Lancashire County Council

Health Cell Assessment of Kidney Cancer Patterns at the Hillhouse Technology Enterprise Zone, Thornton-Cleveleys

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Health Cell membership

The assessment into Kidney cancer patterns in and around the Hillhouse Technology Enterprise Zone and the preparation of the subsequent report was completed by the health cell membership. The membership is comprised of the following:

- Lancashire County Council
- Wyre Borough Council
- Environment Agency
- UK Health Security Agency
- NHS Lancashire and South Cumbria ICB
- National Disease Registration Service

Executive Summary

The Environment Agency, working with Wyre Borough Council, is leading an ongoing inspection under Part 2A of the Environmental Protection Act 1990 to determine whether land within and around the Hillhouse Technology Enterprise Zone may have been affected by historical chemical contamination. This work relates to land surrounding the former ICI chemical manufacturing facility (now operated by AGC Chemicals Europe Ltd) located within the Hillhouse Technology Enterprise Zone. This regulatory inspection is focused on assessing the condition of the land and determining whether it meets the statutory definition of contaminated land.

In response to health concerns about the circumstances of the inspection, the Director of Public Health for Lancashire County Council convened a multi-agency Health Cell to consider whether there were any population level health concerns requiring further assessment.

An initial exploratory screening of routinely collected cancer registration data identified a higher than expected number of kidney cancer cases in a small geographical area close to the site. In line with UK Health Security Agency (UKHSA) guidance on the investigation of non-infectious disease clusters, this initial evidence prompted further assessment to determine whether the observed pattern of cases represented a disease cluster. The Health Cell undertook a robust, structured assessment using national cancer registration data, local public health intelligence analysis, and contextual environmental information supplied by the partner organisations.

The data reviewed by the National Disease Registration Service (NDRS) does not provide strong evidence of an unusually high number of cases that would clearly suggest a disease cluster. The analysis was not based on a specific, pre-identified cluster. This means that many different diseases and areas were looked at the same time. Because of this, some results may appear unusual just by chance, so individual findings need to be interpreted with caution.

Background

The Environment Agency and Wyre Borough Council are leading regulatory work to consider whether land contamination has occurred in the immediate area surrounding the Hillhouse Technology Enterprise Zone in Thornton-Cleveleys using Part 2A of the Environmental Protection Act 1990. This relates to the historical use of per- and polyfluoroalkyl substances (PFAS), including perfluorooctanoic acid (PFOA), at the former ICI facility, now operated by AGCCE (AGC Chemicals Europe Ltd), within the Enterprise Zone. Unless otherwise stated, references in this report to 'the site' or 'the facility' relate to the current location of the AGCCE site within the Hillhouse Technology Enterprise Zone.

To support this wider programme of work, the Director of Public Health for Lancashire County Council established a multi-agency Health Cell comprising representatives from the Environment Agency, UK Health Security Agency (UKHSA), Food Standards Agency, National Disease Registration Service (NDRS), NHS partners and local authorities. The purpose of the Health Cell was to provide coordinated public health advice to the Strategic Coordinating Group by reviewing health data, interpreting emerging evidence, and advising on whether further public health assessment was required.

In response to concerns raised about possible links between PFOA exposure and cancer, and at the request of the Director of Public Health and the Health Cell, the National Disease Registration Service (NDRS) undertook an initial exploratory screening of cancer incidence data based on Lower Layer Super Output Areas (LSOAs) within a 5km radius of the site. [1]LSOAs generally consist of populations of approximately 1,000–3,000 residents, or around 400–1,200 households (ONS, 2025).

[1] Lower Layer Super Output Areas (LSOAs) are small geographic areas used across England and Wales to help analyse and compare data about local communities. They were developed by the Office for National Statistics (ONS) to group neighbourhoods into areas of a similar population size. LSOAs are used to produce and compare statistics such as health, deprivation, and population data in a consistent and fair way across different places.

This initial screening involved comparing the number of cancer cases observed within each local area with the number that would be expected, based on NDRS national (England) cancer incidence rates, using NDRS cancer data between [2]2003 - 2022. Overall, the number of kidney cancer cases within LSOAs surrounding the site was similar to that expected.

That said, there were two LSOAs which had higher than expected number of cases and were both statistically significant. The Health Cell used confidence intervals to judge whether differences from the expected level (100) are likely to be real or due to chance. If the range stays entirely above or below 100, the difference is considered meaningful. If it crosses 100, the difference could be due to chance.

The first LSOA (E01025596) located south-east of the site had 14 cases during 2003-2022 with six cases being expected. The standardised incidence ratio (SIR) was 218 with a 95% confidence interval of 119-367. The second LSOA that was statistically significant was LSOA E01012665 which was located in the North of Blackpool with 17 cases between 2003-2022 which was higher than nine expected cases. The SIR was 181 with a 95% confidence interval of 106-290.

This type of initial screening is used to identify unusual patterns that may warrant further investigation, but on its own it does not confirm a cause or indicate an increased risk to the population. In line with national guidance from the UK Health Security Agency (UKHSA), these findings were therefore examined in further detail.

Methodology

Stage 1: Screening

Health Endpoints

The screening stage focused on malignant cancers (excluding non-melanoma skin cancer), as these outcomes are systematically captured through national cancer registration systems and are suitable for small area analysis. Stage 1 screening used cancer registration service data for the period 2003–2022. Within this screening, cancers were assessed both overall and by specific cancer type, including those identified in international evidence as potentially associated with PFOA exposure, such as kidney, testicular, liver, uterine, and pancreatic cancers.

[2] The period 2003–2022 reflects available cancer registration data, with earlier data more limited and less comparable. The timeframe also provides follow-up after cessation of PFAS/PFOA-related activity in 2012, although cancer latency periods may extend beyond this.

As part of this initial exploratory screening, cancer incidence across a range of cancer sites was examined by comparing the number of cases observed locally with the number that would be expected based on selected comparator populations, using NDRS data and selected comparator populations. This screening did not identify higher than expected rates for most cancers. However, kidney cancer incidence was observed to be higher than expected in two LSOAs, one south east of the site (E01025596) and one situated in the north of Blackpool (E01012665).

On this basis and given the international evidence base linking PFOA exposure to kidney cancer, the Health Cell agreed that kidney cancer should be taken forward for more detailed assessment at Stage 2.

Screening Outputs

Screening analyses included case counts, age-standardised rates and standardised incidence ratios (SIRs) across defined distance bands at 1km, 3km and 5km radius of the site. The Health Cell recognised that such screening analyses are exploratory in nature and that apparent excesses are common when multiple comparisons are undertaken, particularly for rare outcomes and small populations.

In line with UKHSA guidance, the presence of a higher than expected kidney cancer incidence prompted further assessment.

Stage 2: Assessment

Purpose

The purpose of the Stage 2 assessment was to determine:

- whether the observed excess of kidney cancer cases existed during 2003-2022 and when compared with alternative comparators
- whether the observed pattern could, in principle, be linked to a plausible environmental exposure pathway, considering biological plausibility and known limitations of the available data.

Cancer Data

Following the screening findings, and to support a more detailed assessment, the Health Cell requested tumour-level information from NDRS to enable a structured case-mix review. This included information on tumour type, morphology, and other available tumour characteristics. Under a Caldicott-approved data-sharing arrangement, the NDRS provided a pseudonymised, tumour-level dataset of kidney cancer cases covering the period 2003–2022.

This tumour-level dataset enabled the Public Health Knowledge and Intelligence (PHKI) team at Lancashire County Council to review tumour characteristics and assess whether the observed cases were broadly similar or heterogeneous. This analysis was undertaken to support interpretation of the screening findings.

Using the NDRS data, the PHKI team produced a series of maps and charts to support the Health Cell's assessment. This included review of tumour morphology and related characteristics to assess whether cases showed patterns consistent with a common source. Where clarification of morphology coding was required, this was checked through correspondence with an NDRS consultant pathologist to confirm interpretation.

In addition, the UK Health Security Agency (UKHSA) provided specialist epidemiological and methodological advice throughout the assessment. This included advice on the use of additional comparator populations, interpretation of statistical significance, and application of national cluster investigation guidance.

Consideration was given to comparator populations beyond national rates, including wider local and regional populations with similar demographic characteristics, to ensure that observed patterns were assessed against appropriate contextual baselines.

Environmental Information

The Environment Agency provided contextual environmental information to support interpretation of the cancer incidence analysis, including soil sampling data from the ongoing inspection, preliminary air-dispersion modelling outputs and information on the historical timing and relative magnitude of PFOA emissions from the former ICI/AGCCE facility within the Hillhouse Technology Enterprise Zone.
The Health Cell recognised that the inclusion of this information did not represent a direct measure of individual exposure but was used to assess whether broad spatial patterns in cancer incidence were consistent with known contamination profiles or emission patterns. Further limitations relating to environmental data are described in the limitations section.

Soil sampling data from the ongoing inspection were used descriptively, together with maps showing the geographic distribution of kidney cancer cases, to explore whether any broad spatial patterns appeared. This visual comparison was undertaken for

contextual understanding only and does not provide evidence of a causal link between soil contamination and cancer incidence.

Occupational Health Considerations

The Health Cell also explored whether occupational health records relating to former workers at the ICI facility might provide additional insight into potential exposures. Discussions with the Health and Safety Executive (HSE) confirmed that such records are not routinely held by the HSE and, where they exist, are likely to be retained by the employer or its occupational health provider.

The Health Cell considered that, even if available, occupational health records would be unlikely to provide meaningful information on historical or cumulative chemical exposures relevant to long-latency outcomes such as cancers. Given these limitations, and the governance and methodological challenges involved, further progression of occupational health records was not considered proportionate.

Results

An analysis of kidney cancer incidence for the period of 2003-2022 identified two LSOAs with a higher than expected number of cases when compared with England as the comparator. One of the LSOAs was close to the site, located southeast (E01025596) with the second LSOA located in the north of Blackpool (E01012665). These two LSOA were deemed to be statistically significant by the Health Cell.

Additionally, there were no consistent spatial or temporal patterns identified, and there was no evidence of an increasing gradient of risk in relation to proximity to the site. Specifically, there was no clustering of cases close to the current AGCCE site, no pattern of decreasing incidence with distance, and no alignment with expected environmental air dispersion or soil contamination data. When age-standardised rates were compared with England and other LSOAs, the rate in LSOA E01025596 was statistically similar to those in most other LSOAs, although it was higher than the England average.

Using the analyses provided by NDRS (case counts and SIRs), the review of kidney cancer case distributions across the study period demonstrated that cases were geographically dispersed, with no aggregation suggestive of a localised cancer cluster. A contextual comparison with available environmental datasets did not identify any spatial alignment between the distribution of cancer cases and the levels found in soil from the on-going inspection. The review of tumour level information did

not identify similarities in tumour morphology or characteristics suggestive of a common aetiology, with cases displaying heterogeneity consistent with background incidence.

Overall, the findings were considered consistent with the level of random variation expected when undertaking multiple small analyses and multiple statistical comparisons for cancers with relatively low annual case numbers. The statistical analyses, mapping and tumour characteristic review did not identify evidence of a geographically localised or statistically robust excess of kidney cancer cases. In line with national cluster assessment guidance, the Health Cell concluded that there was no evidence of a kidney cancer cluster, no indication of an environmental association, and that further cluster inspection was not required.

Standardised incidence ratios (SIRs) for kidney cancer were calculated at LSOA level for the period 2003–2022. Appendix 1 presents a map showing kidney cancer SIR across LSOA's to support interpretation of the small area statistical analysis.

This map relates to the area across the Hillhouse Technology Enterprise Zone and is intended to support interpretation of small-area analyses. Importantly visual differences between areas do not necessarily indicate meaningful differences in risk, particularly where case numbers are small.

Limitations

Small numbers and statistical instability

Kidney cancer is a relatively rare health outcome, and analyses at small-area (LSOA) levels are based on small case numbers. As a result, statistical measures such as standardised incidence ratios (SIRs) are more likely to vary by chance alone, which limits the ability to distinguish true underlying patterns from random variation.

Multiple comparisons and exploratory analyses

The initial screening involved examination of multiple cancer sites, geographical areas, distance bands and time periods. When multiple statistical comparisons are undertaken, some statistically significant findings are expected to arise by chance alone. Although appropriate comparator populations and extended analyses were applied at Stage 2, the risk of chance findings remains.

Use of residence at diagnosis as a proxy for exposure

The Cancer registration data was based on place of residence at diagnosis, not residence at the time of potential exposure. This approach does not account for residential mobility over time and may result in misclassification of exposure, particularly for outcomes such as cancer that have long latent periods.

Absence of individual-level exposure data

The assessment did not include direct measures of individual exposure to PFAS or other environmental contaminants. Environmental datasets provided by partner agencies were used for contextual interpretation only and cannot be used to infer exposure levels for individual cases.

Limitations of environmental data

Available environmental information, including levels reported in soil samples and the outcome of preliminary air-dispersion modelling, is limited in its ability to characterise historical exposures. In particular, there are no historical, individual-level measurements of PFAS exposure from the relevant time periods. Environmental data were therefore used descriptively rather than analytically.

Occupational exposure information not available

Detailed occupational health records for former workers at the site were not available for review. Even if accessible, such records would be unlikely to provide reliable or comprehensive information on historical or cumulative exposures relevant to long-latency outcomes such as cancer.

Latency and timing considerations

The long latency period of kidney cancer introduces uncertainty when interpreting temporal patterns. Changes in emissions, land use, or population movement over several decades cannot be fully accounted for within routinely collected datasets.

Scope of the assessment

This work was undertaken as a health cell assessment in response to an exploratory screening signal, rather than a full epidemiological study. It does not constitute a formal human health risk assessment, nor does it seek to establish causality. The assessment was designed to determine whether the observed pattern warranted further investigation in line with national guidance.

Conclusion

The Health Cell's work was undertaken as a Health Cell assessment in response to an initial exploratory screening indicating a higher than expected number of kidney cancer cases in two LSOAs. These LSOAs were deemed to be statistically significant, with one located south east of the site, and the other located north of Blackpool. This assessment was undertaken to consider whether available NDRS data indicated a population level health concern requiring further investigation.

There was no consistent spatial or temporal patterns identified, and there was no evidence of an increasing gradient of risk in relation to proximity to the site. Specifically, there was no clustering of cases close to the AGC CE site, no pattern of decreasing incidence with distance, and no alignment with expected environmental air dispersion or soil contamination data. When age-standardised rates were compared with England and other LSOAs, the rate in LSOA E01025596 was similar to those in other LSOAs, although it was higher than the England average. The Health Cell concluded that there is no evidence of a statistically significant kidney cancer cluster and no consistent pattern linking cancer incidence to environmental contamination observed in the area surrounding the site.

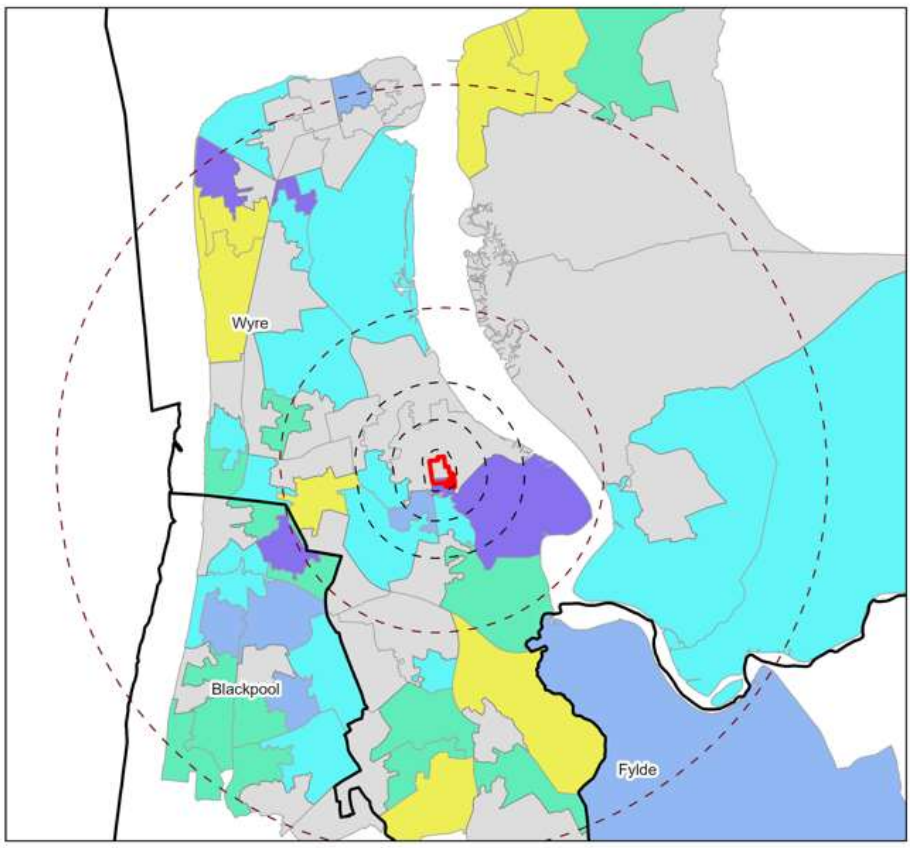
The Health Cell acknowledged the limitations of small-number analyses, the use of residence at diagnosis as a proxy for exposure, and the absence of detailed occupational exposure data. Taking these limitations into account, the observed variation in kidney cancer incidence is consistent with normal statistical fluctuation.

On this basis, and in accordance with UKHSA guidance on non-infectious disease cluster investigations, the Health Cell agreed that no further cluster investigation is warranted at this stage.

Technical Appendix 1

Using the analyses provided by NDRS (case counts, ASR and SIRS), the review of kidney cancer case distributions across the study period demonstrated that cases were geographically dispersed, with no aggregation suggestive of a localised cancer cluster.

Kidney cancer - Standardised Incidence Ratio by LSOA (2003-2022)



Legend

- site_bound_AGCCE
- 5km_buffer_facility
- 2km_buffer_facility
- 1km_buffer_facility
- 500m_buffer_facility
- 100m_buffer_facility
- OS_Area
- Standardised incidence ratio by LSOA
- 65.2 - 90.0
- 90.1 - 120.0
- 120.1 - 145.0
- 145.1 - 167.0
- 167.1 - 218.6
- LSOAs with observation ≤ 5
- Districts

Technical Appendix 2

Kidney tumour records (2003-2022) – high level analysis

Source of cases data and rates: NDRS, NHS England.

The data are based on NDRS supplied tumour records corresponding to the list of 79 LSOAs emailed to NDRS. LSOA E01025596 is the one Wyre LSOA with higher than expected cases (2003-2022) and LSOA E01012665 in Blackpool has higher than expected cases (2003-2022). *Note: When the observed number of events is low (e.g., fewer than 10 or 20), small, random changes in the number of cases can produce massive swings in the ratio.*[3] [4] [5] [6]
Small counts have a significant impact on incident standardised ratios (SIR), often making them unstable, unreliable, and prone to extreme fluctuations and should be interpreted with caution.[7] [8]
Site: Kidney excluding renal pelvis and ureter (ICD10=C64)
Please view this high level analysis in conjunction with the map of SIRs by LSOA (calculated by NDRS).
Maps showing the postcode location of the tumour cases cannot be presented in this report as they are potentially individual identifiable. An individual's postcode counts as personally identifiable information about them.

Cases by sex and age

Note: An individual may appear more than once if they have more than one tumour.
Total number of kidney tumour cases in Wyre, Fylde and Blackpool (based on the list of LSOAs emailed to NDRS) = 498.

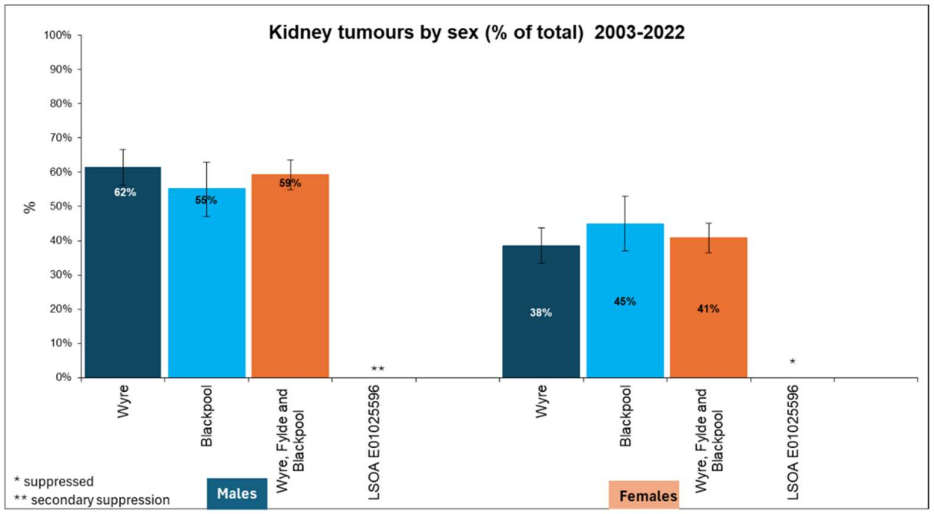
Area	Males	Females	Count of kidney tumours - 2003-2022 aggregated	% male (CI)	% female (CI)
Wyre	210	131	**341**	62% (56%-67%)	38% (33%-44%)
Blackpool	81	66	**147**	55% (47%-63%)	45% (37%-53%)
Wyre, Fylde and Blackpool	295	203	**498**	59% (55%-63%)	41% (37%-45%)
LSOA E01025596	**	*	**14**	**	*

Data source: NDRS *suppressed *secondary suppression

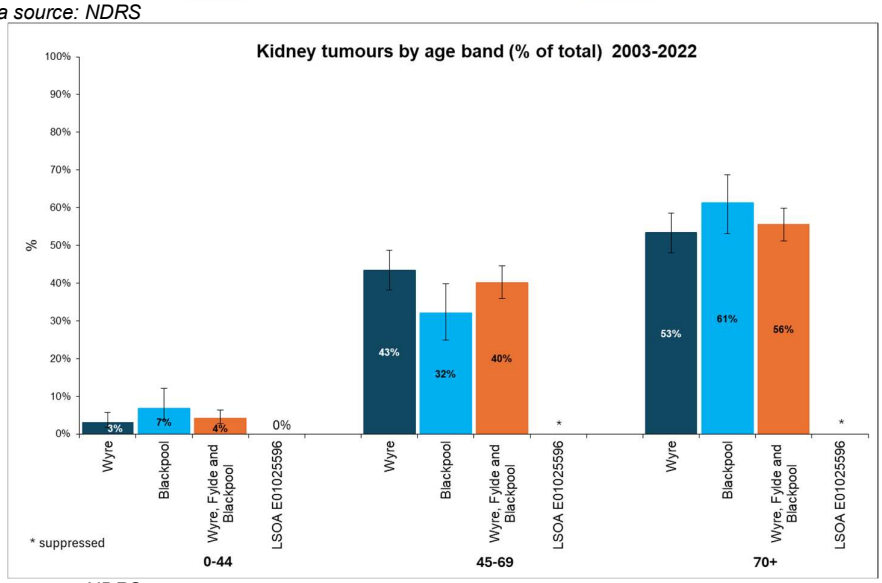
[3] https://www.health.ny.gov/diseases/chronic/ratesmall.htm
[4] https://www.cdc.gov/united-states-cancer-statistics/technical-notes/suppression.html
[5] https://www.ons.gov.uk/aboutus/transparencyandgovernance/freedomofinformationfoi/whydeathcountsof3andbelowaresuppressedinonspublications
[6] https://www.gov.uk/guidance/the-r-value-and-growth-rate
[7] https://fingertips.phe.org.uk/static-reports/public-health-technical-guidance/Standardisation/Overview_standardisation.html
[8] https://www.healthknowledge.org.uk/e-learning/epidemiology/specialists/standardisation

Please note the small sample size in LSOA E01025596; small changes in the count of a small sample can cause large swings in percentages and wider confidence intervals (CIs).

- Similar to Wyre, Fylde and Blackpool, overall, in LSOA E01025596, higher percentage of cases are males which is statistically similar to Wyre, Fylde and Blackpool, overall.
- Similar to Wyre, Fylde and Blackpool, overall, in LSOA E01025596, a higher percentage of cases are in persons aged 70+ years which is statistically similar to Wyre, Fylde and Blackpool, overall.
- In LSOA E01025596, suppression is applied to the percentage of cases by age groups due to counts of five or less or a denominator of less than 1,000.



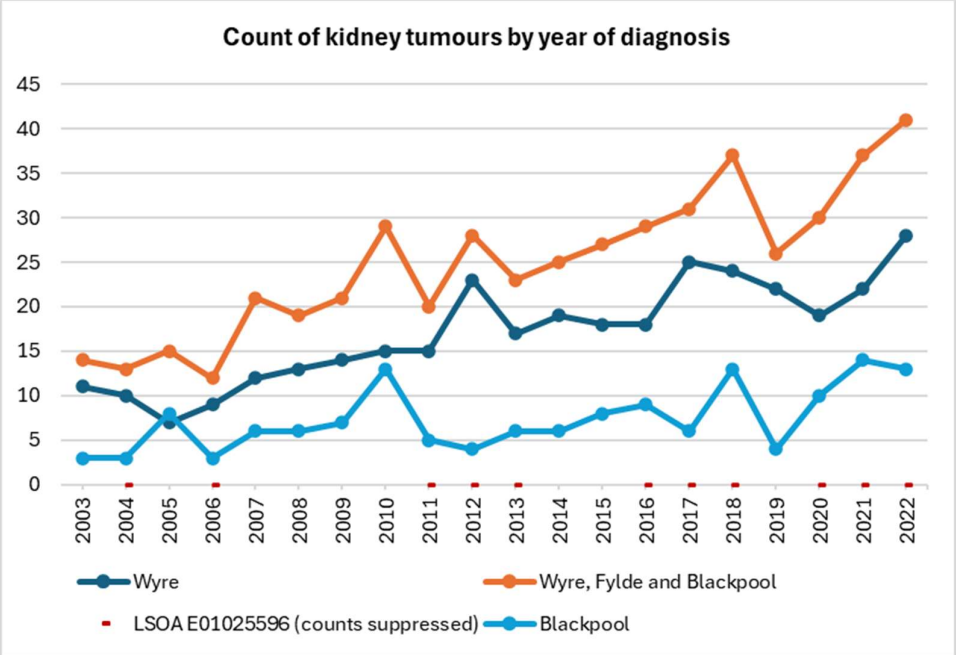
Data source: NDRS



Data source: NDRS

Cases by year of diagnosis (2003-2022)

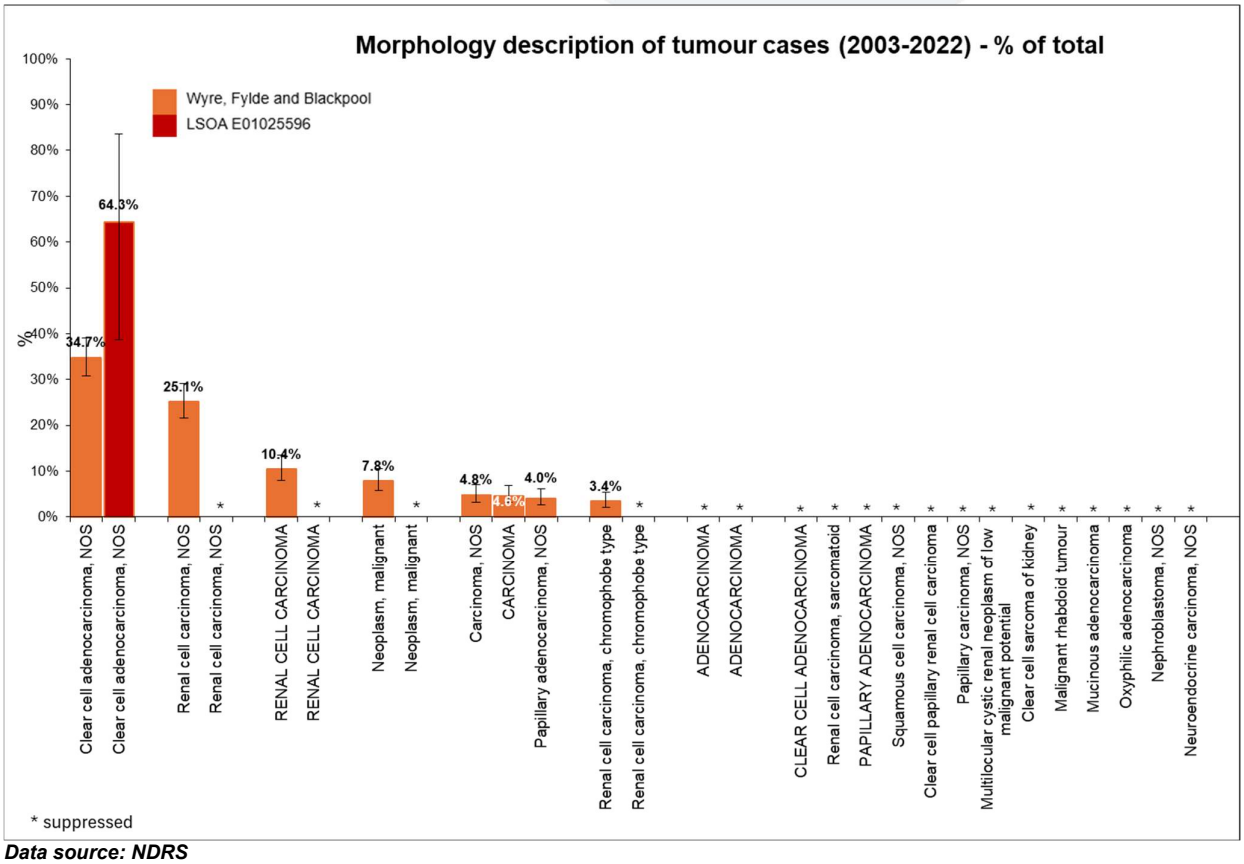
- In Wyre, Fylde and Blackpool, overall, between 2003 and 2022, the number of new cases of tumours diagnosed each year has increased.
- In LSOA E01025596, between 2003 and 2022, the number of new cases has remained one or two, with no new cases in some years.
- After LSOA E01025596 (n=14), in Wyre, LSOA E01025576 has the next highest count of tumour cases (n=13). LSOA E01025562 has the third highest count (n=12).
- Between 2003-2022, in Blackpool, LSOA E01012665 has the highest count of cases (n=17) with an SIR of 181.4 (105.6-290.5) and LSOA E01012718 has the second largest count at 13.



Data source: NDRS

Cases by morphology description

- In LSOA E01025596 (n=9|64.3%) and in Wyre, Fylde and Blackpool, overall (n=173|34.7%) the largest proportion of tumour cases are clear cell adenocarcinoma (NOS[9])
- In LSOA E01025596 the proportion of tumour cases that are clear cell adenocarcinoma (NOS) is similar to Wyre, Fylde and Blackpool, overall.[10]



Data source: NDRS

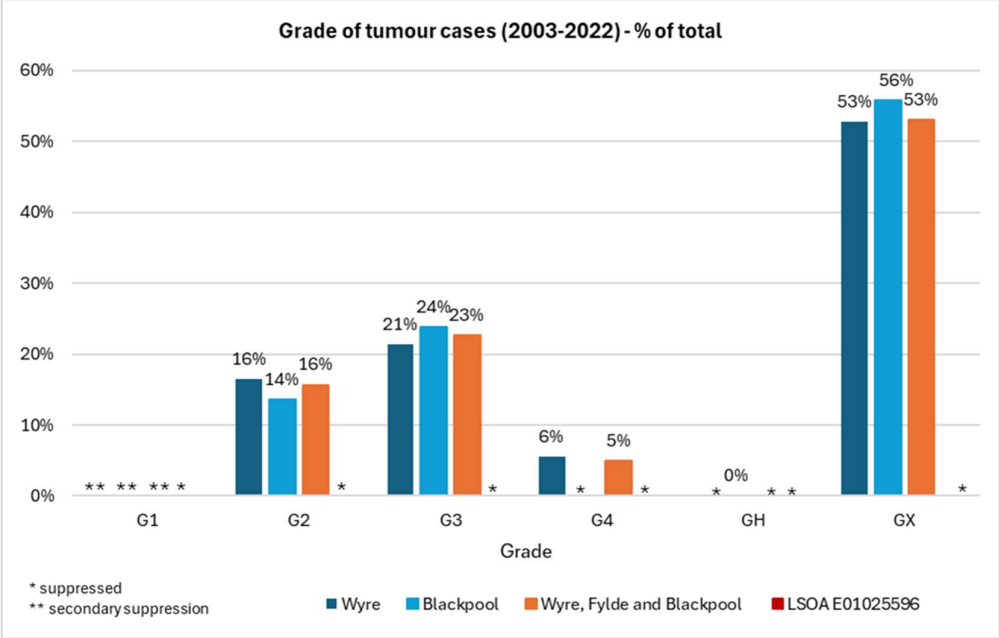
Please note the small sample size (n=14) in LSOA E01025596; small changes in the count of a small sample can cause large swings in percentages.

[9] Not otherwise specified

[10] Wide CI for LSOA E01025596 due to smaller count

Cases by tumour grade

- In LSOA E01025596 a higher proportion of total tumours are grade 3; similar to the 23% (LCI-UCI|19%-27%) for Wyre, Fylde and Blackpool, overall.
- In Wyre and Wyre, Fylde and Blackpool, overall, the highest proportion of tumours are grade undetermined and second highest proportion are grade 3.
- In Wyre, Fylde and Blackpool, overall, the percentage of tumours with grade undetermined (53%) is significantly higher than the percentage in other grades. In LSOA E01025596, the percentage of tumours with grade undetermined is similar to the percentage in other grades (possibly due to wide CIs).

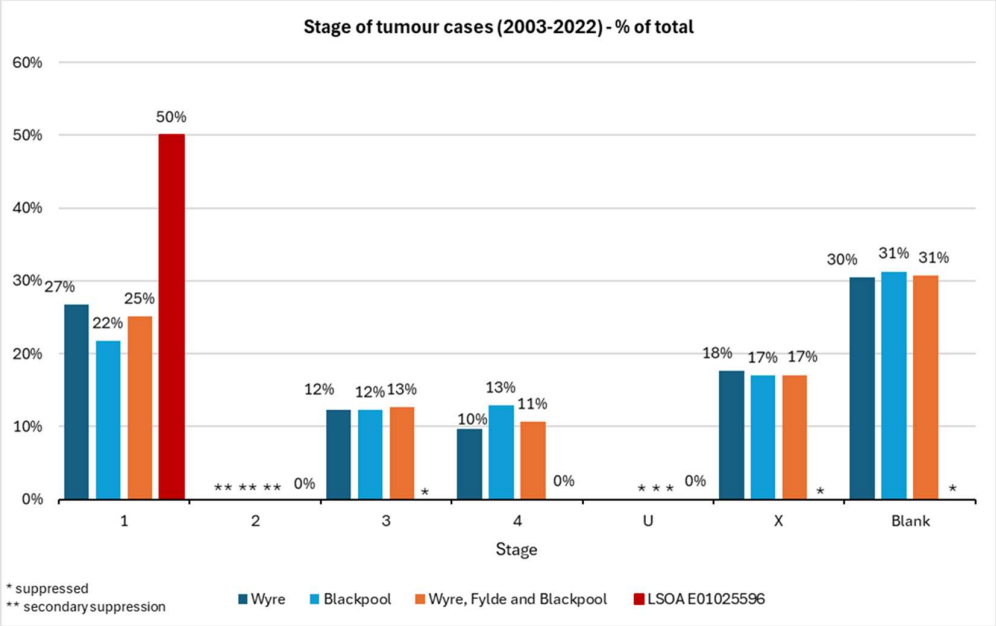


Data source: NDRS

- *GX signifies an "undetermined" or "cannot be assessed" grade*
- *Grade 1 cells look more similar to normal cells. These tend to be less aggressive and less likely to spread. Grade 1 is the least common grade, seen in less than 10 percent of patients.*
- *Grade 2 cells look less normal than grade 1 cells, have more prominent nucleoli and are more aggressive. Grade 2 is the most common grade for kidney cancer, representing roughly half of patients.*
- *Grade 3 cells are higher grade cells. They grow more quickly, look very abnormal and indicate an increased likelihood that cancer might spread. About one-quarter of patients have grade 3 RCC.*
- *Grade 4 cells are high-grade, abnormal cells with large prominent nucleoli. They indicate an aggressive cancer that is more likely to spread. Between 15 and 20 percent of patients will have grade 4 RCC.*

Cases by tumour stage (stage at diagnosis)

- Similar to Wyre, Fylde and Blackpool, overall, in LSOA E01025596, a higher proportion (50%) of tumours are stage 1 and this is statistically similar to the 25% for Wyre, Fylde and Blackpool, overall (possibly due to wide CIs).
- In LSOA E01025596, the percentage of cases with stage recorded as "blank" is statistically similar to the 31% for Wyre, Fylde and Blackpool, overall.



Data source: NDRS
Stage 1 is the earliest stage of cancer and stage 4 is the most advanced.
U Unstageable
X Stageable, missing stage

Profile of LSOA E01025596 – Wyre 012E (Census 2021)

Population

2022

2,300

people

57,144,400 people in England

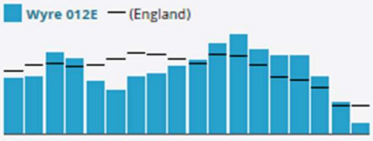
Rounded to the nearest 100 people

Source: Office for National Statistics – Mid Year Population Estimates

Small area: Output area

Age profile

2022



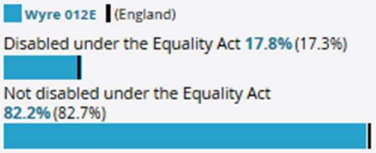
% of all people, 5 year age bands

Source: Office for National Statistics – Mid Year Population Estimates

Small area: Output area

Disability

2021



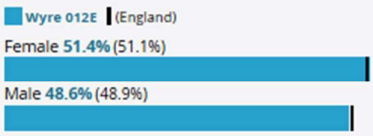
% of all people

Source: Office for National Statistics - Census 2021

Small area: Output area

Sex

2022



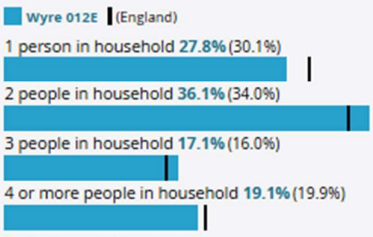
% of all people

Source: Office for National Statistics – Mid Year Population Estimates

Small area: Output area

Household size

2021



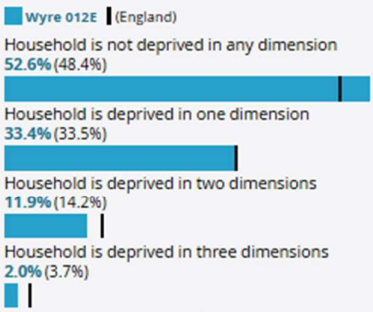
% of all households

Source: Office for National Statistics - Census 2021

Small area: Output area

Household deprivation

2021



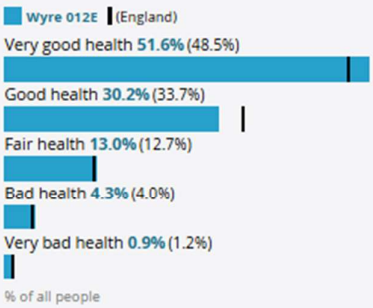
% of all households

Source: Office for National Statistics - Census 2021

Small area: Output area

General health

2021



% of all people

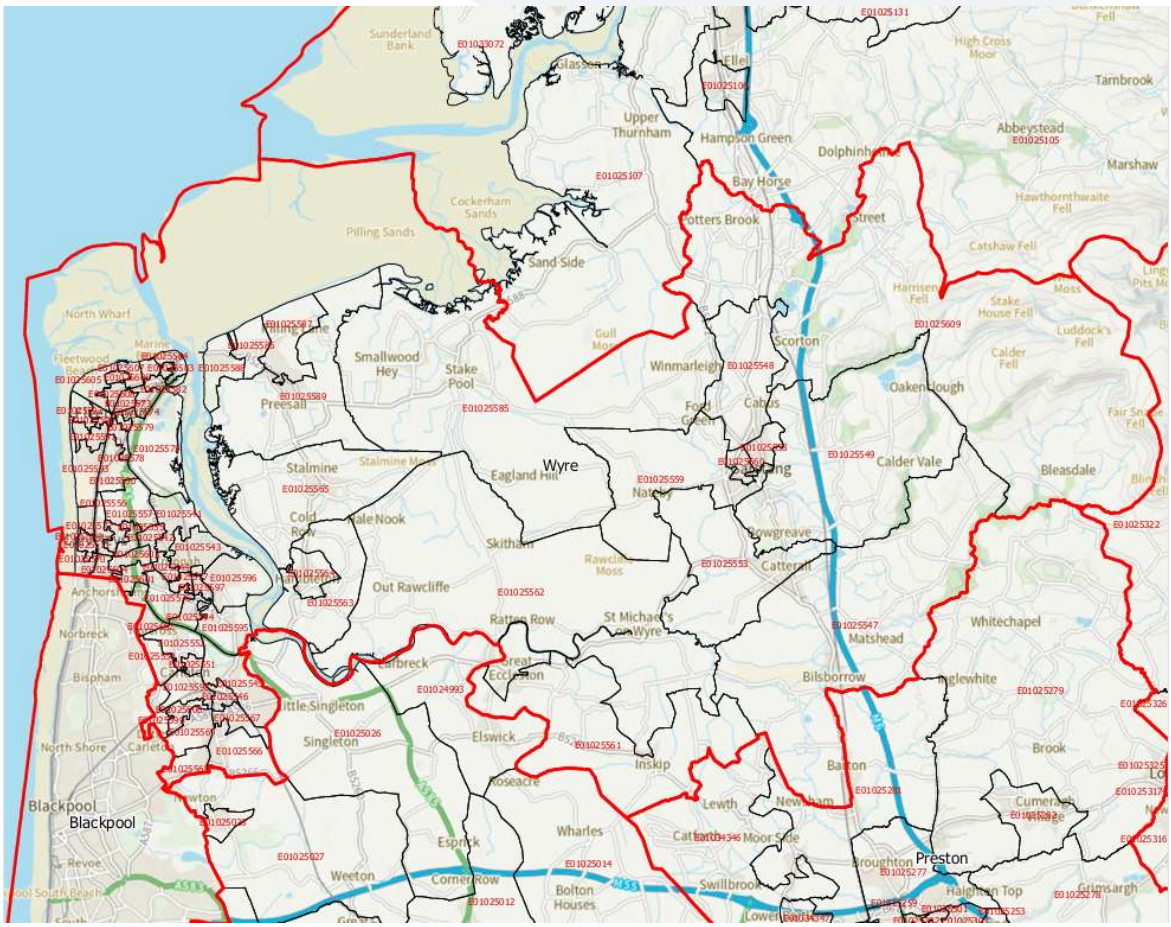
Source: Office for National Statistics - Census 2021

Small area: Output area

October 2025

Technical Appendix 3

Map of LSOA's close to the site



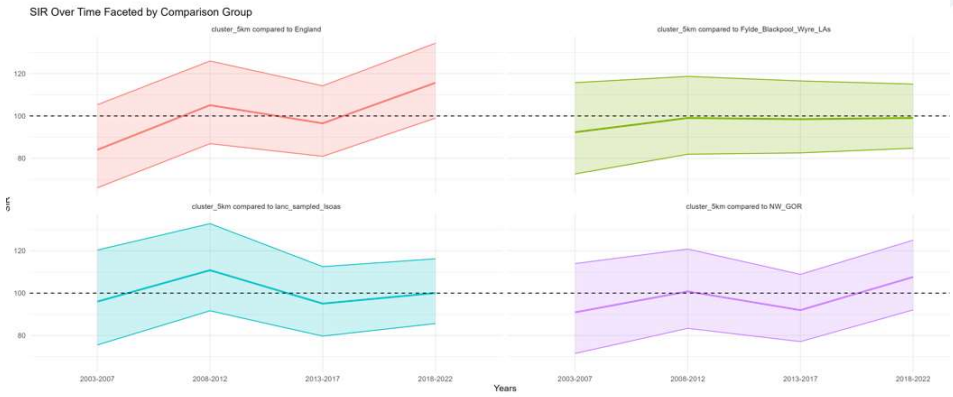
Technical Appendix 4

SIR over time faceted by comparison group plots using NDRS data

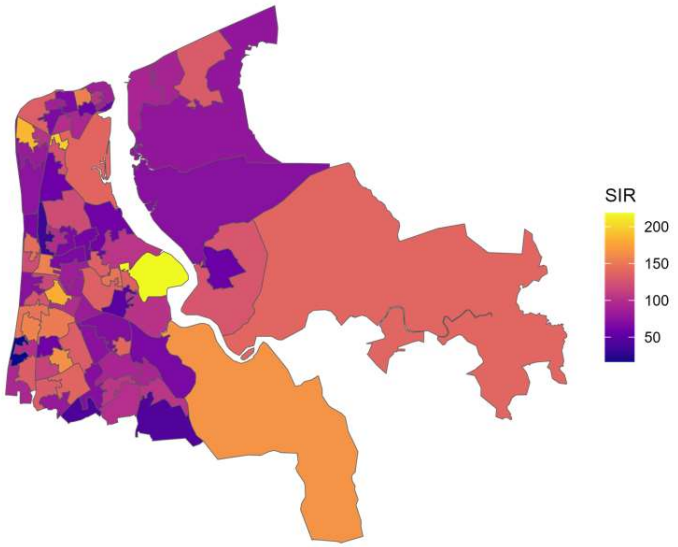
1km radius

3km radius

5km radius



Map of SIR compared to England by LSOA



SIR of each LSOA compared to distance from site