NDRS
NATIONAL DISEASE REGISTRATION SERVICE

NHS

CAS-SOP #4.8

Linking treatment tables: chemotherapy, tumour resections, and radiotherapy

About the NDRS

The National Disease Registration Service (NDRS) is part of NHS England (NHSE). Its purpose is to collect, collate and analyse data on patients with cancer, congenital anomalies, and rare diseases. It provides robust surveillance to monitor and detect changes in health and disease in the population. NDRS is a vital resource that helps researchers, healthcare professionals and policy makers make decisions about NHS services and the treatments people receive.

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.

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1. Introduction

This Standard Operating Procedure (SOP) (v4.8) updates the previous version (v4.7.1) to include tumours diagnosed in 2020. This version also adds resection procedures for melanoma in situ, extramammary paget disease (the latter is grouped with Skin: Rare), and non-malignant bladder tumours (ICD10 D090 and D414). In addition, this version adds outpatient Hospital Episode Statistics (HES) data for surgical resection procedures. Radio-isotope treatments are counted as radiotherapy treatment in this version, rather than as chemotherapy treatment, as in the previous version, and brachytherapy is counted as radiotherapy whereby it was previously not counted at all. The changes to the code since the previous release are summarised in Appendix 1 of this document. The ICD10 codes used for tumour sites and treatment timeframe rules are included in Appendix 2. Resection procedure codes are provided in Appendix 3.

The purpose of this SOP is to describe the method of linking treatment tables to the cancer registration data in the Cancer Analysis System (CAS). This allows basic treatment flags to be created; recording whether there was chemotherapy, tumour resection, or radiotherapy recorded following cancer diagnosis. This method was used for NCRAS publications of treatment work including the workbook 'Chemotherapy, Radiotherapy and Tumour Resections in England, 2013 – 2015' (available here) and the 'Chemotherapy, Radiotherapy and Tumour Resections in England, 2013-2020' tool available on CancerData.

The cancer sites included are the 32 sites which have pre-defined lists of relevant tumour resection procedures. All other sites are grouped under either 'other malignant' or 'other non-malignant' tumours. The term 'tumour resection' (previously termed 'major resection' in other outputs) is used to describe surgical attempts to remove the primary tumour. This SOP replaces the previous method used to count tumour resections (available here).

Cancer site and treatment-specific timeframes have been adopted to strike a balance between including as many treatments as possible carried out as part of the patient's first course of treatment for that tumour, whilst minimising the inclusion of treatments for recurrent tumours.

This SOP is to be used where the analyst wishes to extract data on treatments among cancer sites listed in Appendix 2. The cancer sites with a tumour resection flag have been chosen because they are solid tumours (so are potentially resectable); are commonly diagnosed; and input from a site-specific clinician was available. Expansion of this list to include more cancer sites, where

resection is a treatment choice, will be considered for future NCRAS work. Chemotherapy and radiotherapy data was available for all cancer sites. This SOP exists to set a standard that can be followed to produce uniform and replicable results and in particular for external requests for treatment data received via the NHSE Data Access Request Service (DARS). Certain projects may require a different approach and should be discussed with the lead of the NCRAS therapeutics functional team.

The procedure codes used to select tumour resections are listed in Appendix 3. The SQL script which accompanies this SOP can be found in Appendix 4. The SQL code produces tumour-level data with 3 treatment flags (chemotherapy [CT], tumour resection [SG] and radiotherapy [RT]), with 0 as no treatment and 1 where treatment is present.

2. Method

Cohort definition

Cancer registry data from AT_TUMOUR_ENGLAND was used to identify the cohort of patients. All patients diagnosed with malignant cancer, and some non-malignant tumours, as listed in appendix 2, in England between 2013 and 2020 were included. Males with gynaecological cancer and females with prostate cancer were excluded. Death certificate only registrations are included (0.1% of the cohort with a known route to diagnosis).

Overall approach to identify treatments

The datasets used to collate treatment data are AT_TREATMENT_ENGLAND, SACT (Systemic Anti-Cancer Therapy), RTDS (RadioTherapy DataSet), inpatient (Admitted Patient Care (APC)) HES (Hospital Episode Statistics) and outpatient (OP) HES. The AT_TREATMENT_ENGLAND table is linked at tumour level, based on registration staff linking tumours to recorded treatments. Appendix 5 details the datasets and Snapshots used in this update.

The scope of this SOP is tumours diagnosed from 2013 onwards as it is known that the data quality in AT_TREATMENT_ENGLAND and SACT is lower before this point. However, treatment flags for select groups (e.g. childhood cancers) may be fairly complete in AT_TREATMENT_ENGLAND for earlier years. Cancer Waiting Times (CWT) data is not currently used. This decision was made following an assessment of the coverage of the datasets, and as ≥98% of radiotherapy and ≥94% of chemotherapy were captured by registry, SACT and RTDS in the period October 2012 to March 2013 (with the data completeness believed to be increasing since) it did not justify the complication of including CWT data.

For patients with one tumour diagnosed in 2013-2020, and those patients with multiple tumours diagnosed more than eighteen months apart, data from both the tumour linked treatment table (AT_TREATMENT_ENGLAND) and the patient linked treatment tables (SACT, RTDS and HES) are used. However, for patients with two or more tumours diagnosed within eighteen months of each other, only data from the tumour linked treatment table (AT_TREATMENT_ENGLAND) is used. This is because for the patient linked tables, the precise tumour that a treatment relates to is not identified, only the person. The current scope of this SOP is to define a working methodology for counting treatments in the absence of tumour level linked data, i.e., currently SACT, RTDS and HES data are linked at patient level and while the tumour that any treatment data applies to (where a patient has multiple tumours) can be inferred it is not definitively linked. This may

be modified as and when further tumour-linked treatment data becomes available.

Tumours which received the same treatment more than once are only counted once.

Early stage tumour resections

Previous resections work relied upon lists of procedure codes (OPCS-4 codes) which would be used to remove the primary tumour (available here). These lists were defined in consultation with experienced clinicians. Lack of data on stage at diagnosis at the time of definition meant that the lists were conservative, and each code would apply across all tumours of that particular site regardless of stage. Now that high quality stage at diagnosis data is available for most sites, the list of OPCS-4 procedure codes used to define tumour resections has been adapted to include tumour resections for early stage tumours. Site-specific clinicians were consulted for the 30 sites included in the original major resection list, and stage-specific rules have now been incorporated for relevant sites (cervical, colon, rectum, malignant and non-malignant bladder, liver, oesophageal and stomach cancers).

In addition to the existing tumour resection list, the following procedures were identified as tumour resections in early stage disease only:

Cervical	Cone biopsies for FIGO stage 1a tumours, and also those with stage 1b & 1b1 disease if the patient also had a lymphadenectomy
Colon and rectum	Endoscopic resections and endoscopic biopsy procedures for TNM stage 1 tumours
Malignant bladder	Endoscopic resections, destructions, and cauterisation of lesion of bladder (TURBT) and other specified endoscopic extirpation of lesion of malignant bladder for T1 (non-muscle invasive) tumours
Non-malignant bladder	Endoscopic resections, destructions, and cauterisation of lesion of bladder (TURBT) and other specified endoscopic extirpation of lesion of bladder for ICD10 D090 ICDO 8130 (G2 pTa high grade) tumours

Liver	Percutaneous radiofrequency and microwave ablation of lesion of liver for TNM stage 1 tumours
Oesophagus	Fibreoptic endoscopic resection of lesions of upper gastrointestinal tract and oesophagus for TNM stage 1a tumours
Stomach	Fibreoptic endoscopic resection of lesion of upper gastrointestinal tract and oesophagus for TNM stage 1a tumours

In addition, after clinical review certain OPCS-4 codes were added to or removed from the previous list for all stages of disease. For more information, see Appendix 3, and Appendix 6 for a sensitivity analysis showing the impact of adding stage-specific tumour resections.

Timeframe

NCRAS follows European Network of Cancer Registries (ENCR) rules to define the date of diagnosis. This may be sourced from several data items including the date of the first pathological report confirming the tumour (although the date the pathological sample was taken is preferred, if available). This means that date of diagnosis can be shortly after a surgical resection. To avoid excluding relevant data, treatments in the one month (-31 days inclusive) prior to diagnosis were included in the analysis.

A data-driven approach with additional input from site-specialist clinicians was used to decide a site- and modality- specific post-diagnosis timeframe. The timeframe was chosen to be long enough to capture as many treatments as possible as part of the patient's primary course of treatment, while also minimising the inclusion of treatments for recurrence. This SOP counts treatments between one month before, to up to eighteen months after diagnosis, with the exact timeframe depending on the site and treatment type. For patients who received each treatment for each cancer, the number of days after diagnosis at which 95% of these patients received the treatment was identified. This was rounded up to the nearest three-month interval, and this timeframe cut off was applied. Post-diagnosis timeframes were therefore 6, 9, 12, 15 or 18 months. The timeframes were based on 2013 and 2014 data only, because of the length of follow-up data required.

For example, of the pancreatic tumours diagnosed in 2013-14 which received a tumour resection within two years of diagnosis, 95% had their resection within

226 days. Therefore, for all pancreatic cancers diagnosed in 2013-2016, a post-diagnosis tumour resection timeframe of 274 days (9 months) was applied. Exceptions to the data driven approach were made for particular treatments for certain cancer sites under recommendation from clinicians. For these sites, clinicians decided the timeframe using a combination of their own experience and the data. See Appendix 2 for details, and Appendix 7 for a sensitivity analysis showing the impact of changing the timeframes.

Relative to other tumour sites, treatment data quality for non-melanoma skin cancers (NMSC) (BCC, cSCC and rare tumours) is poor. A data-driven approach failed to identify 95% of chemotherapy and radiotherapy treatments within an appropriate timeframe. Clinician input was therefore used to decide suitable timeframes for treatment periods, with the view that quantifying the current state of treatment data can be used as a base to improve overall data quality. These figures should therefore be considered provisional and are expected to be incomplete.

SQL rules used to identify treatments

In order to match the output from CancerStats, the cascade_inci_flag (from the registry AT_TUMOUR_ENGLAND base table) must equal 1 (refer to the standard operating procedure "CAS-SOP #1: Counting Cancer Cases" for further information on this, available on request to NCRAS). This SOP applies to CAS 1612 onwards, as it uses the newly categorised treatments implemented in December 2016.

Chemotherapy

A tumour is recorded as treated with chemotherapy if:

- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with chemotherapy (event is either 'Cytotoxic Chemotherapy' (code = 02) or 'CT - Other' (code = CTX) or 'chemoradiotherapy' (code = 04) or 'Immunotherapy' (code = 15))
- and the event date (EVENTDATE) occurred in the relevant timeframe (see Appendix 2)

OR

- there is a record in SACT (excluding those null or classified as 'Hormones' or 'Not chemo' or 'Zoledronic acid' or 'Pamidronate' or 'Denosumab' or 'Radium 223' or 'Lutetium-177' or 'Yttrium-90')
- and the start date of the regimen (START_DATE_OF_REGIMEN) occurred in the relevant timeframe
- and the patient had no other tumours diagnosed in the 18 months before or after that tumour's diagnosis date

SACT is linked to cancer registration where NHS numbers are a perfect match. Regimen mappings are based on both those directly confirmed by trusts, and those assigned by the SACT team (for example where trusts haven't addressed unmapped regimens).

Tumour resections

A tumour is recorded as treated by resection if:

- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
- and the OPCS4_CODE is in the tumour resection list
- or the OPCS4_CODE is identified as a tumour resection in early stage tumours for that specific cancer site (see Appendix 3)
- and the operation date (OPERTN) occurred in the relevant timeframe (see Appendix 2)

OR

- there is an inpatient or outpatient HES episode with a tumour resection OPCS-4 code in one of the operation fields
- or one of the operation fields contains an OPCS-4 code identified as a tumour resection in early stage tumours for that specific cancer site (see Appendix 3)
- and the operation date (OPERTN) occurred in the relevant timeframe
- and the patient had no other tumours diagnosed in the 18 months before or after that tumour's diagnosis date

HES is linked to the cancer registration using a matching algorithm taking into account NHS number, date of birth, sex and postcode at diagnosis (details available on request to NCRAS).

Radiotherapy

A tumour is recorded as treated with radiotherapy if:

- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with radiotherapy (event is either 'RT - Teletherapy' (code = 05) or 'chemoradiotherapy' (code = 04) or 'radiosurgery' (code = 22) or 'RT - Other/ NK' (code = RTX) or 'radioisotope therapy (including radioiodine)' (code = 19)) or 'brachytherapy' (code=06)
- and the event date (EVENTDATE) occurred in the relevant timeframe (see Appendix 2)

OR

- there is a record in RTDS (including for 'brachytherapy' (RTTREATMENTMODALITY=06))
- and the appointment date (APPTDATE) occurred in the relevant timeframe
- and the patient had no other tumours diagnosed in the 18 months before or after that tumour's diagnosis date

RTDS is linked to the cancer registration using a matching algorithm taking into account NHS number, date of birth, sex and postcode at diagnosis (details available on request to NCRAS).

From 1 April 2016, NHSE (previously Public Health England) took over full responsibility for RTDS, allowing greater integration of the management, collection, quality assurance and analysis of radiotherapy data alongside the other major national cancer data sets in its charge. For patients whose follow up

period for radiotherapy extended past April 2016, the RTDS.AT_PRESCRIPTIONS_ENGLAND dataset in CAS2303 was used.

Results breakdowns

Results are broken down by 32 tumour sites; the ICD-10 codes used to define these can be found in Appendix 2. Definitions for skin cancer can be found in the CAS_SOP_CountingSkinCancer_2.0.

Stage breakdowns in the data release use TNM staging, except for gynaecological cancers which use Figo staging. For cervical cancers, only FIGO staging was used. For ovarian, uterine and vulval cancers, TNM stage was used where Figo stage was unknown. Figo substages were collated into Figo stages 1, 2, 3, 4, and unknown. To remain consistent with published stage data, Breast tumours (C50) with Paget's disease were excluded. The final recorded stage of a tumour is derived by the registration service using all information available up to 3 months after diagnosis. For this reason, the tumour stage shown in this data may be different to the stage originally available to the clinician when deciding a course of treatment, as it may have been subsequently updated following removal of the tumour and pathology results.

The patient's age group was based on the age of the patient when they were diagnosed with the tumour.

The patient's Index of multiple deprivation (IMD) quintile was allocated by linking the patient's postcode to their 2011 ONS census Lower Super Output Area (LSOA). This was then linked to the Ministry of Housing, Communities & Local Government English Indices of Deprivation equal LSOA weighted quintile for that LSOA and appropriate year (2015 quintiles were using for diagnoses in 2013, 2019 quintiles were used for diagnoses after 2013).

The patient's Charlson comorbidity score was derived from Hospital Episodes Statistics (HES) and Cancer Registry data combined and looks back at the time period between 27 months to 3 months before the patient's cancer diagnosis.

The patient's Cancer Alliance was allocated based on their Cancer Alliance of residence at point of diagnosis, not the location(s) where they were treated.

Appendix 1: Code changes in SOP version 4.8 compared to 4.7.1

Changes have been made to the extraction code and lookups in SOP version 4.8 since SOP version 4.7.1 was published for 2013-2019 diagnoses. These are noted below. Only non-superficial changes are noted; i.e. changes that could potentially impact the results.

Timeframe rules

Timeframes were added for non-malignant bladder cancers (ICD10 D090 and D414), melanoma in situ and extra mammary paget disease tumours.

Tumour resection rules

Resection OPCS-4 codes were added for non-malignant bladder cancers (ICD10 D090 and D414), melanoma in situ tumours and extra mammary paget disease tumours.

Tumour cohort table

The Snapshot used for AT_TUMOUR_ENGLAND and AT_TREATMENT_ENGLAND was updated to AV2020.

Tumours were extracted with diagnoses between 2013-2020.

Cancer group updates:

- ICD10 D414 and D090 are extracted into a non-malignant bladder group.
- Melanoma in situ tumours are extracted in to their own group from AT_TUMOUR_SKIN. For the full definition please refer to CAS_SOP_CountingSkinCancer_2.0.
- The definition for skin: rare tumours were updated to additionally include extra mammary paget disease from AT_TUMOUR_SKIN. For the full definition please refer to CAS_SOP_CountingSkinCancer_2.0.

Chemotherapy flag

The snapshot used for AT_TREATMENT_ENGLAND was updated to AV2020. The snapshot used for the SACT dataset post-July 2017 was updated to CAS2303. Radioisotope therapy is no longer counted as a chemotherapy treatment.

Tumour resection flag

Code to extract tumour resections from outpatient HES data was added, in addition to the pre-existing code to extract tumour resections from inpatient HES. Where a resection procedure is recorded in both the HES APC and HES OP data, the earliest is taken. Where a resection procedure occurs on the same day from the HES APC and HES OP data, the resection from HES APC is taken over HES OP.

Resection codes were added for non-malignant bladder, melanoma in situ and extra mammary paget disease tumours. Endoscopic resections, destructions, and cauterisation of lesion of bladder (TURBT) and other specified endoscopic extirpation of lesion of bladder were only counted for non-malignant bladder tumours of ICD10 D090 ICDO 8130 (G2 pTa high grade) tumours. See appendix 3 for a complete list of resection codes used.

Radiotherapy flag

The snapshot used for AT_TREATMENT_ENGLAND was updated to AV2020. The snapshot used for the RTDS dataset post-April 2016 was updated to CAS2303.

Tumours recorded as receiving radioisotope therapy are now counted as radiotherapy, and not chemotherapy as in the previous SOP (4.7.1). Additionally, those treated with brachytherapy are now counted as radiotherapy compared to the previous version (4.7.1) in which they were not counted at all.

Index of Deprivation

Historically NCRAS have used equal population-weighted income domain quintiles to assess deprivation. This method is limited in that income by itself may not give a full reflection of deprivation. After a recent review NCRAS will now use the 'index of multiple deprivation' (IMD) to assess deprivation, which is in line with the rest of the public health world. The IMD looks at six categories:

1. Employment deprivation
2. Education, skills and training deprivation
3. Health deprivation and disability
4. Crime
5. Barriers to housing and services
6. Living environment deprivation

Quintiles in the IMD are equally weighted by Lower Layer Super Output Areas (LSOAs) where 1 is the most deprived quintile and 5 the least.

The deprivation measure (IMD19_QUINTILE_LSOAS) in this version of the treatment flags table therefore uses the IMD equal LSOA weighted deprivation measures where quintile 1 is the most deprived and quintile 5 this least. This replaces the use of equal population-weighted income domain quintiles, where 1 is the least deprived quintile and quintile 5 the most deprived, used in previous versions.

Appendix 2: Summary of tumour sites & timeframe rules

		Days included as post-diagnostic time period (months)		
Cancer site	ICD10 codes	Chemotherapy	Tumour resections	Radiotherapy
Bladder: Malignant bladder	C67	365 (12)	274 (9)	365 (12)*
Bladder: Non-malignant bladder	D090	274 (9)	456 (15)	547 (18)
Bladder: Non-malignant bladder	D414	183 (6)	456 (15)	547 (18)
Brain: Benign endocrine	D35.2-D35.4	547 (18)	365 (12)	547 (18)
Brain: Malignant brain	C70-72	547 (18)	183 (6)	365 (12)
Brain: Non-benign endocrine	C75.1-C75.3 D44.3-D44.5	547 (18)	183 (6)	365 (12)
Brain: Non-malignant brain	D32-D33, D42-D44.5	547 (18)	365 (12)	547 (18)
Breast	C50	365 (12)*	365 (12)*	365 (12)*
Cervical	C53	274 (9)*	274 (9)*	274 (9)*
Colorectal: Colon	C18-19	365 (12)*	183 (6)*	365 (12)*
Colorectal: Rectum	C20	365 (12)*	365 (12)*	365 (12)*
Hypopharynx	C12, C13	183 (6)	365 (12)	183 (6)
Larynx	C32	365 (12)	456 (15)	183 (6)
Oral cavity	C02, C03, C04, C06	456 (15)	183 (6)	456 (15)
Oropharynx	C01, C09, C10	183 (6)	365 (12)	183 (6)
Other head and neck	C05, C11, C14, C30, C31	365 (12)	456 (15)	274 (9)
Salivary glands	C07, C08	547 (18)	183 (6)	274 (9)
Kidney	C64-C66, C68	365 (12)*	183 (6)	365 (12)*
Liver	C22	456 (15)	365 (12)	547 (18)
SCLC	C33-C34 with ICD-O-2 morphology in list 8041, 8042, 8043, 8044, 8045	183 (6)*	183 (6)*	183 (6)*
NSCLC	C33-C34 with ICD-O-2 morphology not	183 (6)*	183 (6)*	183 (6)*

	in list 8041, 8042, 8043, 8044, 8045			
Oesophagus	C15	183 (6)	274 (9)	274 (9)*
Ovary	C56-C57, C48 (females, excluding ICD-O-2 8693, 8800-8806, 8963, 8990, 8991, 9040-9044, 8810-8921, 9120-9373, 9490, 9500, 9530-9582), D39.1	274 (9)*	274 (9)*	274 (9)*
Pancreas	C25	183 (6)	274 (9)	547 (18)
Prostate	C61	365 (12)*	456 (15)	365 (12)*
Skin: Melanoma^	C43	456 (15)	183 (6)	547 (18)
Skin: Melanoma in situ^	D03	456 (15)	183 (6)	547 (18)
Skin: NMSC BCC^	First ever BCC registration and all BCC genital tumours	547 (18)	365 (12)	547 (18)
Skin: NMSC cSCC^	First ever cSCC registration and all cSCC genital tumours	456 (15)	183 (6)	547 (18)
Skin: Rare^	All registered rare skin tumours	456 (15)	183 (6)	547 (18)
Skin: Rare^	Extramammary Paget's disease	547 (18)	365 (12)	547 (18)
Stomach	C16	183 (6)	274 (9)	274 (9)*
Testis	C62, D29.2	274 (9)	183 (6)	547(18)
Uterine	C54-C55	274 (9)*	274 (9)*	274 (9)*
Other malignant neoplasms	C00, C17, C21, C23-C24, C26, C37-C42, C45-C48, non-ovarian C48, C49, C52, C58-C60, C63, C69, C75.0, C75.4-C97	456 (15)	N/A	547 (18)
Other non-malignant neoplasms	D00, D02, D05, D09.1-D09.9, D10, D12, D14, D17, D19-D24, D26, D28, D30, D31, D34, D35.0-D35.1, D35.5-D35.9, D37-D38, D41.0-D41.3, D41.7-D41.9, D44.0-D44.2, D44.6-D44.9, D45-D47	456 (15)	183 (6)	547 (18)

The following ICD 10 codes and post-diagnostic treatment time periods were used for the cancer sites presented in this workbook. The time periods were identified using a data driven approach detailed in CAS-SOP #4.4, with exceptions (*) made for particular treatments for certain cancer sites under recommendation from clinicians. These timeframes were chosen by clinicians using their own experience and the data.

^ Please refer to the CAS_SOP_CountingSkinCancer_2.0 SOP for full details on how skin tumours, in particular non-melanoma skin cancers (NMSC) are defined.

Appendix 3: Site-specific summary of tumour resection rules

OPCS-4 code	Procedure name	Notes
Malignant and non-malignant bladder (C67, D090, D414)		
M421	Endoscopic resection of lesion of bladder	Non muscle invasive (T1) C67 tumours and G2 pTa high grade (defined by morphology 8130) D090 tumours only. All D414.
M422	Endoscopic cauterisation of lesion of bladder	Non muscle invasive (T1) C67 tumours and G2 pTa high grade (defined by morphology 8130) D090 tumours only. All D414.
M423	Endoscopic destruction of lesion of bladder NEC	Non muscle invasive (T1) C67 tumours and G2 pTa high grade (defined by morphology 8130) D090 tumours only. All D414.
M428	Other specified endoscopic extirpation of lesion of bladder	Non muscle invasive (T1) C67 tumours and G2 pTa high grade (defined by morphology 8130) D090 tumours only. All D414.
M429	Unspecified endoscopic extirpation of lesion of bladder	Non muscle invasive (T1) C67 tumours and G2 pTa high grade (defined by morphology 8130) D090 tumours only. All D414.
M341	Cystoprostatectomy	
M342	Cystourethrectomy	
M343	Cystectomy NEC	
M344	Simple cystectomy	
M348	Other specified total excision of bladder	
M349	Unspecified total excision of bladder	
M359	Unspecified partial excision of bladder	
X142	Anterior exenteration of pelvis	

Brain (C70-C72, C75.1-C75.3)	
A011	Hemispherectomy
A012	Total lobectomy of brain
A013	Partial lobectomy of brain
A018	Other specified major excision of tissue of brain
A019	Unspecified major excision of tissue of brain
A021	Excision of lesion of tissue of frontal lobe of brain
A022	Excision of lesion of tissue of temporal lobe of brain
A023	Excision of lesion of tissue of parietal lobe of brain
A024	Excision of lesion of tissue of occipital lobe of brain
A025	Excision of lesion of tissue of cerebellum
A026	Excision of lesion of tissue of brain stem
A028	Other specified excision of lesion of tissue of brain
A029	Unspecified excision of lesion of tissue of brain
A068	Other specified other excision of lesion of tissue of brain
A069	Unspecified other excision of lesion of tissue of brain
A171	Endoscopic extirpation of lesion of ventricle of brain
A291	Excision of lesion of optic nerve (II)
A292	Excision of lesion of oculomotor nerve (III)
A293	Excision of lesion of trigeminal nerve (V)
A294	Excision of lesion of facial nerve (VII)
A295	Excision of lesion of acoustic nerve (VIII)
A296	Excision of lesion of glossopharyngeal nerve (IX)
A297	Excision of lesion of vagus nerve (X)
A298	Excision of lesion of specified cranial nerve NEC
A299	Unspecified excision of lesion of cranial nerve
A381	Extirpation of lesion of meninges of cortex of brain
A382	Extirpation of lesion of meninges of sphenoidal ridge of cranium

A383	Extirpation of lesion of meninges of subfrontal region of brain
A384	Extirpation of lesion of meninges of parasagittal region of brain
A385	Extirpation of lesion of falx cerebri
A386	Extirpation of lesion of tentorium cerebelli
A388	Other specified excision of lesion of meninges of brain
A389	Unspecified extirpation of lesion of meninges of brain
A431	Extirpation of lesion of meninges of skull base
A432	Extirpation of lesion of meninges of skull clivus
A438	Other specified other extirpation of lesion of meninges of brain
A439	Unspecified other extirpation of lesion of meninges of brain
A441	Chordectomy of spinal cord
A442	Extirpation of lesion of spinal cord NEC
A443	Excision of lesion of intradural intramedullary spinal cord NEC
A444	Excision of lesion of extradural spinal cord
A445	Excision of lesion of intradural extramedullary spinal cord
A448	Other specified partial extirpation of spinal cord
A449	Unspecified partial extirpation of spinal cord
A511	Extirpation of lesion of meninges of spinal cord
A571	Extirpation of lesion of psinal nerve root
A598	Other specified excision of peripheral nerve
A611	Excision of lesion of peripheral nerve
B012	Trans-spenoidal hypophysectomy

B013	Trans-septal hypophysectomy
B014	Transcranial hypophysectomy
B018	Other specified excision of pituitary gland
B019	Unspecified excision of pituitary gland
B041	Excision of lesion of pituitary gland
B061	Excision of pineal gland
B068	Other specified operations on pineal gland
C021	Excision of lesion of orbit
V051	Extirpation of lesion of cranium
V074	Excision of lesion of infratemporal fossa
V291	Primary laminectomy excision of cervical intervertebral disc
V312	Primary anterolateral excision of thoracic intervertebral disc NEC
V318	Other specified primary excision of thoracic intervertebral disc
V319	Unspecified primary excision of thoracic intervertebral disc
V331	Primary laminectomy excision of lumbar intervertebral disc
V339	Unspecified primary excision of lumbar intervertebral disc
V351	Primary excision of intervertebral disc NEC
V431	Excision of lesion of cervical vertebra
V432	Excision of lesion of thoracic vertebra
V433	Excision of lesion of lumbar vertebra
V438	Other specified extirpaiton of lesion of spine
V439	Unspecified extirpation of lesion of spine

Breast (C50)	
B271	Total mastectomy and excision of both pectoral muscles and part of chest wall
B272	Total mastectomy and excision of both pectoral muscles NEC

B273	Total mastectomy and excision of pectoralis minor muscle
B274	Total mastectomy NEC
B275	Subcutaneous mastectomy
B276	Skin sparing mastectomy
B278	Other specified total excision of breast
B279	Unspecified total excision of breast
B281	Quadrantectomy of breast
B282	Partial excision of breast NEC
B283	Excision of lesion of breast NEC
B284	Re-excision of breast margins
B285	Wire guided partial excision of breast
B286	Excision of accessory breast tissue
B287	Wire guided excision of lesion of breast
B288	Other specified other excision of breast
B289	Unspecified other excision of breast
B341	Subareolar excision of mammary duct
B342	Excision of lesion of mammary duct
B343	Excision of lesion of mammary duct
B352	Excision of nipple
B353	Extirpation of lesion of nipple
B374	Capsulectomy of breast
B401	Interstitial laser destruction of lesion of breast
B408	Other specified destruction of lesion of breast
B409	Unspecified destruction of lesion of breast

Cervical (C53)	
P172	Partial colpectomy

Q011	Amputation of cervix uteri	
Q013	Excision of lesion of cervix uteri	
Q018	Other specified excision of cervix uteri	
Q071	Abdominal hysterocolpectomy and excision of periuterine tissue	
Q072	Abdominal hysterectomy and excision of periuterine tissue NEC	
Q073	Abdominal hysterocolpectomy NEC	
Q074	Total abdominal hysterectomy NEC	
Q078	Other specified abdominal excision of uterus	
Q079	Unspecified abdominal excision of uterus	
Q081	Vaginal hysterocolpectomy and excision of periuterine tissue	
Q082	Vaginal hysterectomy and excision of periuterine tissue NEC	
Q083	Vaginal hysterocolpectomy NEC	
Q088	Other specified vaginal excision of uterus	
Q089	Unspecified vaginal excision of uterus	
X141	Total exenteration of pelvis	
X142	Anterior exenteration of pelvis	
X143	Posterior exenteration of pelvis	
X148	Other specified clearance of pelvis	
X149	Unspecified clearance of pelvis	
Q014	Large loop excision of transformation zone	Figo stage 1a only, and stage 1b and 1b1 where also present with a lymphadenectomy code (TT856, T859, T865)
Q031	Knife cone biopsy of cervix uteri	Figo stage 1a only, and stage 1b and 1b1 where also present with a lymphadenectomy code (TT856, T859, T865)

Q032	Laser cone biopsy of cervix uteri	Figo stage 1a only, and stage 1b and 1b1 where also present with a lymphadenectomy code (TT856, T859, T865)
Q033	Cone biopsy of cervix uteri NEC	Figo stage 1a only, and stage 1b and 1b1 where also present with a lymphadenectomy code (TT856, T859, T865)
T856	Block dissection of pelvic lymph nodes	Figo stage 1b and 1b1 where also present with a cone biopsy code (Q014, Q031, Q032, Q033)
T859	Unspecified block dissection of lymph nodes	Figo stage 1b and 1b1 where also present with a cone biopsy code (Q014, Q031, Q032, Q033)
T865	Sampling of mediastinal lymph nodes	Figo stage 1b and 1b1 where also present with a cone biopsy code (Q014, Q031, Q032, Q033)

Colon and rectum (C18, C19 and C20)	
H041	Panproctocolectomy and ileostomy
H042	Panproctocolectomy and anastomosis of ileum to anus and creation of pouch HFQ
H043	Panproctocolectomy and anastomosis of ileum to anus NEC
H048	Other specified total excision of colon and rectum
H049	Unspecified total excision of colon and rectum
H051	Total colectomy and anastomosis of ileum to rectum
H052	Total colectomy and ileostomy and creation of rectal fistula HFQ
H053	Total colectomy and ileostomy NEC
H058	Other specified total excision of colon
H059	Unspecified total excision of colon

H061	Extended right hemicolectomy and end to end anastomosis
H062	Extended right hemicolectomy and anastomosis of ileum to colon
H063	Extended right hemicolectomy and anastemosis NEC
H064	Extended right hemicolectomy and ileostomy HFQ
H065	Extended right hemicolectomy and end to side anastomosis
H068	Other specified extended excision of right hemicolon
H069	Unspecifed extended excision of right hemicolon
H071	Right hemicolectomy and end to end anastomosis of ileum to colon
H072	Right hemicolectomy and side to side anastomosis of ileum to transverse colon
H073	Right hemicolectomy and anastomosis NEC
H074	Right hemicolectomy and ileostomy HFQ
H075	Right hemicolectomy and end to side anastomosis
H078	Other specified other excision of right hemicolon
H079	Unspecified other excision of right hemicolon
H081	Transverse colectomy and end to end anastomosis
H082	Transverse colectomy and anastomosis of ileum to colon
H083	Transverse colectomy and anastomosis NEC
H084	Transverse colectomy and ileostomy HFQ

H085	Transverse colectomy and exteriorisation of bowel NEC
H088	Other specified excision of transverse colon
H089	Unspecified excision of transverse colon
H091	Left hemicolectomy and end to end anastomosis of colon to rectum
H092	Left hemicolectomy and end to end anastomosis of colon to colon
H093	Left hemicolectomy and anastomosis NEC
H094	Left hemicolectomy and ileostomy HFQ
H095	Left hemicolectomy and exteriorisation of bowel NEC
H098	Other specified excision of left hemicolon
H099	Unspecified excision of left hemicolon
H101	Sigmoid colectomy and end to end anastomosis of ileum to rectum
H102	Sigmoid colectomy and anastomosis of colon to rectum
H103	Sigmoid colectomy and anastomosis NEC
H104	Sigmoid colectomy and ileostomy HFQ
H105	Sigmoid colectomy and exteriorisation of bowel NEC
H106	Sigmoid colectomy and end to side anastomosis
H108	Other specified excision of sigmoid colon
H109	Unspecified excision of sigmoid colon
H111	Colectomy and end to end anastomosis of colon to colon NEC
H112	Colectomy and side to side anastomosis of ileum to colon NEC
H113	Colectomy and anastomosis NEC
H114	Colectomy and ileostomy NEC

H115	Colectomy and exteriorisation of bowel NEC
H118	Other specified other excision of colon
H119	Unspecified other excision of colon
H291	Subtotal excision of colon and rectum and creation of colonic pouch and anastomosis of colon to anus
H292	Subtotal excision of colon and rectum and creation of colonic pouch NEC
H293	Subtotal excision of colon and creation of colonic pouch and anastomosis of colon to rectum
H294	Subtotal excision of colon and creation of colonic pouch NEC
H298	Other specified subtotal excision of colon
H299	Unspecified subtotal excision of colon
H322	Hartmann procedure (rectosigmoidectomy)
H331	Abdominoperineal excision of rectum and end colostomy
H332	Proctectomy and anastomosis of colon to anus
H333	Anterior resection of rectum and anastomosis of colon to rectum using staples
H334	Anterior resection of rectum and anastomosis NEC
H335	Rectosigmoidectomy and closure of rectal stump and exteriorisation of bowel
H336	Anterior resection of rectum and exteriorisation of bowel
H337	Perineal resection of rectum HFQ
H338	Other specified excision of rectum
H339	Unspecified excision of rectum
H404	Trans-sphincteric anastomosis of colon to anus

H408	Other specified operations on rectum through anal sphincter	
H409	Unspecified operations on rectum through anal sphincter	
X141	Total exenteration of pelvis	
X142	Anterior exenteration of pelvis	
X143	Posterior exenteration of pelvis	
X148	Other specified clearance of pelvis	
X149	Unspecified clearance of pelvis	
H122	Excision of lesion of colon NEC	Stage 1 only
H181	Open colonoscopy	Stage 1 only
H191	Open biopsy of lesion of colon	Stage 1 only
H201	Fibreoptic endoscopic snare resection of lesion of colon	Stage 1 only
H202	Fibreoptic endoscopic cauterisation of lesion of colon	Stage 1 only
H204	Fibreoptic endoscopic destruction of lesion of colon NEC	Stage 1 only
H205	Fibreoptic endoscopic submucosal resection of lesion of colon	Stage 1 only
H206	Fibreoptic endoscopic resection of lesion of colon NEC	Stage 1 only
H208	Other specified endoscopic extirpation of lesion of colon	Stage 1 only
H209	Unspecified endoscopic extirpation of lesion of colon	Stage 1 only
H221	Diagnostic fibreoptic endoscopic examination of colon and biopsy of lesion of colon	Stage 1 only
H229	Undpecified diagnostic endoscopic examination of colon	Stage 1 only
H231	Endoscopic snare resection of lesion of lower bowel using fibreoptic sigmoidoscope	Stage 1 only

H232	Endoscopic cauterisation of lesion of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H235	Endoscopic submucosal resection of lesion of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H236	Endoscopic resection of lesion of lower bowel using fibreoptic sigmoidoscope NEC	Stage 1 only
H238	Other specified endoscopic extirpation of lesion of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H239	Unspecified endoscopic extirpation of lesion of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H248	Other specified other therapeutic endoscopic operations on lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H251	Diagnostic endoscopic examination of lower bowel and biopsy of lesion of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H259	Unspecified diagnostic endoscopic examination of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H261	Endoscopic snare resection of lesion of sigmoid colon using rigid sigmoidoscope	Stage 1 only
H281	Diagnostic endoscopic examination of sigmoid colon and biopsy of lesion of sigmoid colon using rigid sigmoidoscope	Stage 1 only
H341	Open excision of lesion of rectum	Stage 1 only
H402	Trans-sphincteric excision of lesion of recturm	Stage 1 only
H412	Peranal excision of lesion of rectum	Stage 1 only
H418	Other specified other operations on rectum through anus	Stage 1 only
H419	Unspecified other operations on rectum through anus	Stage 1 only
H561	Biopsy of lesion of anus	Stage 1 only

H024	Incidental appendicectomy	C18.1 (appendix tumours) only
H019	Unspecified emergency excision of appendix	C18.1 (appendix tumours) only
H011	Emergency excision of abnormal appendix and drainage HFQ	C18.1 (appendix tumours) only

Head and neck (C01, C02, C03, C04, C05, C06, C07, C08, C09, C10, C11, C12, C13, C14, C30, C31, C32)	
E191	Total pharyngectomy
E192	Partial pharyngectomy
E214	Plastic repair of pharynx NEC
E231	Open excision of lesion of pharynx
E242	Endoscopic extirpation of lesion of pharynx NEC
E291	Total laryngectomy
E292	Partial horizontal laryngectomy
E293	Partial vertical laryngectomy
E294	Partial laryngectomy NEC
E295	Laryngofissure and chordectomy of vocal chord
E296	Laryngectomy NEC
E299	Unspecified excision of larynx
E301	Excision of lesion of larynx using thryotomy as approach
E341	Microtherapeutic endoscopic extirpation of lesion of larynx using laser
E342	Microtherapeutic endoscopic resection of lesion of larynx NEC
E343	Microtherapeutic endoscopic destruction of lesion of larynx NEC
E352	Endoscopic resection of lesion of pharynx NEC

E414	Tracheo-oesophageal puncture with insertion of speech prothesis	
F011	Excision of vermilion border of lip and advancement of mucosa of lip	
F018	Other specified partial excision of lip	
F021	Excision of lesion of lip	
F042	Reconstruction of lip using skin flap	
F202	Excision of lesion of gingiva	
F221	Total glossectomy	
F222	Partial glossectomy	
F231	Excision of lesion of tongue	
F281	Excision of lesion of palate	
F301	Plastic repair of palate using flap of palate	
F303	Plastic repair of palate using flap of tongue	
F304	Plastic repair of palate using graft of skin	
F305	Plastic repair of palate using flap of mucosa	
F324	Operations on uvula NEC	
F328	Other specified other operations on palate	
F341	Bilateral dissection tonsillectomy	Tonsil tumours (C09) only
F349	Unspecified excision of tonsil	
F381	Excision of lesion of floor of mouth	
F382	Excision of lesion of mouth NEC	
F391	Reconstruction of mouth using flap NEC	
F392	Reconstruction of mouth using graft NEC	
F441	Total excision of parotid gland	
F442	Partial excision of parotid gland	
F443	Excision of parotid gland NEC	
F444	Excision of submandibular gland	
F451	Excision of lesion of parotid gland	

G021	Total oesophagectomy and anastomosis of pharynx to stomach
G032	Partial oesophagectomy and interposition of microvascularly attached jejunum
S171	Distant myocutaneous subcutaneous pedicle flap to head or neck
S208	Other specified other distant flap of skin
S248	Other specified local flap of skin and muscle
S288	Other specified flap of mucosa
S353	Split autograft of skin to head or neck NEC
T851	Block dissection of cervical lymph nodes
V061	Medial maxillectomy
V068	Other specified excision of maxilla
V069	Unspecified excision of maxilla
V141	Hemimandibulectomy
V142	Extensive excision of mandible NEC
V143	Partial excision of mandible NEC
V144	Excision of lesion of mandible
V149	Unspecified excision of mandible
V168	Other specified division of mandible
V191	Reconstruction of mandible
Y051	Total excision of organ NOC
Y592	Harvest of radial artery flap of skin and fascia
Y598	Other specified harvest of flap of skin and fascia
Y612	Harvest of flap of skin and pectoralis major muscle
Y631	Harvest of flap of latissimus dorsi muscle NEC
Y638	Other specified harvest of flap of muscle of trunk

Y662	Harvest of bone from rib	

Kidney (C64-C66, C68)		
M021	Nephrectomy and excision of perirenal tissue	
M022	Nephroureterectomy NEC	
M023	Bilateral nephrectomy	
M024	Excision of half of horseshoe kidney	
M025	Nephrectomy NEC	
M028	Other specified total excision of kidney	
M029	Unspecified total excision of kidney	
M038	Other specified partial excision of kidney	
M039	Unspecified partial excision of kidney	
M042	Open excision of lesion of kidney NEC	
M104	Endoscopic cryoablation of lesion of kidney	
M137	Percutaneous radiofrequency ablation of lesion of kidney	
M181	Total ureterectomy	
M182	Excision of segment of ureter	
M183	Secondary ureterectomy	
M252	Open excision of lesion of ureter NEC	
M291	Endoscopic extirpation of lesion of ureter	Tumours of ureter (C66) & pelvis (C65) only
Y112	Cryotherapy to organ NOC	

Liver (C22)		
J011	Orthotopic transplantation of liver NEC	
J015	Orthotopic transplantation of whole liver	
J019	Unspecified transplantation of liver	
J021	Right hemihepatectomy NEC	
J022	Left hemihepatectomy NEC	
J023	Resection of segment of liver	

J024	Wedge excision of liver	
J026	Extended right hemihepatectomy	
J027	Extended left hemihepatectomy	
J028	Other specified partial excision of liver	
J029	Unspecified partial excision of liver	
J031	Excision of lesion of liver NEC	
J053	Open wedge biopsy of lesion of liver	
J101	Percutaneous transluminal embolisation of hepatic artery	
J124	Percutaneous radiofrequency ablation of lesion of liver	Stage 1 only
J127	Percutaneous microwave ablation of lesion of liver	Stage 1 only

Small cell lung cancer (SCLC) and Non small cell lung cancer (NSCLC) (C33-C34)	
E391	Open excision of lesion of trachea
E398	Other specified partial excision of trachea
E399	Unspecified partial excision of trachea
E438	Other specified other open operations on trachea
E441	Excision of carina
E461	Sleeve resection of bronchus and anastomosis HFQ
E463	Excision of lesion of bronchus NEC
E468	Other specified partial extirpation of bronchus
E541	Total pneumonectomy
E542	Bilobectomy of lung
E543	Lobectomy of lung
E544	Excision of segment of lung
E545	Partial lobectomy of lung NEC
E548	Other specified excision of lung
E549	Unspecified excision of lung

E552	Open excision of lesion of lung
E554	Open destruction of lesion of lung NEC
E559	Unspecified open extirpation of lesion of lung
T011	Thoracoplasty
T012	Removal of plombage material from chest wall
T013	Excision of lesion of chest wall
T018	Other specified partial excision of chest wall
T019	Unspecified partial excision of chest wall
T023	Insertion of prosthesis into chest wall NEC
Oesophagus (C15)	
G011	Oesophagogastrectomy and anastomosis of oesophagus to stomach
G013	Oesophagogastrectomy and anastomosis of oesophagus to jejunum NEC
G018	Other specified excision of oesophagus and stomach
G019	Unspecified excision of oesophagus and stomach
G021	Total oesophagectomy and anastomosis of pharynx to stomach
G022	Total oesophagectomy and interposition of microvascularly attached jejunum
G023	Total oesophagectomy and interposition of jejunum NEC
G024	Total oesophagectomy and interposition of microvascularly attached colon
G025	Total oesophagectomy and interposition of colon NEC
G028	Other specified total excision of oesophagus
G029	Unspecified total excision of oesophagus
G031	Partial oesophagectomy and end to end anastomosis of oesophagus

G032	Partial oesophagectomy and interposition of microvascularly attached jejunum	
G033	Partial oesophagectomy and anastomosis of oesophagus to transposed jejunum	
G034	Partial oesophagectomy and anastomosis of oesophagus to jejunum NEC	
G035	Partial oesophagectomy and interposition of microvascularly attached colon	
G036	Partial oesophagectomy and interposition of colon NEC	
G038	Other specified partial excision of oesophagus	
G039	Unspecified partial excision of oesophagus	
G146	Fibreoptic endoscopic submucosal resection of lesion of oesophagus	Stage 1a disease only
G171	Endoscopic snare resection of lesion of oesophagus using rigid oesophagoscope	Stage 1a disease only
G271	Total gastrectomy and excision of surrounding tissue	
G274	Total gastrectomy and anastomosis of oesophagus to transposed jejunum	
G275	Total gastrectomy and anastomosis of oesophagus to jejunum NEC	
G279	Unspecified total excision of stomach	
G421	Fibreoptic endoscopic submucosal resection of lesion of upper gastrointestinal tract	Stage 1a disease only
G431	Fibreoptic endoscopic snare resection of lesion of upper gastrointestinal tract	Stage 1a disease only
G438	Other specified fibreoptic endoscopic extirpation of lesion of upper gastrointestinal tract	Stage 1a disease only

Ovarian (C56-C57, and selected C48 tumours)

H331	Abdominoperineal excision of rectum and end colostomy
H332	Proctectomy and anastomosis of colon to anus
H333	Anterior resection of rectum and anastomosis of colon to rectum using staples
H334	Anterior resection of rectum and anastomosis NEC
H335	Rectosigmoidectomy and closure of rectal stump and exteriorisation of bowel
H336	Anterior resection of rectum and exteriorisation of bowel
H337	Perineal resection of rectum HFQ
H338	Other specified excision of rectum
H339	Unspecified excision of rectum
Q071	Abdominal hysterocolpectomy and excision of periuterine tissue
Q072	Abdominal hysterectomy and excision of periuterine tissue NEC
Q073	Abdominal hysterocolpectomy NEC
Q074	Total abdominal hysterectomy NEC
Q075	Subtotal abdominal hysterectomy
Q078	Other specified abdominal excision of uterus
Q079	Unspecified abdominal excision of uterus
Q081	Vaginal hysterocolpectomy and excision of periuterine tissue
Q082	Vaginal hysterectomy and excision of periuterine tissue NEC
Q083	Vaginal hysterocolpectomy NEC
Q088	Other specified vaginal excision of uterus
Q089	Unspecified vaginal excision of uterus
Q221	Bilateral salpingoophorectomy
Q223	Bilateral oophorectomy NEC
Q231	Unilateral salpingoophorectomy NEC
Q232	Salpingoophorectomy of remaining solitary fallopian tube and ovary
Q235	Unilateral oophorectomy NEC
Q236	Oophorectomy of remaining solitary ovary NEC
Q241	Salpingoophorectomy NEC
Q243	Oophorectomy NEC

Q438	Other specified partial excision of ovary
Q439	Unspecified partial excision of ovary
Q473	Open biopsy of lesion of ovary
Q478	Other specified other open operations on ovary
Q491	Endoscopic extirpation of lesion of ovary NEC
T331	Open excision of lesion of peritoneum
T332	Open destruction of lesion of peritoneum
T338	Other specified open extirpation of lesion of peritoneum
T339	Unspecified open extirpation of lesion of peritoneum
T361	Omentectomy
T362	Excision of lesion of omentum
X141	Total exenteration of pelvis
X142	Anterior exenteration of pelvis
X143	Posterior exenteration of pelvis
X148	Other specified clearance of pelvis
X149	Unspecified clearance of pelvis

Pancreas (C25)	
J551	Total pancreatectomy and excision of surrounding tissue
J552	Total pancreatectomy NEC
J558	Other specified total excision of pancreas
J559	Unspecified total excision of pancreas
J561	Pancreaticoduodenectomy and excision of surrounding tissue
J562	Pancreaticoduodenectomy and resection of antrum of stomach
J563	Pancreaticoduodenectomy NEC
J568	Other specified excision of head of pancreas
J569	Unspecified excision of head of pancreas
J571	Subtotal pancreatectomy
J573	Left pancreatectomy NEC

J574	Excision of tail of pancreas and drainage of pancreatic duct
J575	Excision of tail of pancreas NEC
J578	Other specified other partial excision of pancreas
J579	Unspecified other partial excision of pancreas
J582	Excision of lesion of pancreas NEC

Prostate (C61)	
M341	Cystoprostatectomy
M611	Total excision of prostate and capsule of prostate
M614	Perineal prostatectomy
M618	Other specified open excision of prostate
M619	Unspecified open excision of prostate
M671	Endoscopic cryotherapy to lesion of prostate
M711	High intensity focused ultrasound of prostate
X141	Total exenteration of pelvis

Skin (Melanoma, Melanoma in situ and Non-Melanoma Skin Cancers (BCC, cSCC, Rare including extra mammary paget disease))	
B279	Unspecified total excision of breast
B283	Excision of lesion of breast NEC
B284	Re-excision of breast margins
C011	Exenteration of orbit
C012	Enucleation of eye
C013	Evisceration of eye
C018	Other specified excision of eye
C019	Unspecified excision of eye
C021	Excision of lesion of orbit
C022	Destruction of lesion of orbit
C028	Other specified extirpation of lesion of orbit
C029	Unspecified extirpation of lesion of orbit

C101	Excision of lesion of eyebrow	
C102	Hair bearing flap to eyebrow	
C103	Hair bearing graft to eyebrow	
C111	Excision of lesion of canthus	
C115	Graft of skin to canthus	
C121	Excision of lesion of eyelid NEC	
C124	Curettage of lesion of eyelid	BCC, cSCC and extra mammary paget tumours only
C126	Wedge excision of lesion of eyelid	
C141	Flap of skin to eyelid	
C142	Graft of skin to eyelid	
C143	Graft of cartilage to eyelid	
C144	Graft of skin and fat to eyelid	
C145	Graft of fascia to eyelid	
C148	Other specified reconstruction of eyelid	
C149	Unspecified reconstruction of eyelid	
C162	Lateral tarsorrhaphy	
C164	Tarsorrhaphy NEC	
C168	Other specified other plastic repair of eyelid	
C178	Other specified other repair of eyelid	
C179	Unspecified other repair of eyelid	
D011	Total excision of external ear	
D012	Partial excision of external ear	
D013	Excision of preauricular abnormality	
D018	Other specified excision of external ear	
D019	Unspecified excision of external ear	
D021	Excision of lesion of external ear	
D028	Other specified extirpation of lesion of external ear	
D031	Reconstruction of external ear using graft	

D032	Reconstruction of external ear NEC	
D063	Repair of external ear NEC	
D064	Graft of skin to external ear	
D065	Flap of skin to external ear	
D191	Excision of lesion of middle ear	
E011	Total excision of nose	
E018	Other specified excision of nose	
E019	Unspecified excision of nose	
E021	Total reconstruction of nose	
E022	Reconstruction of nose NEC	
E023	Septorhinoplasty using implant	
E024	Septorhinoplasty using graft	
E025	Reduction rhinoplasty	
E026	Rhinoplasty NEC	
E027	Alar reconstruction with cartilage graft	
E028	Other specified plastic operations on nose	
E029	Unspecified plastic operations on nose	
E032	Excision of lesion of septum of nose	
E037	Septal reconstruction with cartilage graft	
E091	Excision of lesion of external nose	
E094	Shave of skin of nose	BCC, cSCC and extra mammary paget tumours only
E097	Graft of skin to external nose	
E661	Flap of skin to external nose	
F011	Excision of vermilion border of lip and advancement of mucosa of lip	
F018	Other specified partial excision of lip	
F019	Unspecified partial excision of lip	
F021	Excision of lesion of lip	
F029	Unspecified extirpation of lesion of lip	

F041	Reconstruction of lip using tongue flap
F042	Reconstruction of lip using skin flap
F048	Other specified other reconstruction of lip
F049	Unspecified other reconstruction of lip
F052	Advancement of mucosa of lip NEC
F382	Excision of lesion of mouth NEC
F402	Graft of skin to mouth NEC
F441	Total excision of parotid gland
F442	Partial excision of parotid gland
F443	Excision of parotid gland NEC
F444	Excision of submandibular gland
F445	Excision of sublingual gland
F448	Other specified excision of salivary gland
F449	Unspecified excision of salivary gland
F451	Excision of lesion of parotid gland
F452	Excision of lesion of submandibular gland
N011	Excision of scrotum
N012	Excision of lesion of scrotum
N036	Reconstruction of scrotum
N052	Bilateral orchidectomy NEC
N063	Orchidectomy NEC
N241	Excision of sweat gland bearing skin of male perineum
N243	Excision of male periurethral tissue NEC
N261	Total amputation of penis
N262	Partial amputation of penis
N268	Other specified amputation of penis
N271	Excision of lesion of penis
N287	Graft to penis

N303	Circumcision
P011	Clitoridectomy
P031	Excision of Bartholin gland
P033	Excision of lesion of Bartholin gland
P051	Total excision of vulva
P052	Partial excision of vulva
P054	Excision of lesion of vulva NEC
P058	Other specified excision of vulva
P059	Unspecified excision of vulva
P065	Excision of lesion of labia
P071	Plastic repair of vulva
P078	Other specified repair of vulva
P111	Excision of lesion of female perineum
P137	Excision of sweat gland bearing bearing skin of female perineum
P151	Hymenectomy
P152	Excision of hymenal tag
P201	Excision of lesion of vagina
S018	Other specified plastic excision of skin of head or neck
S019	Unspecified plastic excision of skin of head or neck
S028	Other specified plastic excision of skin of abdominal wall
S029	Unspecified plastic excision of skin of abdominal wall
S038	Other specified plastic excision of skin of other site
S039	Unspecified plastic excision of skin of other site
S041	Excision of sweat gland bearing skin of axilla

S042	Excision of sweat gland bearing skin of groin	
S043	Excision of sweat gland bearing skin NEC	
S048	Other specified other excision of skin	
S049	Unspecified other excision of skin	
S051	Microscopically controlled excision of lesion of skin of head or neck using fresh tissue technique	
S052	Microscopically controlled excision of lesion of skin using fresh tissue technique NEC	
S053	Microscopically controlled excision of lesion of skin of head or neck using chemosurgical technique	
S054	Microscopically controlled excision of lesion of skin using chemosurgical technique NEC	
S055	Microscopically controlled excision of lesion of skin of head or neck NEC	
S058	Other specified microscopically controlled excision of lesion of skin	
S059	Unspecified microscopically controlled excision of lesion of skin	
S063	Shave excision of lesion of skin of head or neck	
S064	Shave excision of lesion of skin NEC	
S065	Excision of lesion of skin of head or neck NEC	
S066	Re-excision of skin margins of head or neck	
S067	Re-excision of skin margins NEC	
S068	Other specified other excision of lesion of skin	
S069	Unspecified other excision of lesion of skin	
S081	Curettage and cauterisation of lesion of skin of head or neck	BCC, cSCC and extra mammary paget tumours only

S082	Curettage and cauterisation of lesion of skin NEC	BCC, cSCC and extra mammary paget tumours only
S083	Curettage of lesion of skin of head or neck NEC	BCC, cSCC and extra mammary paget tumours only
S088	Other specified curettage of lesion of skin	BCC, cSCC and extra mammary paget tumours only
S089	Unspecified curettage of lesion of skin	BCC, cSCC and extra mammary paget tumours only
S143	Shaved deep ellipse biopsy of lesion of skin of head or neck	BCC, cSCC and extra mammary paget tumours only
S144	Shaved deep ellipse biopsy of lesion of skin NEC	BCC, cSCC and extra mammary paget tumours only
S171	Distant myocutaneous subcutaneous pedicle flap to head or neck	
S172	Distant myocutaneous subcutaneous pedicle flap NEC	
S173	Distant myocutaneous flap to head or neck NEC	
S174	Distant myocutaneous free flap to head or neck	
S175	Distant myocutaneous free flap NEC	
S178	Other specified distant flap of skin and muscle	
S179	Unspecified distant flap of skin and muscle	
S181	Distant fasciocutaneous subcutaneous pedicle flap to head or neck	
S182	Distant fasciocutaneous subcutaneous pedicle flap NEC	
S183	Distant fasciocutaneous flap to head or neck NEC	
S184	Distant fasciocutaneous free flap to head or neck	
S185	Distant fasciocutaneous free flap NEC	

S188	Other specified distant flap of skin and fascia
S189	Unspecified distant flap of skin and fascia
S191	Distant tube pedicle flap of skin to head or neck
S192	Distant tube pedicle flap of skin NEC
S198	Other specified distant pedicle flap of skin
S199	Unspecified distant pedicle flap of skin
S201	Axial pattern distant flap of skin to head or neck
S202	Axial pattern distant flap of skin NEC
S203	Random pattern distant flap of skin to head or neck
S204	Random pattern distant flap of skin NEC
S205	Distant flap of skin to head or neck NEC
S206	Distant free flap of skin to head or neck NEC
S207	Distant free flap of skin NEC
S208	Other specified other distant flap of skin
S209	Unspecified other distant flap of skin
S211	Hair bearing flap of skin to scalp for male pattern baldness
S212	Hair bearing flap of skin to scalp NEC
S213	Hair bearing flap of skin to nasolabial area
S214	Hair bearing flap of skin to chin area
S218	Other specified hair bearing flap of skin
S219	Unspecified hair bearing flap of skin
S221	Neurovascular island sensory flap of skin to head or neck
S222	Neurovascular island sensory flap of skin NEC
S223	Local sensory flap of skin to head or neck

S224	Local sensory flap of skin NEC
S228	Other specified sensory flap of skin
S229	Unspecified sensory flap of skin
S231	Z plasty to head or neck
S232	Z plasty NEC
S233	W plasty to head or neck
S234	W plasty NEC
S238	Other specified flap operations to relax contracture of skin
S239	Unspecified flap operations to relax contracture of skin
S241	Local myocutaneous subcutaneous pedicle flap to head or neck
S242	Local myocutaneous subcutaneous pedicle flap NEC
S243	Local myocutaneous flap to head or neck NEC
S248	Other specified local flap of skin and muscle
S249	Unspecified local flap of skin and muscle
S251	Local fasciocutaneous subcutaneous pedicle flap to head or neck
S252	Local fasciocutaneous subcutaneous pedicle flap NEC
S253	Local fasciocutaneous flap to head or neck nec
S258	Other specified local flap of skin and fascia
S259	Unspecified local flap of skin and fascia
S304	Final inset of flap of skin to head or neck
S261	Axial pattern local subcutaneous pedicle flap of skin to head or neck
S262	Axial pattern local subcutaneous pedicle flap of skin NEC

S263	Random pattern local subcutaneous pedicle flap of skin to head or neck
S264	Random pattern local subcutaneous pedicle flap of skin NEC
S265	Local subcutaneous pedicle flap of skin to head or neck NEC
S268	Other specified local subcutaneous pedicle flap of skin
S269	Unspecified local subcutaneous pedicle flap of skin
S271	Axial pattern local flap of skin to head or neck NEC
S272	Axial pattern local flap of skin NEC
S273	Random pattern local flap of skin to head or neck NEC
S274	Random pattern local flap of skin NEC
S275	Local flap of skin to head or neck NEC
S278	Other specified other local flap of skin
S279	Unspecified other local flap of skin
S291	Distant osteocutaneous pedicle flap to head or neck
S292	Distant osteocutaneous pedicle flap NEC
S293	Distant osteocutaneous flap to head or neck NEC
S294	Distant osteocutaneous free flap to head or neck
S295	Distant osteocutaneous free flap NEC
S298	Other specified distant flap of skin and bone
S299	Unspecified distant flap of skin and bone
S302	Transfer of flap of skin to head or neck
S314	Final inset of flap of skin NEC
S321	Distant osteomusculocutaneous pedicle flap of head or neck

S322	Distant osteomusculocutaneous pedicle flap NEC
S323	Distant osteomusculocutaneous flap to head or neck NEC
S324	Distant osteomusculocutaneous free flap to head or neck
S325	Distant osteomusculocutaneous free flap NEC
S328	Other specified distant flap of skin and multiple tissues
S329	Unspecified distant flap of skin and multiple tissues
S338	Other specified hair bearing graft of skin to scalp
S339	Unspecified hair bearing graft of skin to scalp
S341	Hair bearing graft to nasolabial area
S348	Other specified hair bearing graft of skin to other site
S349	Unspecified hair bearing graft of skin to other site
S351	Meshed split autograft of skin to head or neck
S352	Meshed split autograft of skin NEC
S353	Split autograft of skin to head or neck NEC
S358	Other specified split autograft of skin
S359	Unspecified split autograft of skin
S361	Full thickness autograft of skin to head or neck
S362	Full thickness autograft of skin NEC
S363	Composite autograft of skin to head or neck
S364	Composite autograft of skin NEC
S365	Pinch graft of skin to head or neck

S366	Pinch graft of skin NEC
S368	Other specified other autograft of skin
S369	Unspecified other autograft of skin
S371	Allograft of skin to head or neck
S372	Allograft of skin NEC
S373	Xenograft of skin to head or neck
S374	Xenograft of skin NEC
S378	Other specified other graft of skin
S379	Unspecified other graft of skin
S391	Allograft of amniotic membrane to head or neck
S392	Allograft of amniotic membrane NEC
S398	Other specified graft of other tissue to skin
S399	Unspecified graft of other tissue to skin
S641	Excision of nail bed
T013	Excision of lesion of chest wall
T313	Excision of lesion of anterior abdominal wall NEC
T851	Block dissection of cervical lymph nodes
T852	Block dissection of axillary lymph nodes
T853	Block dissection of mediastinal lymph nodes
T854	Block dissection of para-aortic lymph nodes
T855	Block dissection of inguinal lymph nodes
T856	Block dissection of pelvic lymph nodes
T858	Other specified block dissection of lymph nodes
T859	Unspecified block dissection of lymph nodes
T911	Biopsy of sentinel lymph node NEC
T962	Excision of lesion of soft tissue NEC

X071	Forequarter amputation
X072	Disarticulation of shoulder
X073	Amputation of arm above elbow
X074	Amputation of arm through elbow
X075	Amputation of arm through forearm
X078	Other specified amputation of arm
X079	Unspecified amputation of arm
X081	Amputation of hand at wrist
X082	Amputation of thumb
X083	Amputation of phalanx of finger
X084	Amputation of finger NEC
X088	Other specified amputation of hand
X089	Unspecified amputation of hand
X091	Hindquarter amputation
X092	Disarticulation of hip
X093	Amputation of leg above knee
X094	Amputation of leg through knee
X095	Amputation of leg below knee
X098	Other specified amputation of leg
X099	Unspecified amputation of leg
X101	Amputation of foot through ankle
X102	Disarticulation of tarsal bones
X103	Disarticulation of metatarsal bones
X104	Amputation through metatarsal bones
X108	Other specified amputation of foot
X109	Unspecified amputation of foot
X111	Amputation of great toe
X112	Amputation of phalanx of toe
X118	Other specified amputation of toe

X119	Unspecified amputation of toe
X121	Reamputation at higher level
X122	Excision of lesion of amputation stump
X123	Shortening of length of amputation stump
X124	Revision of coverage of amputation stump
X125	Drainage of amputation stump
X128	Other specified operations on amputation stump
X129	Unspecified operations on amputation stump
Y551	Harvest of random pattern flap of skin from limb
Y552	Harvest of random pattern flap of skin from limb
Y553	Harvest of random pattern flap of skin from limb
Y554	Harvest of random pattern flap of skin from limb
Y555	Harvest of random pattern flap of skin from limb
Y556	Harvest of random pattern flap of skin from limb
Y558	Harvest of random pattern flap of skin from limb
Y559	Harvest of random pattern flap of skin from limb
Y561	Harvest of random pattern flap of skin from other site
Y562	Harvest of random pattern flap of skin from other site
Y563	Harvest of random pattern flap of skin from other site
Y564	Harvest of random pattern flap of skin from other site

Y568	Harvest of random pattern flap of skin from other site
Y569	Harvest of random pattern flap of skin from other site
Y571	Harvest of axial pattern flap of skin
Y572	Harvest of axial pattern flap of skin
Y573	Harvest of axial pattern flap of skin
Y574	Harvest of axial pattern flap of skin
Y575	Harvest of axial pattern flap of skin
Y576	Harvest of axial pattern flap of skin
Y578	Harvest of axial pattern flap of skin
Y579	Harvest of axial pattern flap of skin
Y581	Harvest of skin for graft
Y588	Harvest of skin for graft
Y589	Harvest of skin for graft
Y591	Harvest of flap of skin and fascia
Y592	Harvest of flap of skin and fascia
Y593	Harvest of flap of skin and fascia
Y594	Harvest of flap of skin and fascia
Y595	Harvest of flap of skin and fascia
Y596	Harvest of flap of skin and fascia
Y598	Harvest of flap of skin and fascia
Y599	Harvest of flap of skin and fascia
Y601	Other harvest of fascia
Y602	Other harvest of fascia
Y604	Other harvest of fascia
Y608	Other harvest of fascia
Y609	Other harvest of fascia
Y611	Harvest of flap of skin and muscle of trunk
Y612	Harvest of flap of skin and muscle of trunk

Y613	Harvest of flap of skin and muscle of trunk
Y614	Harvest of flap of skin and muscle of trunk
Y615	Harvest of flap of skin and muscle of trunk
Y618	Harvest of flap of skin and muscle of trunk
Y619	Harvest of flap of skin and muscle of trunk
Y621	Harvest of flap of skin and muscle of other site
Y622	Harvest of flap of skin and muscle of other site
Y623	Harvest of flap of skin and muscle of other site
Y628	Harvest of flap of skin and muscle of other site
Y629	Harvest of flap of skin and muscle of other site
Y671	Harvest of other multiple tissue
Y672	Harvest of other multiple tissue
Y678	Harvest of other multiple tissue
Y679	Harvest of other multiple tissue
Y692	Harvest of other tissue

Stomach (C16)	
G011	Oesophagogastrectomy and anastomosis of oesophagus to stomach
G012	Oesophagogastrectomy and anastomosis of oesophagus to transposed jejunum
G013	Oesophagogastrectomy and anastomosis of oesophagus to jejunum NEC
G039	Unspecified partial excision of oesophagus
G271	Total gastrectomy and excision of surrounding tissue

G272	Total gastrectomy and anastomosis of oesophagus to duodenum	
G273	Total gastrectomy and interposition of jejunum	
G274	Total gastrectomy and anastomosis of oesophagus to transposed jejunum	
G275	Total gastrectomy and anastomosis of oesophagus to jejunum NEC	
G278	Other specified total excision of stomach	
G279	Unspecified total excision of stomach	
G281	Partial gastrectomy and anastomosis of stomach to duodenum	
G282	Partial gastrectomy and anastomosis of stomach to transposed jejunum	
G283	Partial gastrectomy and anastomosis of stomach to jejunum NEC	
G288	Other specified partial excision of stomach	
G289	Unspecified partial excision of stomach	
G421	Fibreoptic endoscopic submucosal resection of lesion of upper gastrointestinal tract	Stage 1a disease only
G146	Fibreoptic endoscopic submucosal resection of lesion of oesophagus	Stage 1a disease only
G449	Unspecified other therapeutic fibreoptic endoscopic operations on upper gastrointestinal tract	Stage 1a disease only

Testis (C62, D292)	
N051	Bilateral Subcapsular Orchidectomy
N052	Bilateral Orchidectomy NEC, Ablation of Testes
N053	Bilateral Inguinal Orchidectomy
N061	Subcapsular Orchidectomy NEC
N063	Orchidectomy NEC

N066	Inguinal Orchidectomy NEC
N068	Other Specified Other Excision of Testis
N069	Unspecified Other Excision of Testis
N072	Destruction Of Lesion of Testis
N078	Other Specified Extirpation of Lesion of Testis
N079	Unspecified Extirpation of Lesion of Testis
X163	Excision of Gonad from Abdomen
X164	Excision of Gonad from Pelvis
X165	Excision of Gonad from Inguinal Canal
X166	Excision of Gonad NEC

Uterine (C54-C55)	
Q071	Abdominal hysterocolpectomy and excision of periuterine tissue
Q072	Abdominal hysterectomy and excision of periuterine tissue NEC
Q073	Abdominal hysterocolpectomy NEC
Q074	Total abdominal hysterectomy NEC
Q075	Subtotal abdominal hysterectomy
Q078	Other specified abdominal excision of uterus
Q079	Unspecified abdominal excision of uterus
Q081	Vaginal hysterocolpectomy and excision of periuterine tissue
Q082	Vaginal hysterectomy and excision of periuterine tissue NEC
Q083	Vaginal hysterocolpectomy NEC
Q088	Other specified vaginal excision of uterus
Q089	Unspecified vaginal excision of uterus
Q093	Open excision of lesion of uterus NEC
Q161	Vaginal excision of lesion of uterus
Q221	Bilateral salpingoophorectomy
Q222	Bilateral salpingectomy NEC
Q223	Bilateral oophorectomy NEC
Q228	Other specified bilateral excision of adnexa of uterus

Q229	Unspecified bilateral excision of adnexa of uterus
Q231	Unilateral salpingoophorectomy NEC
Q232	Salpingoophorectomy of remaining solitary fallopian tube and ovary
Q235	Unilateral oophorectomy NEC
Q236	Oophorectomy of remaining solitary ovary NEC
Q238	Other specified unilateral excision of adnexa of uterus
Q239	Unspecified unilateral excision of adnexa of uterus
Q521	Excision of lesion of broad ligament of uterus
X141	Total exenteration of pelvis
X142	Anterior exenteration of pelvis
X143	Posterior exenteration of pelvis
X148	Other specified clearance of pelvis
X149	Unspecified clearance of pelvis

Appendix 4: Example code

--The code presented below was used to generate the ***analysisnataliapetersen.av_treatment_table_1320_4p8@casref01*** table AND should be used to identify treatments for cancers diagnosed in 2013-2020.

----------User notes:----------
-- This is the SQL to generate treatment flags (resection, chemo, radio) for 2013-20 diagnoses, including demographic & geographic breakdowns

--It uses these tables in casref01:
--analysisnataliapetersen.opcs4resection_lookup_13_20@casref01
--analysisnataliapetersen.timeframe_lookup_13_20@casref01

--1. Set your connection to casref01
--2. Create each table in turn in the SQL, starting with your cohort of interest.
--If limiting the cohort, do this in the first table (tr_tumour_cohort_d)
--3. Then the last table brings all the previous ones together into your final export.
--4. After you run each new table, you need to index it and create database stats - this optimises performance.
--This is included throughout using the create index and execute commands
--You only need to create the database stats if you are creating and using that table the same day (otherwise they are automatically generated overnight)
--You will need to change analysisnataliapetersen to your username
--If, after creating and indexing the tables, you need to rerun any, it may be more efficient to truncate the table than drop and create it again, e.g.:
--Truncate table tr_tumour_cohort;
--insert into tr_tumour_cohort_d (
--5. Alternatively you can use the final table here:
--***analysisnataliapetersen.av_treatment_table_1320_4p8@casref01***
--6. If analysing in stata, you can use the code below to collapse the data down so it's not identifiable (example below groups by stage, cancer type & diagnosis year)
--collapse (count) tumourid, by (cancergroup stage_group rt_flag ct_flag SG_flag diagnosisyear)

-------- CREATE TUMOUR COHORT TABLE ----------

CREATE TABLE tr_tumour_cohort AS

```
--Skin cancer have been defined in the at_tumour_skin table and so the skin cohort needs to be selected separately to the cohort for other tumours and joined together
WITH skin_cohort AS
--Create cohort of non-keratinocyte skin cancers
(SELECT ats.patientid, ats.tumourid, ats.diagnosisdatebest, ats.diagnosisyear, avt.nhsnumber, avt.figo, avt.sex, avt.ethnicity, avt.morph_icd10_o2, avt.fiveyearageband, avt.age, avt.dedup_flag, avt.site_icd10_o2, avt.site_icd10_o2_3char, avt.ctry_code, avt.statusofregistration
,CASE WHEN tumour_type_2 = 'Melanoma' THEN 'NON-KC_MELANOMA'
   WHEN tumour_type_2 = 'Rare' THEN 'NON-KC_RARE'
        WHEN tumour_type_1 = 'Extramammary paget disease' THEN 'NON-KC_EMPD'
   WHEN tumour_type_1 = 'Melanoma in situ' THEN 'NON-KC_MELANOMA_INSITU'
END AS tumour_code
FROM analysisbirgittavanbodegraven.at_tumour_skin@casref01 ats
LEFT JOIN av2020.at_tumour_england@casref01 avt ON ats.tumourid=avt.tumourid
WHERE ats.diagnosisyear between 2013 and 2020
AND (ats.tumour_type_2 IN ('Melanoma', 'Rare') OR ats.tumour_type_1 in ('Melanoma in situ','Extramammary paget disease'))
AND avt.ctry_code = 'E'
AND avt.statusofregistration = 'F'
AND avt.dedup_flag = '1'
AND avt.age BETWEEN 0 AND 200
AND avt.sex IN (1,2)

UNION

--Create cohort of keratinoctye skin cancers following the first ever registration of BCC and first ever registration of cSCC tumours in addition to all genital BCC tumours and all genital cSCC tumours
SELECT ats.patientid, ats.tumourid, ats.diagnosisdatebest, ats.diagnosisyear, avt.nhsnumber, avt.figo, avt.sex, avt.ethnicity, avt.morph_icd10_o2, avt.fiveyearageband, avt.age, avt.dedup_flag, avt.site_icd10_o2, avt.site_icd10_o2_3char, avt.ctry_code, avt.statusofregistration
, CASE WHEN tumour_type_3 = 'BCC' THEN 'KC_BCC'
     WHEN tumour_type_3 = 'cSCC' THEN 'KC_CSCC'
 END AS tumour_code
FROM analysisbirgittavanbodegraven.at_tumour_skin@casref01 ats
LEFT JOIN av2020.at_tumour_england@casref01 avt ON ats.tumourid=avt.tumourid
WHERE ats.diagnosisyear between 2013 and 2020
AND (ats.tumour_type_4 IN ('Genital BCC', 'Genital cSCC')
OR ats.tumour_type_5 IN ('First BCC', 'First cSCC'))
AND avt.ctry_code = 'E'
```

```
AND avt.statusofregistration = 'F'
AND avt.dedup_flag = '1'
AND avt.age BETWEEN 0 AND 200
AND avt.sex IN (1,2)),


-- Create tumour cohort for all other (non skin) tumours
non_skin AS
(SELECT tumourid, patientid, nhsnumber, diagnosisdatebest, site_icd10_o2, figo, sex,
ethnicity, morph_icd10_o2, fiveyearageband, age

--Create amended tumour_code variable to differentiate between ovarian and non-
ovarian C48 tumours, changes also for brain and testes.
,CASE
WHEN avt.site_icd10_o2_3char IN ('C48')
AND (avt.morph_icd10_o2 NOT IN (8693, 8800, 8801, 8802, 8803, 8804, 8805, 8806,
8963, 8990, 8991, 9040, 9041, 9042, 9043, 9044, 8810, 9490, 9500)
AND (avt.morph_icd10_o2 NOT BETWEEN 8811 AND 8921)
AND (avt.morph_icd10_o2 NOT BETWEEN 9120 AND 9373)
AND (avt.morph_icd10_o2 NOT BETWEEN 9530 AND 9582)
AND avt.sex=2)
THEN 'C48OVARY'
WHEN avt.site_icd10_o2_3char IN ('C48') THEN 'C48OTHER'
WHEN avt.site_icd10_o2 IN ('D391') THEN 'D39OVARY'
WHEN avt.site_icd10_o2_3char = 'D39' AND avt.site_icd10_o2 NOT IN ('D391') THEN
'D39OTHER'
WHEN avt.site_icd10_o2 IN ('D292') THEN 'D29TESTES'
WHEN avt.site_icd10_o2_3char = 'D29' AND avt.site_icd10_o2 NOT IN ('D292') THEN
'D29OTHER'
WHEN avt.site_icd10_o2 IN ('C751','C752','C753') THEN  'C75BRAIN'
WHEN avt.site_icd10_o2_3char = 'C75' AND avt.site_icd10_o2 NOT IN
('C751','C752','C753') THEN 'C75OTHER'
WHEN avt.site_icd10_o2 IN ('D320','D321','D329') THEN 'D32BRAIN'
WHEN avt.site_icd10_o2 IN ('D330','D331','D332','D333','D334','D337','D339') THEN
'D33BRAIN'
WHEN avt.site_icd10_o2 IN ('D352','D353','D354') THEN 'D35BRAIN'
WHEN avt.site_icd10_o2 IN ('D420','D421','D429') THEN 'D42BRAIN'
WHEN avt.site_icd10_o2 IN ('D430','D431','D432','D433','D434','D437','D439') THEN
'D43BRAIN'
WHEN avt.site_icd10_o2 IN ('D443','D444','D445') THEN 'D44BRAIN'
WHEN avt.site_icd10_o2 IN ('D414') THEN 'D41BLADDER'
WHEN avt.site_icd10_o2 IN ('D090') THEN 'D09BLADDER'
ELSE avt.site_icd10_o2_3char
```

```
END AS tumour_code

FROM av2020.at_tumour_england@casref01 AVT

--Define cohort of interest here
WHERE avt.diagnosisyear between 2013 and 2020
AND avt.site_icd10_o2_3char NOT IN ('D01','D03','D04','D06','D07','D11','D13','D15','D16','D18','D25','D27','D36','D40','D48','C44')
AND avt.cascade_inci_flag = 1
AND avt.ctry_code = 'E'
AND avt.statusofregistration = 'F'
AND avt.dedup_flag = '1'
AND avt.age BETWEEN 0 AND 200
AND avt.sex IN (1,2)),

--Remove any tumours from the all tumours cohort that also appear in the skin cohort to avoid duplication
non_skin_cohort AS
(SELECT nsk.tumourid, nsk.patientid, nsk.nhsnumber, nsk.diagnosisdatebest, nsk.site_icd10_o2, nsk.figo, nsk.sex, nsk.ethnicity, nsk.morph_icd10_o2, nsk.fiveyearageband, nsk.age, nsk.tumour_code
FROM non_skin nsk
LEFT JOIN skin_cohort skn ON nsk.tumourid=skn.tumourid
WHERE skn.tumourid IS NULL),

--Now union together the skin and non-skin cancer cohorts to create the full cohort
tumour_cohort AS
(SELECT tumourid, patientid, nhsnumber, diagnosisdatebest, site_icd10_o2, figo, sex, ethnicity, morph_icd10_o2, fiveyearageband, age, tumour_code
FROM skin_cohort

UNION

SELECT tumourid, patientid, nhsnumber, diagnosisdatebest, site_icd10_o2, figo, sex, ethnicity, morph_icd10_o2, fiveyearageband, age, tumour_code
FROM non_skin_cohort)

--Identify patients with multiple tumours within an 18-month period with tumour_flag
SELECT tumourid, patientid, nhsnumber, diagnosisdatebest, site_icd10_o2, figo, sex, ethnicity, morph_icd10_o2, fiveyearageband, age, tumour_code, tumour_flag
FROM
```

```
(SELECT avt.tumourid, avt.patientid, avt.nhsnumber, avt.diagnosisdatebest, avt.site_icd10_o2, avt.figo, avt.sex, avt.ethnicity, avt.morph_icd10_o2, avt.fiveyearageband, avt.age, avt.tumour_code

-- This join flags any tumours diagnosed in 2013-20 that belong to a patient who had another tumour in the 18 months before or after that diagnosis
--(so that later, patient level datasets (hes, sact, rtds) are only used for patients with 1 tumour)
-- Tumour_flag = 1; the tumour belonged to a patient who had another tumour within 18 months

,CASE WHEN ABS(avt.diagnosisdatebest-avt2.diagnosisdatebest)<548 THEN 1 ELSE 0 END AS tumour_flag

-- In the process of joining AVT2 to AVT to identify multiple tumours, duplicate rows are generated
-- The difference between diagnosis date for tumours in AVT AND AVT2 ranks multiple tumours where more than one exists AND drops all but the closest tumour to the original tumour.
-- Where rk = 1; this is the tumour record to keep

,RANK() OVER (PARTITION BY avt.tumourid ORDER BY ABS(avt.diagnosisdatebest-avt2.diagnosisdatebest) ASC, avt2.tumourid) AS rk
FROM tumour_cohort AVT

-- Multiple tumours join:
-- For tumours diagnosed from 2013-2020, identify any other tumour IDs that occurred between 2011-2022
-- A second copy of the tumour cohort (AVT2) is joined to the original tumour cohort of 2013-20 diagnoses (TC)
-- Records from AVT2 are only joined if the patient ID is the same but the tumour ID is different

LEFT JOIN av2020.at_tumour_england@casref01 AVT2 ON avt.patientid=avt2.patientid AND NOT(avt.tumourid=avt2.tumourid)
--AND avt2.cascade_inci_flag = 1
AND avt2.site_icd10_o2_3char NOT IN ('D01','D03','D04','D06','D07','D11','D13','D15','D16','D18','D25','D27','D36','D40','D48','C44')
AND avt2.diagnosisyear BETWEEN 2011 AND 2022

--Removes duplicate tumour rows that had been added to identify patients with multiple tumours
```

```
)WHERE rk=1;

--Create table indexes for tumour cohort table

CREATE UNIQUE INDEX analysisnataliapetersen.tr_tumcohort_tumourid_uq ON analysisnataliapetersen.tr_tumour_cohort ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE INDEX analysisnataliapetersen.tr_tumcohort_patientid_ix ON analysisnataliapetersen.tr_tumour_cohort ( patientid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE INDEX analysisnataliapetersen.tr_tumcohort_nhsnumber_ix ON analysisnataliapetersen.tr_tumour_cohort ( nhsnumber ) NOLOGGING TABLESPACE analysisdata_IX;
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_tumour_cohort')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_tumcohort_tumourid_uq')



--------------------------------------------------------------------------------
--------------------CREATE SURGERY FLAG TABLES - ALL SITES-------------
--------------------------------------------------------------------------------
--1)---------------- ALL SITES - SURGERY FROM AT_TREATMENT_ENGLAND ----------
-----
-- Create a surgery flag for the tumour if:
-- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4_code is in the tumour resection list
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)

CREATE TABLE tr_av_sg AS(
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS avsg_flag
, eventdate AS avsg_date
, avsg_trust_code
FROM (
SELECT tumourid, datediff, rk , eventdate, avsg_trust_code
FROM (
SELECT tc.tumourid,
(avtreat.eventdate-tc.diagnosisdatebest) AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk
```

```
, avtreat.eventdate
, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2020.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
AND eventcode IN ('01a','01b','01z', '01c') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)
INNER JOIN analysisnataliapetersen.opcs4resection_lookup_13_20@casref01 opcs ON opcs.tumouricdsite3code = tc.tumour_code AND TRIM(opcs.opcsresectioncode) = avtreat.opcs4_code
)
WHERE rk=1
));

--2)---------- ALL SITES - SURGERY FROM HES ----------
-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- and the operation date (opertn) occurred in the relevant timeframe create table
CREATE TABLE tr_hes_sg AS(
SELECT DISTINCT tumourid, hessg_flag, hessg_date, hessg_trust_code
FROM (
select tumourid, hessg_flag, hessg_date, hessg_trust_code, RANK() OVER (PARTITION BY tumourid ORDER BY hessg_date, source) as rk
FROM (
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS hessg_flag
, opdate AS hessg_date
, hessg_trust_code
, 'HESAPC' as source
FROM (
SELECT tumourid, datediff, rk , opdate, hessg_trust_code
FROM (
SELECT tc.tumourid,
ho.opdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear,hl.epikeyanon,POS) AS rk
, ho.opdate
, procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
```

```
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN analysisnataliapetersen.opcs4resection_lookup_13_20@casref01 opcs ON opcs.tumouricdsite3code = tc.tumour_code AND TRIM(opcs.opcsresectioncode) = ho.opertn
)
WHERE rk=1)

UNION ALL

SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS hessg_flag
, apptdate AS hessg_date
, hessg_trust_code
, 'HESOP' as source
FROM (
SELECT tumourid, datediff, rk , apptdate, hessg_trust_code
FROM (
SELECT tc.tumourid,
op.apptdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY op.apptdate, h2.datayear,h2.attendkeyanon,POS) AS rk
, op.apptdate
, procodet AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_op@casref01 h2 ON tc.patientid = h2.patientid
INNER JOIN heslive.hesop_opertn@casref01 ho2 ON ho2.datayear = h2.datayear AND ho2.attendkeyanon = h2.attendkeyanon
INNER JOIN heslive.hesop@casref01 op ON op.datayear = h2.datayear and op.attendkeyanon = h2.attendkeyanon
INNER JOIN analysisnataliapetersen.opcs4resection_lookup_13_20@casref01 opcs ON opcs.tumouricdsite3code = tc.tumour_code
where op.apptdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND TRIM(opcs.opcsresectioncode) = ho2.opertn
```

```
)
WHERE rk=1)))
WHERE rk=1)
;

--------------------------------------------------------------------------------
----------CREATE SURGERY FLAG TABLES - STAGE SPECIFIC RESECTIONS----------
--------------------------------------------------------------------------------
--3)---------------- LIVER C22 - AT_TREATMENT_ENGLAND ------------------
-- Create a surgery flag for the tumour if:
-- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4_code is a percutaneous radiofrequency AND microwave ablation of lesion of liver (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1 (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)

CREATE TABLE tr_av_liver as (
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS liver_avtreat
, eventdate AS avsg_date
, avsg_trust_code
FROM (
SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (
SELECT tc.tumourid,
avtreat.eventdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate
, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2020.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)
AND avtreat.opcs4_code IN ('J124','J127') AND tc.tumour_code IN ('C22'))
WHERE rk=1));
```

```
--4)---------- LIVER C22 - HES----------
-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- and the opcs4_code is a percutaneous radiofrequency AND microwave ablation of lesion of liver (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1 (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)
-- and the patient only had one tumour in the time period of interest (this is also incorporated in the final table)

CREATE TABLE tr_hes_liver AS(
SELECT DISTINCT tumourid, liver_hes, hessg_date, hessg_trust_code
FROM (
select tumourid, liver_hes, hessg_date, hessg_trust_code, RANK() OVER (PARTITION BY tumourid ORDER BY hessg_date, source) as rk
FROM (
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS liver_hes
, opdate AS hessg_date
, hessg_trust_code
, 'HESAPC' as source
FROM (
SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (
SELECT tc.tumourid,
ho.opdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear,hl.epikeyanon,pos) AS rk
, ho.opdate
, procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho.opertn IN ('J124','J127') AND tc.tumour_code in ('C22'))
WHERE rk=1)
```

```
UNION ALL

SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS liver_hes
, apptdate AS hessg_date
, hessg_trust_code
, 'HESOP' as source
FROM (
SELECT tumourid, datediff, rk, apptdate, hessg_trust_code FROM (
SELECT tc.tumourid,
op.apptdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY op.apptdate, h2.datayear,h2.attendkeyanon,pos) AS rk
, op.apptdate
, procodet AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_op@casref01 h2 ON tc.patientid = h2.patientid
INNER JOIN heslive.hesop@casref01 op ON op.datayear = h2.datayear and op.attendkeyanon = h2.attendkeyanon
INNER JOIN heslive.hesop_opertn@casref01 ho2 ON ho2.datayear = h2.datayear AND ho2.attendkeyanon = h2.attendkeyanon
where op.apptdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho2.opertn IN ('J124','J127') AND tc.tumour_code in ('C22'))
WHERE rk=1)))
WHERE rk=1);

--------------------------------------------------------------------------------
--5)---------------- OESOPHAGUS C15 - AT_TREATMENT_ENGLAND ------------------
-- Create a surgery flag for the tumour if:
-- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4_code is a fibreoptic endoscopic resection of lesions of upper gastrointestinal tract AND oesophagus (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1a (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)

CREATE TABLE tr_av_oesoph AS(
SELECT DISTINCT
```

```
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS oesoph_avtreat
, eventdate AS avsg_date
, avsg_trust_code
FROM (
SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (
SELECT tc.tumourid,
avtreat.eventdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate
, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2020.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)
AND avtreat.opcs4_code IN ('G421','G431','G146','G171','G438') AND tc.tumour_code IN ('C15'))
WHERE rk=1));


--6)---------- OESOPHAGUS C15 - HES ----------
-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- and the opcs4_code is a fibreoptic endoscopic resection of lesions of upper gastrointestinal tract AND oesophagus (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1a (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)
-- and the patient only had one tumour in the time period of interest (this is also incorporated in the final table)

CREATE TABLE tr_hes_oesoph AS(
SELECT DISTINCT tumourid, oesoph_hes, hessg_date, hessg_trust_code
FROM (
select tumourid, oesoph_hes, hessg_date, hessg_trust_code, RANK() OVER (PARTITION BY tumourid ORDER BY hessg_date, source) as rk
FROM (
SELECT DISTINCT
```

```
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS oesoph_hes
, opdate AS hessg_date
, hessg_trust_code
, 'HESAPC' as source
FROM (
SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (
SELECT tc.tumourid,
ho.opdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear,hl.epikeyanon,POS) AS rk
, ho.opdate
, procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho.opertn IN ('G421','G431','G146','G171','G438') AND tc.tumour_code IN ('C15'))
WHERE rk=1)

UNION ALL

SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS oesoph_hes
, apptdate AS hessg_date
, hessg_trust_code
, 'HESOP' as source
FROM (
SELECT tumourid, datediff, rk, apptdate, hessg_trust_code FROM (
SELECT tc.tumourid,
op.apptdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY op.apptdate, h2.datayear,h2.attendkeyanon,pos) AS rk
, op.apptdate
, procodet AS hessg_trust_code
FROM tr_tumour_cohort tc
```

```
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_op@casref01 h2 ON tc.patientid = h2.patientid
INNER JOIN heslive.hesop@casref01 op ON op.datayear = h2.datayear and op.attendkeyanon = h2.attendkeyanon
INNER JOIN heslive.hesop_opertn@casref01 ho2 ON ho2.datayear = h2.datayear AND ho2.attendkeyanon = h2.attendkeyanon
where op.apptdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho2.opertn IN ('G421','G431','G146','G171','G438') AND tc.tumour_code IN ('C15'))
WHERE rk=1)))
WHERE rk=1);


--------------------------------------------------------------------------------
--7)---------- STOMACH C16 - AT_TREATMENT_ENGLAND ----------
-- Create a surgery flag for the tumour if:
-- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4_code is a fibreoptic endoscopic resection of lesions of upper gastrointestinal tract AND oesophagus (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1a (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)

CREATE TABLE tr_av_stomach AS(
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS stomach_avtreat
, eventdate AS avsg_date
, avsg_trust_code
FROM (
SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (
SELECT tc.tumourid,
avtreat.eventdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate
, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2020.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
```

```
AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdatebest
BETWEEN -31 AND tim.resect_time)
AND avtreat.opcs4_code IN ('G421','G146','G449') AND tc.tumour_code IN ('C16'))
WHERE rk=1));


--8)---------- STOMACH C16 - HES ----------
-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the
operation fields
-- and the opcs4_code is a fibreoptic endoscopic resection of lesions of upper
gastrointestinal tract AND oesophagus (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1a (a stage-specific tumour resection flag will incorporate
this stage criteria in the final table)
-- and the patient only had one tumour in the time period of interest (this is also
incorporated in the final table)

CREATE TABLE tr_hes_stomach AS(
SELECT DISTINCT tumourid, stomach_hes, hessg_date, hessg_trust_code
FROM (
select tumourid, stomach_hes, hessg_date, hessg_trust_code, RANK() OVER
(PARTITION BY tumourid ORDER BY hessg_date, source) as rk
FROM (
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS stomach_hes
, opdate AS hessg_date
, hessg_trust_code
, 'HESAPC' as source
FROM (
SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (
SELECT tc.tumourid,
ho.opdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate,
hl.datayear,hl.epikeyanon,POS) AS rk
, ho.opdate
, procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON
tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
```

```
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho.opertn IN ('G421','G146','G449') AND tc.tumour_code IN ('C16'))
WHERE rk=1)

UNION ALL

SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS stomach_hes
, apptdate AS hessg_date
, hessg_trust_code
, 'HESOP' as source
FROM (
SELECT tumourid, datediff, rk, apptdate, hessg_trust_code FROM (
SELECT tc.tumourid,
op.apptdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY op.apptdate, h2.datayear,h2.attendkeyanon,pos) AS rk
, op.apptdate
, procodet AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_op@casref01 h2 ON tc.patientid = h2.patientid
INNER JOIN heslive.hesop@casref01 op ON op.datayear = h2.datayear and op.attendkeyanon = h2.attendkeyanon
INNER JOIN heslive.hesop_opertn@casref01 ho2 ON ho2.datayear = h2.datayear AND ho2.attendkeyanon = h2.attendkeyanon
where op.apptdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho2.opertn IN ('G421','G146','G449') AND tc.tumour_code IN ('C16'))
WHERE rk=1)))
WHERE rk=1);

--------------------------------------------------------------------------------
--9)---------------- BLADDER CANCERS (C67) - AT_TREATMENT_ENGLAND----------
-- Create a surgery flag for the tumour if:
-- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
```

```
-- and the opcs4_code is a endoscopic resections of lesion of bladder (TURBT) (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is T1 (non-muscle invasive) (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)

CREATE TABLE tr_av_bladder AS(
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS bladder_avtreat
, eventdate AS avsg_date
, avsg_trust_code
FROM (
SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (
SELECT tc.tumourid,
avtreat.eventdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate
, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2020.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)
AND avtreat.opcs4_code IN ('M421', 'M422', 'M423', 'M428', 'M429') AND tc.tumour_code IN ('C67','D09BLADDER'))
WHERE rk=1));

--10)---------------- BLADDER CANCERS (C67) - HES ----------------------
-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- and the opcs4_code is an endoscopic resections of lesion of bladder (TURBT) (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is T1 (non-muscle invasive) (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)
-- and the patient only had one tumour in the time period of interest (this is also incorporated in the final table)
```

```
CREATE TABLE tr_hes_bladder AS(
SELECT DISTINCT tumourid, bladder_hes, hessg_date, hessg_trust_code
FROM (
select tumourid, bladder_hes, hessg_date, hessg_trust_code, RANK() OVER (PARTITION BY tumourid ORDER BY hessg_date, source) as rk
FROM (
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS bladder_hes
, opdate AS hessg_date
, hessg_trust_code
, 'HESAPC' as source
FROM (
SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (
SELECT tc.tumourid,
ho.opdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear,hl.epikeyanon,POS) AS rk
, ho.opdate
, procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho.opertn IN ('M421', 'M422', 'M423', 'M428', 'M429') AND tc.tumour_code IN ('C67','D09BLADDER'))
WHERE rk=1)

UNION ALL

SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS bladder_hes
, apptdate AS hessg_date
, hessg_trust_code
, 'HESOP' as source
FROM (
SELECT tumourid, datediff, rk, apptdate, hessg_trust_code FROM (
```

```
SELECT tc.tumourid,
op.apptdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY op.apptdate, h2.datayear,h2.attendkeyanon,pos) AS rk
, op.apptdate
, procodet AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_op@casref01 h2 ON tc.patientid = h2.patientid
INNER JOIN heslive.hesop@casref01 op ON op.datayear = h2.datayear and op.attendkeyanon = h2.attendkeyanon
INNER JOIN heslive.hesop_opertn@casref01 ho2 ON ho2.datayear = h2.datayear AND ho2.attendkeyanon = h2.attendkeyanon
where op.apptdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho2.opertn IN ('M421', 'M422', 'M423', 'M428', 'M429') AND tc.tumour_code IN ('C67','D09BLADDER'))
WHERE rk=1)))
WHERE rk=1);


--------------------------------------------------------------------------------
--11)---------------- CERVICAL CANCERS; CONE BIOPSIES - AT_TREATMENT_ENGLAND ------------------
--The final treatment table will create a surgery flag for the tumour if:
--The tumour received a cone biopsy and was FIGO stage 1a (see SOP Appendices for list of opcs4 codes)
--Or the tumour received a cone biopsy and was FIGO stage 1b & 1b1 disease, if the tumour also received a lymphadenectomy
--Tables 11-14 flag the cone biopsies and lymphadenectomies, AND a cervical tumour resection flag will bring this together in the final table
-- Create a cone biopsy flag for the tumour if:
-- there is a record in at_treatment_england which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4_code is a cone biopsy
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)

CREATE TABLE tr_av_conebiops AS(
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS conebiops_avtreat
, eventdate AS avsg_date
, avsg_trust_code
```

```
FROM (
SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (
SELECT tc.tumourid,
avtreat.eventdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate
, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2020.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)
AND avtreat.opcs4_code IN ('Q014','Q033','Q031','Q032') AND tc.tumour_code='C53')
WHERE rk=1));


--12)---------- CERVICAL CANCERS; CONE BIOPSIES - HES ----------
-- Create a cone biopsy flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- and the opcs4_code is a cone biopsy (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the patient only had one tumour in the time period of interest (this is incorporated in the final table)

CREATE TABLE tr_hes_conebiops AS(
SELECT DISTINCT tumourid, conebiops_hes, hessg_date, hessg_trust_code
FROM (
select tumourid, conebiops_hes, hessg_date, hessg_trust_code, RANK() OVER (PARTITION BY tumourid ORDER BY hessg_date, source) as rk
FROM (
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS conebiops_hes
, opdate AS hessg_date
, hessg_trust_code
, 'HESAPC' as source
FROM (
SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (
SELECT tc.tumourid,
```

```
ho.opdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear,hl.epikeyanon,POS) AS rk
, ho.opdate
, procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho.opertn IN ('Q014','Q033','Q031','Q032') AND tc.tumour_code='C53')
WHERE rk=1)

UNION ALL

SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS conebiops_hes
, apptdate AS hessg_date
, hessg_trust_code
, 'HESOP' as source
FROM (
SELECT tumourid, datediff, rk, apptdate, hessg_trust_code FROM (
SELECT tc.tumourid,
op.apptdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY op.apptdate, h2.datayear,h2.attendkeyanon,pos) AS rk
, op.apptdate
, procodet AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_op@casref01 h2 ON tc.patientid = h2.patientid
INNER JOIN heslive.hesop@casref01 op ON op.datayear = h2.datayear and op.attendkeyanon = h2.attendkeyanon
INNER JOIN heslive.hesop_opertn@casref01 ho2 ON ho2.datayear = h2.datayear AND ho2.attendkeyanon = h2.attendkeyanon
where op.apptdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho2.opertn IN ('Q014','Q033','Q031','Q032') AND tc.tumour_code='C53')
```

```
WHERE rk=1)))
WHERE rk=1);


--13)---------- CERVICAL CANCERS; LYMPHADENECTOMIES - AT_TREATMENT_ENGLAND ----------
-- Create a lymphadenectomy flag for the tumour if:
-- there is a record in at_treatment_england which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4_code is a lymphadenectomy (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)

CREATE TABLE tr_av_lymph AS(
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS lymph_avtreat
, eventdate AS avsg_date
, avsg_trust_code
FROM (
SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (
SELECT tc.tumourid,
avtreat.eventdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate
, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2020.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)
AND avtreat.opcs4_code IN ('T856','T859','T865') AND tc.tumour_code='C53')
WHERE rk=1));


--14)---------- CERVICAL CANCERS; LYMPHADENECTOMIES - HES ----------
-- Create a lymphadenectomy flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
```

```
-- And the opcs4_code is a lymphadenectomy (see SOP Appendices for list of opcs4 codes)
-- And the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- And the patient only had one tumour in the time period of interest (this is incorporated in the final table)
CREATE TABLE tr_hes_lymph AS(
SELECT DISTINCT tumourid, lymph_hes, hessg_date, hessg_trust_code
FROM (
select tumourid, lymph_hes, hessg_date, hessg_trust_code, RANK() OVER (PARTITION BY tumourid ORDER BY hessg_date, source) as rk
FROM (
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS lymph_hes
, opdate AS hessg_date
, hessg_trust_code
, 'HESAPC' as source
FROM (
SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (
SELECT tc.tumourid,
ho.opdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear,hl.epikeyanon,pos) AS rk
, ho.opdate
, procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho.opertn IN ('T856','T859','T865') AND tc.tumour_code='C53')
WHERE rk=1)

UNION ALL

SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS lymph_hes
, apptdate AS hessg_date
```

```
, hessg_trust_code
, 'HESOP' as source
FROM (
SELECT tumourid, datediff, rk, apptdate, hessg_trust_code FROM (
SELECT tc.tumourid,
op.apptdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY op.apptdate, h2.datayear,h2.attendkeyanon,pos) AS rk
, op.apptdate
, procodet AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_op@casref01 h2 ON tc.patientid = h2.patientid
INNER JOIN heslive.hesop@casref01 op ON op.datayear = h2.datayear and op.attendkeyanon = h2.attendkeyanon
INNER JOIN heslive.hesop_opertn@casref01 ho2 ON ho2.datayear = h2.datayear AND ho2.attendkeyanon = h2.attendkeyanon
where op.apptdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho2.opertn IN ('T856','T859','T865') AND tc.tumour_code='C53')
WHERE rk=1)))
WHERE rk=1);


--------------------------------------------------------------------------------
--15)---------- COLORECTAL CANCERS; ENDOSCOPIES - AT_TREATMENT_ENGLAND---------
-- Create a surgery flag for the tumour if:
-- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4_code is an endoscopic resection or endoscopic biopsy procedure (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1 (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)


CREATE TABLE tr_av_colorec AS(
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS colorec_avtreat
, eventdate AS avsg_date
, avsg_trust_code
```

```
FROM (
SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (
SELECT tc.tumourid,
avtreat.eventdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate
, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2020.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)
AND avtreat.opcs4_code IN ('H201','H412','H206','H231','H236','H205','H202','H122','H235','H239','H402','H232','H261','H208','H341','H418',
'H209','H248','H238','H204','H419','H221','H251','H259','H229','H181','H281','H191','H561')
AND tc.tumour_code in ('C18', 'C19', 'C20'))
WHERE rk=1));


--16)---------- COLORECTAL CANCERS; ENDOSCOPIES - HES ----------
-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- and the opcs4_code is an endoscopic resection or endoscopic biopsy procedure (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1 (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)
-- and the patient only had one tumour in the time period of interest (this is also incorporated in the final table)

CREATE TABLE tr_hes_colorec AS(
SELECT DISTINCT tumourid, colorec_hes, hessg_date, hessg_trust_code
FROM (
select tumourid, colorec_hes, hessg_date, hessg_trust_code, RANK() OVER (PARTITION BY tumourid ORDER BY hessg_date, source) as rk
FROM (
SELECT DISTINCT
```

```
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS colorec_hes
, opdate AS hessg_date
, hessg_trust_code
, 'HESAPC' as source
FROM (
SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (
SELECT tc.tumourid,
ho.opdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear,hl.epikeyanon,POS) AS rk
, ho.opdate
, procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho.opertn IN ('H201','H412','H206','H231','H236','H205','H202','H122','H235','H239','H402','H232',
'H261','H208','H341',
'H418','H209','H248','H238','H204','H419','H221','H251','H259','H229','H181','H281','H191','H561')
AND tc.tumour_code in ('C18', 'C19', 'C20'))
WHERE rk=1)

UNION ALL

SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS colorec_hes
, apptdate AS hessg_date
, hessg_trust_code
, 'HESOP' as source
FROM (
SELECT tumourid, datediff, rk, apptdate, hessg_trust_code FROM (
SELECT tc.tumourid,
op.apptdate-tc.diagnosisdatebest AS datediff,
```

```
RANK() OVER (PARTITION BY tc.tumourid ORDER BY op.apptdate, h2.datayear,h2.attendkeyanon,pos) AS rk
, op.apptdate
, procodet AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_op@casref01 h2 ON tc.patientid = h2.patientid
INNER JOIN heslive.hesop@casref01 op ON op.datayear = h2.datayear and op.attendkeyanon = h2.attendkeyanon
INNER JOIN heslive.hesop_opertn@casref01 ho2 ON ho2.datayear = h2.datayear AND ho2.attendkeyanon = h2.attendkeyanon
where op.apptdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho2.opertn IN ('H201','H412','H206','H231','H236','H205','H202','H122','H235','H239','H402','H232', 'H261','H208','H341',
'H418','H209','H248','H238','H204','H419','H221','H251','H259','H229','H181','H281','H191','H561')
AND tc.tumour_code in ('C18', 'C19', 'C20'))
WHERE rk=1)))
WHERE rk=1);


--17)---------- COLORECTAL CANCERS; APPENDECTOMIES FOR APPENDIX TUMOURS ONLY C18.1 - AT_TREATMENT_ENGLAND ----------
-- Create a surgery flag for the tumour if:
-- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- And the opcs4_code is an appendectomy procedure (see SOP Appendices for list of opcs4 codes)
-- And the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- And the tumour is an appendix tumour (C18.1)

CREATE TABLE tr_av_coloappen AS
(SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS colorec_avtreat_appen
, eventdate AS avsg_date
, avsg_trust_code
FROM (
SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (
SELECT tc.tumourid,
```

```
avtreat.eventdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate
, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2020.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)
AND avtreat.opcs4_code IN ('H024','H019','H011') AND tc.site_icd10_o2 in ('C181'))
WHERE rk=1));


--18)---------- COLORECTAL CANCERS; APPENDECTOMIES FOR APPENDIX TUMOURS ONLY C18.1 - HES ----------
-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- and the opcs4_code is an appendectomy procedure (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is an appendix tumour (C18.1)
-- and the patient only had one tumour in the time period of interest (this is also incorporated in the final table)

CREATE TABLE
tr_hes_coloappen AS (
SELECT DISTINCT tumourid, colorec_hes_appen, hessg_date, hessg_trust_code
FROM (
select tumourid, colorec_hes_appen, hessg_date, hessg_trust_code, RANK() OVER (PARTITION BY tumourid ORDER BY hessg_date, source) as rk
FROM (
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS colorec_hes_appen
, opdate AS hessg_date
, hessg_trust_code
, 'HESAPC' as source
FROM (
SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (
SELECT tc.tumourid,
```

```
ho.opdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear,hl.epikeyanon,POS) AS rk
, ho.opdate
, procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho.opertn IN ('H024','H019','H011') AND tc.site_icd10_o2 in ('C181'))
WHERE rk=1)

UNION ALL

SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS colorec_hes_appen
, apptdate AS hessg_date
, hessg_trust_code
, 'HESOP' as source
FROM (
SELECT tumourid, datediff, rk, apptdate, hessg_trust_code FROM (
SELECT tc.tumourid,
op.apptdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY op.apptdate, h2.datayear,h2.attendkeyanon,pos) AS rk
, op.apptdate
, procodet AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_op@casref01 h2 ON tc.patientid = h2.patientid
INNER JOIN heslive.hesop@casref01 op ON op.datayear = h2.datayear and op.attendkeyanon = h2.attendkeyanon
INNER JOIN heslive.hesop_opertn@casref01 ho2 ON ho2.datayear = h2.datayear AND ho2.attendkeyanon = h2.attendkeyanon
where op.apptdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho2.opertn IN ('H024','H019','H011') AND tc.site_icd10_o2 in ('C181'))
```

```
WHERE rk=1)))
WHERE rk=1);

--------------------------------------------------------------------------------
----------------------- CREATE CHEMO FLAG TABLES ------------------------
--------------------------------------------------------------------------------
--19)---------------- ALL SITES - AVCT TABLE ------------------------------
-- Create a chemo flag for the tumour if:
-- There is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with chemotherapy (event is either 'Cytotoxic Chemotherapy' (code = 02) or 'CT - Other' (code = CTX) or ‘chemoradiotherapy’ (code = 04) or 'Immunotherapy' (code = 15))
-- AND the event date (eventdate) occurred in the relevant timeframe (see SOP)
CREATE TABLE tr_av_ct AS(
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS avct_flag
, eventdate AS avct_date
, avct_trust_code
FROM (
SELECT tumourid, datediff, rk ,eventdate, avct_trust_code FROM (
SELECT tc.tumourid,
avtreat.eventdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk
, avtreat.eventdate
, avtreat.trust_code AS avct_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2020.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
AND eventcode IN ('02','04','15','CTX') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.CHEMO_TIME)
)
WHERE rk=1));


--20)----------------ALL SITES - SACT LEGACY -- UP TO 30th JUNE 2017 ----------
-- Create a chemo flag for the tumour if:
```

```
-- there is a record in SACT LEGACY (excluding those null or classified as 'hormones' or 'Not chemo' or 'Zoledronic acid' or 'Pamidronate' or 'Denosumab' or 'RADIUM 223' or 'LUTETIUM-177' or 'YTTRIUM-90')
-- AND the start date of the regimen (start_date_of_regimen) occurred in the relevant timeframe
-- AND the patient only had one tumour in the time period of interest (this is also incorporated in the final table)
-- AND the start date of the regimen is up to 30th June 2017
CREATE TABLE tr_sact AS (
SELECT DISTINCT tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS sact_flag
, start_date_of_regimen AS sact_date
, sact_trust_code
FROM ( SELECT tumourid,datediff,rk , start_date_of_regimen, sact_trust_code
FROM ( SELECT tc.tumourid, sr.start_date_of_regimen-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY sr.start_date_of_regimen, sr.merged_regimen_id, st.merged_tumour_id) AS rk
, sr.start_date_of_regimen
, SUBSTR(st.organisation_code_of_provider,1,3) AS sact_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN sact_legacy.patient@casref01 sp ON tc.nhsnumber=sp.nhs_number
INNER JOIN sact_legacy.tumour@casref01 st ON sp.merged_patient_id=st.merged_patient_id
INNER JOIN sact_legacy.regimen@casref01 SR on st.merged_tumour_id=sr.merged_tumour_id
AND (NOT (benchmark_group IN ('NOT CHEMO','HORMONES','ZOLEDRONIC ACID','PAMIDRONATE','DENOSUMAB', 'RADIUM 223', 'LUTETIUM-177', 'YTTRIUM-90') OR benchmark_group IS NULL))
AND sr.start_date_of_regimen-tc.diagnosisdatebest BETWEEN -31 AND tim.chemo_time
AND sr.start_date_of_regimen<=TO_DATE('2017-06-30','YYYY-MM-DD')
) WHERE rk=1
));


--21)----------ALL SITES - SACT ENCORE -- FROM 1 JULY 2017 ----------
-- Create a chemo flag for the tumour if:
-- there is a record in SACT ENCORE (excluding those null or classified as 'hormones' or 'Not chemo' or 'Zoledronic acid' or 'Pamidronate' or 'Denosumab' or 'RADIUM 223' or 'LUTETIUM-177' or 'YTTRIUM-90')
```

```
-- AND the start date of the regimen (start_date_of_regimen) occurred in the relevant timeframe
-- AND the patient only had one tumour in the time period of interest (this is also incorporated in the final table)
-- AND the start date of the regimen is from 1 July 2017 onwards
CREATE TABLE tr_sact_2 AS
(SELECT
DISTINCT tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS sact2_flag,
start_date_of_regimen AS sact2_date
, sact2_trust_code
FROM (SELECT /*+ USE_HASH(tc tim) USE_HASH(tim sp) USE_HASH(sp st) USE_HASH(st sr)*/
tumourid, datediff ,rk, start_date_of_regimen, sact2_trust_code
        FROM (SELECT tc.tumourid,
                sr.start_date_of_regimen-tc.diagnosisdatebest AS datediff, RANK() OVER (PARTITION BY tc.tumourid ORDER BY sr.start_date_of_regimen, sr.merged_regimen_id, st.sact_tumour_id) AS rk,
                sr.start_date_of_regimen, SUBSTR(st.organisation_code_of_provider,1,3) AS sact2_trust_code
                FROM tr_tumour_cohort tc
                INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 TIM ON TIM.tumouricdsite3code = tc.tumour_code
                INNER JOIN sact.at_patient_england@cas2303 sp ON tc.nhsnumber=sp.nhs_number
                INNER JOIN sact.at_tumour_england@cas2303 st ON sp.encore_patient_id = st.encore_patient_id
                INNER JOIN sact.at_regimen_england@cas2303 sr ON st.sact_tumour_id=sr.sact_tumour_id
                AND (NOT (benchmark_group IN ('NOT CHEMO','HORMONES','ZOLEDRONIC ACID','PAMIDRONATE','DENOSUMAB', 'RADIUM 223', 'LUTETIUM-177', 'YTTRIUM-90') OR benchmark_group IS NULL))
                AND sr.start_date_of_regimen-tc.diagnosisdatebest BETWEEN -31 AND TIM.chemo_time
                AND sr.start_date_of_regimen>=TO_DATE('2017-07-01','YYYY-MM-DD')
                )
        WHERE rk=1
        ));

-------------------------------------------------------------------------
---------------- CREATE RADIOTHERAPY FLAG TABLES ------------------
-------------------------------------------------------------------------
--22)---------------- ALL SITES - AT_TREATMENT_ENGLAND ------------------
```

```
-- Create a radiotherapy flag for the tumour if:
-- There is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with radiotherapy
--(event is either 'RT - Teletherapy' (code = 05) or ‘chemoradiotherapy’ (code = 04) or 'brachytherapy' (code = 06) or ‘radiosurgery’ (code = 22) or 'RT - Other/ NK' (code = RTX) or ‘radioisotope therapy (including radioiodine)’ (code = 19))
-- AND the event date (eventdate) occurred in the relevant timeframe (see SOP)

CREATE TABLE tr_av_rt AS(
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS avrt_flag
, eventdate AS avrt_date
, avrt_trust_code
FROM (
SELECT tumourid, datediff, rk, eventdate, avrt_trust_code FROM (
SELECT tc.tumourid,
avtreat.eventdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk
, avtreat.eventdate
, avtreat.trust_code AS avrt_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2020.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
AND eventcode IN ('04', '05', '06', '22', 'RTX', '19') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.RADIO_TIME)
)
WHERE rk=1
));


--23)----------ALL SITES - RTDS PRE APRIL 2016 (COLLECTED BY NATCANSAT)----------
-- Create a radiotherapy flag for the tumour if:
-- There is a record in rtds (excluding those classed as Brachytherapy, i.e., with RTTREATMENTMODALITY='06') -- removed this restriction due to now counting radio-isotope treatments as radiotherapy rather than chemotherapy
-- AND the appointment date (APPTDATE) occurred in the relevant timeframe
-- AND the patient only had one tumour in the time period of interest (this is also incorporated in the final table)
```

```
CREATE TABLE
tr_rtds
AS(
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS rtds_flag
, apptdate AS rtds_date
, rtds_trust_code
FROM (
SELECT tumourid,datediff,rk , apptdate, rtds_trust_code FROM (
SELECT tc.tumourid, rl.apptdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY rl.apptdate,rl.attendid,rl.orgcodeprovider,pr.radiotherapyepisodeid,pr.prescriptionid) AS rk
, rl.apptdate
, CAST(SUBSTR(pr.orgcodeprovider,1,3) AS VARCHAR(3)) AS rtds_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN rtds2016.opcds_cas1712_linkage rl ON tc.patientid=rl.patientid AND rl.apptdate-tc.diagnosisdatebest BETWEEN -31 AND tim.radio_time
INNER JOIN rtds2016.rtds_prescriptions pr ON pr.orgcodeprovider = rl.orgcodeprovider
AND pr.attendid = rl.attendid
AND pr.apptdate = rl.apptdate
)
WHERE rk=1
)
);

--24)---------- ALL SITES - RTDS POST APRIL 2016 (COLLECTED BY NCRAS; PROCESSED BY ENCORE) ----------
-- Create a radiotherapy flag for the tumour if:
-- There is a record in rtds (excluding those classed as Brachytherapy, i.e., with RTTREATMENTMODALITY='06') -- removed this restriction due to now counting radio-isotope treatments as radiotherapy rather than chemotherapy
-- AND the appointment date (APPTDATE) occurred in the relevant timeframe
-- AND the patient only had one tumour in the time period of interest (this is also incorporated in the final table)
-- Do not flag the patient as receiving radiotherapy if the appointment date was before 1st April 2016

CREATE TABLE
tr_rtds_2 AS (
```

```
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS rtds2_flag
, TO_DATE(apptdate) AS rtds2_date
, rtds2_trust_code
FROM (
SELECT tumourid,datediff,rk, apptdate, rtds2_trust_code FROM (
SELECT tc.tumourid, TO_DATE(pr.apptdate)-tc.diagnosisdatebest AS datediff
, TO_DATE(pr.apptdate) AS apptdate,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY TO_DATE(pr.apptdate),pr.attendid,pr.orgcodeprovider,pr.radiotherapyepisodeid,pr.prescriptionid) AS rk
, pr.orgcodeprovider AS rtds2_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysisnataliapetersen.timeframe_lookup_13_20@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN rtds.at_prescriptions_england@cas2303 pr ON pr.patientid=tc.patientid
AND pr.orgcodeprovider <>'7A3'
AND TO_DATE(pr.apptdate)-tc.diagnosisdatebest BETWEEN -31 AND tim.radio_time
AND TO_DATE(pr.apptdate) BETWEEN TO_DATE('01-APR-16', 'dd-mm-yy') AND TO_DATE('31-DEC-20 23:59:00', 'DD/MM/YY HH24:MI:SS')
)
WHERE rk=1
)
);
--------------------------------------------------------------------------------
---------- Index the tables from above--------------------------------
--------------------------------------------------------------------------------
CREATE UNIQUE INDEX analysisnataliapetersen.tr_AVCT_tumourid_uq ON analysisnataliapetersen.tr_av_CT ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_AVRT_tumourid_uq ON analysisnataliapetersen.tr_av_RT ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_AVSG_tumourid_uq ON analysisnataliapetersen.tr_av_sg ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_av_bladder_tumourid_uq ON analysisnataliapetersen.tr_av_bladder ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_av_coloappen_tumourid_uq ON analysisnataliapetersen.tr_av_coloappen ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
```

```
CREATE UNIQUE INDEX analysisnataliapetersen.tr_av_colorec_tumourid_uq ON analysisnataliapetersen.tr_av_colorec ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_av_conebiops_tumourid_uq ON analysisnataliapetersen.tr_av_conebiops ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_av_liver_tumourid_uq ON analysisnataliapetersen.tr_av_liver ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_av_lymph_tumourid_uq ON analysisnataliapetersen.tr_av_lymph ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_av_oesoph_tumourid_uq ON analysisnataliapetersen.tr_av_oesoph ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_av_stomach_tumourid_uq ON analysisnataliapetersen.tr_av_stomach ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;

EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_av_CT')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_AVCT_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_av_RT')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_AVRT_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_av_sg')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_AVSG_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_av_bladder')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_av_bladder_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_av_coloappen')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_av_coloappen_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_av_colorec')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_av_colorec_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_av_conebiops')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_av_conebiops_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_av_liver')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_av_liver_tumourid_uq')
```

```
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_av_lymph')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_av_lymph_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_av_oesoph')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_av_oesoph_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_av_stomach')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_av_stomach_tumourid_uq')

CREATE UNIQUE INDEX analysisnataliapetersen.tr_hes_sg_tumourid_uq ON analysisnataliapetersen.tr_hes_sg ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_hes_bladder_tumid_uq ON analysisnataliapetersen.tr_hes_bladder ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_hes_coloappen_tumid_uq ON analysisnataliapetersen.tr_hes_coloappen ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_hes_colorec_tumourid_uq ON analysisnataliapetersen.tr_hes_colorec ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_hes_conebiops_tumid_uq ON analysisnataliapetersen.tr_hes_conebiops ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_hes_liver_tumourid_uq ON analysisnataliapetersen.tr_hes_liver ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_hes_lymph_tumourid_uq ON analysisnataliapetersen.tr_hes_lymph ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_hes_oesoph_tumourid_uq ON analysisnataliapetersen.tr_hes_oesoph ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_hes_stomach_tumourid_uq ON analysisnataliapetersen.tr_hes_stomach ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_rtds_tumourid_uq ON analysisnataliapetersen.tr_rtds ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_rtds_2_tumourid_uq ON analysisnataliapetersen.tr_rtds_2 ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
```

```
CREATE UNIQUE INDEX analysisnataliapetersen.tr_sact_tumourid_uq ON analysisnataliapetersen.tr_sact ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysisnataliapetersen.tr_sact_2_tumourid_uq ON analysisnataliapetersen.tr_sact_2 ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;

EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_hes_sg')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_hes_sg_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_hes_bladder')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_hes_bladder_tumid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_hes_coloappen')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_hes_coloappen_tumid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_hes_colorec')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_hes_colorec_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_hes_conebiops')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_hes_conebiops_tumid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_hes_liver')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_hes_liver_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_hes_lymph')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_hes_lymph_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_hes_oesoph')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_hes_oesoph_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_hes_stomach')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_hes_stomach_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_rtds')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_rtds_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_rtds_2')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_rtds_2_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_sact')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_sact_tumourid_uq')
```

```
EXECUTE dbms_stats.gather_table_stats('analysisnataliapetersen', 'tr_sact_2')
EXECUTE dbms_stats.gather_index_stats('analysisnataliapetersen', 'tr_sact_2_tumourid_uq')

--------------------------------------------------------------------------------
---------- Create final table drawing on all previous tables-----------------
--------------------------------------------------------------------------------
CREATE TABLE av_treatment_table_1320_4p8 NOLOGGING COMPRESS
AS
SELECT

--Create radiotherapy (RT) flag for the tumour
--Only use the patient level datasets (rtds, rtds2) if the patient had no other tumours recorded in the 18 months before or after this tumour diagnosis

CASE
WHEN avrt_flag=1 THEN 1
WHEN rtds_flag=1 AND tc.tumour_flag=0 THEN 1
WHEN rtds2_flag=1 AND tc.tumour_flag=0 THEN 1
ELSE 0
END AS rt_flag

--------------------------------------------------------------------------------
--Create chemo (CT) flag for the tumour
--Only use the patient level datasets (sact, sact2) if the patient had no other tumours recorded in the 18 months before or after this tumour diagnosis

,CASE
WHEN avct_flag=1 THEN 1
WHEN sact_flag=1 AND tc.tumour_flag=0 THEN 1
WHEN sact2_flag=1 AND tc.tumour_flag=0 THEN 1
ELSE 0
END AS ct_flag
--------------------------------------------------------------------------------
--Create resection flag for the tumour
--Only use the patient level datasets (hes) if the patient had no other tumours recorded in the 18 months before or after this tumour diagnosis

,CASE
-- Firstly, incorporate non-stage specific resection flag using opcs4 resection lookup table

WHEN AVSG_flag=1 THEN 1
WHEN hessg_flag=1 AND tc.tumour_flag=0 THEN 1
```

```
-- Secondly, incorporate stage specific rules for particular cancer sites
--Cervical
WHEN avt.site_icd10_o2_3char='C53' AND (upper(SUBSTR(tc.figo,1,2))) IN ('1A','IA') AND conebiops_avtreat=1 THEN 1
WHEN avt.site_icd10_o2_3char='C53' AND (upper(SUBSTR(tc.figo,1,2))) IN ('1A','IA') AND conebiops_hes=1 AND tc.tumour_flag=0 THEN 1
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_avtreat=1) AND (lymph_avtreat=1) THEN 1
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_avtreat=1) AND (lymph_hes=1 AND tc.tumour_flag=0) THEN 1
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_hes=1 AND tc.tumour_flag=0) AND (lymph_avtreat=1) THEN 1
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_hes=1 AND tc.tumour_flag=0) AND (lymph_hes=1 AND tc.tumour_flag=0) THEN 1

--colorectal:
WHEN avt.site_icd10_o2_3char IN ('C18','C19','C20') AND SUBSTR(avt.stage_best,1,1)='1' AND colorec_avtreat=1 THEN 1
WHEN avt.site_icd10_o2_3char IN ('C18','C19','C20') AND SUBSTR(avt.stage_best,1,1)='1' AND colorec_hes=1 AND tc.tumour_flag=0 THEN 1
--Sub rule for appendectomies for colorectal:
WHEN avt.site_icd10_o2 IN ('C181') AND colorec_avtreat_appen=1 THEN 1
WHEN avt.site_icd10_o2 IN ('C181') AND colorec_hes_appen=1 AND tc.tumour_flag=0 THEN 1

--bladder
WHEN avt.site_icd10_o2_3char IN ('C67') AND SUBSTR(avt.t_best, 1,1) = '1' AND bladder_avtreat=1 THEN 1
WHEN avt.site_icd10_o2_3char IN ('C67') AND SUBSTR(avt.t_best, 1,1) = '1' AND bladder_hes=1 AND tc.tumour_flag=0 THEN 1

WHEN avt.site_icd10_o2 IN ('D090') AND avt.morph_icd10_o2 = '8130' AND bladder_avtreat=1 THEN 1
WHEN avt.site_icd10_o2 IN ('D090') AND avt.morph_icd10_o2 = '8130' AND bladder_hes=1 AND tc.tumour_flag=0 THEN 1

-- liver
```

```
WHEN avt.site_icd10_o2_3char IN ('C22') AND SUBSTR(avt.stage_best,1,1)='1' AND liver_avtreat=1 THEN 1
WHEN avt.site_icd10_o2_3char IN ('C22') AND SUBSTR(avt.stage_best,1,1)='1' AND liver_hes=1 AND tc.tumour_flag=0 THEN 1

-- oesophagus
WHEN avt.site_icd10_o2_3char IN ('C15') AND SUBSTR(avt.stage_best, 1,2)='1A' AND oesoph_avtreat=1 THEN 1
WHEN avt.site_icd10_o2_3char IN ('C15') AND SUBSTR(avt.stage_best,1,2)='1A' AND oesoph_hes=1 AND tc.tumour_flag=0 THEN 1

-- stomach
WHEN avt.site_icd10_o2_3char IN ('C16') AND SUBSTR(avt.stage_best,1,2)='1A' AND stomach_avtreat=1 THEN 1
WHEN avt.site_icd10_o2_3char IN ('C16') AND SUBSTR(avt.stage_best,1,2)='1A' AND stomach_hes=1 AND tc.tumour_flag=0 THEN 1
ELSE 0

END AS sg_flag

------------------------------------------------------------------------------
--Create cancer site names
,CASE WHEN tumour_code IN ('C67') THEN 'MALIGNANT BLADDER'
WHEN tumour_code IN ('D09BLADDER','D41BLADDER') THEN 'NON-MALIGNANT BLADDER'
WHEN tumour_code IN ('C50') THEN 'BREAST'
WHEN tumour_code IN ('C53') THEN 'CERVICAL'
WHEN tumour_code IN ('C18','C19') THEN 'COLON'
WHEN tumour_code IN ('C20') THEN 'RECTUM'
WHEN tumour_code IN ('C01', 'C09', 'C10') THEN 'OROPHARYNX'
WHEN tumour_code IN ('C02', 'C03', 'C04', 'C06') THEN 'ORAL_CAVITY'
WHEN tumour_code IN ('C07', 'C08') THEN 'SALIVARY_GLANDS'
WHEN tumour_code IN ('C12', 'C13') THEN 'HYPOPHARYNX'
WHEN tumour_code IN ('C32') THEN 'LARYNX'
WHEN tumour_code IN ('C05', 'C11', 'C14', 'C30', 'C31') THEN 'OTHER_HEAD_AND_NECK'
WHEN tumour_code IN ('C64', 'C65', 'C66', 'C68') THEN 'KIDNEY'
WHEN tumour_code IN ('C22') THEN 'LIVER'
WHEN tumour_code IN ('C33', 'C34') AND tc.morph_icd10_o2 IN ('8041','8042','8043','8044','8045') THEN 'SCLC'
WHEN tumour_code IN ('C33', 'C34') AND tc.morph_icd10_o2 NOT IN ('8041','8042','8043','8044','8045') THEN 'NSCLC'
WHEN tumour_code IN ('C25') THEN 'PANCREAS'
```

```
WHEN tumour_code IN ('C61') THEN 'PROSTATE'
WHEN tumour_code IN ('C15') THEN 'OESOPHAGUS'
WHEN tumour_code IN ('C56', 'C57','C48OVARY', 'D39OVARY') THEN 'OVARY'
WHEN tumour_code IN ('C16') THEN 'STOMACH'
WHEN tumour_code IN ('C54', 'C55') THEN 'UTERINE'
WHEN tumour_code IN ('C51') THEN 'VULVA'
WHEN tumour_code IN ('C70', 'C71', 'C72') THEN 'MALIGNANT BRAIN'
WHEN tumour_code IN ('D32BRAIN', 'D33BRAIN', 'D42BRAIN', 'D43BRAIN') THEN 'NON-MALIGNANT BRAIN'
WHEN tumour_code IN ('D35BRAIN') THEN 'BENIGN ENDOCRINE'
WHEN tumour_code IN ('C75BRAIN', 'D44BRAIN') THEN 'NON-BENIGN ENDOCRINE'
WHEN tumour_code IN ('C62', 'D29TESTES') THEN 'TESTES'
WHEN tumour_code IN ('NON-KC_MELANOMA') THEN 'SKIN:NON-KERATINOCYTE, MELANOMA'
WHEN tumour_code IN ('NON-KC_MELANOMA_INSITU') THEN 'SKIN:NON-KERATINOCYTE, MELANOMA IN SITU'
WHEN tumour_code IN ('NON-KC_RARE','NON-KC_EMPD') THEN 'SKIN:NON-KERATINOCYTE, RARE'
WHEN tumour_code IN ('KC_BCC') THEN 'SKIN:KERATINOCYTE SKIN, BCC'
WHEN tumour_code IN ('KC_CSCC') THEN 'SKIN:KERATINOCYTE, CSCC'
WHEN SUBSTR(tumour_code,1,1)='D' AND tumour_code NOT IN ('D01','D04','D03','D06','D07','D11','D13','D15','D16','D18','D25','D27','D36','D40','D48','
D29TESTES', 'D32BRAIN', 'D33BRAIN', 'D35BRAIN', 'D39OVARY', 'D39OVARY', 'D42BRAIN', 'D43BRAIN', 'D44BRAIN') THEN 'OTHER NON-MALIGNANT'
ELSE 'OTHER MALIGNANT'
END AS cancergroup

-- Select all other variables
,avt.tumourid
,avt.diagnosisyear
,avt.age
,avt.sex as gender
,avt.dco
,avt.basisofdiagnosis
,atg.ccg_2021_code
,atg.gor_code
,avt.fiveyearageband
,avt.ethnicity
,chrl.chrl_tot_27_03
,case
   when (diagnosisyear = 2013) then IMD15_quintile_lsoas
   when (diagnosisyear IN ('2014', '2015', '2016', '2017', '2018', '2019', '2020')) then IMD19_quintile_lsoas
```

```
    end as imd_quintile_lsoas
,atg.canalliance_2021_name
,atg.canalliance_2021_code
--For checking
,avt.morph_icd10_o2
,tc.figo
,avt.t_best
,avt.stage_best
,tc.site_icd10_o2
,site_icd10_o2_3char
,tc.tumour_flag

-----------------------------------------------------------------------------------------------------------
--Select dates of treatment from at_treatment_england
,avt.diagnosisdatebest
,avt.deathdatebest
,avct.avct_date
,avrt.avrt_date
,avsg.avsg_date

--Select dates of treatment from patient-level datasets where only 1 tumour was diagnosed in 18 months before or after that tumour
,CASE WHEN tc.tumour_flag=0 THEN sact.sact_date END AS sact_date
,CASE WHEN tc.tumour_flag=0 THEN sact2.sact2_date END AS sact2_date
,CASE WHEN tc.tumour_flag=0 THEN rtds.rtds_date END AS rtds_date
,CASE WHEN tc.tumour_flag=0 THEN hessg.hessg_date END AS hessg_date
,CASE WHEN tc.tumour_flag=0 THEN rtds2.rtds2_date END AS rtds2_date

-----------------------------------------------------------------------------------------------------------
--Select date of surgery where there were additional site-specific resections flagged:
------------------CERVICAL------------------
-- Take date of cone biopsy in at_treatment_england if:
-- The tumour received a cone biopsy and was FIGO stage 1a
-- Or the tumour received a cone biopsy and was FIGO stage 1b & 1b1 disease, if the tumour also received a lymphadenectomy

, CASE
WHEN avt.site_icd10_o2_3char='C53' AND (upper(SUBSTR(tc.figo,1,2)) IN ('1A','IA')) AND conebiops_avtreat=1 THEN cbavt.avsg_date
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_avtreat=1) AND (lymph_avtreat=1) THEN cbavt.avsg_date
```

```
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_avtreat=1) AND (lymph_hes=1 AND tc.tumour_flag=0) THEN cbavt.avsg_date
END AS cbavsg_date

--Take date of cone biopsy in hes if:
--The tumour received a cone biopsy and was FIGO stage 1a
--Or the tumour received a cone biopsy and was FIGO stage 1b & 1b1 disease, if the tumour also received a lymphadenectomy
--and only 1 tumour was diagnosed in 18 months before or after that tumour

, CASE
WHEN avt.site_icd10_o2_3char='C53' AND (upper(SUBSTR(tc.figo,1,2)) IN ('1A','IA')) AND conebiops_hes=1 AND tc.tumour_flag=0 THEN cbhes.hessg_date
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_hes=1 AND tc.tumour_flag=0) AND (lymph_avtreat=1) THEN cbhes.hessg_date
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_hes=1 AND tc.tumour_flag=0) AND (lymph_hes=1 AND tc.tumour_flag=0) THEN cbhes.hessg_date
END AS cbhessg_date

----------colorectal----------
-- As with cervical, select the date of the stage-specific resection for each tumour, according to the rules specified earlier for generating the stage-specific resection flag for that tumour site
,CASE WHEN avt.site_icd10_o2_3char IN ('C18','C19','C20') AND SUBSTR(avt.stage_best,1,1)='1' AND colorec_avtreat=1 THEN coloavt.avsg_date
END AS coloavsg_date
,CASE WHEN avt.site_icd10_o2_3char IN ('C18','C19','C20') AND SUBSTR(avt.stage_best,1,1)='1' AND colorec_hes=1 AND tc.tumour_flag=0 THEN colohes.hessg_date
END AS colohessg_date
,CASE WHEN avt.site_icd10_o2 IN ('C181') AND colorec_avtreat_appen=1 THEN coloavt_appen.avsg_date
END AS appenavsg_date
, CASE WHEN avt.site_icd10_o2 IN ('C181') AND colorec_hes_appen=1 AND tc.tumour_flag=0 THEN colohes_appen.hessg_date
END AS appenhessg_date

----------bladder----------
,CASE WHEN avt.site_icd10_o2_3char IN ('C67') AND SUBSTR(avt.t_best, 1,1) = '1' AND bladder_avtreat=1 THEN blad1_avt.avsg_date
```

```
END AS bladavsg_date
, CASE WHEN avt.site_icd10_o2_3char IN ('C67') AND SUBSTR(avt.t_best, 1,1) = '1' AND bladder_hes=1 AND tc.tumour_flag=0 THEN blad1_hes.hessg_date
END AS bladhessg_date

,CASE WHEN avt.site_icd10_o2 IN ('D090') AND avt.morph_icd10_o2 = '8130' AND bladder_avtreat=1 THEN blad1_avt.avsg_date
END AS blad_insitu_avsg_date
, CASE WHEN avt.site_icd10_o2 IN ('D090') AND avt.morph_icd10_o2 = '8130' AND bladder_hes=1 AND tc.tumour_flag=0 THEN blad1_hes.hessg_date
END AS blad_insitu_hessg_date

----------liver----------
,CASE WHEN avt.site_icd10_o2_3char IN ('C22') AND SUBSTR(avt.stage_best,1,1)='1' AND liver_avtreat=1 THEN livavt.avsg_date
END AS livavsg_date
, CASE WHEN avt.site_icd10_o2_3char IN ('C22') AND SUBSTR(avt.stage_best,1,1)='1' AND liver_hes=1 AND tc.tumour_flag=0 THEN livhes.hessg_date
END AS livhessg_date

----------oesophageal----------
,CASE WHEN avt.site_icd10_o2_3char IN ('C15') AND SUBSTR(avt.stage_best,1,2)='1A' AND oesoph_avtreat=1 THEN oesoavt.avsg_date
END AS oesoavsg_date
, CASE WHEN avt.site_icd10_o2_3char IN ('C15') AND SUBSTR(avt.stage_best,1,2)='1A' AND oesoph_hes=1 AND tc.tumour_flag=0 THEN oesohes.hessg_date
END AS oesohessg_date

----------stomach----------
, CASE WHEN avt.site_icd10_o2_3char IN ('C16') AND SUBSTR(avt.stage_best,1,2)='1A' AND stomach_avtreat=1 THEN stomavt.avsg_date
END AS stomavsg_date
, CASE WHEN avt.site_icd10_o2_3char IN ('C16') AND SUBSTR(avt.stage_best,1,2)='1A' AND stomach_hes=1 AND tc.tumour_flag=0 THEN stomhes.hessg_date
END AS stomhessg_date

----------
--Select trust codes from at_treatment_england
, avsg.avsg_trust_code
, avct_trust_code
, avrt_trust_code
```

```
--Select trust codes of treatment from patient-level datasets where only 1 tumour was diagnosed in 18 months before or after that tumour
,CASE WHEN tc.tumour_flag=0 THEN hessg.hessg_trust_code END AS hessg_trust_code
,CASE WHEN tc.tumour_flag=0 THEN sact.sact_trust_code END AS sact_trust_code
,CASE WHEN tc.tumour_flag=0 THEN sact2.sact2_trust_code END AS sact2_trust_code
,CASE WHEN tc.tumour_flag=0 THEN rtds.rtds_trust_code END AS rtds_trust_code
,CASE WHEN tc.tumour_flag=0 THEN rtds2.rtds2_trust_code END AS rtds2_trust_code

-----------------------------------------------------------------------------------------------------
--Select trust codes of surgery where there were additional site-specific resections flagged:
------------------CERVICAL------------------
-- Take trust code of cone biopsy in at_treatment_england if:
-- The tumour received a cone biopsy and was FIGO stage 1a
-- Or the tumour received a cone biopsy and was FIGO stage 1b & 1b1 disease, if the tumour also received a lymphadenectomy

, CASE
WHEN avt.site_icd10_o2_3char='C53' AND (upper(SUBSTR(tc.figo,1,2)) IN ('1A','IA')) AND conebiops_avtreat=1 THEN cbavt.avsg_trust_code
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_avtreat=1) AND (lymph_avtreat=1) THEN cbavt.avsg_trust_code
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_avtreat=1) AND (lymph_hes=1 AND tc.tumour_flag=0) THEN cbavt.avsg_trust_code
END AS cbavsg_trust_code

--Take date of cone biopsy in hes if:
--The tumour received a cone biopsy AND was FIGO stage 1a
--Or the tumour received a cone biopsy AND was FIGO stage 1b & 1b1 disease, if the tumour also received a lymphadenectomy
--AND only 1 tumour was diagnosed in 18 months before or after that tumour

, CASE
WHEN avt.site_icd10_o2_3char='C53' AND (upper(SUBSTR(tc.figo,1,2)) IN ('1A','IA')) AND conebiops_hes=1 AND tc.tumour_flag=0 THEN cbhes.hessg_trust_code
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_hes=1 AND tc.tumour_flag=0) AND (lymph_avtreat=1) THEN cbhes.hessg_trust_code
```

```
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_hes=1 AND tc.tumour_flag=0) AND (lymph_hes=1 AND tc.tumour_flag=0) THEN cbhes.hessg_trust_code
END AS cbhessg_trust_code

----------colorectal----------
-- As with cervical, select the date of the stage-specific resection for each tumour, according to the rules specified earlier for generating the stage-specific resection flag for that tumour site
,CASE WHEN avt.site_icd10_o2_3char IN ('C18','C19','C20') AND SUBSTR(avt.stage_best,1,1)='1' AND colorec_avtreat=1 THEN coloavt.avsg_trust_code
END AS coloavsg_trust_code
,CASE WHEN avt.site_icd10_o2_3char IN ('C18','C19','C20') AND SUBSTR(avt.stage_best,1,1)='1' AND colorec_hes=1 AND tc.tumour_flag=0 THEN colohes.hessg_trust_code
END AS colohessg_trust_code
,CASE WHEN avt.site_icd10_o2 IN ('C181') AND colorec_avtreat_appen=1 THEN coloavt_appen.avsg_trust_code
END AS appenavsg_trust_code
, CASE WHEN avt.site_icd10_o2 IN ('C181') AND colorec_hes_appen=1 AND tc.tumour_flag=0 THEN colohes_appen.hessg_trust_code
END AS appenhessg_trust_code

----------bladder----------
,CASE WHEN avt.site_icd10_o2_3char IN ('C67') AND SUBSTR(avt.t_best, 1,1) = '1' AND bladder_avtreat=1 THEN blad1_avt.avsg_trust_code
END AS bladavsg_trust_code
, CASE WHEN avt.site_icd10_o2_3char IN ('C67') AND SUBSTR(avt.t_best, 1,1) = '1' AND bladder_hes=1 AND tc.tumour_flag=0 THEN blad1_hes.hessg_trust_code
END AS bladhessg_trust_code

,CASE WHEN avt.site_icd10_o2 IN ('D090') AND avt.morph_icd10_o2 = '8130' AND bladder_avtreat=1 THEN blad1_avt.avsg_trust_code
END AS blad_insitu_avsg_trust_code
, CASE WHEN avt.site_icd10_o2 IN ('D090') AND avt.morph_icd10_o2 = '8130' AND bladder_hes=1 AND tc.tumour_flag=0 THEN blad1_hes.hessg_trust_code
END AS blad_insitu_hessg_trust_code

----------liver----------
,CASE WHEN avt.site_icd10_o2_3char IN ('C22') AND SUBSTR(avt.stage_best,1,1)='1' AND liver_avtreat=1 THEN livavt.avsg_trust_code
END AS livavsg_trust_code
```

```
, CASE WHEN avt.site_icd10_o2_3char IN ('C22') AND SUBSTR(avt.stage_best,1,1)='1'
AND liver_hes=1 AND tc.tumour_flag=0 THEN livhes.hessg_trust_code
END AS livhessg_trust_code

----------oesophageal----------
,CASE WHEN avt.site_icd10_o2_3char IN ('C15') AND
SUBSTR(avt.stage_best,1,2)='1A' AND oesoph_avtreat=1 THEN
oesoavt.avsg_trust_code
END AS oesoavsg_trust_code
, CASE WHEN avt.site_icd10_o2_3char IN ('C15') AND
SUBSTR(avt.stage_best,1,2)='1A' AND oesoph_hes=1 AND tc.tumour_flag=0 THEN
oesohes.hessg_trust_code
END AS oesohessg_trust_code

----------stomach----------
, CASE WHEN avt.site_icd10_o2_3char IN ('C16') AND
SUBSTR(avt.stage_best,1,2)='1A' AND stomach_avtreat=1 THEN
stomavt.avsg_trust_code
END AS stomavsg_trust_code
, CASE WHEN avt.site_icd10_o2_3char IN ('C16') AND
SUBSTR(avt.stage_best,1,2)='1A' AND stomach_hes=1 AND tc.tumour_flag=0 THEN
stomhes.hessg_trust_code
END AS stomhessg_trust_code

--------------------------------------------------------------------------------

-- final join of tables with flags
-- Treatment flag tables
-- Do not flag surgery for non-ovarian C48 tumour morphologies (these are classified as
"other" tumours)

FROM av2020.at_tumour_england@casref01 AVT
INNER JOIN analysisnataliapetersen.tr_tumour_cohort@casref01 tc ON avt. tumourid
=tc. tumourid
LEFT JOIN analysisnataliapetersen.tr_av_ct@casref01 avct ON
avt.tumourid=avct.tumourid
LEFT JOIN analysisnataliapetersen.tr_sact@casref01 sact ON
avt.tumourid=sact.tumourid
LEFT JOIN analysisnataliapetersen.tr_sact_2@casref01 sact2 ON
avt.tumourid=sact2.tumourid
LEFT JOIN analysisnataliapetersen.tr_av_rt@casref01 avrt ON
avt.tumourid=avrt.tumourid
```

```
LEFT JOIN analysisnataliapetersen.tr_av_sg@casref01 avsg ON avt.tumourid=avsg.tumourid AND (tc.tumour_code NOT IN ('C48OTHER'))
LEFT JOIN analysisnataliapetersen.tr_rtds@casref01 rtds ON avt.tumourid=rtds.tumourid
LEFT JOIN analysisnataliapetersen.tr_hes_sg@casref01 hessg ON avt.tumourid=hessg.tumourid AND (tc.tumour_code NOT IN ('C48OTHER'))
LEFT JOIN analysisnataliapetersen.tr_rtds_2@casref01 rtds2 ON avt.tumourid=rtds2.tumourid

-- Add further joins for stage-specific resections:
-- add gynae tables:

LEFT JOIN analysisnataliapetersen.tr_av_conebiops@casref01 CBAVT ON avt.tumourid=cbavt.tumourid
LEFT JOIN analysisnataliapetersen.tr_hes_conebiops@casref01 CBhes ON avt.tumourid=cbhes.tumourid
LEFT JOIN analysisnataliapetersen.tr_av_lymph@casref01 lyavt ON avt.tumourid=lyavt.tumourid
LEFT JOIN analysisnataliapetersen.tr_hes_lymph@casref01 lyhes ON avt.tumourid=lyhes.tumourid

-- add colorectal tables:
LEFT JOIN analysisnataliapetersen.tr_av_colorec@casref01 coloavt ON avt.tumourid=coloavt.tumourid
LEFT JOIN analysisnataliapetersen.tr_hes_colorec@casref01 colohes ON avt.tumourid=colohes.tumourid
LEFT JOIN analysisnataliapetersen.tr_av_coloappen@casref01 coloavt_appen ON avt.tumourid=coloavt_appen.tumourid
LEFT JOIN analysisnataliapetersen.tr_hes_coloappen@casref01 colohes_appen ON avt.tumourid=colohes_appen.tumourid

-- add urological tables:
LEFT JOIN analysisnataliapetersen.tr_av_bladder@casref01 blad1_avt ON avt.tumourid=blad1_avt.tumourid
LEFT JOIN analysisnataliapetersen.tr_hes_bladder@casref01 blad1_hes ON avt.tumourid=blad1_hes.tumourid

-- add UGI tables:
LEFT JOIN analysisnataliapetersen.tr_av_liver@casref01 livavt ON avt.tumourid=livavt.tumourid
LEFT JOIN analysisnataliapetersen.tr_hes_liver@casref01 livhes ON avt.tumourid=livhes.tumourid
```

```
LEFT JOIN analysisnataliapetersen.tr_av_oesoph@casref01 oesoavt ON avt.tumourid=oesoavt.tumourid
LEFT JOIN analysisnataliapetersen.tr_hes_oesoph@casref01 oesohes ON avt.tumourid=oesohes.tumourid
LEFT JOIN analysisnataliapetersen.tr_av_stomach@casref01 stomavt ON avt.tumourid=stomavt.tumourid
LEFT JOIN analysisnataliapetersen.tr_hes_stomach@casref01 stomhes ON avt.tumourid=stomhes.tumourid

-- Additional demographics
LEFT JOIN av2020.at_geography_england@casref01 atg ON avt.tumourid=atg.tumourid
--join on tumour id
LEFT JOIN imd.imd2015_equal_lsoas imd15 ON atg.lsoa11_code = imd15.lsoa11_code
LEFT JOIN imd.imd2019_equal_lsoas imd19 ON atg.lsoa11_code = imd19.lsoa11_code
LEFT JOIN av2020.charlson_2006to2020@casref01 chrl ON chrl.tumourid=avt.tumourid

/*
LEFT JOIN (select avtu.tumourid
        , CASE WHEN avtu.stage_best is null THEN 'X'
          WHEN (SUBSTR(avtu.stage_best,1,1) NOT IN ('1','2','3','4'))  THEN  'X'
          ELSE SUBSTR(avtu.stage_best,1,1) END AS stage
        from av2020.at_tumour_england@casref01 avtu
        WHERE avtu.diagnosisyear BETWEEN 2012 AND 2020
        AND (NOT (avtu.site_icd10_o2_3char='C50' AND SUBSTR(avtu.stage_best,1,1)='0') or avtu.stage_pi is null)
) stage_nopagets
ON stage_nopagets.tumourid=avt.tumourid
*/
;
```

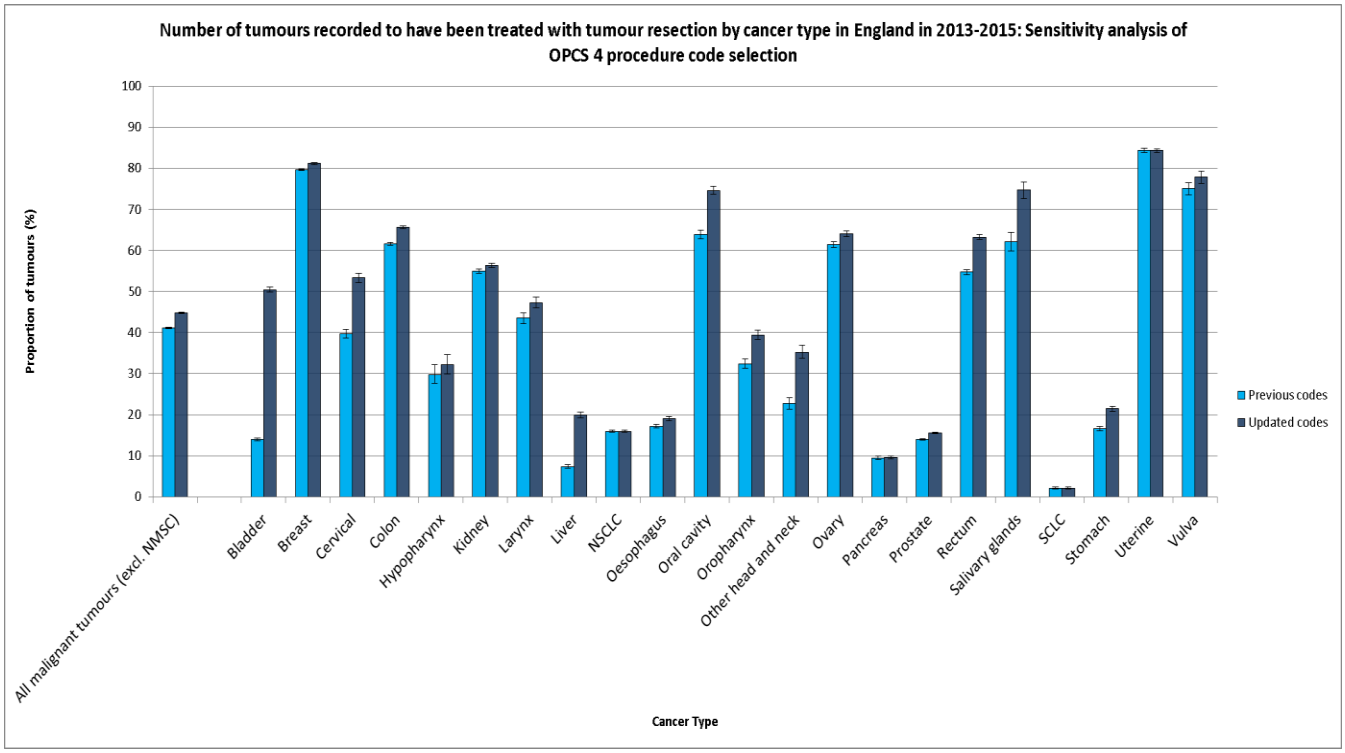
Appendix 5: Datasets used

Treatment type	Dataset	Data table version	Follow up period available	Linkage type	Data quality notes
Chemotherapy	Registry data from AT_TREATMENT_ENGLAND	AV2020.AT_TREATMENT_ENGLAND@CASREF01	Historical – October 2022	Tumour level	Corresponds to CAS2210.
Chemotherapy	Systemic Anti-Cancer Therapy (SACT) 2018	SACT_LEGACY.PATIENT, SACT_LEGACY.TUMOUR and SACT_LEGACY.REGIMEN @CASREF01	January 2013 – March 2018	Patient level	Data was not submitted regularly from all NHS Trusts until July 2014 onwards. Regimen start date used to identify date of chemotherapy may be inaccurate for some tumours diagnosed at the start of 2013.
Chemotherapy	Systemic Anti-Cancer Therapy (SACT) pre-2018	SACT.AT_PATIENT_ENGLAND, SACT.AT_TUMOUR_ENGLAND and SACT.AT_REGIMEN_ENGLAND@CAS2303	April 2018 – September 2022	Patient level	
Tumour resection	Registry data from AT_TREATMENT_ENGLAND	AV2020.AT_TREATMENT_ENGLAND@CASREF01AT_TREATMENT_ENGLAND	Historical – October 2022	Tumour level	Corresponds to CAS2210.
Tumour resection	Inpatient Hospital Episodes Statistics (HES)	HESLIVE.HESAPC and	April 2000 – October 2022	Patient level	

		HESLIVE.HESAPC_OPERTN @CASREF01			
Tumour resection	Outpatient Hospital Episodes Statistics (HES)	HESLIVE.HESOP and HESLIVE.HESOP_OPERTN @CASREF01	April 2000 – October 2022	Patient level	
Radiotherapy	Registry data from AT_TREATMENT_ENGLAND	AV2020.AT_TREATMENT_ENGLAND@CASREF01AT_TREATMENT_ENGLAND	Historical – October 2022	Tumour level	Corresponds to CAS2210.
Radiotherapy	Radiotherapy Dataset (RTDS) collected by NATCANSAT, pre-April 2016	RTDS2016.RTDS_PRESCRIPTIONS@CASREF01	April 2009 – April 2016	Patient level	Brachytherapy & teletherapy variable known to be inaccurate (there is over allocation to brachytherapy & underreporting of teletherapy). Data may be incomplete for selected NHS Trusts. There are known to be undercounts in RTDS in the period between mid-2015 and March 2016.
Radiotherapy	Radiotherapy Dataset (RTDS) collected by PHE, post April 2016	RTDS.AT_PRESCRIPTIONS@CAS2303	April 2016 – December 2022	Patient level	As above

Appendix 6: Sensitivity analysis – impact of tumour resection code update

The list of relevant tumour resection codes was updated for SOP (v4.4) and previous versions of CAS-SOP#4, from a previous list that did not include stage-specific resections (available here). Please note, this analysis is from SOP (v4.4) and has not been updated for this v4.8 SOP update. Below is a comparison of the previous coding used and the current version, which includes stage-specific resections. The previous code list was applied to the current sites (selected with the same ICD10 codes), and the same timeframes obtained from this SOP.



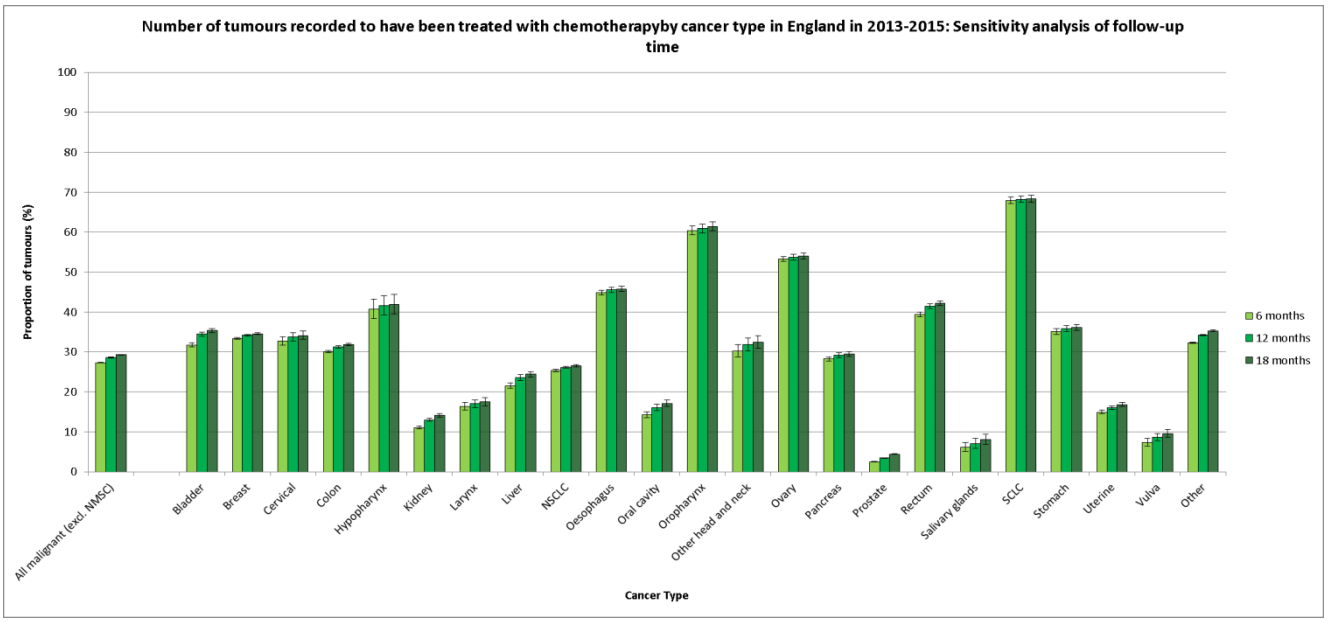
Findings

- For the 22 cancer sites with defined tumour resections codes, 41% of tumours had a tumour resection using the previous list of codes, and 45% had a tumour resection when using the updated list of codes, plus the site-specific additions (as listed in Appendix 3).
- Statistically significant differences between the proportions are present for all but three of the 22 sites (non-small lung cancer, small cell lung cancer and uterine cancers).
- The differences are most noticeable for bladder cancer (36% absolute difference), cervical (14% absolute difference), salivary glands (13% absolute difference), liver (13% absolute difference), and other head and neck (12% absolute difference).

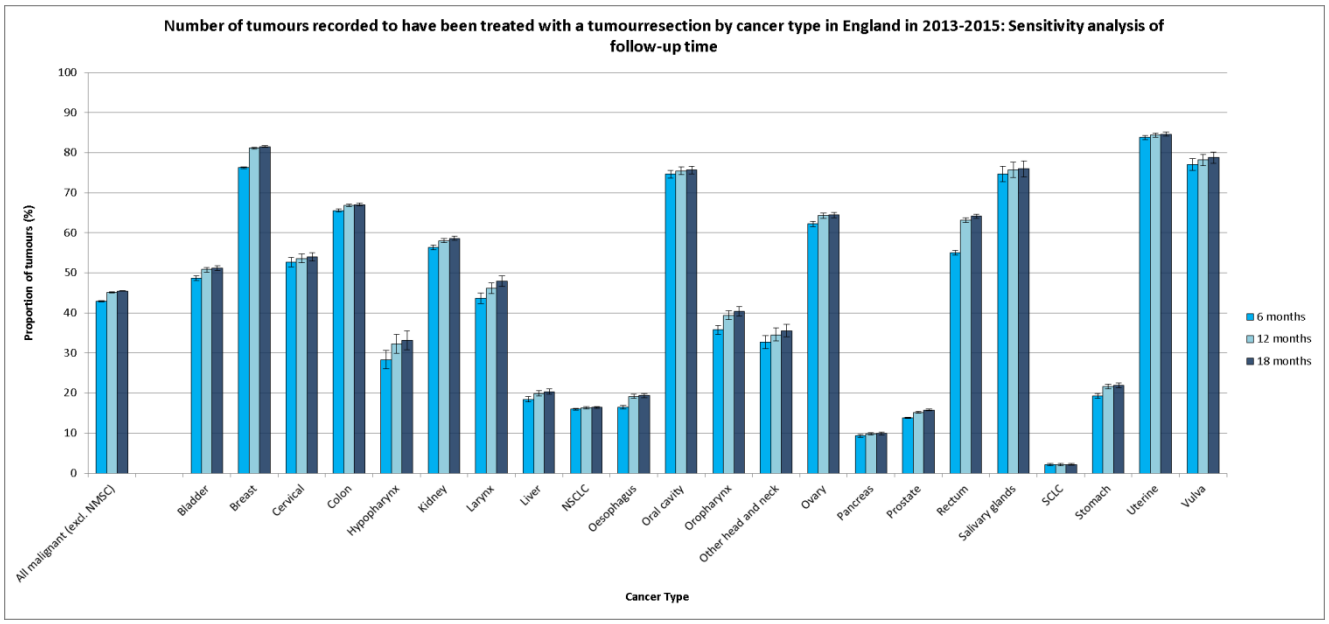
Appendix 7: Sensitivity analysis – impact of timeframe update

The timeframes as defined above may not capture all treatments for certain cancer sites (underestimate of true figure) or include treatments for recurrence (overestimate of true figure). Therefore, follow-up periods of 6/12/18 months were tested and the results are shown below. Please note, this analysis is from SOP (v4.4) and has not been updated for this v4.8 SOP update.

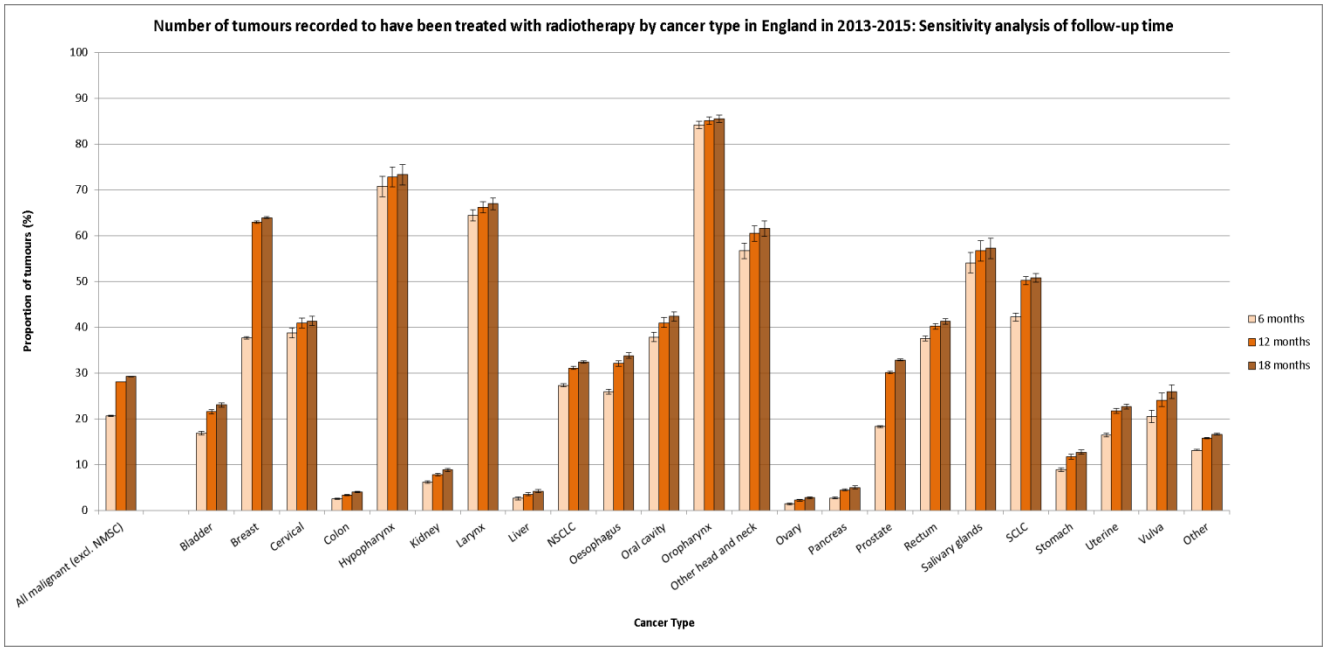
Chemotherapy



Tumour Resection



Radiotherapy



Findings

- Overall across all sites (excluding NMSC), 27% of tumours received chemotherapy within six months of diagnosis, increasing to 29% within 12 and 18 months. Sites with the greatest absolute differences in proportions from six to 18 months are bladder, kidney, liver, oral cavity, rectum and other (3-4% absolute difference).
- Of the 22 cancer sites with defined tumour resections codes (excluding 'Other' sites), 43% of tumours received a tumour resection within six months of diagnosis, increasing to 45% within 12 and 18 months. Sites with the greatest absolute differences in proportions from six to 18 months are rectum, breast, hypopharynx and oropharynx (5-9% absolute difference).
- Overall across all sites (excluding NMSC), 20% of tumours received radiotherapy within six months of diagnosis, increasing to 28% within 12 months and 29% within 18 months. Sites with the greatest absolute differences in proportions from six to 18 months are breast, prostate, small cell lung cancer and oesophageal (8-26% absolute difference).