

# Case-mix adjusted 30 day mortality post Systemic Anti-Cancer Therapy (SACT) rates for bowel, breast and lung cancer

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A companion brief to support the interpretation of this data

## About the NDRS

The National Disease Registration Service (NDRS) is part of NHS Digital (NHSD). Its purpose is to collect and quality-assure high-quality, timely data on a wide range of diseases and provide robust surveillance to monitor and detect changes in health and disease in the population.

The NDRS includes:

- the National Cancer Registration and Analysis Service (NCRAS) and
- the National Congenital Anomaly and Rare Disease Registration Service (NCARDRS)

Healthcare professionals, researchers and policy makers use data to better understand population health and disease. The data is provided by patients and collected by the NHS as part of their care and support. The NDRS uses the data to help:

- understand cancer, rare diseases and congenital anomalies;
- improve diagnosis;
- plan NHS services;
- improve treatment;
- evaluate policy;
- improve genetic counselling.



National Disease Registration Service  
NHS Digital (NHSD)  
The Leeds Government Hub  
7&8 Wellington Place  
Leeds  
LS1 4AP

For queries relating to this document, please contact:

[NDRSenquiries@nhs.net](mailto:NDRSenquiries@nhs.net)

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# Contents

About the NDRS .....	1
Contents .....	2
Overview .....	3
Summary .....	3
Key messages .....	4
Cancer restrictions .....	6
Data consistency restrictions .....	7
30 day SACT mortality restrictions .....	7
Treatment restrictions .....	7
Excluded treatment regimen values .....	8
Presentation of results .....	9
Summary of changes in methods .....	9
CMAR bowel cancer flowchart .....	11
CMAR breast cancer flowchart .....	12
CMAR lung cancer flowchart .....	13
Trusts with no data .....	14
Excluded trusts and outlier trusts .....	16
Trust comments .....	18

## Overview

This document provides specific details and trust comments for the bowel and lung workbook release. For detailed information on the Case-Mix Adjusted Rates (CMAR) workbooks, including background information, the methodology used, data restrictions, and guidance on how to interpret the data, please refer to the **CMAR Toolkit**.

The data for CMAR workbooks are also now available as an interactive web application at <https://www.cancerdata.nhs.uk/sact/cmarreport>. This presents all CMAR cancer sites covering ages 18+ in one output and enables new functionality; such as displaying trust name, number of patients treated, and case-mix adjusted 30 day mortality rate when hovering over datapoints on the funnel plot.

Please see the [UK Chemotherapy Board \(UKCB\) morbidity and mortality within 30 days of SACT recommended proforma](#)<sup>1</sup> for information on reviewing current practice.

## Summary

In November 2021, the National Disease Registration Service (NDRS) team, as part of the NHS Digital (NHSD) / NHS England-Improvement (NHSE-I) SACT data partnership, produced case-mix adjusted 30 day mortality post Systemic Anti-Cancer Therapy (SACT) rates (CMAR) for bowel, breast and lung cancer. These CMAR were calculated for NHS trusts and the workbook will be circulated to all trusts.

The data is case-mix adjusted to allow for comparisons to be made between trusts and within a trust over time. Trusts are able to request NHS numbers of patients who have died within 30 days of receiving SACT at their trust. We developed this information to support clinical governance at trusts and potentially identify areas where clinical care could be improved. We provided all trusts with the opportunity to comment on their data and their statements are included in this Companion Brief, published February 2022.

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<sup>1</sup> UK Chemotherapy Board (UKCB) Morbidity and Mortality within 30 Days of Systemic Anti-Cancer Therapy - Review of Current Practice - Standardised Review Process main page:

<https://www.ukchemotherapyboard.org/morbidity-and-mortality-within-30-d>

UK Chemotherapy Board (UKCB) morbidity and mortality within 30 days of SACT recommended proforma: [https://4bd2316d-e45d-4e90-96b5-431f1c12dd3e.filesusr.com/ugd/638ee8\\_e5a2706d61124ae18f5a6e40e7e451af.pdf](https://4bd2316d-e45d-4e90-96b5-431f1c12dd3e.filesusr.com/ugd/638ee8_e5a2706d61124ae18f5a6e40e7e451af.pdf)

## Key messages

- 92 NHS trusts were included for bowel; 80 trusts were included for breast; and 98 NHS trusts were included for lung. The average case-mix adjusted 30 day mortality post-SACT rate was 3.6% for bowel; 2.7% for breast; and 10.5% for lung.
- Across all trusts included in analysis for each cancer site, some trusts were identified as outliers on the basis of their case-mix adjusted 30 day mortality post-SACT. For bowel 1 trust was identified as an outlier; for breast 3 trusts were identified as an outlier; and for lung 6 trusts were identified as outliers.
- The number of trusts with no deaths within 30 days of SACT treatment are as follows, with counts calculated excluding trusts treating <5 patients. For bowel 3 trusts had no deaths within 30 days of SACT treatment in 2020; for breast 5 trusts had no deaths within 30 days of SACT treatment in 2020; and for lung 0 trusts had no deaths within 30 days of SACT treatment between 2019 and 2020.
- The number of patients receiving SACT treatment in the study period and meeting the study inclusion criteria varied by NHS trust and cancer site. The range and average caseloads are as follows, with average caseloads calculated excluding trusts treating <5 patients. For bowel this ranged from <5 to 1,152 with an average caseload of 204; for breast this ranged from <5 to 1,644 with an average caseload of 284; and for lung this ranged from <5 to 1,363 with an average caseload of 300.
- A number of trusts were excluded from the analyses as they did not meet the 70% data completeness threshold for the data-fields used to adjust for case-mix. For bowel 10 trusts were excluded; for breast 20 trusts were excluded; and for lung 4 trusts were excluded.
- A number of trusts had no patients meeting the study inclusion criteria, so were excluded from the analyses. For bowel and lung 24 trusts had no patients meeting the study inclusion criteria; for breast 26 trusts had no patients meeting the study inclusion criteria.
- For bowel 5 trusts treated fewer than 10 patients during the study period; for breast 1 trust treated fewer than 10 patients during the study period; and for lung 2 trusts treated fewer than 10 patients during the study period. The case-mix adjusted mortality rates for these trusts are not considered statistically robust. All data for trust caseload counts less than 5 have been suppressed in the output.

# Workbook

The workbook is produced as part of the NHSD / NHSE-I SACT partnership and is based on routine data submitted by NHS trusts to the [SACT Dataset](#)<sup>2</sup>. It includes patients diagnosed with bowel, breast or lung cancer in England between 2010 and 2020 and treated with SACT in an NHS trust in England between January 2019 and December 2020, though the period of treatment activity used varied depending on the cancer type studied (see [Table 1](#)).

Each patient was allocated to the trust where they received their final treatment, regardless of any prior treatment received at other trusts.

**Table 1: ICD-10 code and treatment activity covered**

Cancer site	ICD-10 code	Period of treatment activity
<b>Bowel</b>	C18, C19, C20	Jan 2020 – Dec 2020
	C21.8 (in NCRD only as ICD-10 codes are only recorded to 3-characters in the RCRD)	
<b>Breast</b>	C50	Jan 2020 – Dec 2020
<b>Lung</b>	C33, C34, C37, C38, C39	Jan 2019 – Dec 2020

For the purposes of the analysis, patients were selected from the [National Cancer Registration Dataset \(NCRD\)](#)<sup>3</sup> and [Rapid Cancer Registration Dataset \(RCRD\)](#)<sup>4</sup>. The RCRD contains proxy tumour registrations and some associated events on the cancer patient pathway (e.g. surgery, radiotherapy and chemotherapy) from January 2018 to the most recently available data on cancer diagnoses. Data from NCRD and RCRD was then linked to the [SACT Dataset](#) on NHS number in order to retrieve the latest treatment records for these patients. Certain restrictions were applied to the data to ensure the appropriate patients and treatments were selected for each

<sup>2</sup> Bright, Lawton, Benson et al. (2020). Data Resource Profile: The Systemic Anti-Cancer Therapy (SACT) dataset. *International journal of epidemiology*, 49(1), 15–15l.  
<https://doi.org/10.1093/ije/dyz137>

<sup>3</sup> Henson, Elliss-Brookes, Coupland et al. (2020). Data Resource Profile: National Cancer Registration Dataset in England. *International journal of epidemiology*, 49(1), 16–16h.  
<https://academic.oup.com/ije/article/49/1/16/5476570>

<sup>4</sup> Rapid Cancer Registration Dataset: [http://www.ncin.org.uk/collecting\\_and\\_using\\_data/rcrd](http://www.ncin.org.uk/collecting_and_using_data/rcrd)

cancer site. These restrictions mean that some trusts may have no data included in the workbook because their patients and patients' treatment activity did not fit the criteria applied.

The specific restrictions applied to the data are outlined below. A full overview of all CMAR restrictions is available in the **CMAR Toolkit**.

## Cancer restrictions

- The cohort was restricted to diagnoses between 2010 and 2018 for the [National Cancer Registration Dataset](#) and between 2019 and 2020 for the [Rapid Cancer Registration Dataset](#).
- Patients whose most recent cancer diagnosis was bowel, breast or lung cancer were selected. If patients had more than one cancer site diagnosed on the same day, the bowel, breast or lung cancer site was selected.

It is important to note that in some cases, the cancer diagnosis recorded in the [National Cancer Registration Dataset](#) and [Rapid Cancer Registration Dataset](#) may differ from that recorded by the trust.

## Data completeness restrictions

Trusts with less than 70% completeness for the key variables of co-morbidity score<sup>5</sup>, performance status<sup>6</sup> and stage at diagnosis<sup>7</sup> were excluded from the analysis. Please note that these variables were sourced from the [SACT Dataset](#), [National Cancer Registration Dataset](#), [Rapid Cancer Registration Dataset](#) and [Hospital Episode Statistics](#)<sup>8</sup>. For CMAR reports, cancer sites were selected for analysis on the basis that less than 20% of trusts would be excluded using the 70% completeness threshold. For the current analyses, 10% of trusts were excluded from the bowel analyses; 20% of trusts were excluded from the breast analyses; and 4% of trusts were excluded from the lung analyses.

Please refer to the **CMAR Toolkit** for more information.

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<sup>5</sup> The co-morbidity score relates to the [Charlson comorbidity score](#) derived using inpatient Hospital Episode Statistics data with the same methodology as described by [Maringe et al.](#) but with a different time window: from 27 months to 3 months prior to the cancer diagnosis

<sup>6</sup> Performance status (PS) at start of cycle was used. PS at start of regimen was also included for cases where PS at start of cycle data was missing

This was adjusted for in the regression analysis by categorising as 0, 1, 2+ and Unknown

For further information please see the [ECOG Performance Status page](#)

<sup>7</sup> For further information on stage at diagnosis please see the [National Cancer Registration Dataset in England, Data Resource Profile](#)

<sup>8</sup> Hospital Episode Statistics (HES) is a data warehouse containing details of all admissions, outpatient appointments and A and E attendances at NHS hospitals in England:

<https://digital.nhs.uk/data-and-information/data-tools-and-services/data-services/hospital-episode-statistics>

## Data consistency restrictions

- The trust at which the latest SACT treatment was completed in the treatment activity period is important for calculating the CMAR. Any patients whose latest SACT treatment was recorded at two different trusts on the same day have therefore been removed from the analysis.
- Any patients who had a record of SACT treatment after death were removed from the analysis.

These were not common events in the data.

## 30 day SACT mortality restrictions

We count deaths (for any reason) within 30 days of the date that the last SACT treatment was prescribed.

## Treatment restrictions

For the purposes of the analysis, and to ensure treatment data was relevant to the cancer site of interest, the following rules were applied when linking SACT data to the cohort of patients identified from the [National Cancer Registration Dataset](#) and [Rapid Cancer Registration Dataset](#):

1. For those patients with only one cancer diagnosed, all treatment records within the relevant time frame were selected.
2. For those patients with more than one cancer diagnosed, treatment records were selected if they met the following criteria:
  - a. Within the relevant timeframe (2020 for bowel or breast, 2019-2020 for lung).
  - b. The first three characters of the primary diagnosis (ICD-10) recorded in SACT matched the first three characters of the cancer site identified in the [National Cancer Registration Dataset](#) and [Rapid Cancer Registration Dataset](#).
3. For those patients with treatment records that did not fall within categories 1 and 2 outlined above, treatment records were selected if they were within the relevant timeframe and fell within 31 days before and 'x' days after the diagnosis of interest. For bowel or breast this was within 31 days before and 365 days after diagnosis. For lung this was within 31 days before and 456 days after diagnosis. The decision to restrict based on the time between treatment and diagnosis is in accordance with [Version 4.6 of the 'Linking treatment tables – chemotherapy, tumour resections and radiotherapy' standard operating procedure](#)<sup>9</sup>. The timeframes used ensure that treatment given soon after diagnosis is included for those patients where the diagnosis codes recorded in the [National Cancer Registration Dataset](#) and [Rapid Cancer Registration Dataset](#) are not an exact match to those recorded in SACT. This is particularly relevant for some cancers where coding of the cancer site sometimes differs between data sources.

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<sup>9</sup> Version 4.6 of the 'Linking treatment tables – chemotherapy, tumour resections and radiotherapy' standard operating procedure: <http://www.ncin.org.uk/view?rid=4299>



4. For bowel cancer patients in our cohort, treatment records (within the treatment activity window) were also excluded where the SACT primary diagnosis was a non-bowel cancer ICD-10 code (or closely related codes) and the SACT regimen was not a treatment option for bowel cancer. The same approach was used in the breast and lung analyses.
5. Treatment records with regimens that clinicians had advised us were not treatments for the cancers covered in this report were also excluded.

### **Excluded treatment regimen values**

Regimens that were non-harmful, supportive treatments, hormones and non-chemo treatments were excluded from the analysis. These treatments were excluded at regimen level rather than drug level. For non-excluded regimens all drug administrations have been retained in the analyses, even those that were, for example, supportive treatments.

The set of values from the treatment regimen data fields which have been excluded are listed below. These were selected for exclusion in consultation with clinicians and pharmacists and are reviewed on a site-specific basis for every release. Please note some terms in this list, e.g. retinoblastoma, are not regimens, but reflect data incorrectly entered in the regimen fields within the SACT Dataset.

**Table 2: Excluded treatment regimen values**

Regimen A–E	Regimens F–O	Regimens P–Z
Abiraterone	Finasteride	Pamidronate
Anagrelide	Flutamide	Pasireotide
Anastrozole	Folinic Acid	Progesterone
Anti-Emetics	Fulvestrant	Retinoblastoma
Anti-Histamines	GCSF	Sandostatin
Apalutamide	Goserelin	Signifor
APML	Hepatoblastoma	Somatostatin
B12	Hormone	Somatuline
Bicalutamide	Hydrocortisone Intrathecal (Any Age)	Steroid
Bisphosphonates	Ibandronic Acid	Stilbestrol
Clodronic Acid	Lanreotide	Stilboestrol
Cyproterone	Letrozole	Tamoxifen
Cyproterone + Goserelin	Leuprorelin	Trial
Darolutamide	Medroxyprogesterone	Triptorelin
Degarelix	Megestrol	Vitamin
Denosumab	Not Chemo	Zoledronic Acid
Enzalutamide	Octreotide	
Exemestane		

## Presentation of results

All data for trust caseload counts less than 5 have been suppressed in the output.

## Summary of changes in methods

This report provides case-mix adjusted 30-day mortality rates post-SACT for three cancer sites previously included in workbooks released in 2020.

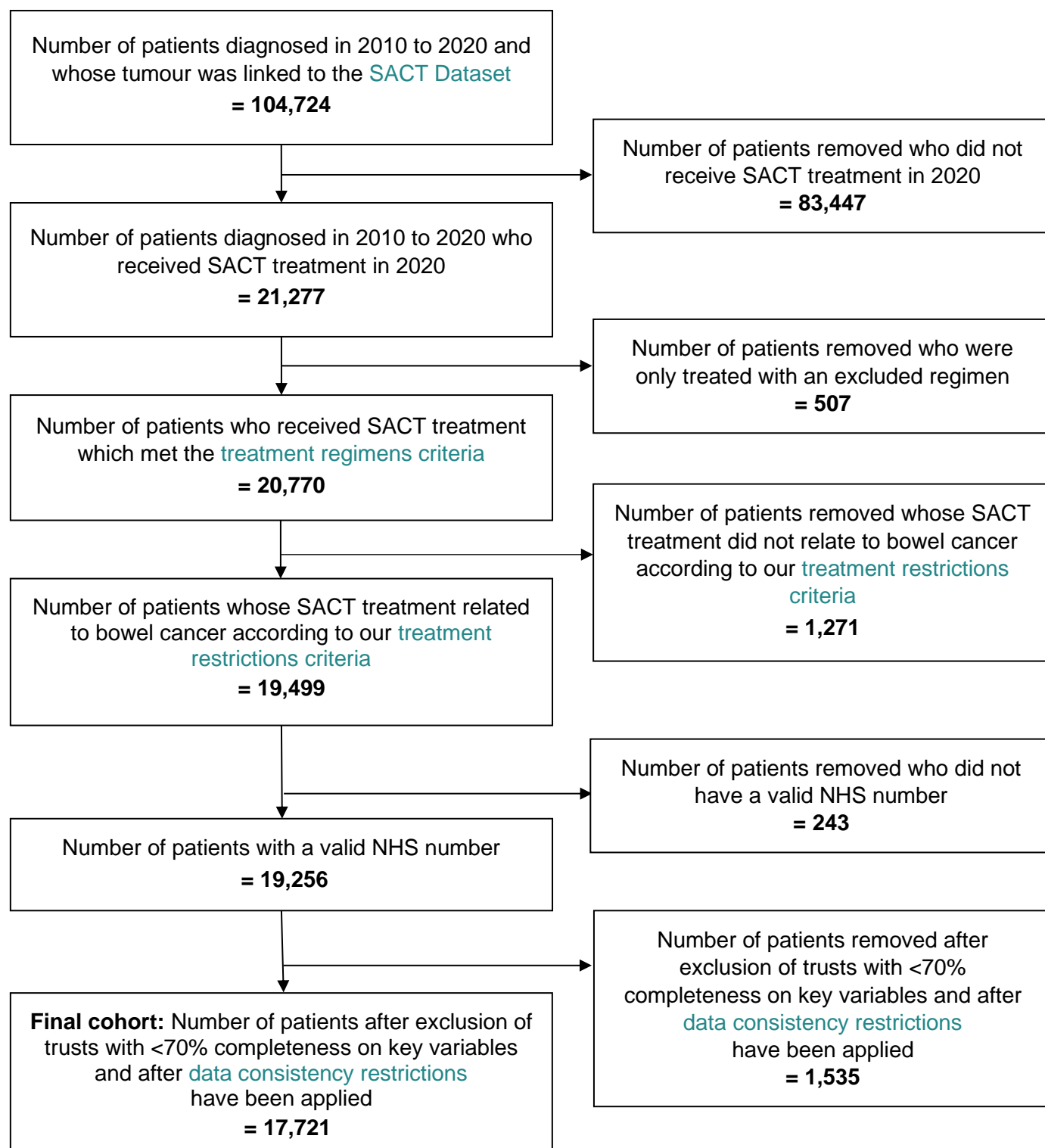
It is important to note that the methods used in the analyses in both workbooks while very similar are not the same, and any comparisons of CMARs over time should take the changes in methods into account.

**Table 3: Summary of changes in methods**

Change	1 <sup>st</sup> bowel, breast and lung reports	2 <sup>nd</sup> bowel, breast and lung reports
Source(s) of cancer diagnosis data	Used just the <a href="#">National Cancer Registration Dataset</a> and diagnoses between 2010 and 2018 for bowel and breast; and between 2010 and 2017 for lung cancer	Used the <a href="#">National Cancer Registration Dataset</a> to capture diagnoses between 2010 and 2018 and <a href="#">Rapid Cancer Registration Dataset</a> data to capture diagnoses between 2019 and 2020
Cohort definition	Used both ICD-10 codes and morphology for lung cancer	Used only ICD-10 codes for lung cancer due to the <a href="#">Rapid Cancer Registration Dataset</a> having insufficient morphology information for lung cancer
Cohort definition – treatment activity	Patients whose SACT treatment had not finished in the treatment activity period were excluded from the analyses	All patients receiving SACT treatment in the treatment activity period are included
Treatment restrictions	The post-diagnostic time period used in <a href="#">treatment restriction 3</a> was 183 days (6 months) for all three cancer sites <sup>10</sup>	The post-diagnostic time period used in <a href="#">treatment restriction 3</a> were longer than the 1 <sup>st</sup> bowel, breast and lung release. For the 2 <sup>nd</sup> bowel and breast release the post-diagnostic time period was 365 days (12 months); for the 2 <sup>nd</sup> lung release the post-diagnostic time period was 456 days (15 months). These were set according to the <a href="#">Linking treatment tables standard operating procedure version 4.6</a>
Excluded regimens	Non-SACT regimens were excluded as per Table 3 in the <b>CMAR Toolkit</b>	The method to exclude regimens was modified (see <a href="#">Treatment restrictions</a> )

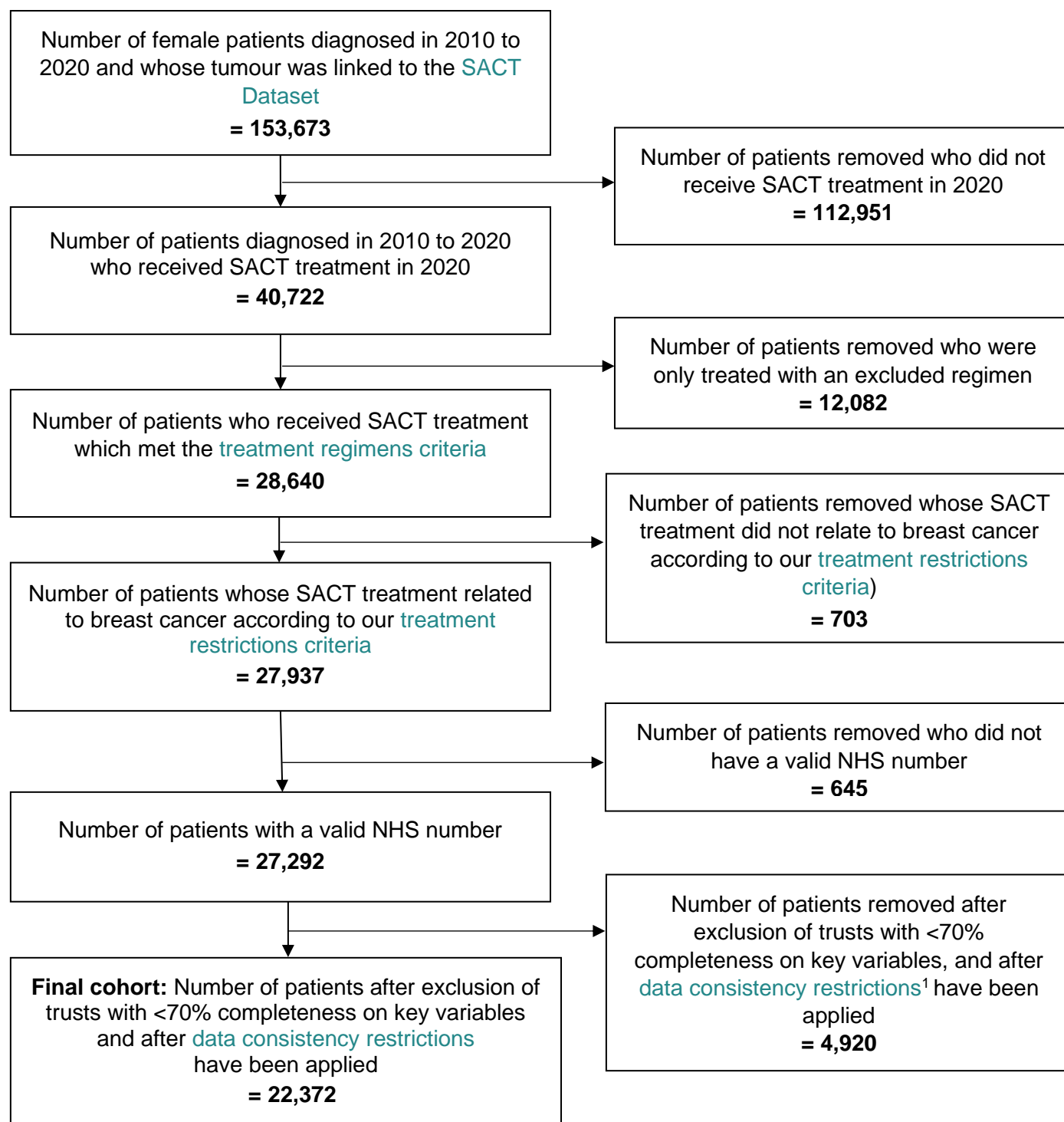
<sup>10</sup> A post-diagnosis time period of 183 days was set for the 1<sup>st</sup> bowel and breast analyses, which differs slightly from the standard operating procedure recommendations ([Version 4.6 of the 'Linking treatment tables – chemotherapy, tumour resections and radiotherapy' standard operating procedure](#)). This means a very small proportion (~1%) were not included in the 1<sup>st</sup> bowel and breast analyses.

## CMAR bowel cancer flowchart



Please refer to the **CMAR Toolkit** for detailed information on the methodology and risk-adjustments applied.

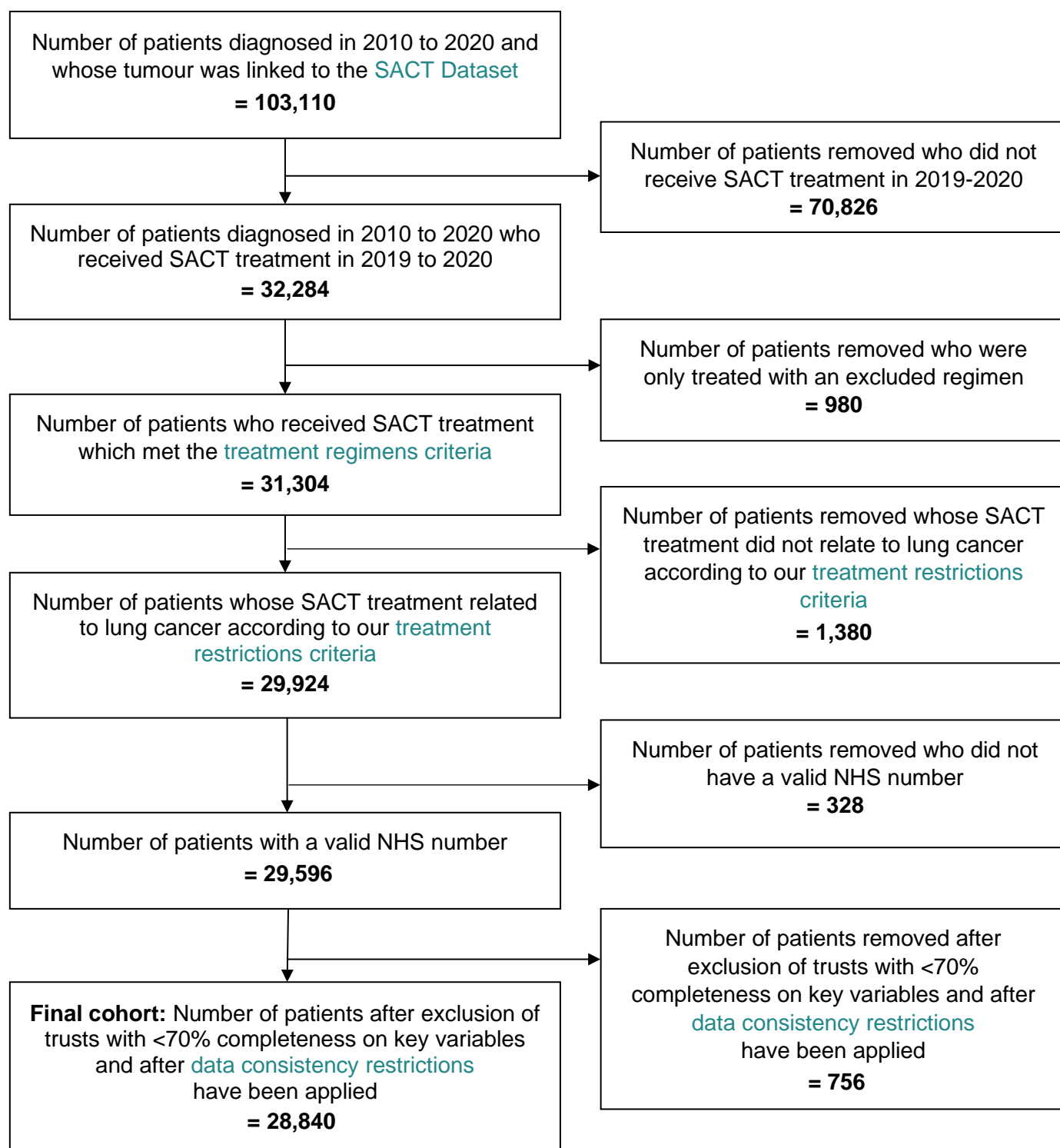
## CMAR breast cancer flowchart



<sup>1</sup> A total of 53 patients with missing deprivation data were also excluded at the regression modelling stage, due to modelling restrictions.

Please refer to the **CMAR Toolkit** for detailed information on the methodology and risk-adjustments applied.

## CMAR lung cancer flowchart



Please refer to the **CMAR Toolkit** for detailed information on the methodology and risk-adjustments applied.

## Trusts with no data

Some trusts had 'no data' in the workbook. This means that they had no activity data for patients who were treated in the treatment period (2020 for bowel and breast, 2019-2020 for lung), who fit the inclusion criteria. Strict criteria were applied to the data for this work and so there are a few reasons why a trust may have no data in the workbook. Examples of this include:

- Patients were treated with regimens that were excluded from the analysis (see [list of excluded regimens](#))
- Patients received their last treatment at a different trust
- We were not able to match the patient's diagnosis in the [National Cancer Registration Dataset](#) or [Rapid Cancer Registration Dataset](#) to that of the [SACT Dataset](#) and the patient's treatment fell outside of the diagnosis-to-treatment time window

The table below presents those trusts with no data in the analysis.

**Table 4: Trusts with no data**

Trust name	Bowel	Breast	Lung
Barnsley Hospital NHS Foundation Trust	No data	No data	No data
Bolton NHS Foundation Trust			No data
Chesterfield Royal Hospital NHS Foundation Trust	No data	No data	
Countess of Chester Hospital NHS Foundation Trust	No data	No data	No data
Croydon Health Services NHS Trust	No data	No data	No data
Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust		No data	No data
East Cheshire NHS Trust	No data	No data	No data
Epsom and St Helier University Hospitals NHS Trust	No data	No data	No data
Kingston Hospital NHS Foundation Trust	No data	No data	No data
Liverpool University Hospitals NHS Foundation Trust	No data	No data	No data
Manchester University NHS Foundation Trust	No data	No data	
Mid Cheshire Hospitals NHS Foundation Trust		No data	No data
North Bristol NHS Trust	No data	No data	
Pennine Acute Hospitals NHS Trust	No data	No data	No data

Case-mix adjusted 30 day mortality post-SACT for bowel, breast and lung

Trust name	Bowel	Breast	Lung
Salford Royal NHS Foundation Trust	No data	No data	No data
Sandwell and West Birmingham Hospitals NHS Trust	No data	No data	No data
Southport and Ormskirk Hospital NHS Trust	No data	No data	No data
St Helens and Knowsley Teaching Hospitals NHS Trust	No data	No data	No data
Stockport NHS Foundation Trust	No data	No data	No data
Tameside and Glossop Integrated Care NHS Foundation Trust	No data	No data	No data
The Hillingdon Hospitals NHS Foundation Trust	No data	No data	No data
The Rotherham NHS Foundation Trust	No data	No data	No data
Warrington and Halton Teaching Hospitals NHS Foundation Trust	No data	No data	No data
West Hertfordshire Hospitals NHS Trust	No data	No data	No data
Wirral University Teaching Hospital NHS Foundation Trust	No data	No data	No data
Wrightington, Wigan and Leigh NHS Foundation Trust	No data	No data	No data
Wye Valley NHS Trust	No data	No data	No data



## Excluded trusts and outlier trusts

The table below presents those trusts that were found to be:

- Outliers for the 30-day post-SACT mortality rates, which have been included in analysis<sup>11</sup>
- Excluded based on the 70% data completeness threshold<sup>12</sup>

**Table 5: Trusts that were outliers for the 30-day post-SACT mortality rates and trusts excluded based on the 70% completeness threshold, by cancer site**

Trust name	Bowel	Breast	Lung
Ashford and St Peter's Hospitals NHS Foundation Trust	Excluded	Excluded	Excluded
Barts Health NHS Trust		Outlier (>3SD)	Outlier (>3SD)
Blackpool Teaching Hospitals NHS Foundation Trust			Outlier (>3SD)
Bradford Teaching Hospitals NHS Foundation Trust		Excluded	
East Suffolk and North Essex NHS Foundation Trust		Excluded	
East Sussex Healthcare NHS Trust		Excluded	
Hull University Teaching Hospitals NHS Trust		Excluded	
King's College Hospital NHS Foundation Trust		Excluded	
London North West University Healthcare NHS Trust	Excluded	Excluded	Excluded
Maidstone and Tunbridge Wells NHS Trust	Excluded		
Medway NHS Foundation Trust	Excluded	Excluded	Excluded
North Middlesex University Hospital NHS Trust	Excluded	Excluded	
North West Anglia NHS Foundation Trust	Excluded	Excluded	
Northampton General Hospital NHS Trust		Excluded	
Nottingham University Hospitals NHS Trust			Outlier (>3SD)
Royal Cornwall Hospitals NHS Trust		Outlier (>3SD)	Outlier (>3SD)

<sup>11</sup> Outlier trusts included in analysis are referred to as 'Outlier (>3SD)' in the table

<sup>12</sup> Trusts with less than 70% completeness for the key variables of co-morbidity score, performance status and stage at diagnosis were excluded from the analysis. Please note that these variables were sourced from the [SACT Dataset](#), [National Cancer Registration Dataset](#), [Rapid Cancer Registration Dataset](#) and [Hospital Episode Statistics](#)

Trusts excluded based on the 70% completeness threshold are referred to as 'Excluded' in the table

Case-mix adjusted 30 day mortality post-SACT for bowel, breast and lung

Trust name	Bowel	Breast	Lung
Royal Free London NHS Foundation Trust	Excluded	Excluded	
Royal Surrey County Hospital NHS Foundation Trust		Excluded	
Sheffield Teaching Hospitals NHS Foundation Trust		Outlier (>3SD)	
Sherwood Forest Hospitals NHS Foundation Trust		Excluded	
St George's University Hospitals NHS Foundation Trust		Excluded	
Surrey and Sussex Healthcare NHS Trust	Excluded	Excluded	
The Princess Alexandra Hospital NHS Trust	Excluded	Excluded	Excluded
Torbay and South Devon NHS Foundation Trust	Outlier (>3SD)		
University College London Hospitals NHS Foundation Trust	Excluded	Excluded	
University Hospitals Birmingham NHS Foundation Trust		Excluded	
University Hospitals of Leicester NHS Trust		Excluded	
University Hospitals of North Midlands NHS Trust			Outlier (>3SD)
University Hospitals Plymouth NHS Trust			Outlier (>3SD)

## Trust comments

Trusts were invited to comment on their results. We received the following comments:

### **Blackpool Teaching Hospitals NHS Foundation Trust**

Blackpool Teaching Hospitals NHS Foundation Trust would like to thank NCRAS for the opportunity to comment on the case-mix adjusted 30 day mortality post-SACT analysis for patients with lung cancer covering 2019-2020.

Within the Trust every patient death within 30 days of receiving SACT has their care reviewed at the Oncology or Haematology SACT Mortality Meeting. A consensus is reached as to whether the last cycle of SACT was appropriate, the cause of death, and whether the death was causally related to the SACT.

For the 2019-2020 dataset, the Trust has been identified as an outlier for the treatment of patients with lung cancer. NCRAS have identified several patients who died within 30 days of their last SACT administration. Investigations on these patients found the following:

- Treatment for one patient at a trust which shared the same e-prescribing platform and was incorrectly assigned to Blackpool Teaching Hospitals. Since then, a new e-prescribing system has been adopted which should prevent subsequent similar errors.
- A number of patients were treated for non-small cell lung cancer (NSCLC) or small cell lung cancer (SCLC). Details for patients treated for NSCLC and SCLC are as follows:
  - A small number of patients were receiving adjuvant treatment and died following acute myocardial infarction after a second cycle of SACT.
  - A small number of patients who died from a treatment-related cause, namely neutropenic sepsis. The Acute Oncology Team recorded the antibiotic door-to-needle treatment time for these patients as ranging from 12 to 64 minutes (mean 43 minutes).
  - A small number of patients (with NSCLC) were considered to have died because of COVID-19 infection, due to having received treatment with combination chemotherapy and immunotherapy; or with immunotherapy only.
  - The cause of death was identified as progressive disease in several patients, due to
    - unrelated causes in a number of patients
    - co-morbid conditions in a small number of patients

- unknown/inconclusive (often sudden unexplained deaths at home) in a small number patients

Of the patients identified as dying from progressive disease, a small number died following their first cycle indicating rapidly progressing disease at presentation: a small number of patients had SCLC; a small number had NSCLC and received immunotherapy only; and a small number had NSCLC and received combination chemotherapy-immunotherapy. In all these cases the consensus opinion was that the decision to offer treatment was appropriate even though the subsequent outcome was poor.

Within the review of these cases the overall level of care was considered to be good for the majority of cases. Areas of improvement identified included the door-to-needle time for antibiotic administration for the treatment of suspected neutropenic sepsis and wider usage of prophylactic granulocyte colony-stimulating factor and antibiotics. There was also recognition that the use of PS to determine a patient's fitness for treatment was not without its limitations. Other assessment methods such as Clinical Frailty Score, G8 geriatric screening tool, Charlson Comorbidity Index, and the Cancer and Aging Research Group chemo-toxicity calculator have been used and are currently being considered for routine practice.

**If you have any questions regarding this work, please contact the SACT Dataset Helpdesk ([ndrs.datasets@nhs.net](mailto:ndrs.datasets@nhs.net))**