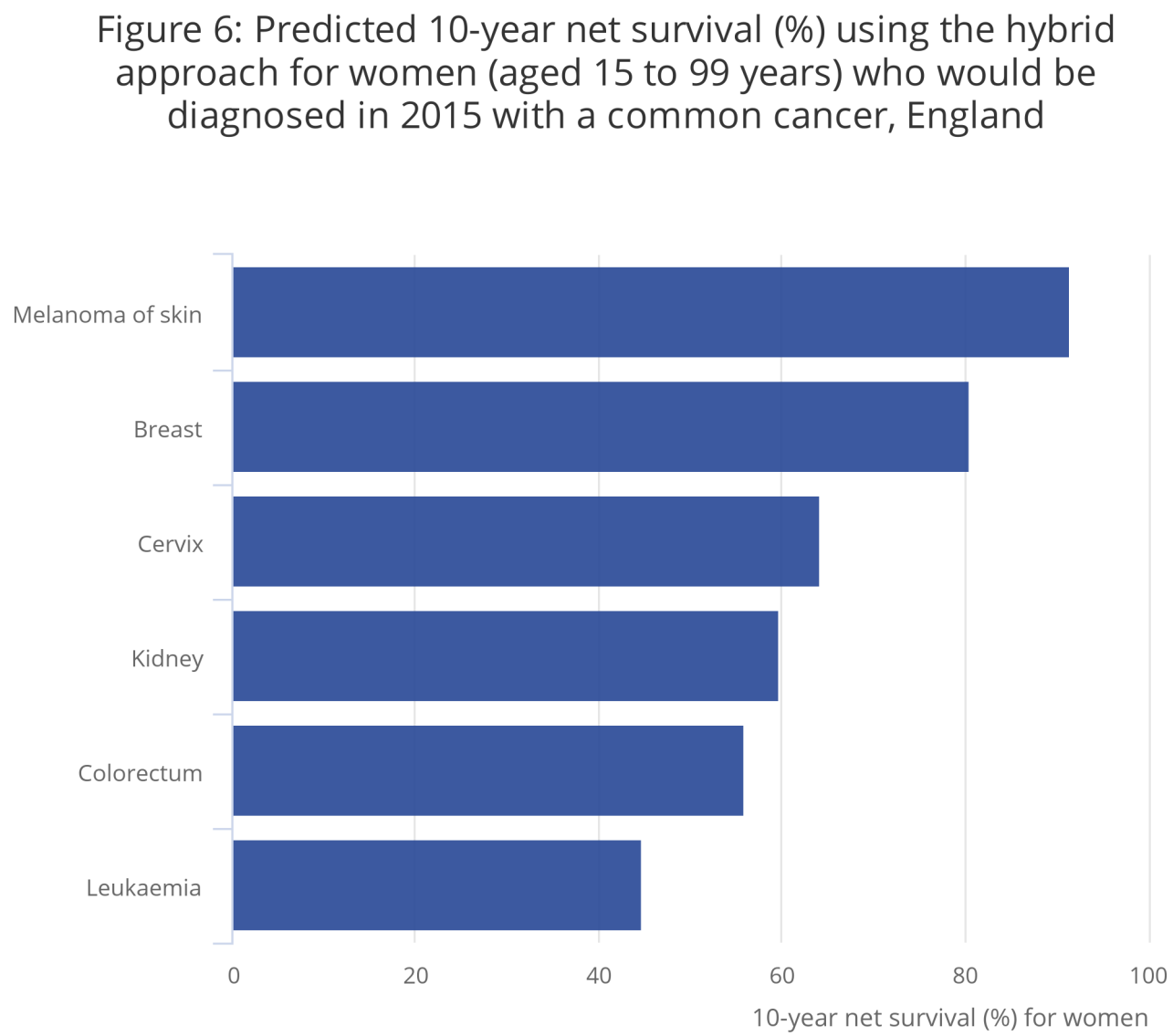


Source: Office for National Statistics and London School of Hygiene & Tropical Medicine

Notes:

1. Data for Hodgkin lymphoma, Mesothelioma and Brain, Larynx, Liver, Lung, Myeloma, Oesophagus, Pancreas, Rectum, Stomach, Testis and Thyroid Cancer are 'not available', because there was not sufficient data available to make robust estimates of survival.

Figure 6: Predicted 10-year net survival (%) using the hybrid approach for women (aged 15 to 99 years) who would be diagnosed in 2015 with a common cancer, England



Source: Office for National Statistics and London School of Hygiene & Tropical Medicine

Notes:

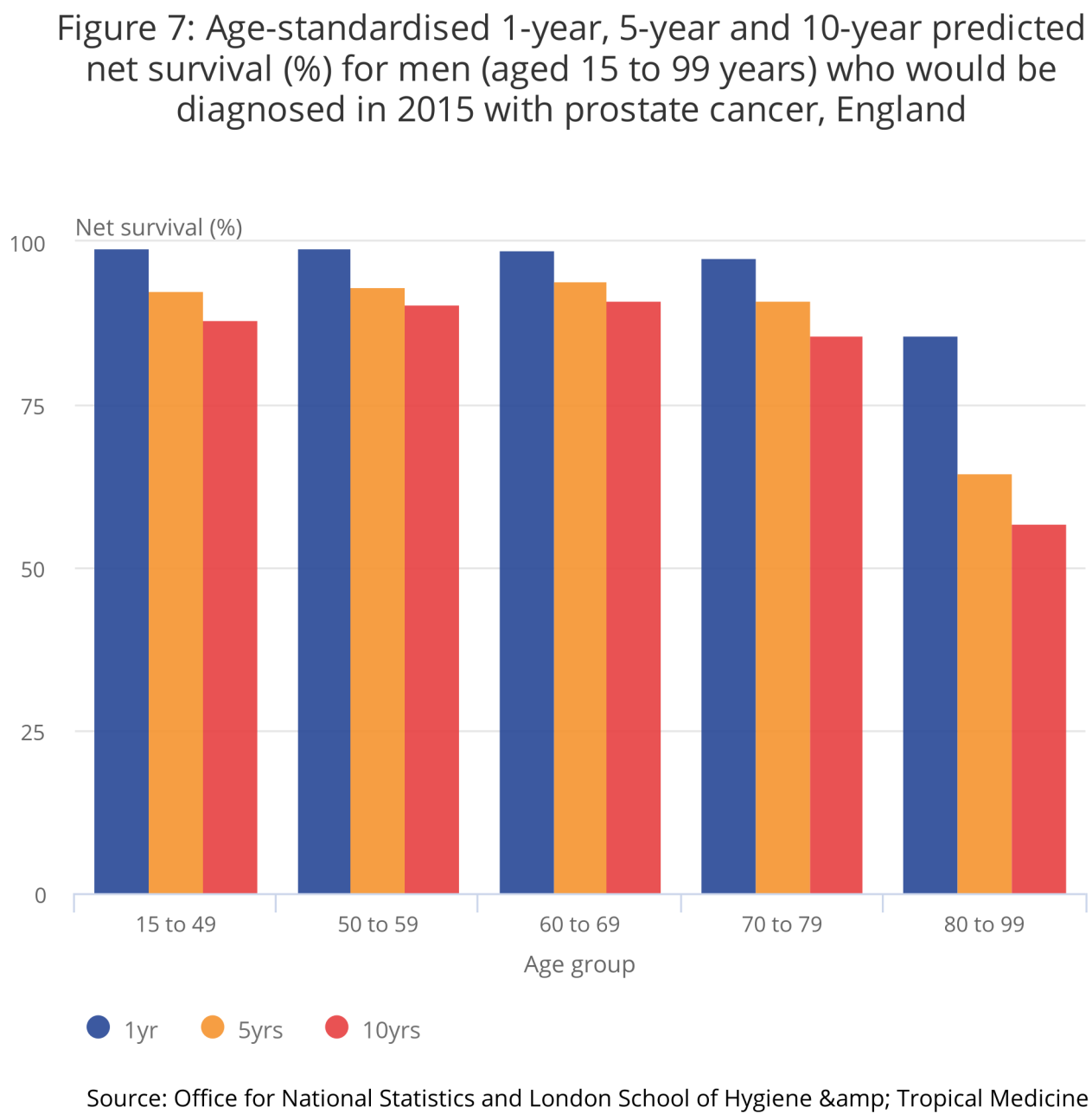
1. Data for Hodgkin lymphoma, Mesothelioma, Non-Hodgkin lymphoma, Bladder, Brain, Colon, Liver, Lung, Myeloma, Oesophagus, Ovary, Pancreas, Rectum, Stomach, Thyroid and Uterus Cancer are 'not available', because there was not sufficient data available to make robust estimates of survival.

7 . Predicted survival in each age group for patients diagnosed in 2015

Dataset table 5 presents age-specific predicted net survival at 1-, 5- and 10-years after diagnosis for each of the most common cancers. There are distinct patterns in survival by age group, with generally lower survival estimates among older patients, even after taking into account the fact that the elderly are also more likely to die of other causes. Two well-known exceptions to this pattern are prostate and breast cancer.

For instance, for prostate cancer (Figure 7), 5-year survival is slightly higher for men aged 50 to 69 years (ranging from 93.1% to 93.9%) than for men aged 15 to 49 years (at 92.6%). This trend remains consistent for 1- and 10-year survival. This may be partly due to more widespread (but not national) use of the prostate-specific antigen (PSA) test in older men.

Figure 7: Age-standardised 1-year, 5-year and 10-year predicted net survival (%) for men (aged 15 to 99 years) who would be diagnosed in 2015 with prostate cancer, England



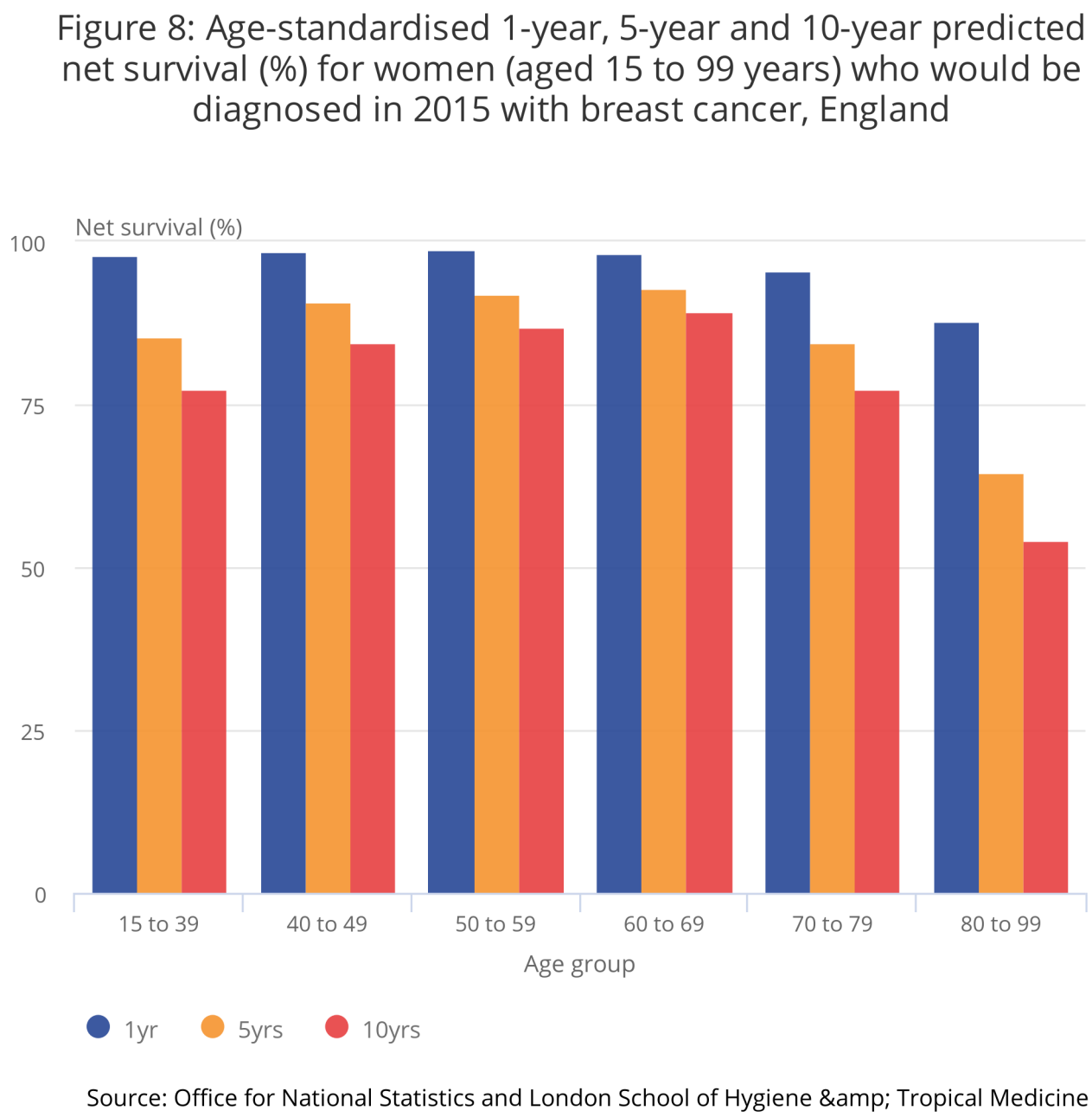
Source: Office for National Statistics and London School of Hygiene & Tropical Medicine

Notes:

1. The hybrid approach was used to calculate 1-year, 5-year and 10-year net survival.

A similar trend can be seen for breast cancer in 1-year, 5-year and 10-year survival estimates (Figure 8). Survival is higher for women aged 40 to 69 than for their younger peers (15 to 39 year olds). For example, 5-year survival is lower for women aged 15 to 39 years at diagnosis (85.5%) than for women aged 40 to 69 years (ranging from 90.7% to 93.0%). These differences are probably explained at least in part by breast screening for women aged 50 to 70, and by the National Health Service introducing an age extension trial in 2009 [5], where some younger women (aged 47 to 49 years) and some older women (aged 71 to 73 years) are invited for screening. The national breast cancer screening programme identifies cancer patients at an earlier stage than in older age groups [6]. Screening aims to detect a tumour at an earlier stage of cancer, which helps improve survival.

Figure 8: Age-standardised 1-year, 5-year and 10-year predicted net survival (%) for women (aged 15 to 99 years) who would be diagnosed in 2015 with breast cancer, England



Source: Office for National Statistics and London School of Hygiene & Tropical Medicine

Notes:

1. The hybrid approach was used to calculate 1-year, 5-year and 10-year net survival.

8 . International comparisons

Overall, cancer survival has been improving steadily in England but it is still lower than in comparably wealthy countries. Findings from the CONCORD-2 study have shown that 5-year survival for adult patients in England diagnosed between 2005 and 2009 with leukaemia and cancers of the stomach, colon, rectum, liver, lung, breast, cervix, ovary and prostate is still lower than in Australia, Canada, Denmark, Norway and Sweden [7]. A study [8] using more recent data has shown that England is not closing the international gap, with survival from cancers of the stomach, colon, rectum, lung and ovary remaining lower than, in particular, Australia, Canada, Norway and Sweden.

9 . Policy context

Health policymakers use population-based cancer survival statistics to plan services aimed at cancer prevention and treatment. Cancer survival estimates feed in to national cancer plans, such as Achieving world-class cancer outcomes: A Strategy for England 2015 to 2020 [9]. The report recommends 6 strategic priorities to help improve cancer survival in England by 2020.

Cancer survival estimates also feed into outcomes strategies that set out how the National Health Service (NHS), public health and social-care services will contribute to the progress agreed with the Secretary of State, in each of the high-level outcomes frameworks. The indicators set for the NHS Outcomes Framework 2015 to 2016 [10] include 1- and 5-year survival from colorectal, breast and lung cancers.

10 . Definition of cancers

Table 1: Codes in the International Classification of Diseases, tenth revision (ICD-10)

Table 1: Codes in the International Classification of Diseases, tenth revision (ICD-10)

Cancer	ICD-10 code
Bladder	C67
Brain	C71
Breast	C50
Cervix	C53
Colon	C18
Colorectum	C18 to C20, C21.8
Hodgkin lymphoma	C81
Kidney	C64 to C66, C68
Larynx	C32
Leukaemia	C91 to C95
Liver	C22
Lung	C33 and C34
Melanoma of skin	C43
Mesothelioma	C45
Myeloma	C90
Non-Hodgkin lymphoma	C82 to C85
Oesophagus	C15
Ovary	C56 to C57.7
Pancreas	C25
Prostate	C61
Rectum	C19 to C20, C21.8
Stomach	C16
Testis	C62
Thyroid	C73
Uterus	C54 and C55

Sources: World Health Organization. International Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) and International Classification of Diseases for Oncology, Second Edition (ICD-O). Geneva: World Health Organization.

11 . References

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13 . Quality and methodology

The Quality and Methodology Information documents contain important information on:

- the strengths and limitations of the data and how it compares with related data
- users and uses of the data
- how the output was created
- the quality of the output including the accuracy of the data

More information regarding these statistics can be found in the Quality and Methodology Information (QMI) report [17] for cancer survival. QMI reports are overview notes which pull together important qualitative information on the various dimensions of the quality of statistics as well as providing a summary of the methods used to compile the output.

14. Background notes

1. Net survival is the probability of survival derived solely from the risk of death from cancer, compensating for the risk of death from other causes (background mortality). Background mortality is accounted for through life tables [11] of all-cause mortality rates for the general population in England. For convenience, net survival is expressed as a percentage in the range 0 to 100%. We applied rules restricting the analyses to cancers and periods of follow-up for which sufficient data were available to make robust estimates of survival. This is because survival estimates are unstable when there are few patients at risk initially and when the number of patients at risk drops sharply over time. Survival at a certain time since diagnosis is only reported if at least 10 patients were alive at that time and if there were at least 5 events in either the years before or the years after; additionally, at least 1 event in the years before this time is required.

2. The “complete approach” to estimating survival is applied [12], including all patients diagnosed between 2010 and 2014. Survival is estimated using the Pohar-Perme estimator [13], which provides unbiased estimates of net survival at all ages. Survival is estimated using the publicly available stns algorithm [14] in STATA 14 software. Conversely, the hybrid approach is used for short-term predictions when the follow-up data are more recent than the data. It is effectively a hybrid of the complete and period approaches, in which the most recent follow-up data for up to 10 years are combined with follow-up data for the first few years after diagnosis from the most recent cohort for which such data are available. It provides more precise estimates, with narrower confidence intervals, because it includes additional subjects who contribute to the conditional probabilities of survival in the period immediately after diagnosis [18].

3. Net survival varies with age, and the age profile of cancer patients varies with time and between geographical areas. Estimates are age-standardised to allow for comparison over time and between different geographical areas. The weights used to age-standardise survival can be found in Coleman et al [15].

4. Confidence intervals (95%) can be found in the reference tables. A 95% confidence interval is a measure of the uncertainty around an estimate. It provides a range of values which contains the true population parameter with a 95% level of confidence.

5. All adults (aged 15 to 99 years) in England who were diagnosed between 2010 and 2014 with 1 of the 24 most common cancers as an invasive, primary, malignant neoplasm were eligible for inclusion in the analyses. Ineligible patients were those whose tumour was benign (not malignant) or in situ (malignant but not invasive) or of uncertain behaviour (uncertain whether benign or malignant), or for which the organ of origin was unknown. Details of the eligibility and exclusion criteria have been published [16].

6. Cancers were defined by anatomic site codes in the International Classification of Diseases, Tenth Revision (ICD-10) and by morphology and behaviour codes in the International Classification of Diseases for Oncology, Second Edition (ICD-O-2) (reference table 6).

7. The 2 changes implemented for the 2012 publication of the national cancer survival statistics have been maintained this year, namely:

   (i) Net survival, using an unbiased estimator [13], instead of relative survival.

   (ii) Patients with zero follow-up time are included: these are patients known to have died on the same day as they were diagnosed. Patients for whom a death certificate was the only information available are excluded, because the duration of their survival is unknown.

8. Data are presented for cancer of the colon and cancer of the rectum separately, and also combined (colorectal cancer).

9. Differences between any 2 survival estimates are taken as the arithmetic difference: for example, 12% is shown as 2% (not 20%) higher than 10%. Differences are based on the exact underlying survival estimates, but they are shown in the bulletin at 1 decimal place or integer.

10. When the data for this report were extracted for analysis on 18 April 2016, cancer registrations in 2014 were believed to be at least 99% complete, and each patient's vital status at 31 December 2015 was known for 99% of cancers registered between 2010 and 2014. As in other countries, cancer registration is a dynamic process; a small number of late registrations may arrive up to 5 years after the end of a given calendar period, whereas other registrations may be amended or deleted. The figure of 99% completeness is based on the average number of cases for the 3 previous years (2011 to 2013), including late registrations received after publication of the data for those years.

11. Further cancer statistics for the UK can be found through:

    - Information Services Division (Scotland)
    - Welsh Cancer Intelligence Surveillance Unit
    - Northern Ireland Cancer Registry

12. The UK Statistics Authority has designated these statistics as National Statistics, in accordance with the Statistics and Registrations Service Act 2007 and signifying compliance with the Code of Practice for Official Statistics. Designation can be broadly interpreted to mean that the statistics:

    - meet identified user needs
    - are well explained and readily accessible
    - are produced according to sound methods
    - are managed impartially and objectively in the public interest

Once statistics have been designated as National Statistics it is a statutory requirement that the Code of Practice shall continue to be observed.