



**Public health surveillance of cancer survival in the US and world-wide: the contribution of the CONCORD programme**

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## Public health surveillance of cancer survival in the US and world-wide: the contribution of the CONCORD programme

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### Abstract

CONCORD is a program for the global surveillance of cancer survival. In 2015, the second cycle of the program (CONCORD-2) established long-term surveillance of cancer survival world-wide, for the first time, in the largest cancer survival study published to date.

CONCORD-2 provided cancer survival trends for 25,676,887 patients diagnosed during the 15-year period 1995-2009 with one of 10 common cancers that collectively represented 63% of the global cancer burden in 2009.<sup>5</sup>

In this article, we summarise the past, describe the present and outline the future of the CONCORD program. We discuss the difference between population based studies and clinical trials, and we review the importance of international comparisons of population-based cancer survival. We focus on the US. We explain why population-based survival estimates are crucial for driving effective cancer control strategies to reduce the wide and persistent disparities in cancer survival between whites and blacks, which are likely to be attributable to differences in access to early diagnosis and optimal treatment.

## Introduction

The CONCORD programme started in the late 1990s, with the aim of monitoring population-based cancer survival world-wide.

The first CONCORD study<sup>1</sup> produced five-year survival estimates for almost 2 million patients diagnosed with breast, colorectal or prostate cancer during 1990-1994 and followed up to 1999. The data were provided by 101 cancer registries in 31 countries, 16 with national coverage. Global variation in survival was very wide. Survival was generally higher in North America, Australia and Japan, and in northern, western, and southern Europe, and lower in Algeria, Brazil, and eastern Europe. The CONCORD study covered 42% of the US population, and it provided the first population-based cancer survival estimates for 11 US states covered by the National Program of Cancer Registries (NPCR).

Two high-resolution studies were carried out<sup>2,3</sup> to explain the differences in survival for breast and colorectal cancers between Europe and the US. Detailed data on stage at diagnosis, investigation and treatment were collected directly from the original medical records for about 19,000 women with breast cancer and 12,500 adults with colorectal cancer. Differences in breast cancer survival between Europe and the US were mainly explained by lower survival in Eastern Europe, where low healthcare expenditure may have constrained the quality of treatment.<sup>4</sup> Differences in colorectal cancer survival between Europe and the US persisted into the late 1990s. They were probably attributable to earlier stage and more extensive surgery and adjuvant treatment in the US than in Europe.

In 2015, the second cycle of the program (CONCORD-2) established, for the first time, long-term surveillance of cancer survival world-wide; it is the largest cancer survival study published to date.

CONCORD-2 provided cancer survival trends for 25,676,887 patients diagnosed during the 15-year period 1995-2009 with one of 10 common cancers that collectively represented 63% of the global cancer burden in 2009.<sup>5</sup> The data were provided by 279 population-based cancer registries that covered a total population of 896 million people in 67 countries. In 40 of those countries, the cancer patient data provided 100% coverage of the national population. The CONCORD Working Group included almost 500 collaborators.

As a result, health ministers in 67 countries, home to two-thirds (4.8 billion) of the world's population, finally obtained cancer survival estimates that are methodologically rigorous and internationally comparable, to help them prioritise and formulate cancer control strategies.<sup>6</sup> For some countries, this was the first time such data had been available.

The US Centers for Disease Control (CDC) described CONCORD-2 as [the start of global surveillance of cancer survival](#),<sup>a</sup> with survival estimates *"that can be compared, so scientists can begin to determine why survival differs among countries. This could lead to improvements in cancer control programs."* In the US, the analyses included individual data for 9,815,173 cancer patients, provided by 44 population-based cancer registries in 37 states with a total population of 257 million, doubling the population coverage of the US in the CONCORD programme to 83%.

The world-wide results were striking. Age-standardised five-year net survival from colon, rectal and breast cancers had increased steadily in most developed countries up to 2009, reaching 60% or more in 22 countries for colon and rectal cancers, and up to 85% or more in 17 countries for breast cancer in women. For cancers of the liver and lung, however, 5-year survival was still below 20% everywhere. Striking rises in prostate cancer survival were seen

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<sup>a</sup> <https://www.cdc.gov/cancer/dcpc/research/articles/CONCORD-2.htm>

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3 in many countries, but survival still varied from less than 60% in Bulgaria and Thailand to  
4 95% or more in Brazil, Puerto Rico and the USA. Survival from cervical cancer also ranged  
5 widely, from below 50% to over 70%, and improvements since the late 1990s were generally  
6 small. For women with ovarian cancer, 5-year survival was above 40% in only 20 of the 67  
7 countries, including the USA. For stomach cancer, 5-year survival was very high in Japan  
8 and South Korea (54–58%), compared with less than 40% in all other countries. Oddly, 5-  
9 year survival from adult leukaemia in Japan and South Korea (18–23%) was lower than in  
10 most other countries. For acute lymphoblastic leukaemia in children, survival was less than  
11 60% in several countries, but close to 90% in Canada, the US and four European countries,  
12 suggesting major deficiencies in many countries in the management of what is now  
13 considered a largely curable disease.  
14

15 Alexander Langmuir, who founded CDC's epidemic intelligence service for communicable  
16 diseases more than 50 years ago, commented that "*good surveillance does not necessarily*  
17 *ensure the making of the right decisions, but it reduces the chances of wrong ones*".<sup>7</sup>  
18 Chronic diseases such as cancer have long since become the predominant causes of  
19 morbidity and mortality in the US. Alongside incidence and mortality, population-based  
20 cancer survival has become one of the key metrics of overall progress in cancer control.<sup>8</sup>  
21

22 For most of the ten malignancies examined in CONCORD-2, five-year net survival among  
23 patients diagnosed in the US up to 2009 was very high on a global scale. These figures are  
24 encouraging, but detailed examination of the data reveals wide differences in survival  
25 between blacks and whites, and to a lesser extent between US states and regions.  
26

27 This *Cancer Supplement* presents the results of further analyses of the US data from  
28 CONCORD-2. In particular, it provides survival estimates by race (black, white) and stage at  
29 diagnosis for nine solid tumours in adults, and for acute lymphoblastic leukaemia in children,  
30 in each of the 37 participating states, for patients diagnosed 2001-2009. Separate results for  
31 the main types of leukaemia in adults will be presented in other publications.  
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### 33 ***Clinical trials or population-based survival?***

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35 It is worth spending a moment to consider the contrast between the survival estimates  
36 derived from population-based cancer registries and those derived from randomised clinical  
37 trials, with which most clinicians will be more familiar. Randomised trials and population-  
38 based studies of cancer survival are both immensely useful, but they have very different  
39 purposes. As a consequence, they differ in design, execution and interpretation.  
40

41 Randomised clinical trials test the **efficacy** of a new surgical approach, radiotherapy  
42 regimen, systemic drug or drug combination. They are the gold standard method to assess  
43 whether a new treatment is better than the best treatment available to date. However, trials  
44 typically include **fewer than 10% of patients** with a specific cancer in a given country. They  
45 often exclude patients older than (say) 70 years of age, or with specific comorbidities, or with  
46 advanced disease. The clinicians conducting the trials are the most research-oriented, with  
47 access to the best available facilities. Treatment protocols are rigidly enforced. The  
48 outcomes most often measured are short-term differences in the median duration of  
49 disease-free survival, rather than longer-term estimates of overall survival.  
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51  
52 A report from the Institute of Medicine in 2010 commented that the system for conducting  
53 cancer clinical trials in the US was approaching a state of crisis.<sup>9</sup> More than 25,000 patients  
54 were being recruited into clinical trials each year, but that still represented less than 3% of all  
55 cancer patients. The report noted that substantial progress in clinical management of various  
56 cancers had been produced by NCI-sponsored trials, but also that only about 60% were  
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3 actually completed and published. More recently, the Cancer Moonshot<sup>b</sup> initiative set out to  
4 improve participation in clinical trials. This may lead to improvement in population-based  
5 outcomes if personalized cancer care and targeted therapies become available to a much  
6 higher proportion of cancer patients.  
7

8 By contrast, population-based cancer survival studies are the gold standard approach to  
9 assess the overall **effectiveness** of the entire health system in dealing with cancer.<sup>8</sup> Cancer  
10 survival estimates derived from population-based cancer registries include **all patients**  
11 **diagnosed with cancer** in a country or region, young and old, rich and poor, with or without  
12 serious comorbidity, and whether diagnosed at an early stage or with disease that is too  
13 advanced for any treatment of curative intent. They are diagnosed and managed in the  
14 entire range of healthcare facilities, with a wide range of treatment regimens, some of which  
15 may be unavailable to some patients contraindicated in others. Some patients will not  
16 adhere tightly to the treatment they are prescribed. Others may withdraw from treatment  
17 altogether if out-of-pocket payments are too expensive, or travelling or taking time off work is  
18 too difficult, or the side-effects of treatment are too severe.  
19

20 Differences in survival between study groups in a clinical trial are easily interpreted as being  
21 attributable to differences in the efficacy of the treatment regimens being compared, to the  
22 skill of the medical staff who designed the trial, and the rigour with which they delivered the  
23 protocol. By contrast, results from population-based studies are often profoundly  
24 misinterpreted.  
25

26 International differences in population-based cancer survival may be criticised by doctors in  
27 a country or region with lower survival, on grounds such as bad data, bias or incompetent  
28 analysis, or simply dismissed out of hand as flawed or unacceptable. The unspoken fear  
29 behind some of these criticisms is the implication that the doctors in the country with lower  
30 survival are somehow being judged as less competent. This concern is misplaced.  
31

32 No physician, surgeon or radiotherapist sees a representative sample of all cancer patients.  
33 The survival of patients seen by a single doctor, cancer team or hospital will thus rarely  
34 reflect the overall national picture. Patients whose disease is too advanced at diagnosis for  
35 surgery are more likely to be referred for radiotherapy. Survival estimates derived from a  
36 single hospital are subject to referral bias. For all except the most common cancers and in  
37 the largest hospitals, they are also affected by statistical instability.<sup>10</sup>  
38

39 Population-based cancer survival estimates differ in both purpose and scope from the  
40 survival estimates derived from clinical trials, or from the patients seen by an individual  
41 clinician, clinical team, or hospital. Population-based survival estimates are designed for  
42 public health surveillance, and to inform strategic policy-making on how to improve cancer  
43 management.  
44

45 Life expectancy at birth provides a useful analogy. It encapsulates the likely longevity of  
46 recently born baby, and it incorporates many factors that have affected recent mortality in  
47 children and young people, but also the current mortality patterns of people who were born  
48 as long as 80 or 90 years ago. Despite this complexity, trends and international comparisons  
49 in life expectancy are readily interpreted. Life expectancy is generally increasing, but sharp  
50 reductions have been seen as a result of war, the AIDS epidemic in Lesotho and South  
51 Africa,<sup>11</sup> and the relaxation of alcohol control policy in the former Soviet Union.<sup>12</sup> Similarly,  
52 population-based cancer survival trends encapsulate a wide range of factors, including the  
53 speed with which patients seek help when they have symptoms suggestive of malignancy,  
54 as well as the efficiency of primary care, the speed of referral to secondary care, access to  
55 health insurance, and the availability of staff and equipment to deliver a thorough  
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58 <sup>b</sup> <https://www.whitehouse.gov/CancerMoonshot>  
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3 investigation and prompt, optimal treatment. They also reflect the human and financial  
4 resources available in the health system, and the efficiency with which it is organised.  
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6 A simple thought experiment should suffice to prove this point. Even the most experienced  
7 oncological team would be unable to deliver the standard of care and the level of survival  
8 they can achieve in a developed country if they were transposed to a country where patients  
9 are seen in a hospital with no pathologist and no access to radiotherapy, where they may  
10 have had to travel for days to seek attention, and they cannot afford to return after the first  
11 surgical intervention, perhaps for vital follow-up care or chemotherapy. Seen in that context,  
12 the skills and competence of any one doctor or cancer team are part of a much wider  
13 system, in which many other elements contribute to the overall outcome for all cancer  
14 patients.  
15

16 That is why the CONCORD programme for the global surveillance of population-based  
17 cancer survival is useful. It provides internationally comparable data on cancer survival  
18 trends in many countries, and for most of the common cancers. It contributes vital  
19 information to public health programmes designed to improve cancer outcomes. This *Cancer  
20 Supplement* offers more detailed results for the US, by race and stage at diagnosis. The  
21 results are relevant for cancer patients and public health strategy for cancer control in each  
22 state.  
23

24 Studying how best to implement laboratory findings into clinical practice - “from the bench to  
25 the bedside” – may be characterised as early translational research. However, it is also  
26 important that effective new interventions identified in clinical trials become available to all  
27 patients for whom they are clinically appropriate. Public health research focusses on how  
28 best to deliver those gains as quickly as possible. This may be described as “late  
29 translational research”: from the paper to the people.  
30

### 31 ***The impact of the CONCORD programme*** 32

33 The US National Cancer Institute recognised the impact of CONCORD-2 in an [invited  
34 commentary](#) for *The Lancet*, noting that global analyses of cancer survival provide an  
35 opportunity for lessons from countries with successful cancer control initiatives to be applied  
36 to other regions.<sup>6</sup> The commentary added that the availability of better data “*provides a  
37 clearer picture of the effect of cancer control programmes on the ultimate goal of improving  
38 survival and reducing the effect of cancer on the social and economic development of  
39 countries.*”  
40

41 In September 2015, the International Atomic Energy Agency’s Programme for Action on  
42 Cancer Therapy (PACT) used CONCORD-2 results to launch an ambitious [world-wide  
43 campaign](#) to highlight the global divide in survival, and to raise awareness of persistent  
44 inequalities in access to life-saving cancer services.<sup>13</sup>  
45

46 From 2017, the [Organisation for Economic Co-operation and Development](#) will include  
47 survival estimates from the CONCORD programme for 48 countries in its biennial publication  
48 [Health at a Glance](#).<sup>14</sup> CONCORD will thus become the *de facto* standard for international  
49 cancer survival comparisons. This provides formal recognition by an international agency of  
50 the global coverage, methodological rigour and international comparability of the CONCORD  
51 survival estimates, which will become crucial for the evaluation of health systems  
52 performance in all OECD Member States and many associated countries.  
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### 54 ***Updating the global surveillance of cancer survival*** 55

56 CONCORD-3 is now in progress. It will update world-wide surveillance of cancer survival  
57 trends from 1990-94<sup>1</sup> and 1995-2009<sup>5</sup> to include patients diagnosed as recently as 2014. It  
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3 will include 15 malignancies that collectively represent 75% of the global cancer burden:  
4 oesophagus, stomach, colon, rectum, liver, pancreas, lung, melanoma, breast (women),  
5 cervix, ovary and prostate in adults (15-99 years), and brain tumours, lymphomas and  
6 leukaemias in both adults and children (0-14 years).  
7

8 CONCORD-3 will compare geographic variation and time trends in cancer survival in 70 or  
9 more countries. Where adequate data are available, we will examine survival by stage at  
10 diagnosis, morphology, and race/ethnicity. We will also include information on the first  
11 course of treatment for each patient.  
12

13 The data call was issued in May 2016, and we expect to begin producing up-to-date survival  
14 estimates from the first half of 2017. The US contribution is expected to cover up to 90% of  
15 the national population.  
16

17 In a global study of this scale, good communication is vital. The data specification for  
18 CONCORD-3 has been translated from English into eight other languages: Arabic, Chinese,  
19 French, Italian, Japanese, Portuguese, Russian and Spanish. Face-to-face discussions on  
20 the protocol have been held with Canada, China, the Russian Federation, Malaysia, the UK,  
21 the US and at international meetings. The CONCORD team communicates with colleagues  
22 in six languages.  
23

24 The results of CONCORD-3 are likely to have a substantial impact on the public, in the  
25 media and in the scientific and public health community. CONCORD-2 was covered by TV,  
26 radio, press and wire services world-wide. The [Altmetric score](#) of 780, reflecting social media  
27 impact, is higher than 99.98% of 6.5 million articles evaluated to date. Results have been  
28 incorporated into the American Cancer Society's [Cancer Atlas](#).<sup>15</sup> The article<sup>5</sup> has been cited  
29 590 times since 2015 ([Google Scholar](#)).  
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31 The results of CONCORD-3 will help monitor progress toward the overarching goal of the  
32 2013 World Cancer Declaration, to achieve major improvements in cancer survival by 2020.  
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### 35 **Improving cancer survival in the US**

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37 The analyses reported in this *Supplement* show that by 2010, the longstanding differences in  
38 cancer survival between blacks and whites in the US had not diminished, at least up to the  
39 time when implementation of the Patient Protection and Affordable Care Act (ACA) began to  
40 improve access to health insurance, screening and cancer treatment.<sup>16,17</sup> CDC reported in  
41 2016 that the proportion of the US population without health insurance had dropped from  
42 16% in 2010 to 9% by 2015, representing some 20 million people who had gained access to  
43 health insurance since introduction of the ACA.<sup>18</sup> The drop was especially marked for those  
44 living below the federal poverty line, among whom the proportion uninsured fell from 29.5%  
45 to 17.2%.<sup>19</sup>  
46

47 One motive for producing the detailed analyses in this *Supplement* of cancer survival trends  
48 in the US by race, stage at diagnosis and state was to provide a baseline set of survival  
49 patterns, against which any impact of the Affordable Care Act could later be observed. As  
50 Weir and colleagues point out elsewhere in this *Supplement*: “the challenge [of  
51 implementation of the ACA] will be to ensure that everyone diagnosed with cancer in the  
52 United States benefits equally from advancements in medical care”.<sup>20</sup>  
53

54 The survival estimates from CONCORD-3 and the distributions of stage and treatment for  
55 patients diagnosed 2010-2014 will offer a preliminary evaluation of the impact of the ACA on  
56 cancer patient survival. We do not know yet how the legislation proposed to replace the ACA  
57 from 2017 will change access to health insurance, diagnostic investigation, and treatment. It  
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will therefore be particularly important to maintain national surveillance of cancer survival in the US beyond 2014.

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In 2015, the second cycle of the program (CONCORD-2) established, for the first time, long-term surveillance of cancer survival world-wide; it is the largest cancer survival study published to date.

CONCORD-2 provided cancer survival trends for 25,676,887 patients diagnosed during the 15-year period 1995-2009 with one of 10 common cancers that collectively represented 63% of the global cancer burden in 2009.<sup>5</sup> The data were provided by 279 population-based cancer registries that covered a total population of 896 million people in 67 countries. In 40 of those countries, the cancer patient data provided 100% coverage of the national population. The CONCORD Working Group included almost 500 collaborators.

As a result, health ministers in 67 countries, home to two-thirds (4.8 billion) of the world's population, finally obtained cancer survival estimates that are methodologically rigorous and internationally comparable, to help them prioritise and formulate cancer control strategies.<sup>6</sup> For some countries, this was the first time such data had been available.

The US Centers for Disease Control (CDC) described CONCORD-2 as [the start of global surveillance of cancer survival](#),<sup>a</sup> with survival estimates *"that can be compared, so scientists can begin to determine why survival differs among countries. This could lead to improvements in cancer control programs."* In the US, the analyses included individual data for 9,815,173 cancer patients, provided by 44 population-based cancer registries in 37 states with a total population of 257 million, doubling the population coverage of the US in the CONCORD programme to 83%.

The world-wide results were striking. Age-standardised five-year net survival from colon, rectal and breast cancers had increased steadily in most developed countries up to 2009, reaching 60% or more in 22 countries for colon and rectal cancers, and up to 85% or more in 17 countries for breast cancer in women. For cancers of the liver and lung, however, 5-year survival was still below 20% everywhere. Striking rises in prostate cancer survival were seen

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<sup>a</sup> <https://www.cdc.gov/cancer/dcpc/research/articles/CONCORD-2.htm>

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3 in many countries, but survival still varied from less than 60% in Bulgaria and Thailand to  
4 95% or more in Brazil, Puerto Rico and the USA. Survival from cervical cancer also ranged  
5 widely, from below 50% to over 70%, and improvements since the late 1990s were generally  
6 small. For women with ovarian cancer, 5-year survival was above 40% in only 20 of the 67  
7 countries, including the USA. For stomach cancer, 5-year survival was very high in Japan  
8 and South Korea (54–58%), compared with less than 40% in all other countries. Oddly, 5-  
9 year survival from adult leukaemia in Japan and South Korea (18–23%) was lower than in  
10 most other countries. For acute lymphoblastic leukaemia in children, survival was less than  
11 60% in several countries, but close to 90% in Canada, the US and four European countries,  
12 suggesting major deficiencies in many countries in the management of what is now  
13 considered a largely curable disease.  
14

15 Alexander Langmuir, who founded CDC's epidemic intelligence service for communicable  
16 diseases more than 50 years ago, commented that "*good surveillance does not necessarily*  
17 *ensure the making of the right decisions, but it reduces the chances of wrong ones*".<sup>7</sup>  
18 Chronic diseases such as cancer have long since become the predominant causes of  
19 morbidity and mortality in the US. Alongside incidence and mortality, population-based  
20 cancer survival has become one of the key metrics of overall progress in cancer control.<sup>8</sup>  
21

22 For most of the ten malignancies examined in CONCORD-2, five-year net survival among  
23 patients diagnosed in the US up to 2009 was very high on a global scale. These figures are  
24 encouraging, but detailed examination of the data reveals wide differences in survival  
25 between blacks and whites, and to a lesser extent between US states and regions.  
26

27 This *Cancer Supplement* presents the results of further analyses of the US data from  
28 CONCORD-2. In particular, it provides survival estimates by race (black, white) and stage at  
29 diagnosis for nine solid tumours in adults, and for acute lymphoblastic leukaemia in children,  
30 in each of the 37 participating states, for patients diagnosed 2001-2009. Separate results for  
31 the main types of leukaemia in adults will be presented in other publications.  
32

### 33 ***Clinical trials or population-based survival?***

34  
35 It is worth spending a moment to consider the contrast between the survival estimates  
36 derived from population-based cancer registries and those derived from randomised clinical  
37 trials, with which most clinicians will be more familiar. Randomised trials and population-  
38 based studies of cancer survival are both immensely useful, but they have very different  
39 purposes. As a consequence, they differ in design, execution and interpretation.  
40

41 Randomised clinical trials test the **efficacy** of a new surgical approach, radiotherapy  
42 regimen, systemic drug or drug combination. They are the gold standard method to assess  
43 whether a new treatment is better than the best treatment available to date. However, trials  
44 typically include **fewer than 10% of patients** with a specific cancer in a given country. They  
45 often exclude patients older than (say) 70 years of age, or with specific comorbidities, or with  
46 advanced disease. The clinicians conducting the trials are the most research-oriented, with  
47 access to the best available facilities. Treatment protocols are rigidly enforced. The  
48 outcomes most often measured are short-term differences in the median duration of  
49 disease-free survival, rather than longer-term estimates of overall survival.  
50

51  
52 A report from the Institute of Medicine in 2010 commented that the system for conducting  
53 cancer clinical trials in the US was approaching a state of crisis.<sup>9</sup> More than 25,000 patients  
54 were being recruited into clinical trials each year, but that still represented less than 3% of all  
55 cancer patients. The report noted that substantial progress in clinical management of various  
56 cancers had been produced by NCI-sponsored trials, but also that only about 60% were  
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3 actually completed and published. More recently, the Cancer Moonshot<sup>b</sup> initiative set out to  
4 improve participation in clinical trials. This may lead to improvement in population-based  
5 outcomes if personalized cancer care and targeted therapies become available to a much  
6 higher proportion of cancer patients.  
7

8 By contrast, population-based cancer survival studies are the gold standard approach to  
9 assess the overall **effectiveness** of the entire health system in dealing with cancer.<sup>8</sup> Cancer  
10 survival estimates derived from population-based cancer registries include **all patients**  
11 **diagnosed with cancer** in a country or region, young and old, rich and poor, with or without  
12 serious comorbidity, and whether diagnosed at an early stage or with disease that is too  
13 advanced for any treatment of curative intent. They are diagnosed and managed in the  
14 entire range of healthcare facilities, with a wide range of treatment regimens, some of which  
15 may be unavailable to some patients contraindicated in others. Some patients will not  
16 adhere tightly to the treatment they are prescribed. Others may withdraw from treatment  
17 altogether if out-of-pocket payments are too expensive, or travelling or taking time off work is  
18 too difficult, or the side-effects of treatment are too severe.  
19

20 Differences in survival between study groups in a clinical trial are easily interpreted as being  
21 attributable to differences in the efficacy of the treatment regimens being compared, to the  
22 skill of the medical staff who designed the trial, and the rigour with which they delivered the  
23 protocol. By contrast, results from population-based studies are often profoundly  
24 misinterpreted.  
25

26 International differences in population-based cancer survival may be criticised by doctors in  
27 a country or region with lower survival, on grounds such as bad data, bias or incompetent  
28 analysis, or simply dismissed out of hand as flawed or unacceptable. The unspoken fear  
29 behind some of these criticisms is the implication that the doctors in the country with lower  
30 survival are somehow being judged as less competent. This concern is misplaced.  
31

32 No physician, surgeon or radiotherapist sees a representative sample of all cancer patients.  
33 The survival of patients seen by a single doctor, cancer team or hospital will thus rarely  
34 reflect the overall national picture. Patients whose disease is too advanced at diagnosis for  
35 surgery are more likely to be referred for radiotherapy. Survival estimates derived from a  
36 single hospital are subject to referral bias. For all except the most common cancers and in  
37 the largest hospitals, they are also affected by statistical instability.<sup>10</sup>  
38

39 Population-based cancer survival estimates differ in both purpose and scope from the  
40 survival estimates derived from clinical trials, or from the patients seen by an individual  
41 clinician, clinical team, or hospital. Population-based survival estimates are designed for  
42 public health surveillance, and to inform strategic policy-making on how to improve cancer  
43 management.  
44

45 Life expectancy at birth provides a useful analogy. It encapsulates the likely longevity of  
46 recently born baby, and it incorporates many factors that have affected recent mortality in  
47 children and young people, but also the current mortality patterns of people who were born  
48 as long as 80 or 90 years ago. Despite this complexity, trends and international comparisons  
49 in life expectancy are readily interpreted. Life expectancy is generally increasing, but sharp  
50 reductions have been seen as a result of war, the AIDS epidemic in Lesotho and South  
51 Africa,<sup>11</sup> and the relaxation of alcohol control policy in the former Soviet Union.<sup>12</sup> Similarly,  
52 population-based cancer survival trends encapsulate a wide range of factors, including the  
53 speed with which patients seek help when they have symptoms suggestive of malignancy,  
54 as well as the efficiency of primary care, the speed of referral to secondary care, access to  
55 health insurance, and the availability of staff and equipment to deliver a thorough  
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58 <sup>b</sup> <https://www.whitehouse.gov/CancerMoonshot>  
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3 investigation and prompt, optimal treatment. They also reflect the human and financial  
4 resources available in the health system, and the efficiency with which it is organised.  
5

6 A simple thought experiment should suffice to prove this point. Even the most experienced  
7 oncological team would be unable to deliver the standard of care and the level of survival  
8 they can achieve in a developed country if they were transposed to a country where patients  
9 are seen in a hospital with no pathologist and no access to radiotherapy, where they may  
10 have had to travel for days to seek attention, and they cannot afford to return after the first  
11 surgical intervention, perhaps for vital follow-up care or chemotherapy. Seen in that context,  
12 the skills and competence of any one doctor or cancer team are part of a much wider  
13 system, in which many other elements contribute to the overall outcome for all cancer  
14 patients.  
15

16 That is why the CONCORD programme for the global surveillance of population-based  
17 cancer survival is useful. It provides internationally comparable data on cancer survival  
18 trends in many countries, and for most of the common cancers. It contributes vital  
19 information to public health programmes designed to improve cancer outcomes. This *Cancer*  
20 *Supplement* offers more detailed results for the US, by race and stage at diagnosis. The  
21 results are relevant for cancer patients and public health strategy for cancer control in each  
22 state.  
23

24 Studying how best to implement laboratory findings into clinical practice - “from the bench to  
25 the bedside” – may be characterised as early translational research. However, it is also  
26 important that effective new interventions identified in clinical trials become available to all  
27 patients for whom they are clinically appropriate. Public health research focusses on how  
28 best to deliver those gains as quickly as possible. This may be described as “late  
29 translational research”: from the paper to the people.  
30

### 31 ***The impact of the CONCORD programme***

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33 The US National Cancer Institute recognised the impact of CONCORD-2 in an [invited](#)  
34 [commentary](#) for *The Lancet*, noting that global analyses of cancer survival provide an  
35 opportunity for lessons from countries with successful cancer control initiatives to be applied  
36 to other regions.<sup>6</sup> The commentary added that the availability of better data “provides a  
37 clearer picture of the effect of cancer control programmes on the ultimate goal of improving  
38 survival and reducing the effect of cancer on the social and economic development of  
39 countries.”  
40

41  
42 In September 2015, the International Atomic Energy Agency’s Programme for Action on  
43 Cancer Therapy (PACT) used CONCORD-2 results to launch an ambitious [world-wide](#)  
44 [campaign](#) to highlight the global divide in survival, and to raise awareness of persistent  
45 inequalities in access to life-saving cancer services.<sup>13</sup>  
46

47 From 2017, the [Organisation for Economic Co-operation and Development](#) will include  
48 survival estimates from the CONCORD programme for 48 countries in its biennial publication  
49 [Health at a Glance](#).<sup>14</sup> CONCORD will thus become the *de facto* standard for international  
50 cancer survival comparisons. This provides formal recognition by an international agency of  
51 the global coverage, methodological rigour and international comparability of the CONCORD  
52 survival estimates, which will become crucial for the evaluation of health systems  
53 performance in all OECD Member States and many associated countries.  
54

### 55 ***Updating the global surveillance of cancer survival***

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57 CONCORD-3 is now in progress. It will update world-wide surveillance of cancer survival  
58 trends from 1990-94<sup>1</sup> and 1995-2009<sup>5</sup> to include patients diagnosed as recently as 2014. It  
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3 will include 15 malignancies that collectively represent 75% of the global cancer burden:  
4 oesophagus, stomach, colon, rectum, liver, pancreas, lung, melanoma, breast (women),  
5 cervix, ovary and prostate in adults (15-99 years), and brain tumours, lymphomas and  
6 leukaemias in both adults and children (0-14 years).  
7

8 CONCORD-3 will compare geographic variation and time trends in cancer survival in 70 or  
9 more countries. Where adequate data are available, we will examine survival by stage at  
10 diagnosis, morphology, and race/ethnicity. We will also include information on the first  
11 course of treatment for each patient.  
12

13 The data call was issued in May 2016, and we expect to begin producing up-to-date survival  
14 estimates from the first half of 2017. The US contribution is expected to cover up to 90% of  
15 the national population.  
16

17 In a global study of this scale, good communication is vital. The data specification for  
18 CONCORD-3 has been translated from English into eight other languages: Arabic, Chinese,  
19 French, Italian, Japanese, Portuguese, Russian and Spanish. Face-to-face discussions on  
20 the protocol have been held with Canada, China, the Russian Federation, Malaysia, the UK,  
21 the US and at international meetings. The CONCORD team communicates with colleagues  
22 in six languages.  
23

24 The results of CONCORD-3 are likely to have a substantial impact on the public, in the  
25 media and in the scientific and public health community. CONCORD-2 was covered by TV,  
26 radio, press and wire services world-wide. The [Altmetric score](#) of 780, reflecting social media  
27 impact, is higher than 99.98% of 6.5 million articles evaluated to date. Results have been  
28 incorporated into the American Cancer Society's [Cancer Atlas](#).<sup>15</sup> The article<sup>5</sup> has been cited  
29 590 times since 2015 ([Google Scholar](#)).  
30

31 The results of CONCORD-3 will help monitor progress toward the overarching goal of the  
32 2013 World Cancer Declaration, to achieve major improvements in cancer survival by 2020.  
33  
34

### 35 **Improving cancer survival in the US**

36

37 The analyses reported [in this Supplement](#) show that by 2010, the longstanding differences in  
38 cancer survival between blacks and whites in the US had not diminished, at least up to the  
39 time when implementation of the Patient Protection and Affordable Care Act (ACA) began to  
40 improve access to health insurance, screening and cancer treatment.<sup>16,17</sup> CDC reported in  
41 2016 that the proportion of the US population without health insurance had dropped from  
42 16% in 2010 to 9% by 2015, representing some 20 million people who had gained access to  
43 health insurance since introduction of the ACA.<sup>18</sup> The drop was especially marked for those  
44 living below the federal poverty line, among whom the proportion uninsured fell from 29.5%  
45 to 17.2%.<sup>19</sup>  
46

47 One motive for producing the detailed analyses [in this Supplement](#) of cancer survival trends  
48 in the US by race, stage at diagnosis and state was to provide a baseline set of survival  
49 patterns, against which any impact of the Affordable Care Act could later be observed. As  
50 Weir and colleagues point out elsewhere in this *Supplement*: “the challenge [of  
51 implementation of the ACA] will be to ensure that everyone diagnosed with cancer in the  
52 United States benefits equally from advancements in medical care”.<sup>20</sup>  
53

54 The survival estimates from CONCORD-3 and the distributions of stage and treatment for  
55 patients diagnosed 2010-2014 will offer a preliminary evaluation of the impact of the ACA on  
56 cancer patient survival. We do not know yet how the legislation proposed to replace the ACA  
57 from 2017 will change access to health insurance, diagnostic investigation, and treatment. It  
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will therefore be particularly important to maintain national surveillance of cancer survival in the US beyond 2014.

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