UK - Deaths from Malignant Neoplasms – Individual Causes, Ages 15-44

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Summary

In this study we investigate the UK trends in death rates for malignant neoplasms for individuals aged 15 to 44 by computing excess death rates, which are the difference between observed deaths rates and a given baseline for expected death rates. We measure and compare changes in the behaviour of mortality patterns before the Covid-19 pandemic with the post-pandemic period for deaths with attributed to malignant neoplasms.

We show a large increase in mortality due malignant neoplasms that started in 2021 and accelerated substantially in 2022. The increase in excess deaths in 2022 is highly statistically significant (extreme event). The results indicate that from late 2021 a novel phenomenon leading to increased malignant neoplasm deaths appears to be present in individuals aged 15 to 44 in the UK.

We also investigate the equivalent trends in deaths from individual ICD10 codes within malignant neoplasms (C00 to C99 codes). We analyse individually the 10 most common causes for malignant neoplasm deaths, and some causes of particular interest that are gender specific.

Contents

1. Introduction

Beginning in early 2020, the world changed due to the emergence of a global pandemic caused by the SARS-Cov2 virus which, in some individuals, manifested in the form of Covid-19 viral disease. The Covid-19 crisis led to alterations in individuals' lifestyles and perceptions of relative and absolute risk, which impacted their day-to-day decision-making. To add to the social changes, governments added to the hysteria with the introduction of unprecedented measures of social engineering such as control of media communications, the introduction of pandemic lockdowns for healthy individuals, and from 2021, mass inoculations based upon experimental mRNA-based vaccine technology. All these factors led to a break in individuals' behaviours from 2020 onwards.

In this context, at Phinance Technologies we performed several analyses showing excess mortality (all cause) since 2020, which is a common feature for different countries, from Europe to the US. We published a methodology report to explain our estimates for excess mortality, which is based on measuring excess death rates instead of excess deaths[1]. By accurately measuring, and then tracking excess mortality trends, we can have a clearer picture of the implications of the different stages of Covid-19 pandemic, that were mentioned above.

The purpose of this study is to go into more detail and measure the changes in death rates due to malignant neoplasms. We focus our research on younger individuals, aged 15-44, as presently it is a topic of particular interest due to the rise in anecdotal evidence of many unexplained aggressive and unusual cancers (such as turbo cancers[2]) occurring in the population, particularly in younger individuals. The focus of this study is not to examine individual claims and anecdotes, but instead to provide a statistical analysis at a population level and clarify if the anecdotal evidence is abnormal or not.

The relationships that we uncover in our analysis should be a basis for a reality check for health professionals to understand underlying trends in individuals' health.

In sections 2 and 3 we describe the data sources and the methodology, respectively. In section 4 we investigate the trends in death rates due to deaths from all malignant neoplasms combined while in section 5 we investigate deaths from individual malignant neoplasms, focusing on the 10 most common types.

[1] https://phinancetechnologies.com/HumanityProjects/Resources/Report%20on%20measuring%20death%20rates%20-%20V4%20-%20UK.pdf

[2] How COVID Vaccines Can Lead to 'Turbo Cancers' • Children's Health Defense (childrenshealthdefense.org)

2. Data

2.1. Cause of Death Data

The data used in this analysis is the number of deaths that occurred in England and Wales between 2010 and 2022, by underlying cause code (ICD-10), sex, and age group (up to 90+). The source is the UK Office for National Statistics (ONS). The direct links to the mortality data by cause for 2010 to 2021 and 2022 are listed below:

Link to the 2022 data source: Death occurrences by sex, five year age group and underlying cause (ICD-10 code) England and Wales: 2022 - Office for National Statistics (ons.gov.uk)

Direct link to the source file:
https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/adhocs/1050deathoccurrencesbysexfiveyearagegroupandunderlyingcauseicd10codeenglandandwales2022/deathoccsengwal2022final.xlsx

Link to the 2010-2021 data source: Death occurrences by sex, five year age group and underlying cause (ICD-10 code) England and Wales: 2010 to 2021 - Office for National Statistics (ons.gov.uk)

Direct link to the source file:
https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/adhocs/1017deathoccurrencesbysexfiveyearagegroupandunderlyingcauseicd10codeenglandandwales2010to2021/deathsoccsengwal20102021finalnew.xlsx

2.2. Registered Deaths (All Deaths)

Registered deaths are all the deaths registered in England and Wales, independently of if a cause of death has been attributed. The investigation of deaths and attribution of ICD10 codes with a cause of death can take up to 2 years to be performed.

UK Monthly Registered Deaths (All cause): Deaths registered monthly in England and Wales - Office for National Statistics (ons.gov.uk)

3. Methodology

In this study, we investigate the trends in **death rates** for the selected cause: malignant neoplasm (or oncologic causes for PIP disability claims). We investigate these trends using yearly data and therefore we do not have to perform a seasonal adjustment to the data.

In general terms, to measure trends in these variables we use a methodology of computing **excess rates**, which are the difference between the actual **observed rates** and a given **baseline** (expected rates). Because we want to measure the impact of the Covid-19 pandemic and post-pandemic periods relative to the prior state of the world, our baselines are based upon the estimation of the trend for a period prior to the pandemic.

In this study we will use method 2C, as described in our report on methodologies for measuring excess deaths[3] in the population. Method 2C is based on computing the trends in death rates (deaths adjusted by the population) instead of deaths, as the baseline for estimating excess mortality. This method significantly reduces the noise of the estimation (as it adjusts for population growth or decline) and also takes into account the prior trend in death rates, which tend to decline over time (over the last 100 years) as population grow healthier and different risk factors are better managed.

3.1. Method 2C for Estimating Excess Death Rates

$$ExcessDeaths_{ti}^{AG} = Deaths_{ti}^{AG} - Baseline_{ti}^{AG} \qquad Eq.\ 1$$

Equation (1) is a general expression for estimating the excess absence rates relative to a given baseline. We use the subscript "AG" to indicate a given population age cohort which could refer to an age range, region, sex, or underlying cause of death.

For estimating the baseline for "normal or expected" death rates we use a simple linear fit:

$$Baseline(t_i) = \hat{b} + \hat{a}(t_i - t_0) \qquad Eq.\ 2$$

Where $\hat{b}$ and $\hat{a}$ are the estimated coefficients of the death rate trendline from 2010 to 2019.

3.2. ICD10 code list of selected causes of death for: Malignant neoplasms

For this analysis we selected all the ICD10 codes from category I, namely C00 to C99 which refer to deaths attributed to malignant neoplasms.

The detailed list that was extracted from the ONS cause of death database shows the codes and description that were aggregated for the purpose of our analysis. The list is shown in Appendix 7.1.

Some ICD10 codes, such as C27 with the generic description of "Malignant neoplasms" refer to ICD10 codes that were not used in the UK from 2010 to 2022.

[3] Https://phinancetechnologies.com/HumanityProjects/Resources/Report%20on%20measuring%20death%20rates%20-%20V4%20-%20UK.pdf

4. Yearly Analysis of Excess Death Rates

In this section we perform a yearly analysis of the death rates for England and Wales, using the ONS cause of death data. In this analysis we use the 2010-2019 trend in death per 100,000 (death rates) as the baseline estimate for excess death rates. Excess death rates for the 2010-2019 period are in-sample while the rates for 2020, 2021, and 2022 are out of sample computations.

The analysis is performed for all the deaths from a particular range of underlying causes of death, as described by the list of ICD10 codes in section 3.2, which refer to all deaths from malignant neoplasms.

4.1. Deaths for All Causes versus Registered Deaths

When analysing the ONS data for cause of death we noticed that there are discrepancies between the number of deaths which have a cause of death and the number of registered deaths for a year. This is particularly the case for deaths in 2022 (the most recent year) and younger individuals where there are significant discrepancies between both these datasets.

The reason for the discrepancy is that death certificates for younger individuals take longer as each death is thoroughly examined and, on many occasions, post-mortems need to be performed. For older individuals, the discrepancies are small. In this report we only investigate deaths for individuals aged from 15 to 44. For this age group, we show the differences between registered deaths and all the causes of deaths in Figure 1.

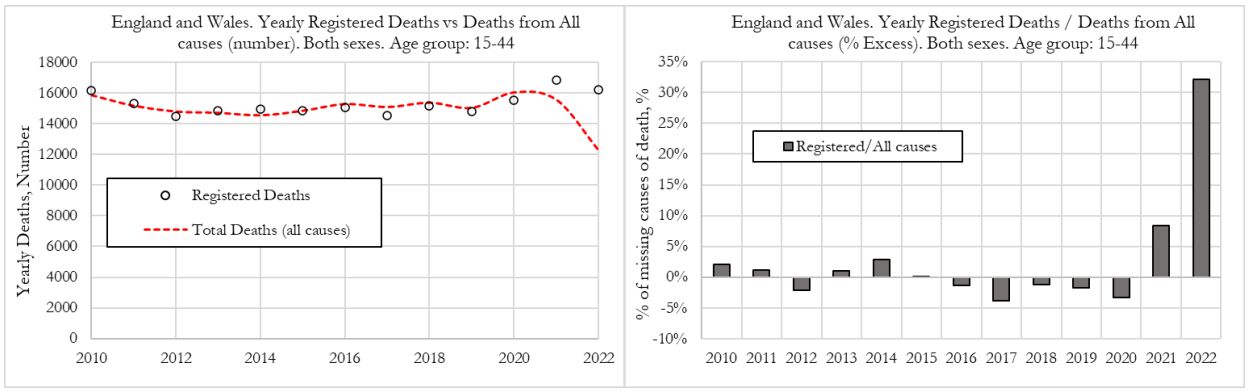


Figure 1- England and Wales, registered deaths versus deaths from all causes in the ONS deaths by cause data table for age group 15 to 44. Left: Yearly numbers. Right: % missing cause of death relative to registered deaths.

We can observe that the discrepancy between registered deaths and the sum of all deaths by cause ranges between -3% to +3% from 2010 to 2020. We consider these normal discrepancies between these databases as there are many factors that could lead to these discrepancies, including if the deaths occurred within England and Wales or abroad, or if they occurred with individuals that were temporary stays in England and Wales.

For 2021 however, we observe about 8% more registered deaths than the sum of the deaths from all causes. In 2022, there are still about 32% of registered deaths without a final cause of death. This is a large discrepancy that needs to be corrected.

To correct for the discrepancies in registered deaths compared to deaths from all causes, we scale the deaths for each ICD10 code by the ratio R=(registered/all cause deaths). This adjustment is significant for 2022 and assumes

that the proportion of deaths from the different ICD10 codes will remain the same after the final figures are published (in 1 or 2 years). This may not be the case and, therefore, the results need to be taken with a degree of caution.

In summary, to estimate the trends in death rates for different causes, we use Adjusted Deaths (Adj-deaths) which refers to the deaths from a particular cause or range of causes adjusted by the ratio defined above. Adjusted death rates are computed based on adjusted deaths.

4.2. Death Rates for Age Group 15-44

In this section we investigate the trends in death rates in England and Wales, for the 15-44 age group. We compare all-cause mortality (registered deaths) with deaths from malignant neoplasms, with ICD10 codes ranging from C00 to C99. When computing death rates, we chose to show the numbers as deaths per 100,000 as death rates for younger age groups are very low.

4.2.1. Unadjusted (Raw) Death Rates for Age Group 15-44 from Malignant neoplasms (C00-C99)

The first analysis that we perform is the analysis of the unadjusted (raw) deaths from malignant neoplasms. Before starting the analysis, it needs to be reiterated that as mentioned in section 4.1, there are a significant number of missing records for recorded causes of death relative to registered deaths in 2021 and 2022. This is because younger individuals are not expected to die from natural causes and, consequently, those deaths need to be investigated to understand the underlying causes.

In section 4.1 we observed that for the 15-44 age group, for 2021 there are about 8.3% of missing records in the ONS cause of death dataset, and 32% for 2022. The missing records for 2022 are about a third, which means that when analysing the raw numbers of deaths (without adjustment) for malignant neoplasms, they will likely underreport actual deaths by that amount.

With these caveats in mind, Figure 2 shows the deaths (right) and death rate per 100,000 individuals (left) for malignant neoplasm deaths in England and Wales from 2010 to 2022. We can observe that even with a large number of missing records, we can already observe a clear signal in above-trend malignant neoplasm deaths in both 2021 and 2022.

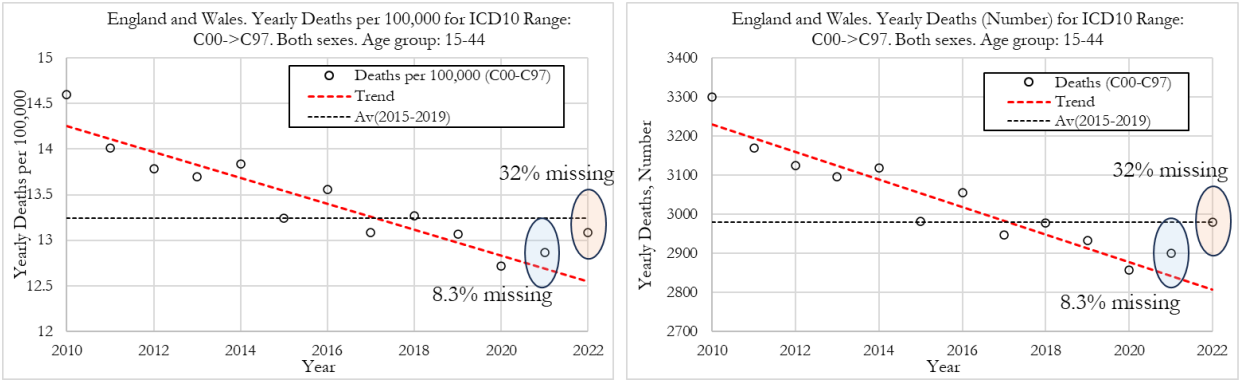


Figure 2 - Yearly unadjusted (raw) deaths from malignant neoplasms in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Deaths per 100,000. Right: Deaths (number).

4.2.2. Registered Deaths

The analysis of the registered deaths allows us to have a context by which we can then compare the death rates for malignant neoplasms. Figure 3 shows the death rate per 100,000 individuals for all registered deaths in England and Wales from 2010 to 2022. We can observe that registered deaths per year had been trending slightly lower from 2010 to 2019.

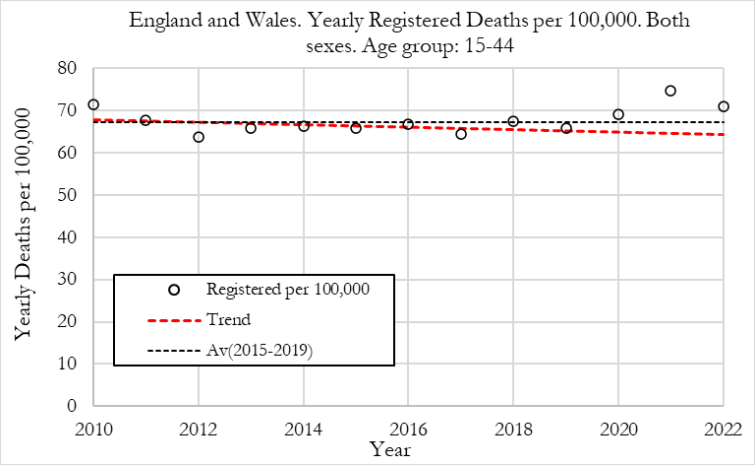


Figure 3 - Yearly registered deaths per 100,000 for England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate.

In 2019, the death rate was about 67 per 100,000 individuals aged 15 to 44. The death rate increased in 2020 to about 69 per 100,000 and then again in 2021 to 75 per 100,000. In 2022 the death rate dropped slightly to about 71 per 100,000, the same level as observed in 2010 and still above the 2020 level.

4.2.3. Adjusted Deaths from ICD10 codes C00 to C99 (Malignant neoplasms).

We now investigate adjusted[4] deaths for all malignant neoplasms (ICD10 codes C00 to C99). Figure 4 (left) shows the death rate per 100,000 individuals for malignant neoplasms deaths (adjusted for under-reporting) in England and Wales from 2010 to 2022. We can observe that deaths per year from malignant neoplasms have been trending lower from 2010 to 2019, with a significant downward slope. In 2010 the deaths rate was 15 per 100,000, in 2019 it was around 12.8 per 100,000, a 14.7% drop.

[4] Deaths adjusted for the missing causes of death relative to registered deaths.

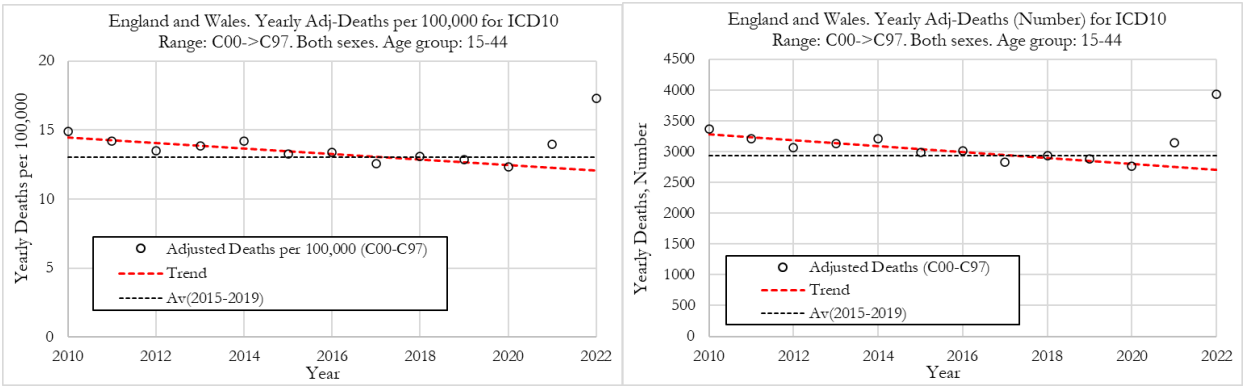


Figure 4 - Yearly adjusted deaths for diseases by malignant neoplasms in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Adj-Deaths (Number).

The death rate dropped in 2020 to about 12.5 per 100,000 and then rose to 14 per 100,000 in 2021. In 2022 the death rate increased again to about 17.5 per 100,000, a level that is 11.7% higher than observed in 2010. The death rate in 2022 was about 4.7 deaths per 100,000, higher than the 2015-2019 average.

When translating these numbers into the absolute number of deaths for diseases from malignant neoplasms, shown in Figure 4 (right), we can observe that the 5-year average deaths from 2015 to 2019 was about 3000 deaths. In 2020, malignant neoplasm deaths were about 2,800, 200 less than the prior 5-year average. In 2021 there were about 3200 deaths (200 more than the 2015-2019 average) and in 2022, 4000 (1000 more than the 2015-2019 average).

4.2.4. Relative Deaths from ICD10 codes C00 to C99 (Malignant neoplasms) vs All Causes.

In our study we also analyse the trends in the relative incidence of malignant neoplasm deaths relative to all other causes, which provides a different type of information related to breaks in the normal pattern of deaths in this age group.

For this purpose, in Figure 5 we plot the fraction of deaths from all causes that are attributed to malignant neoplasms. We observe that there was a slightly declining trend in deaths due to malignant neoplasms from 2010 to 2019. In 2010, deaths attributed to malignant neoplasms accounted for 21% of total deaths, while in 2019, the fraction was only 19.5%.

In 2020 the fraction of deaths due to malignant neoplasms dropped to about 17.5% of total deaths. The fraction then increased to 18.5% in 2021 (on top of the 2010-2019 trendline) and then jumped to about 24.5% in 2022, which is a lot above the 2010 level.

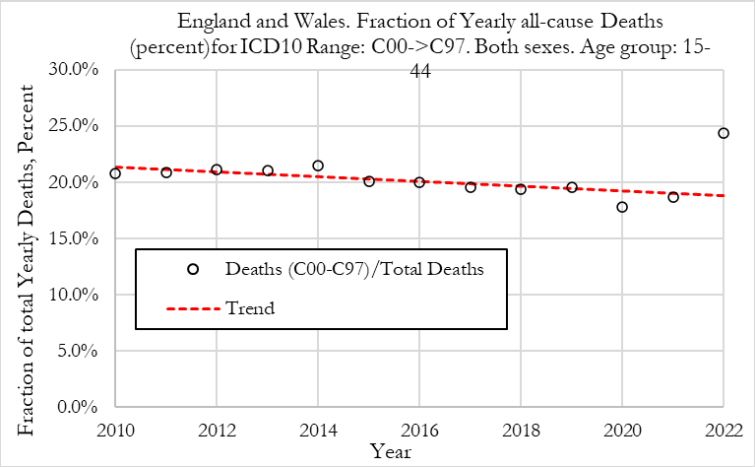


Figure 5 – Fraction of all causes for yearly deaths attributed to malignant neoplasms, for England and Wales. The red dashed line shows the average from 2010 to 2019.

4.3. Excess Death Rates for Age Group 15-44

In this section we investigate the trends in excess death rates in England and Wales, for the 15-44 age group. We compare excess all-cause mortality (registered deaths) with excess deaths from malignant neoplasms, with ICD10 codes ranging from C00 to C99. We also compare excess deaths for males and females.

4.3.1. Excess Adjusted Deaths from ICD10 codes C00 to C99 (Malignant neoplasms).

Figure 6 compares the excess death rate for malignant neoplasms (adjusted for under-reporting) and excess registered deaths, in England and Wales from 2010 to 2022. The figure on the Figure 6 (left) refers to relative deviations from the 2010-2019 trend, while Figure 6 (right) shows the Z-Score (signal strength) for the deviations from trend.

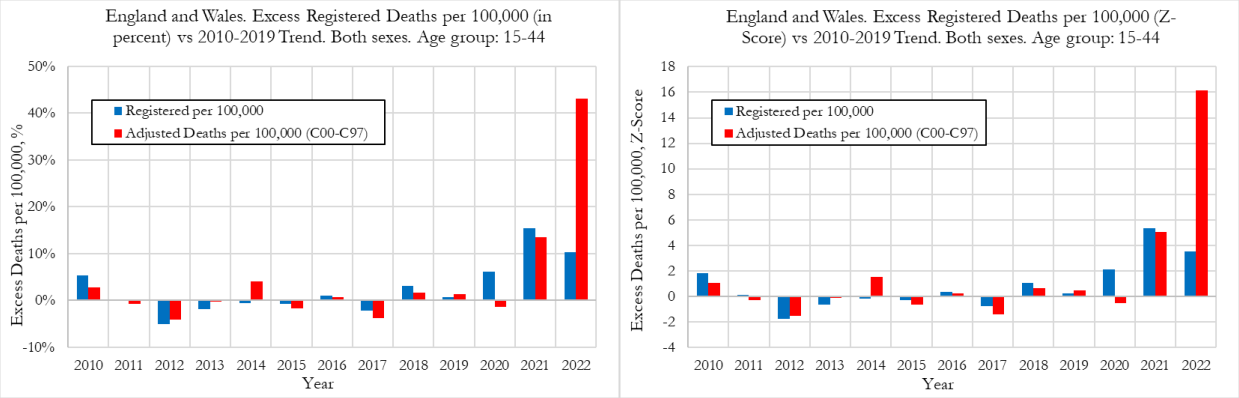


Figure 6 - Excess adjusted deaths rates for diseases by malignant neoplasms versus excess death rates for all registered deaths in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 6 (left) we can observe that the excess deaths rates from malignant neoplasms were close to zero in 2020, rose by about 13% in 2021 and about 43% in 2022. On the other hand, the excess mortality for all registered deaths was about 5% in 2020, 15% in 2021 and 10% in 2022. The drop in excess mortality for all registered deaths from

2021 to 2022 was not mirrored in a drop in malignant neoplasm deaths. The opposite occurred, with a sharp acceleration in excess deaths due to malignant neoplasms.

In terms of statistical significance of the excess deaths, we observe from Figure 6 (right) that for all registered deaths, the Z-score in 2020 was only about 2, which is not a strong signal. However, in 2021, the Z-score was slightly above 5.0 which is a very strong signal. In 2022 the Z-score dropped to about 3.5, which still indicates that the excess deaths are statistically significant deviations from the 2010-2019 trend.

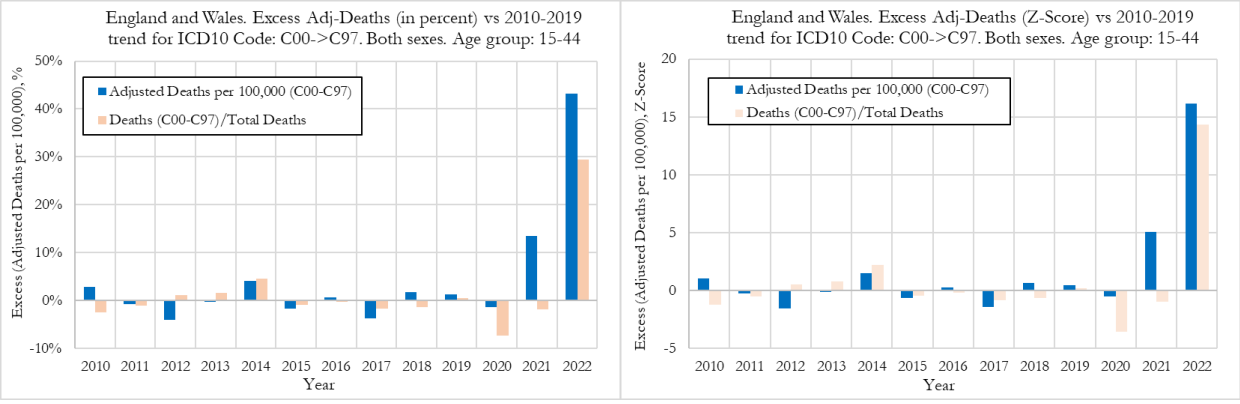
When looking at excess deaths from malignant neoplasms, the Z-score in 2020 was around 0, indicating that prior to the start of the vaccinations there was no signal pointing to an increase in malignant neoplasm deaths. That trend however accelerated substantially in 2021 and 2022 where we observe Z-scores of around 5 and 16, respectively. These are extreme events that we believe need a thorough investigation. Our previous work on measuring excess mortality and disabilities in the UK[5] points to the Covid-19 vaccines likely playing a significant role in the rise of mortality and morbidity. However, the pandemic rules, lockdowns and Covid-19 could have played a role in the rise of malignant neoplasm deaths.

4.3.2. Excess Relative Deaths from ICD10 codes C00 to C99 (Malignant neoplasms) vs all causes.

A different perspective is to analyse the fraction of deaths from all causes that are attributed to malignant neoplasms and compare them with the absolute changes in death rates due to malignant neoplasms, as shown in Figure 7.

We observe that in 2020 and 2021 the fraction of malignant neoplasm deaths relative to all other causes did not deviate significantly from the 2010-2019 trend. In 2021, both registered deaths and malignant neoplasm deaths increased by similar amounts so that the fraction of neoplasm deaths remained unchanged. For 2022, we observe that in similarity with excess death rates, the fraction of neoplasm deaths jumped substantially, by about 30%.

When looking at the statistical significance of the signals, in 2022, the fraction of excess deaths due to malignant neoplasms had a Z-score of about 16, similar in magnitude than that for excess adjusted deaths rates. This reinforces the fact that deaths related to the malignant neoplasms are of particular concern for this age group and needs further investigation.



[5] See our work on excess deaths in the UK: (https://phinancetechnologies.com/HumanityProjects/yearly%20Excess%20Death%20Rate%20Analysis%20-%20UK.htm). and the analysis of PIP clearances: (https://phinancetechnologies.com/HumanityProjects/PIP%20Analysis-Systems.htm)

Figure 7 – Excess adjusted deaths rates for malignant neoplasms versus excess fraction of all deaths that were from malignant neoplasms, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

4.3.3. Excess Adjusted Deaths for Malignant neoplasms for Males and Females.

When looking at deaths attributed to malignant neoplasms for males and females, shown in Figure 8, we observe that in 2020 both had no noticeable excess mortality (slightly negative), with respective Z-scores close to zero (low statistical significance).

However, we also observe that in 2021 men suffered slightly worse outcomes than women, with men experiencing a 16% deviation from trend, compared to about 10% for women. In 2022 men suffered much worse outcomes than women, with men experiencing a 52% deviation from trend, compared to about 31% for women. The signal strengths for both men and women were highly statistically significant, as shown in Figure 8-right.

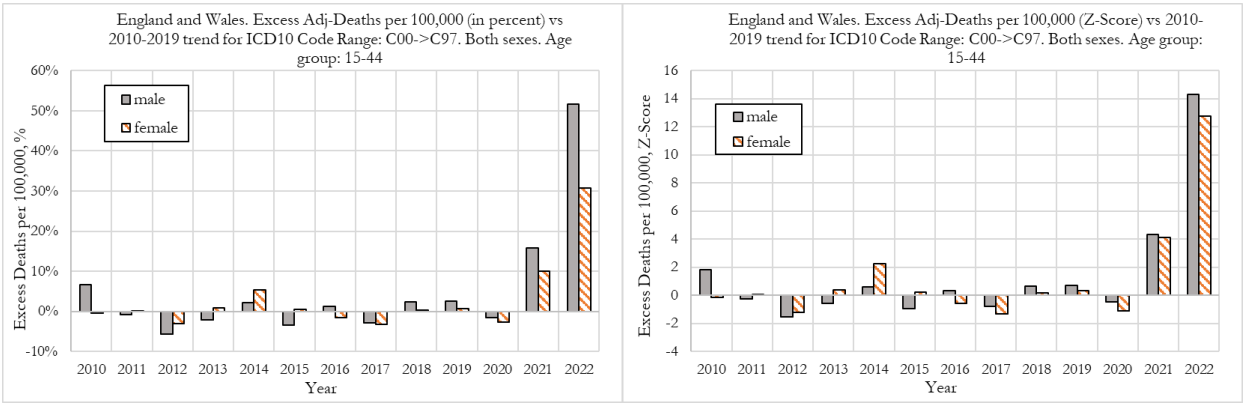


Figure 8 - Excess adjusted deaths rates by malignant neoplasms for males and females, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

4.4. Summary of the Analysis of Death Rates

We started our analysis of excess death rates due to malignant neoplasms by showing that the analysis needs to be performed with caution as not all deaths had a classified cause up to the time of publication of the ONS dataset. This issue is particularly relevant in younger age groups, which is the case of the present analysis, where we observe that in 2022, about 32% of registered deaths were still not classified with a cause (Figure 1).

We perform a correction to this problem by extrapolating the deaths in each year as if the proportion of each cause of death remained the same, when the missing deaths are finally classified. This is an assumption that must be taken with care. To make sure that we are identifying an actual trend in the data, we also analyse the deaths from malignant neoplasms relative to all classified causes of death (Figure 7). The results show that the rise in deaths from malignant neoplasms in 2022 was similar to the relative rise in malignant neoplasms in relation to all other causes. We also analyse raw unadjusted deaths (Figure 2) which show that even without accounting for the missing records, 2022 already shows significant above-trend deaths.

Our analysis shows that the excess death rates from malignant neoplasms were close to zero in 2020, rose by about 13% in 2021 and about 43% in 2022. On the other hand, the excess mortality for all registered deaths was about 5% in 2020, 15% in 2021 and 10% in 2022. The drop in excess mortality for all registered deaths from 2021 to 2022 was not mirrored in a drop in malignant neoplasm deaths. The opposite occurred, with a sharp acceleration in excess deaths due to malignant neoplasms.

The excess mortality from malignant neoplasm deaths in 2021 and 2022 are highly statistically significant with Z-scores of 5 and 16, respectively. These are very strong signals. As mentioned above, these signals are corroborated by similar findings when measuring rises in the fraction of deaths from malignant neoplasms relative to all other deaths with classified causes.

When looking at deaths attributed to malignant neoplasms for males and females, shown in Figure 8, we observe that in 2020 both had no noticeable excess mortality (slightly negative), with respective Z-scores close to zero (low statistical significance).

When comparing outcomes for men and women, we observe that both had no significant changes in deaths from malignant neoplasms in 2020. However, in 2021 men suffered slightly worse outcomes than women, with men experiencing a 16% deviation from trend, compared to about 10% for women. In 2022 men suffered much worse outcomes than women, with men experiencing a 52% deviation from trend, compared to about 31% for women. The signal strengths for both men and women were highly statistically significant, as shown in Figure 8-right.

When translating these numbers into the absolute number of deaths from malignant neoplasm, shown in Figure 4 (right) we can observe that in 2020, malignant neoplasm deaths were about 2,800, 200 less than the prior 5-year average. In 2021 there were about 3200 deaths, 200 more than the 2015-2019 average, and in 2022, 4000 (1000 more than the 2015-2019 average).

In the future, we plan to expand our analysis to identify the individual causes of death (ICD10 codes) within the malignant neoplasms (ICD10 codes C00-C99) that were responsible for the acceleration in these deaths.

5. Analysis of the 10 most common individual ICD10 cause deaths within Malignant Neoplasms (C00-C97).

5.1. The 10 Most Common Causes of Death within Malignant Neoplasm Deaths (C00 to C97).

To better understand the underlying trends in mortality within malignant neoplasms, we decided to investigate the 10 largest individual causes of death (ICD10 codes). To such effect we ranked the number of deaths for the individual ICD10 codes within malignant neoplasms by the number of deaths in 2019, prior to the Covid-19 pandemic (Table 1).

We can observe that the 3 main causes of malignant neoplasm deaths for 15 to 44 year-olds in the UK were C50->Malignant neoplasm of breast, C71->Malignant neoplasm of brain and C18->Malignant neoplasm of colon, which accounted respectively for 15.7%, 10.2% and 6.7% of malignant neoplasm deaths in 2019. Altogether these three causes represent about 32.6% of malignant neoplasm deaths. Furthermore, we can observe from Table 1 that the top 10 causes of malignant neoplasm deaths accounted for about 61% of all malignant neoplasm deaths.

Analysis of top 10 causes of malignant neoplasm deaths		Fraction of Malignant Neoplasm deaths				Change from 2019 baseline		
ICD10 code	Description	2019	2020	2021*	2022**	2020	2021*	2022**
C50	Malignant neoplasm of breast	15.68%	15.36%	15.69%	15.10%	-2.03%	0.07%	-3.72%
C71	Malignant neoplasm of brain	10.16%	10.81%	10.38%	10.27%	6.45%	2.19%	1.07%
C18	Malignant neoplasm of colon	6.68%	6.54%	7.28%	7.92%	-2.05%	8.92%	18.51%
C34	Malignant neoplasm of bronchus and lung	6.03%	6.05%	5.59%	5.30%	0.34%	-7.40%	-12.14%
C53	Malignant neoplasm of cervix uteri	5.04%	5.18%	5.00%	4.53%	2.66%	-0.88%	-10.22%
C80	Malignant neoplasm without specification of site	4.09%	4.48%	4.86%	4.50%	9.50%	18.88%	9.91%
C92	Myeloid leukemia	3.65%	3.71%	3.48%	2.85%	1.70%	-4.50%	-21.81%
C19	Malignant neoplasm of rectosigmoid junction	3.61%	3.08%	3.72%	3.66%	-14.77%	3.08%	1.21%
C43	Malignant melanoma of skin	3.10%	3.11%	2.97%	3.09%	0.40%	-4.39%	-0.50%
C16	Malignant neoplasm of stomach	3.07%	3.71%	3.24%	3.46%	20.91%	5.67%	12.64%
	Top 10 causes	61.11%	62.04%	62.21%	60.65%	1.51%	1.79%	-0.75%
	All the rest	38.89%	37.96%	37.79%	39.35%	-2.38%	-2.82%	1.18%
*The fraction of missing cause of death data for 2021 for the 15-44 age group is about 8.3%								
**The fraction of missing cause of death data for 2022 for the 15-44 age group is about 32%								

Table 1 - Analysis of changes in the fraction of deaths attributed to the largest 10 causes within Malignant Neoplasm deaths (C00 to C99).

The results shown in Table 1 must be interpreted with some caution as they refer to the fraction of deaths for a given individual ICD10 code, relative to all malignant neoplasm deaths in a given year. This means that only the relative rates of death by individual causes can be compared in each year and they cannot be compared in absolute terms, as they do not capture the rise in overall malignant cancer deaths that we described previously in section 4. As an example, we can observe that the relative fraction of malignant neoplasm deaths from breast cancer decreased successively from 2019 to 2022, but this does not mean that no signal was present in malignant cancers of the breast. In fact, as will be shown in section 5.2, cancers of the breast have a strong signal, particularly in 2022.

The results in Table 1 show that some cancers saw explosive changes from 2020 relative to the 2019 baseline. Of particular interest are cancers of the colon (C18) and stomach (C16) which will be investigated in detail, together with cancers of the esophagus (C15). These cancers related to the digestive tract appear to have risen substantially in importance, and we also notice that they seem to be affecting men in a disproportionate manner.

We also notice that the most common cause of cancer is that of the breast which affects women in the vast majority of cases[6], accounting for 15.7% of all malignant cancer deaths. However, as we observed previously in section 4, men saw a disproportionate rise in malignant neoplasm deaths when compared to women which means that the deaths in men are likely spread out among less common cancers that affect men more than women. We observe this pattern in a number of the cancers we analyse below, with a typical example being cancers of the brain (C71) or cancers of bronchus and lung (C34), which we investigate in sections 5.3 and 5.5, respectively.

In subsequent sections we are going to investigate the trends in death rates for different single ICD10 codes of particular interest, which allow us to better understand the underlying phenomenon at action.

[6] We do not perform the analysis of these cancers for men as they are insignificant in absolute numbers.

5.2. Analysis of ICD10 Code C50 -> Malignant Neoplasm of Breast (Rank 1: 15.7%)

In this section we investigate the trends in death rates for ICD10 code C50 (malignant neoplasm of breast), which represents 15.7% of all malignant neoplasm deaths in 2019 for 15 to 44 year-olds in the UK. This analysis investigates the absolute trends in adjusted deaths for a single ICD10 code. We also investigate the fraction of deaths attributable to ICD10 code C50 versus deaths from all other causes.

Note that this analysis is distinct from the one performed in the previous section (5.1) which referred to relative changes within malignant neoplasms of the 10 most frequent individual ICD10 code causes. As we've shown in our overall analysis for trends in deaths for malignant neoplasms, we observe an overall rise in those deaths in 2020, 2021, and 2022.

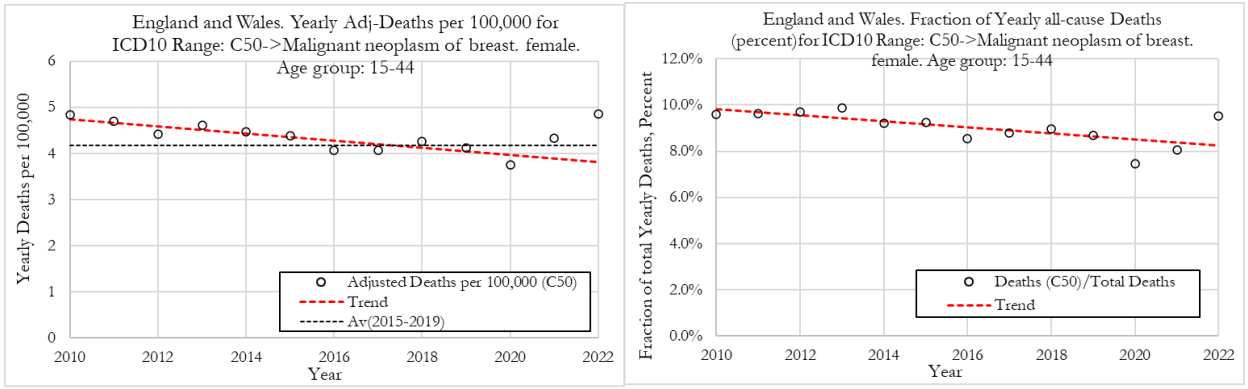


Figure 9 - Yearly adjusted deaths for ICD10 code C50 (Malignant neoplasm of breast) in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Fraction of all deaths.

We can observe that death rates per year from malignant neoplasms of the breast have been trending lower from 2010 to 2019, with a significant downward slope. In 2010 the deaths rate was 4.9 per 100,000, in 2019 it was around 4 per 100,000, an 18.4% drop.

The death rate dropped in 2020 to about 3.8 per 100,000 and then rose to 4.2 per 100,000 in 2021. In 2022 the death rate increased again to about 4.9 per 100,000, a level that is similar to that observed in 2010. The death rate in 2022 was about 0.9 deaths per 100,000 above the death rate in 2019, that is, a +22.5% rise.

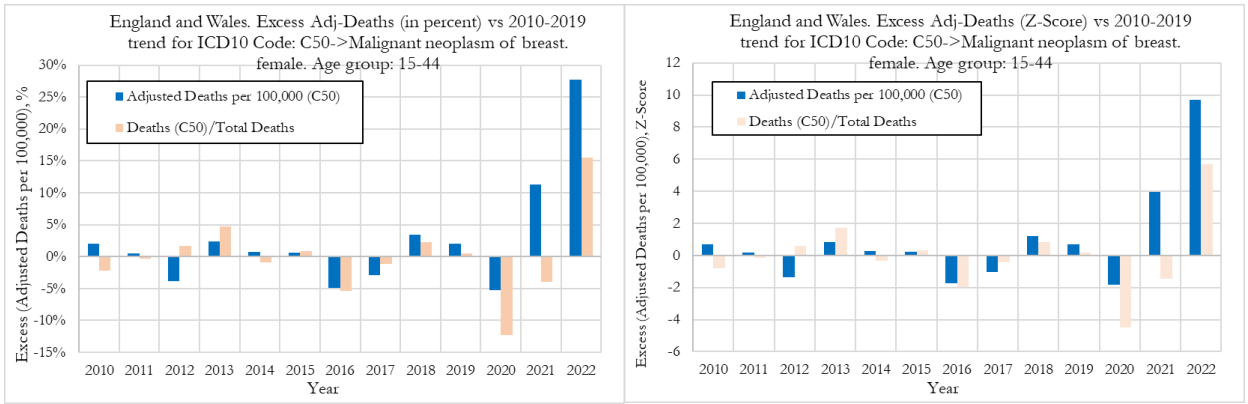


Figure 10 - Excess adjusted deaths rates for ICD10 code C50 (Malignant neoplasm of breast) versus excess fraction of all deaths for C50 deaths, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 10 (left) we can observe that the excess deaths rates from malignant breast neoplasms were -5% in 2020, then rose to about 12% in 2021 and about 28% in 2022. In terms of statistical significance of the excess deaths, we observe from Figure 10 (right) that for breast cancers, the Z-score in 2020 was only about -2, which is not a strong negative signal but perhaps something worth investigating in further detail. We speculate that perhaps the Covid-19 pandemic measures, lifestyle changes or misclassification of breast cancer deaths as Covid-19 deaths led to fewer breast cancer deaths. When looking at changes in the fraction of all deaths attributed to breast cancers, we observe that breast cancer rates were about 12% lower, with a -4 Z-score which points to a strong effect and corroborates the previous observations.

In 2021, the Z-score for adjusted death rates was close to 4.0 which is a strong signal. In 2022 the Z-score rose to about 9.8, which is a very strong signal and indicates that the excess deaths from breast cancers are statistically significant deviations from the 2010-2019 trend.

5.3. Analysis of ICD10 Code C71 -> Malignant neoplasm of brain (Rank 2: 10.2%)

In this section we investigate the trends in death rates for ICD10 code C71 (Malignant neoplasm of brain), which represents 10.2% of all malignant neoplasm deaths in 2019 for 15 to 44 year-olds in the UK. This analysis investigates the absolute trends in adjusted deaths for a single ICD10 code. We also investigate the fraction of deaths attributable to ICD10 code C71 versus deaths from all other causes.

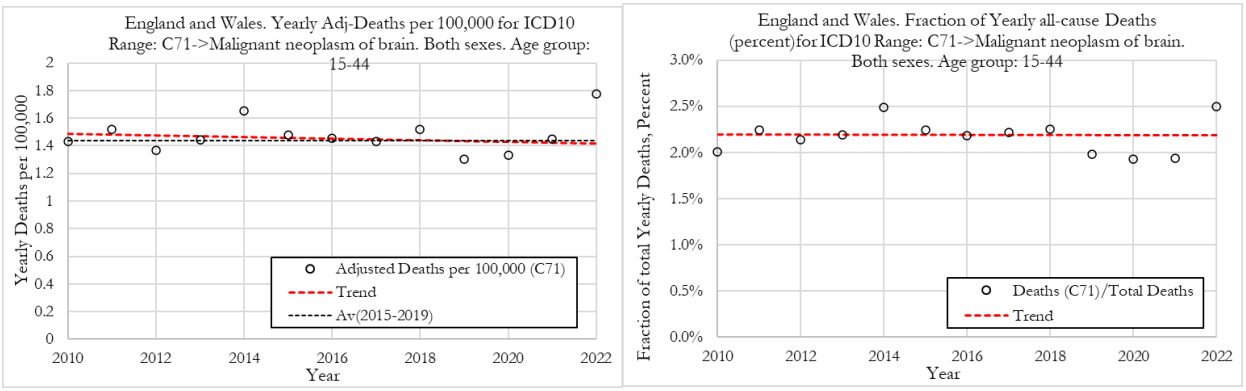


Figure 11 - Yearly adjusted deaths for ICD10 code C71 (Malignant neoplasm of brain) in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Fraction of all deaths.

We can observe that death rates per year from malignant neoplasms of the brain have been stable from 2010 to 2019, at a value of about 1.4 deaths per 100,000. The death rate did not deviate significantly from trend in both 2020 and 2021. In 2022 the death rate increased again to about 1.8 per 100,000. Next, we'll investigate if this change is a significant deviation from trend.

In terms of the malignant neoplasms of the brain relative to all death causes Figure 11 (right), we observe that the fraction has remained stable at about 2.2% and in 2022 it rose to 2.5%, which does not point to a significant signal.

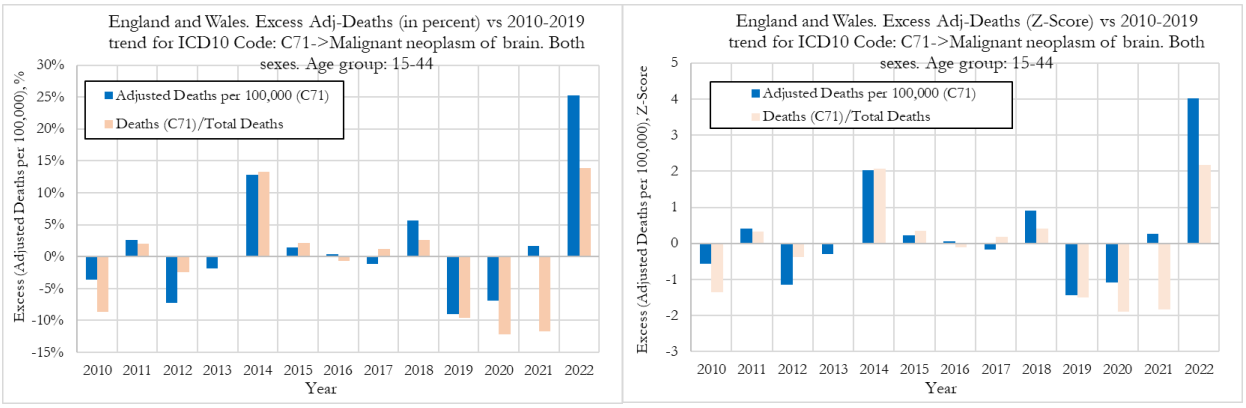


Figure 12 - Excess adjusted deaths rates for ICD10 code C71 (Malignant neoplasm of brain) versus excess fraction of all deaths for C71 deaths, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 12 (left) we can observe that the excess deaths rates from malignant neoplasms of the brain were -7% in 2020, then rose to about +1.5% in 2021, and about 25% in 2022. In terms of statistical significance of the excess deaths, we observe from Figure 12 (right) that for brain cancers, in 2020 and 2021, the Z-scores for adjusted death rates were low, which point to low statistical significance. In 2022 the Z-score rose to about 4, which is a strong signal and indicates that the excess deaths from brain cancers are statistically significant deviations from the 2010-2019 trend.

When looking at changes in the fraction of all deaths attributed to brain cancers, we observe that the fraction of deaths for these cancers was about 12% below trend in both in 2020 and 2021 (with a negative Z-score indicating low statistical significance). In 2022, however, the fraction of deaths for these cancers jumped about 14%, with a Z-score of about 2, also indicating low statistical significance. It appears that brain cancers as a fraction of all deaths did not deviate significantly from prior trends.

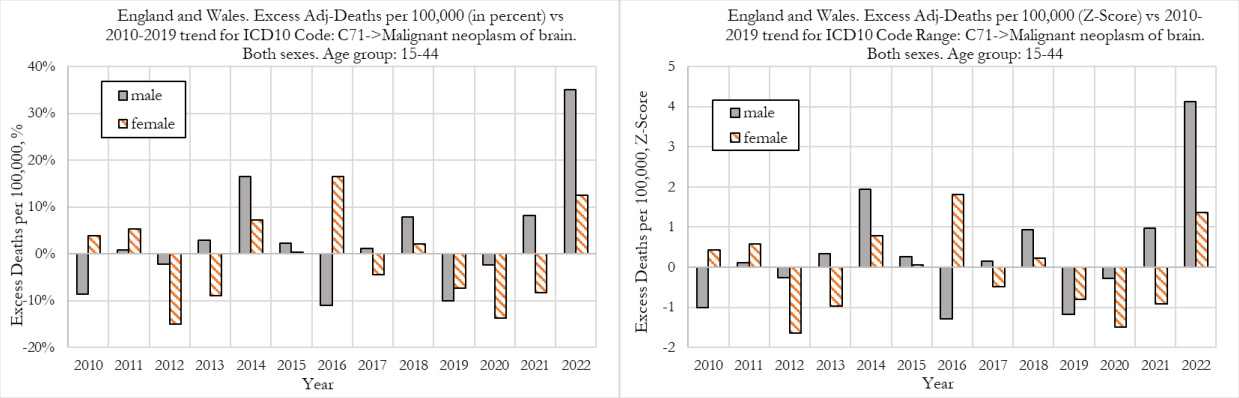


Figure 13 - Excess adjusted deaths rates for ICD10 code C71 (Malignant neoplasm of brain) for males and females, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

When comparing excess death rates attributed to malignant neoplasms of the brain for males and females, shown in Figure 13, we observe that in 2020 and 2021 both males and females showed no noticeable excess mortality, with respective Z-scores close or below 1 (low statistical significance).

In 2022 men suffered much worse outcomes than women, with men experiencing about 35% deviation from trend, compared to about 12% for women. The signal strength for men was very strong (with a Z-score of 4.1) but for women the deviation from trend shows low statistical significance (with a Z-score of 1.4), as shown in Figure 13-right.

5.4. Analysis of ICD10 Code C18 -> Malignant neoplasm of colon (Rank 3: 6.7%)

In this section we investigate the trends in death rates for ICD10 code C18 (Malignant neoplasm of colon), which represents 6.7% of all malignant neoplasm deaths in 2019 for 15 to 44 year-olds in the UK. This analysis investigates the absolute trends in adjusted deaths for a single ICD10 code. We also investigate the fraction of deaths attributable to ICD10 code C18 versus deaths from all other causes.

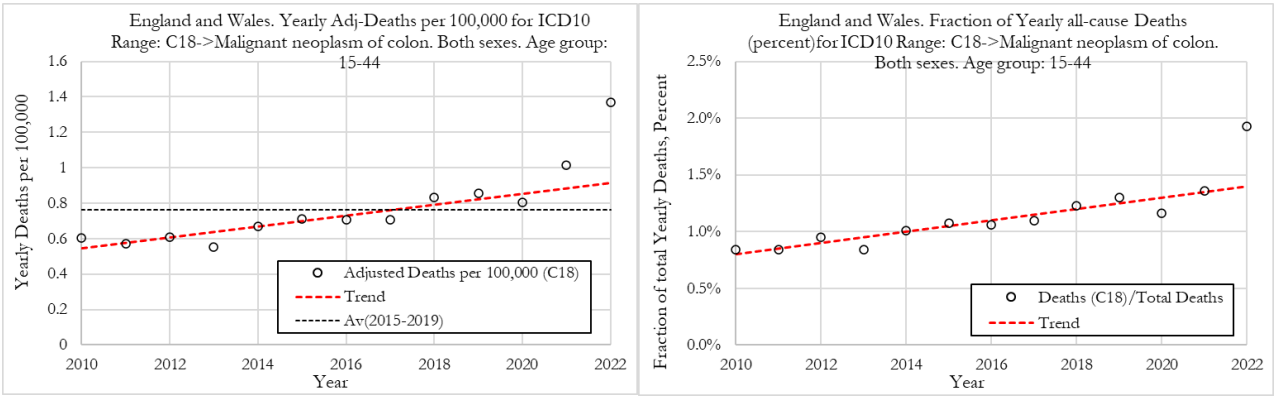


Figure 14 - Yearly adjusted deaths for ICD10 code C18 (Malignant neoplasm of colon) in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Fraction of all deaths.

We can observe that death rates per year from malignant neoplasms of colon have been trending **higher** from 2010 to 2019, with a significant upward slope. In 2010 the death rate was about 0.6 per 100,000. In 2019 it was around 0.85 per 100,000, a 41.7% rise. We believe that the pattern of rising death rates from colon cancers prior to 2020 is already worth investigating on its own merit.

The death rate dropped slightly in 2020 to about 0.8 per 100,000 and then rose to 1 per 100,000 in 2021. In 2022 the death rate increased again to about 1.4 per 100,000.

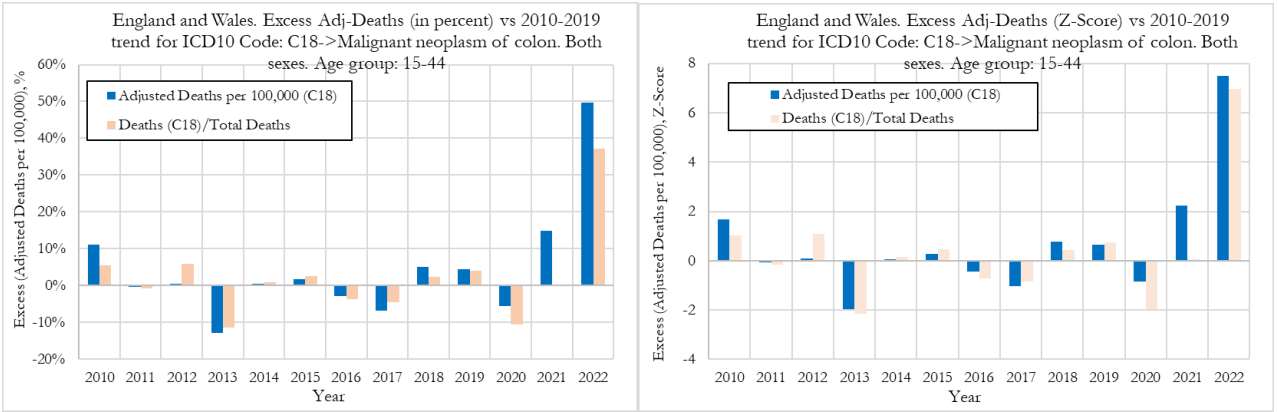


Figure 15 - Excess adjusted deaths rates for ICD10 code C18 (Malignant neoplasm of colon) versus excess fraction of all deaths for C18 deaths, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 15 (left) we can observe that the excess deaths rates from malignant neoplasms of the colon were -5% in 2020, then rose to about +15% in 2021 and about +50% in 2022. In terms of statistical significance of the excess deaths, we observe from Figure 15 (right) that for colon cancers, in 2020 the Z-score for adjusted death rates was low, which point to low statistical significance. In 2021 the Z-score was about 2, which is a weak signal in statistical

terms. In 2022 the Z-score was above 7, which is a very strong signal and indicates that the excess deaths from colon cancers are statistically significant deviations from the 2010-2019 trend.

When looking at changes in the fraction of all deaths attributed to colon cancers, we observe that the fraction of deaths for these cancers was about 10% below trend in 2020 and at trend for 2021. In 2022, however, the fraction of deaths for these cancers jumped about 37%, with a Z-score of above 7, indicating very high statistical significance. It appears that colon cancers as a fraction of all deaths deviated significantly from prior trends in 2022.

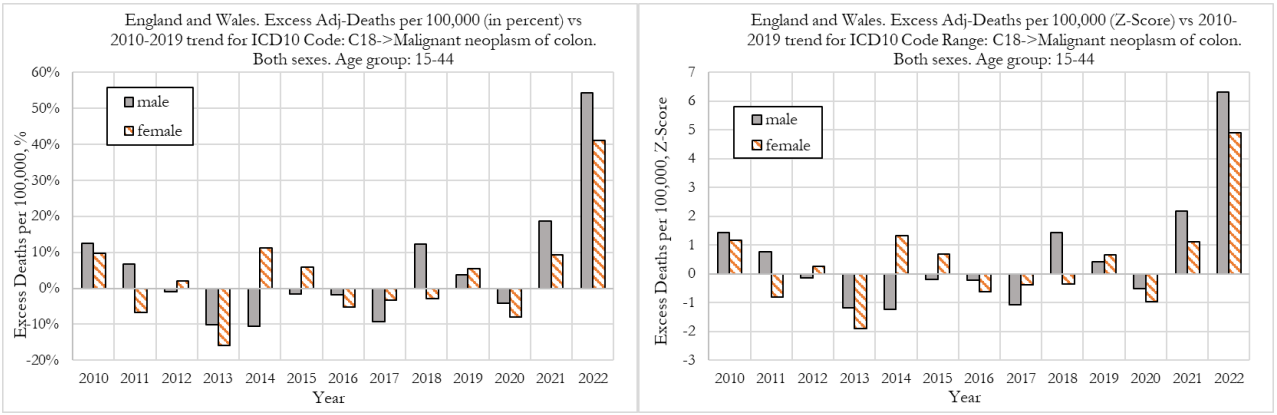


Figure 16 - Excess adjusted deaths rates for ICD10 code C18 (Malignant neoplasm of colon) for males and females, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

When comparing excess death rates attributed to malignant neoplasms of the colon for males and females, shown in Figure 16, we observe that in 2020 both males and females showed no noticeable excess mortality, with respective Z-scores close or above -1 (low statistical significance).

In both 2021 and 2022 men suffered much worse outcomes than women, with men experiencing about 19.5% and 55% deviations from trend in 2021 and 2022 respectively, compared to about 10% and 41% for women. In 2021 the signal strength for men was weak (with a Z-score of 2.1) and for women the deviation from trend had low statistical significance (with a Z-score of 1.1), as shown in Figure 16-right. In 2022 the signal strength for men was very strong (with a Z-score of 6.4) but for women the deviation from trend shows low statistical significance (with a Z-score of 5), as shown in Figure 16-right.

Malignant neoplasms of the colon appear to have accelerated in 2022 for males and females, with outcomes for men being slightly worse than women.

5.5. Analysis of ICD10 Code C34 -> Malignant neoplasm of bronchus and lung (Rank 4 – 6.0%)

In this section we investigate the trends in death rates for ICD10 code C34 (Malignant neoplasm of bronchus and lung), which represents 6.0% of all malignant neoplasm deaths in 2019 for 15 to 44 year-olds in the UK. This analysis investigates the absolute trends in adjusted deaths for a single ICD10 code. We also investigate the fraction of deaths attributable to ICD10 code C34 versus deaths from all other causes.

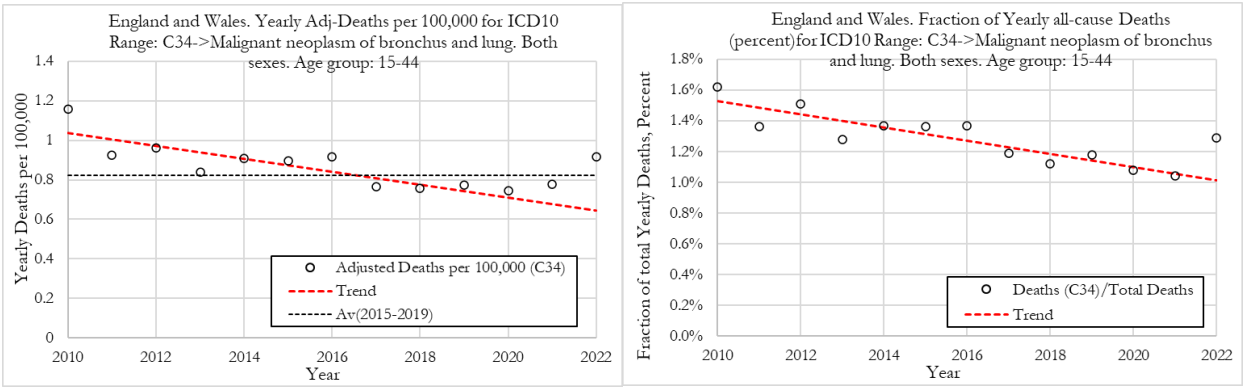


Figure 17 - Yearly adjusted deaths for ICD10 code C34 (Malignant neoplasm of bronchus and lung) in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Fraction of all deaths.

We can observe that death rates per year from malignant neoplasms of the bronchus and lung have been trending lower from 2010 to 2019, with a significant downward slope. In 2010 the deaths rate was about 1 per 100,000, in 2019 it was around 0.8 per 100,000, a 20% drop.

The death rate dropped slightly in 2020 to about 0.78 per 100,000 and then rose back to 0.8 per 100,000 in 2021. In 2022 the death rate increased again to about 0.9 per 100,000.

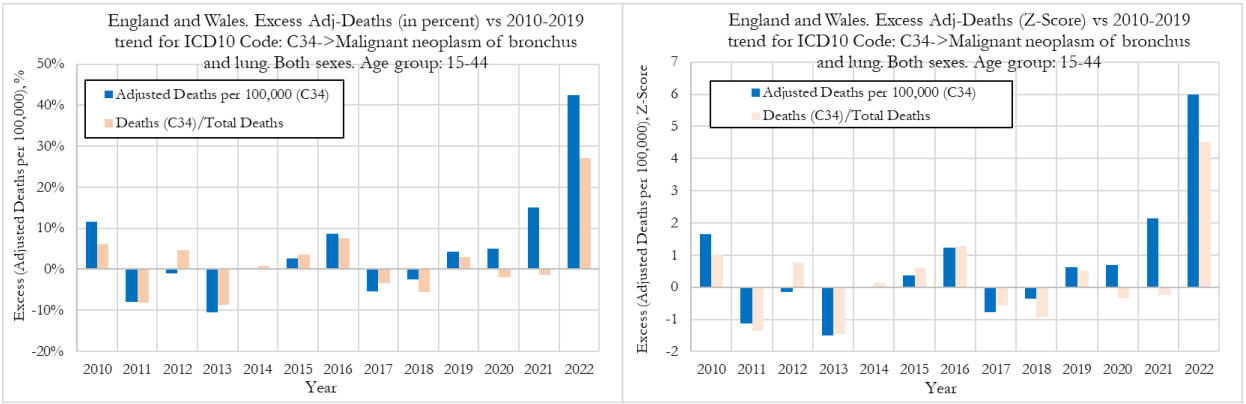


Figure 18 - Excess adjusted deaths rates for ICD10 code C34 (Malignant neoplasm of bronchus and lung) versus excess fraction of all deaths for C34 deaths, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 18 (left) we can observe that the excess deaths rates from malignant neoplasms of the bronchus and lung were +5% in 2020, then rose to about 15% in 2021, and about 42% in 2022. In terms of statistical significance of the excess deaths, we observe from Figure 18 (right) that for bronchus and lung cancers, in 2021, the Z-score for adjusted death rates was about to 2.1 which could already point to a signal that needs further investigating. In 2022

the Z-score rose to about 6, which is a very strong signal and indicates that the excess deaths from bronchus and lung cancers are statistically significant deviations from the 2010-2019 trend.

When looking at changes in the fraction of all deaths attributed to bronchus and lung cancers, we observe that the fraction of deaths for these cancers was slightly below trend in both in 2020 and 2021 (with a low negative Z-score indicating no statistical significance). In 2022, however, the fraction of deaths for these cancers jumped about 28%, with a Z-score of about 4.5 which points to a strong effect.

When looking at deaths attributed to malignant neoplasms of the bronchus and lung for males and females, shown in Figure 19, we observe that in 2020 neither had noticeable excess mortality, with respective Z-scores below 1.0 (low statistical significance).

We also observe that in 2021 men suffered slightly worse outcomes than women, with men experiencing a 22% deviation from trend, compared to about 6% for women. These values, however, do not constitute strong signals, even for the rise in death rates in men, as the Z-score was around 2.0. The reason for this is that there was significant year-on-year volatility in death rates from these cancers for the 2010-2019 period, which led to low statistical significance of the changes in death rates in 2021.

In 2022, men suffered much worse outcomes than women, with men experiencing about 56% deviation from trend, compared to about 26% for women. The signal strength for men was very strong (with a Z-score of 4.8) but for women signal was weak (with a Z-score of 2.5), as shown in Figure 19-right.

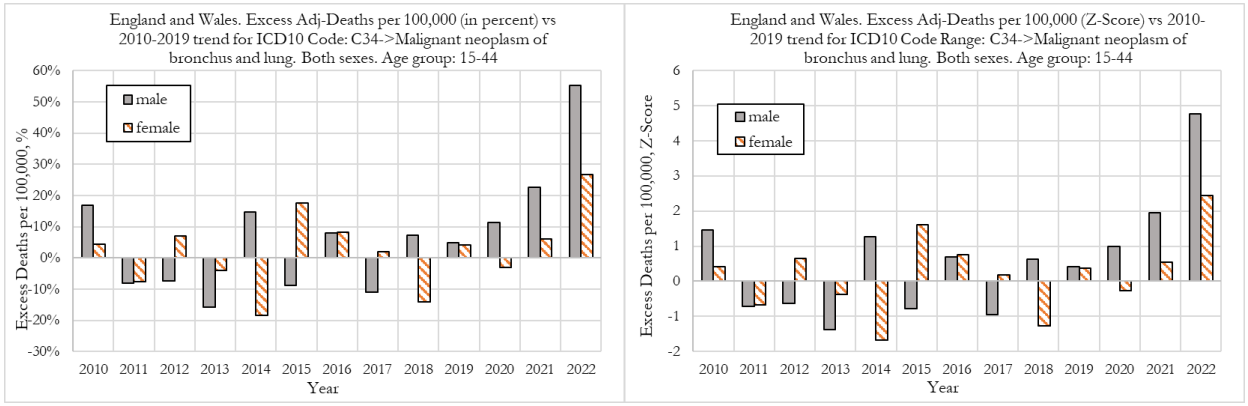


Figure 19 - Excess adjusted deaths rates for ICD10 code C34 (Malignant neoplasm of bronchus and lung) for males and females, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

5.6. Analysis of ICD10 Code C80 -> Malignant neoplasm without specification of site (Rank 6: 4.1%)

In this section we investigate the trends in death rates for ICD10 code C80 (Malignant neoplasm without specification of site), which represents 4.1% of all malignant neoplasm deaths in 2019 for 15 to 44 year-olds in the UK. This analysis investigates the absolute trends in adjusted deaths for a single ICD10 code. We also investigate the fraction of deaths attributable to ICD10 code C80 versus deaths from all other causes.

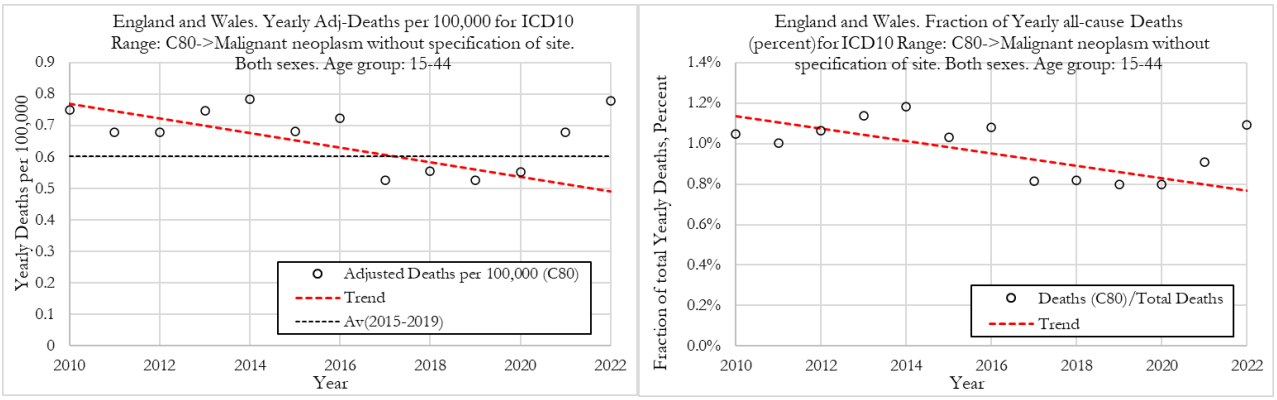


Figure 20 - Yearly adjusted deaths for ICD10 code C80 (Malignant neoplasm without specification of site) in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Fraction of all deaths.

We can observe that death rates per year from malignant neoplasms without specification of site have been trending lower from 2010 to 2019, with a significant downward slope. In 2010 the deaths rate was about 0.75 per 100,000, and in 2019 it was around 0.52 per 100,000, a 30.7% reduction.

The death rate in 2020 remained almost unchanged at 0.55 per 100,000 and then rose to close to 0.7 per 100,000 in 2021. In 2022 the death rate increased again to about 0.79 per 100,000, a level higher than that of 2010.

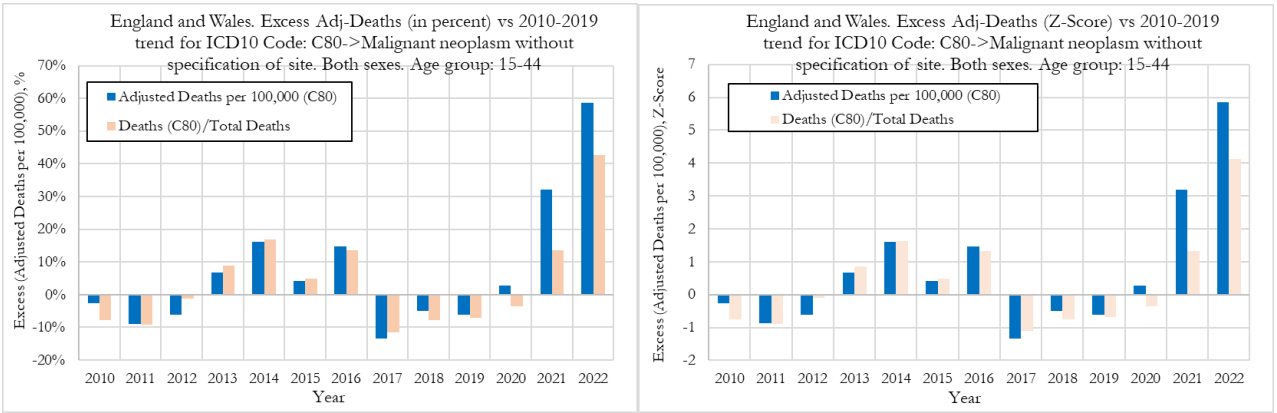


Figure 21 - Excess adjusted deaths rates for ICD10 code C80 (Malignant neoplasm without specification of site) versus excess fraction of all deaths for C80 deaths, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 21 (left) we can observe that the excess deaths rates from malignant neoplasms without specification of site were close to zero in 2020, then rose to about +32% in 2021 and about +59% in 2022. In terms of statistical significance of the excess deaths, we observe from Figure 21 (right) that for cancers without specification of site, in

2020 the Z-score for adjusted death rates was low, which points to low statistical significance. In 2021 the Z-score was about 3.1, which is a strong signal in statistical terms. In 2022 the Z-score was close to 6, which is a very strong signal and indicates that the excess deaths from these cancers are statistically significant deviations from the 2010-2019 trend.

When looking at changes in the fraction of all deaths attributed to cancers without specification of site, we observe that the fraction of deaths from these cancers was slightly below trend in 2020 and at 13% above trend for 2021 (with low statistical significance). In 2022, however, the fraction of deaths for these cancers jumped about 42%, with a Z-score of above 4, indicating very high statistical significance. In 2022, it appears that deaths from cancers without specification of site as a fraction of all deaths deviated significantly from prior trends.

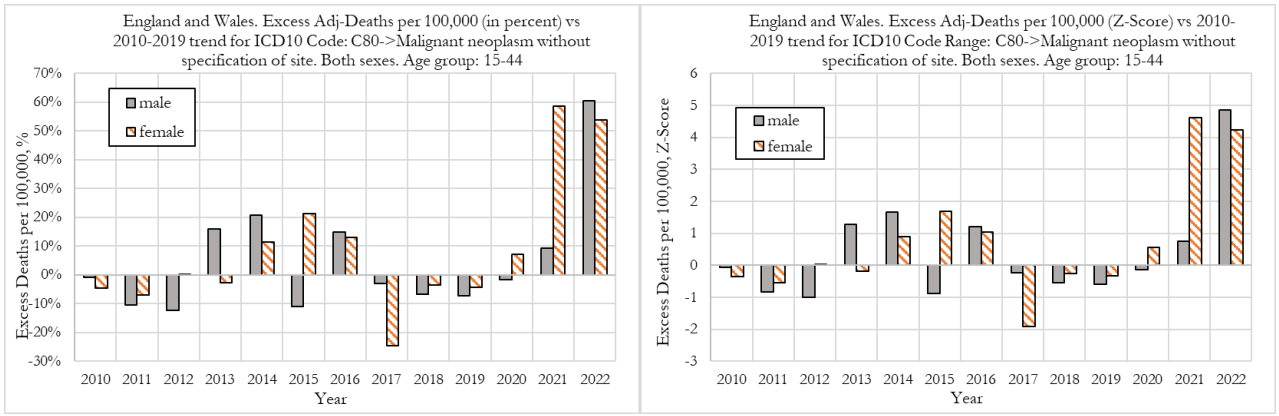


Figure 22 - Excess adjusted deaths rates for ICD10 code C80 (Malignant neoplasm without specification of site) for males and females, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

When comparing excess death rates attributed to malignant neoplasms without specification of site for males and females, shown in Figure 22, we observe that in 2020 both males and females showed no noticeable excess mortality, with respective Z-scores close to zero (low statistical significance).

In 2021 women suffered much worse outcomes than men, with women experiencing about 60% deviation from trend, compared to about 10% for men. In 2021 the signal strength for men was weak (with a Z-score below 1) but for women the deviation from trend had very high statistical significance (with a Z-score close to 5), as shown in Figure 22-right. In 2022 the signal strengths for both women and men were very strong (with a Z-score of above 4), with the deviation from trend of being 55% for women and 60% for men.

Malignant neoplasms without specification of site appear to have accelerated in 2022 for both males and females. However, an interesting observation is that these cancers also exploded in 2021 for women, which we believe should also be subject to further research by medical doctors.

5.7. Analysis of ICD10 Code C25 -> Malignant neoplasm of pancreas (Rank 14: 2.65%)

In this section we investigate the trends in death rates for ICD10 code C25 (Malignant neoplasm of pancreas), which represents only 2.65% of all malignant neoplasm deaths in 2019 for 15 to 44 year-olds in the UK. This analysis investigates the absolute trends in adjusted deaths for a single ICD10 code. We also investigate the fraction of deaths attributable to ICD10 code C25 versus deaths from all other causes.

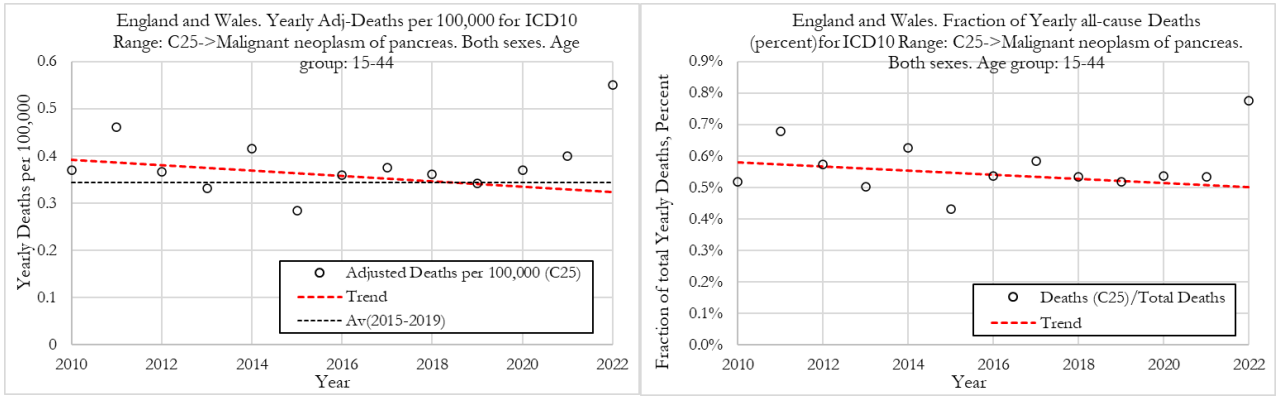


Figure 23 - Yearly adjusted deaths for ICD10 code C25 (Malignant neoplasm of pancreas) in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Fraction of all deaths.

We can observe that death rates per year from malignant neoplasms of the pancreas have been trending slightly lower from 2010 to 2019. In 2010 the deaths rate was about 0.38 per 100,000, in 2019 it was around 0.35 per 100,000, a 7.9% reduction.

The death rate in 2020 remained almost unchanged at 0.38 per 100,000 and then rose to 0.4 per 100,000 in 2021. In 2022 the death rate jumped to about 0.55 per 100,000, a level higher than that of 2010.

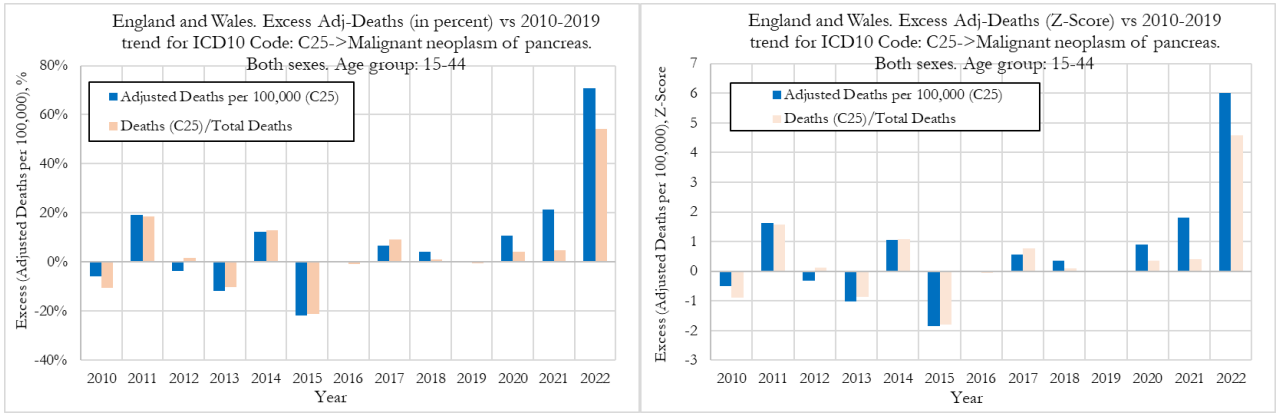


Figure 24 - Excess adjusted deaths rates for ICD10 code C25 (Malignant neoplasm of pancreas) versus excess fraction of all deaths for C25 deaths, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 24 (left) we can observe that the excess death rates from malignant neoplasms of pancreas were close to zero in 2020, then rose to about +20% in 2021 and about +70% in 2022. In terms of statistical significance of the excess deaths, we observe from Figure 24 (right) that for cancers of pancreas, in 2020 the Z-score for adjusted death rates was low, which points to low statistical significance. In 2021 the Z-score was close to 2, which is a weak signal

in statistical terms. In 2022 the Z-score was 6, which is a very strong signal and indicates that the excess deaths from cancers of the pancreas are statistically significant deviations from the 2010-2019 trend.

When looking at changes in the fraction of all deaths attributed to cancers of pancreas, we observe that the fraction of deaths for these cancers was close to trend in 2020 and 2021 (slightly above trend but with low statistical significance). In 2022, however, the fraction of deaths for these cancers jumped about 55%, with a Z-score of above 4, indicating very high statistical significance. It appears that pancreatic cancers as a fraction of all deaths deviated significantly from prior trends in 2022.

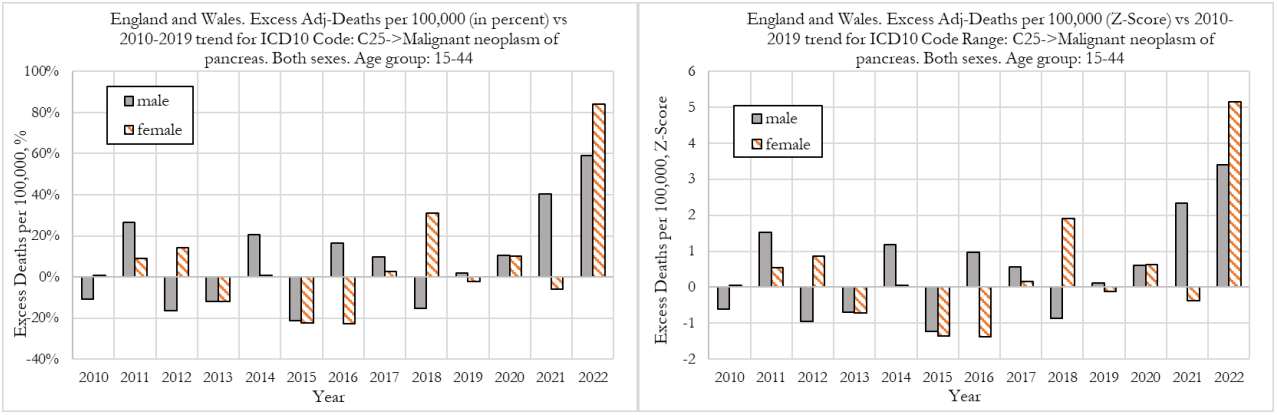


Figure 25 - Excess adjusted deaths rates for ICD10 code C25 (Malignant neoplasm of pancreas) for males and females, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

When comparing excess death rates attributed to malignant neoplasms of pancreas for males and females, shown in Figure 25, we observe that in 2020 both males and females showed no noticeable excess mortality, with respective Z-scores close to zero (low statistical significance).

In 2021 men suffered much worse outcomes than women, with men experiencing about 40% deviation from trend, compared to about -5% for women. In 2021 the signal strength for men was strong enough to warrant further investigation (with a Z-score close to 2.5) but for women the deviation from trend was statistically insignificant (with a Z-score close to zero), as shown in Figure 25 (right). In 2022 the signal strengths for both men and women were strong (with a Z-score of above 3), with the deviation from trend of being 60% for men and 85% for women.

Malignant neoplasms of the pancreas appear to have accelerated in 2022 for both males and females. However, an interesting observation is that these cancers also started rising in 2021 for men, which we believe should also be subject to further research by medical doctors.

5.8. Analysis of ICD10 Code C16 -> Malignant neoplasm of stomach (Rank 10: 3.1%)

In this section we investigate the trends in death rates for ICD10 code C16 (Malignant neoplasm of stomach), which represents only 3.1% of all malignant neoplasm deaths in 2019 for 15 to 44 year-olds in the UK. This analysis investigates the absolute trends in adjusted deaths for a single ICD10 code. We also investigate the fraction of deaths attributable to ICD10 code C16 versus deaths from all other causes.

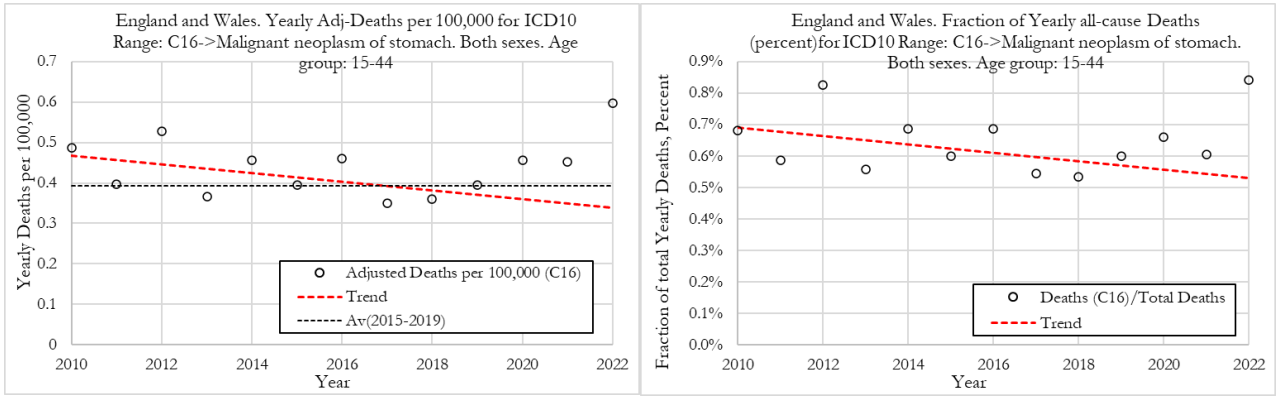


Figure 26 - Yearly adjusted deaths for ICD10 code C16 (Malignant neoplasm of stomach) in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Fraction of all deaths.

We can observe that death rates per year from malignant neoplasms of the stomach have been trending lower from 2010 to 2019. In 2010 the deaths rate was about 0.5 per 100,000, in 2019 it was around 0.4 per 100,000, a 20% reduction.

The death rate rose to 0.46 per 100,000 in 2020 and then dropped slightly to 0.45 per 100,000 in 2021. In 2022 the death rate jumped to about 0.6 per 100,000, a level higher than that of 2010.

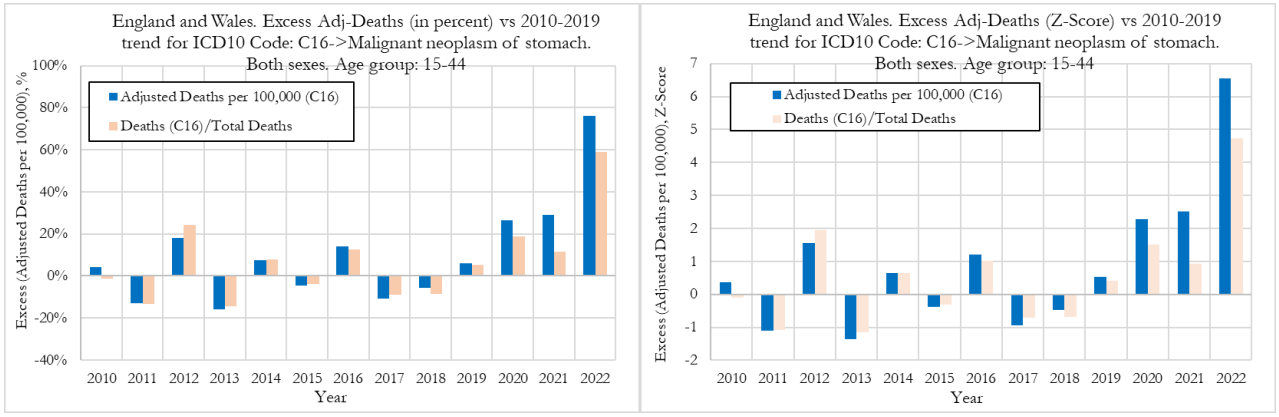


Figure 27 - Excess adjusted deaths rates for ICD10 code C16 (Malignant neoplasm of stomach) versus excess fraction of all deaths for C16 deaths, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 27 (left) we can observe that the excess deaths rates from malignant neoplasms of stomach were about 27% above trend both 2020 and 2021, and about +77% in 2022. In terms of statistical significance of the excess deaths, we observe from Figure 27 (right) that for cancers of stomach, in 2020 the Z-score for adjusted death rates was about 2.2, which points to a weak signal already in 2020. In 2021 the Z-score was close to 2.5, which is also a

weak signal in statistical terms. In 2022 the Z-score was above 6, which is a very strong signal and indicates that the excess deaths from stomach cancers are statistically significant deviations from the 2010-2019 trend.

When looking at changes in the fraction of all deaths attributed to cancers of stomach, we observe that the fraction of deaths for these cancers were above trend in 2020 and 2021 (but with low statistical significance). In 2022, however, the fraction of deaths for these cancers jumped about 60%, with a Z-score of above 4, indicating very high statistical significance. It appears that cancers of the stomach as a fraction of all deaths deviated significantly from prior trends in 2022.

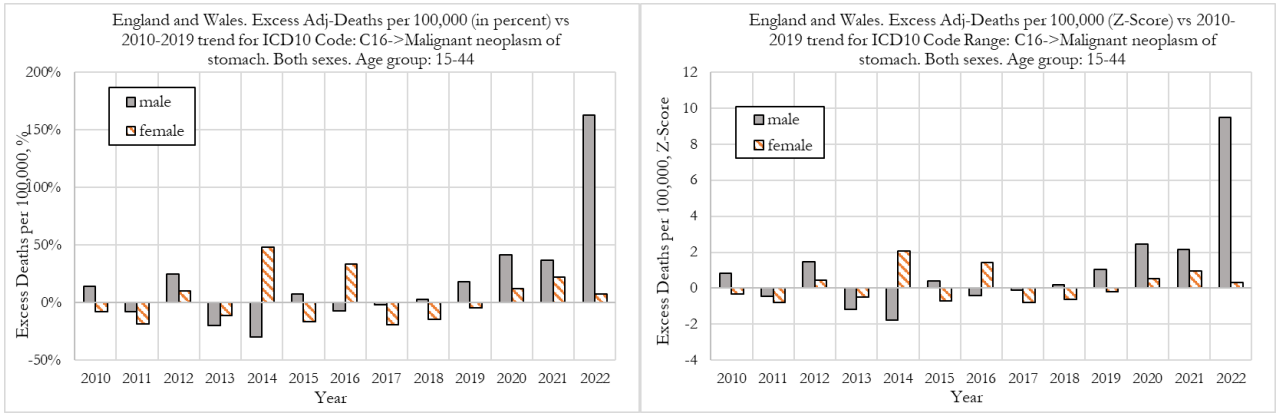


Figure 28 - Excess adjusted deaths rates for ICD10 code C16 (Malignant neoplasm of stomach) for males and females, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

When comparing excess death rates attributed to malignant neoplasms of stomach for males and females, shown in Figure 28, we observe that in 2020, 2021 and 2022 females showed no noticeable excess mortality, with respective Z-scores close to zero (low statistical significance).

However, men suffered rising excess death rates from malignant neoplasms of the stomach with about +45% in 2020 and +40% in 2021. The signal strengths for men in both 2020 and 2021 was strong enough to warrant further investigation (with a Z-score about to 2.5 in 2020 and 2.1 in 2021) as shown in Figure 28 (right). In 2022 the signal strengths for both men were very strong (with a Z-score of above 9), with the deviation from trend of being +165%.

Malignant neoplasms of the stomach appear to have accelerated in 2022, but only for males, which we believe should also be subject to further research by medical doctors.

5.9. Analysis of ICD10 Code C15 -> Malignant neoplasm of esophagus (Rank 18: 2.3%)

In this section we investigate the trends in death rates for ICD10 code C15 (Malignant neoplasm of esophagus), which represents only 2.3% of all malignant neoplasm deaths in 2019 for 15 to 44 year-olds in the UK. This analysis investigates the absolute trends in adjusted deaths for a single ICD10 code. We also investigate the fraction of deaths attributable to ICD10 code C15 versus deaths from all other causes.

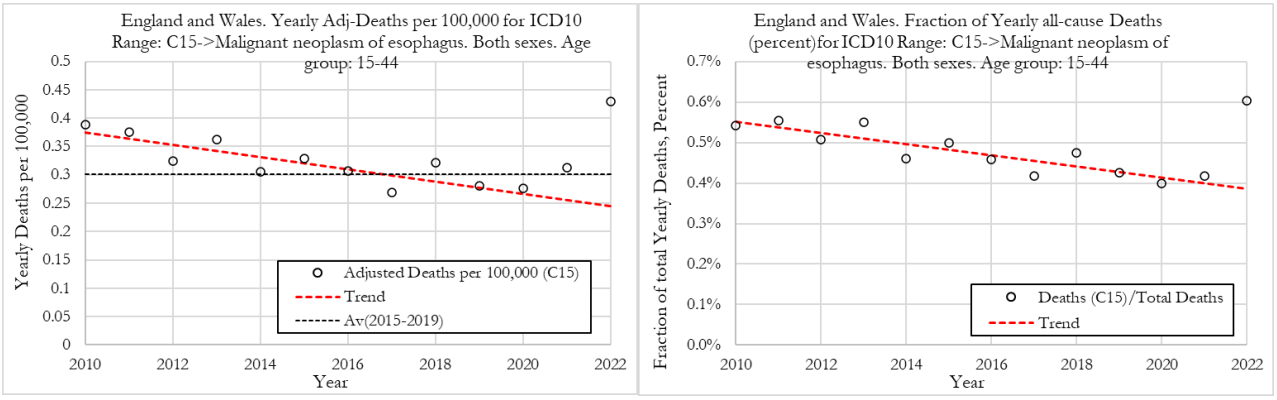


Figure 29 - Yearly adjusted deaths for ICD10 code C15 (Malignant neoplasm of esophagus) in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Fraction of all deaths.

We can observe that annual death rates from malignant neoplasms of the esophagus have been trending lower from 2010 to 2019. In 2010 the deaths rate was about 0.4 per 100,000, in 2019 it was around 0.28 per 100,000, a 30% reduction.

The death rate remained unchanged in 2020 at 0.28 per 100,000 and then rose slightly to 0.31 per 100,000 in 2021. In 2022 the death rate jumped to about 0.44 per 100,000, a level higher than that of 2010.

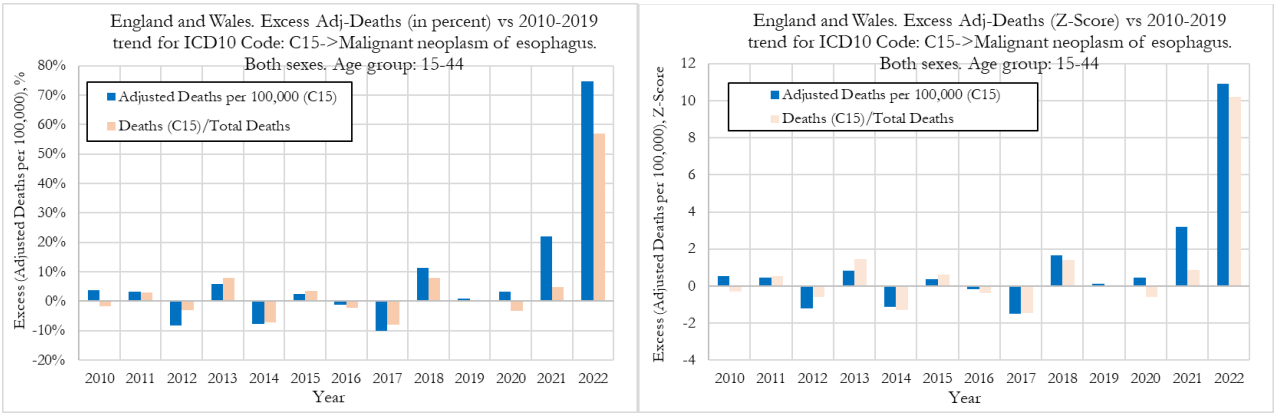


Figure 30 - Excess adjusted deaths rates for ICD10 code C15 (Malignant neoplasm of esophagus) versus excess fraction of all deaths for C15 deaths, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 30 (left) we can observe that the excess death rates from malignant neoplasms of esophagus were close to zero in 2020, about 22% above trend in 2021, and about +75% in 2022. In terms of statistical significance of the excess deaths, we observe from Figure 30 (right) that for cancers of esophagus, in 2020 the Z-score for adjusted death rates was about close to zero, which points to a weak signal already in 2020. In 2021 the Z-score was about 3.2, which is also a strong signal in statistical terms. In 2022 the Z-score was above 10, which is a very strong signal

and indicates that the excess deaths from esophagus cancers are statistically significant deviations from the 2010-2019 trend.

When looking at changes in the fraction of all deaths attributed to cancers of stomach, we observe that the fraction of deaths for these cancers was close to trend in 2020 and 2021 (with low statistical significance). In 2022, however, the fraction of deaths for these cancers jumped by 57%, with a Z-score of above 10, indicating very high statistical significance. It appears that cancers of the esophagus as a fraction of all deaths deviated significantly from prior trends in 2022.

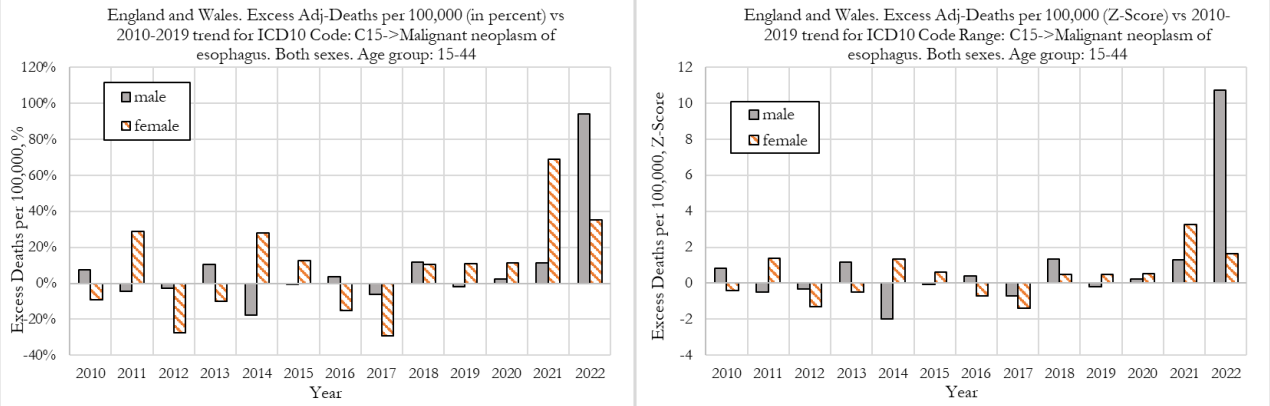


Figure 31 - Excess adjusted deaths rates for ICD10 code C15 (Malignant neoplasm of esophagus) for males and females, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

When comparing excess death rates attributed to malignant neoplasms of esophagus for males and females, shown in Figure 31, we observe that in 2020 both males and females showed no noticeable excess mortality, with respective Z-scores close to zero (low statistical significance).

In 2021 women suffered much worse outcomes than men, with women experiencing about 70% deviation from trend, compared to about 10% for men. In 2021 the signal strength for men was weak (with a Z-score close to 1) but for women the deviation from trend had high statistical significance (with a Z-score close to 3.5), as shown in Figure 31 (right).

In 2022, excess adjusted deaths exploded for men to about +95% with very high statistical significance (with a Z-Score close to 11). For women however, the signal strengths decreased, showing a deviation from trend of about 38% (with a Z-score close to 2).

Malignant neoplasms of the esophagus appear to have accelerated in 2021 for women and later in 2022 for men. This is a noticeable observation and worth investigating the internal mechanisms that led to these patterns, as well as further research by medical doctors. The pattern is somewhat similar to that observed for malignant neoplasms without site specification that we presented in section 5.6.

5.10. Analysis of ICD10 Code C43 -> Malignant neoplasm of skin (Rank 9: 3.1%)

In this section we investigate the trends in death rates for ICD10 code C43 (Malignant neoplasm of skin), which represents only 3.1% of all malignant neoplasm deaths in 2019 for 15 to 44 year-olds in the UK. This analysis investigates the absolute trends in adjusted deaths for a single ICD10 code. We also investigate the fraction of deaths attributable to ICD10 code C43 versus deaths from all other causes.

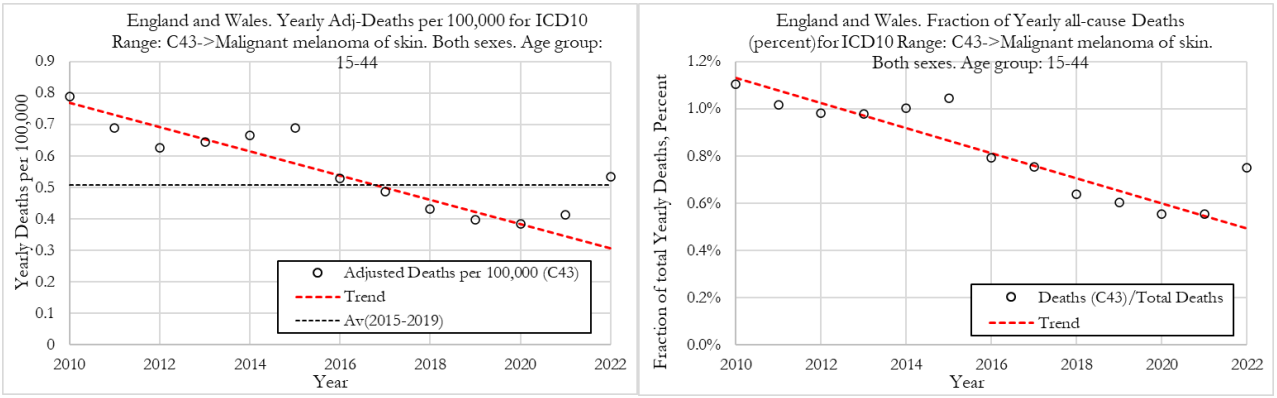


Figure 32 - Yearly adjusted deaths for ICD10 code C43 (Malignant neoplasm of skin) in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Fraction of all deaths.

We can observe that death rates per year from malignant neoplasms of the skin have been trending lower from 2010 to 2019. In 2010 the deaths rate was about 0.8 per 100,000, in 2019 it was around 0.4 per 100,000, a 50% reduction.

The death rate dropped slightly in 2020 to 0.39 per 100,000 and then rose slightly to 0.41 per 100,000 in 2021. In 2022 the death rate jumped to about 0.53 per 100,000.

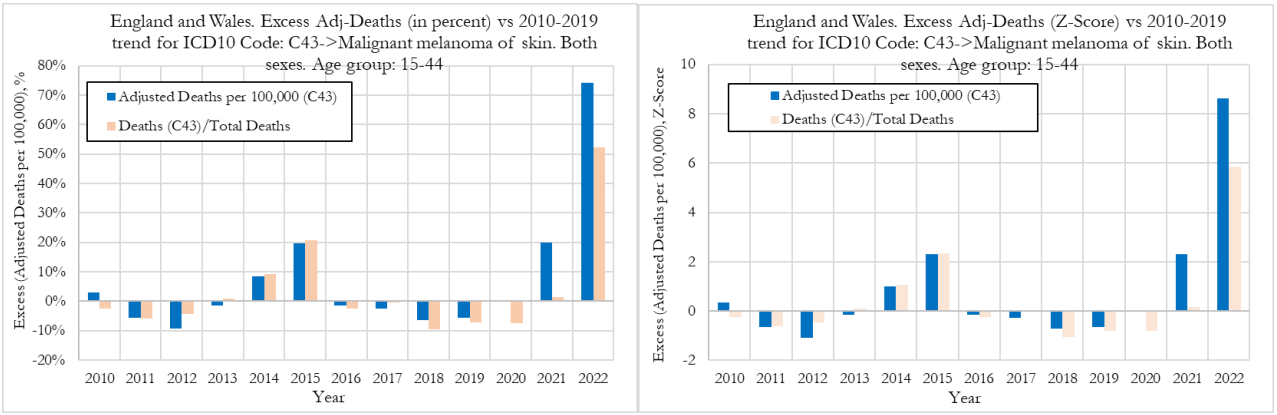


Figure 33 - Excess adjusted deaths rates for ICD10 code C43 (Malignant neoplasm of skin) versus excess fraction of all deaths for C43 deaths, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 33 (left) we can observe that the excess deaths rates from malignant neoplasms of skin were about zero in 2020, +20% in 2021, and about +75% in 2022. In terms of statistical significance of the excess deaths, we observe from Figure 33 (right) that for cancers of skin, in 2020 the Z-score for adjusted death rates was zero. In 2021 the Z-score was close to 2.2, which is a weak signal in statistical terms. In 2022 the Z-score was above 8, which is a very

strong signal and indicates that the excess deaths from skin cancers are statistically significant deviations from the 2010-2019 trend.

When looking at changes in the fraction of all deaths attributed to cancers of skin, we observe that the fraction of deaths for these cancers was below trend in 2020 and slightly above trend 2021 (but with low statistical significance). In 2022, however, the fraction of deaths for these cancers jumped by about 52%, with a Z-score close to 6, indicating very high statistical significance. It appears that cancers of the skin as a fraction of all deaths deviated significantly from prior trends in 2022.

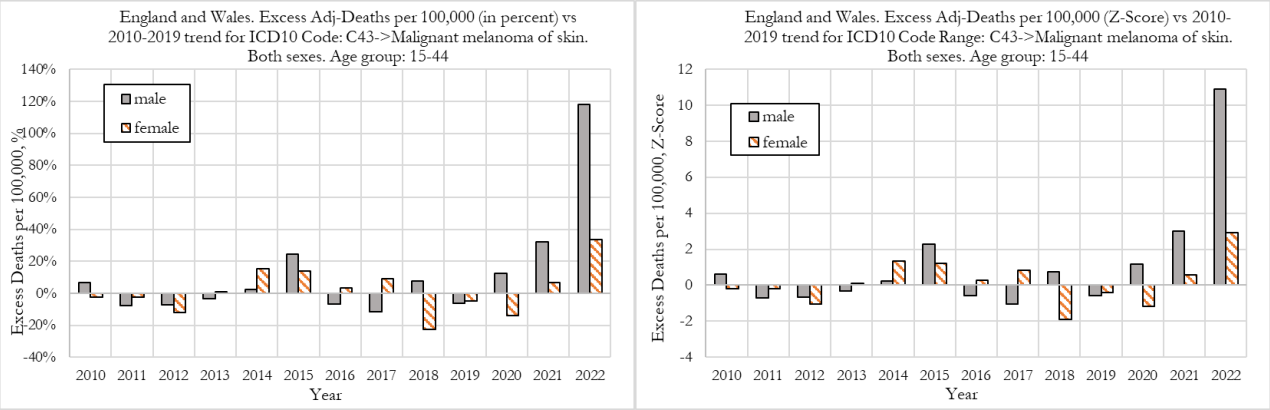


Figure 34 - Excess adjusted deaths rates for ICD10 code C43 (Malignant neoplasm of skin) for males and females, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

When comparing excess death rates attributed to malignant neoplasms of skin for males and females, shown in Figure 34, we observe that in 2020 and 2021 females showed no noticeable excess mortality, with respective Z-scores close to zero (low statistical significance). In 2022, however, women experienced about +35% deviation from trend with high statistical significance (with a Z-score around 3).

However, men suffered rising excess death rates from malignant neoplasms of the skin with +15% in 2020 and +35% in 2021. The signal strength for men in 2020 was weak (with a Z-score about to 1.5), and in 2021 the signal was strong enough to warrant further investigation (with a Z-score about to 3), as shown in Figure 34 (right). In 2022 the signal strength for men was very strong (with a Z-score close to 11), with the deviation from trend of being +120%.

Malignant neoplasms of the skin appear to have affected men earlier than women with men showing rising deaths rates in 2021 which then accelerated in 2022. Females only saw rising death rates from skin cancers in 2022, later than men and to a much lower extent. This pattern should be a subject of further investigation by medical doctors.

5.11. Analysis of ICD10 Code C53 (female) -> Malignant neoplasm of cervix uteri (Rank 5: 5.0%)

In this section we investigate the trends in death rates for ICD10 code C53 (malignant neoplasm of cervix uteri), which represents 5.0% of all malignant neoplasm deaths in 2019 for 15 to 44 year-olds in the UK. This analysis investigates the absolute trends in adjusted deaths for a single ICD10 code. We also investigate the fraction of deaths attributable to ICD10 code C53 for females versus deaths from all other causes for females.

It should be noted that the death rates presented in this analysis refer to the female population only, which are about half of the total population.

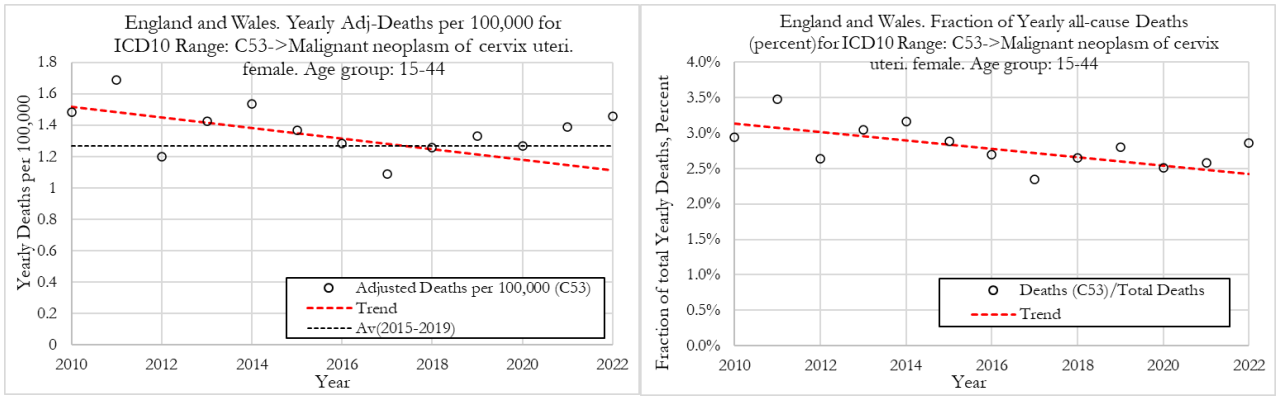


Figure 35 - Yearly adjusted deaths for ICD10 code C53 (Malignant neoplasm of cervix uteri) in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Fraction of all deaths.

We can observe that death rates per year from malignant neoplasms of the cervix uteri have been trending slightly lower from 2010 to 2019. In 2010 the deaths rate was about 1.5 per 100,000; in 2019 it was around 1.3 per 100,000, a 13.3% reduction.

The death rate dropped slightly in 2020 to 1.25 per 100,000 and then rose slightly to 1.4 per 100,000 in 2021. In 2022 the death rate jumped to about 1.45 per 100,000.

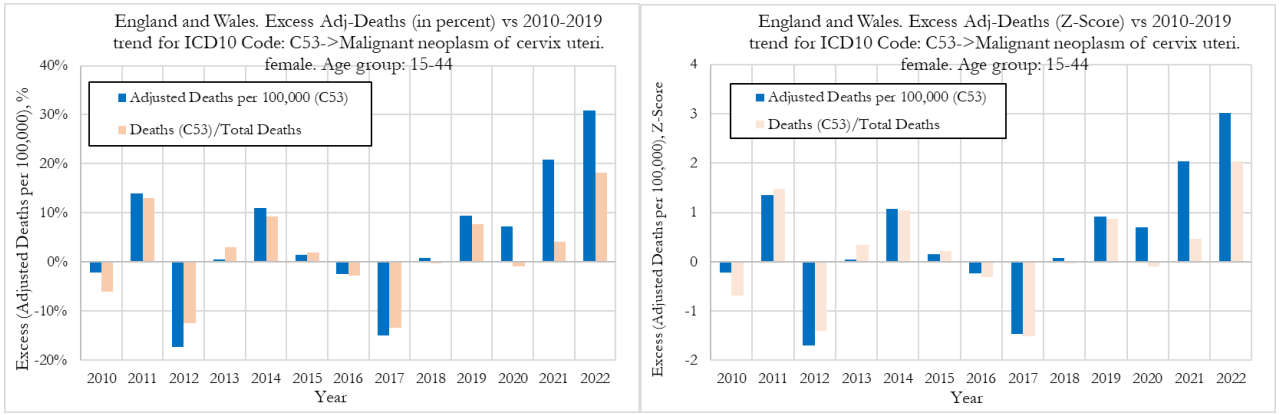


Figure 36 - Excess adjusted deaths rates for ICD10 code C53 (Malignant neoplasm of cervix uteri) versus excess fraction of all deaths for C53 deaths, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 36 (left) we can observe that the excess deaths rates from malignant neoplasms of cervix uteri were about +7% in 2020, +20% in 2021, and about +30% in 2022. In terms of statistical significance of the excess deaths, we

observe from Figure 36 (right) that for cancers of cervix uteri, in 2020 the Z-score for adjusted death rates was below 1 (low statistical significance). In 2021 the Z-score was close to 2, which is a weak signal in statistical terms. In 2022 the Z-score was around 3, which is a signal and indicates that the excess deaths from cancers of the cervix uteri are statistically significant deviations from the 2010-2019 trend.

When looking at changes in the fraction of all deaths attributed to cancers of cervix uteri, we observe that the fraction of deaths for these cancers was below trend in 2020 and slightly above trend 2021 (but with low statistical significance). In 2022, however, the fraction of deaths for these cancers jumped about 18%, with a Z-score close to 2, indicating some degree of statistical significance.

Compared to other cancers reported previously, including cancers of the breast, cancers of the cervix uteri did not show substantial increases in death rates in 2021 or 2022.

5.12. Analysis of ICD10 Code C56 (female) -> Malignant neoplasm of ovary (Rank 17: 2.6%)

In this section we investigate the trends in death rates for ICD10 code C56 (malignant neoplasm of ovary), which represents only 2.6% of all malignant neoplasm deaths in 2019 for 15 to 44 year-olds in the UK. This analysis investigates the absolute trends in adjusted deaths for a single ICD10 code. We also investigate the fraction of deaths attributable to ICD10 code C56 for females versus deaths from all other causes for females.

It should be noted that the death rates presented in this analysis refer to the female population only, which are about half of the total population.

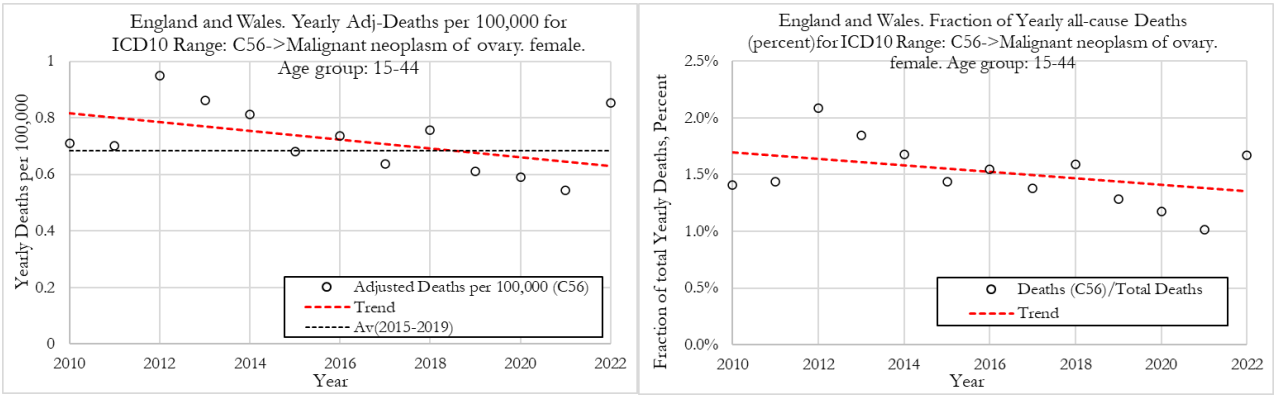


Figure 37 - Yearly adjusted deaths for ICD10 code C56 (Malignant neoplasm of ovary) in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Fraction of all deaths.

We can observe that death rates per year from malignant neoplasms of the ovary have been trending slightly lower from 2010 to 2019. In 2010 the deaths rate was about 0.7 per 100,000 and in 2019 it was around 0.6 per 100,000, a 14.3% reduction.

The death rate dropped slightly in 2020 to slightly below 0.6 per 100,000 and then dropped again to 0.55 per 100,000 in 2021. In 2022 the death rate jumped to about 0.85 per 100,000.

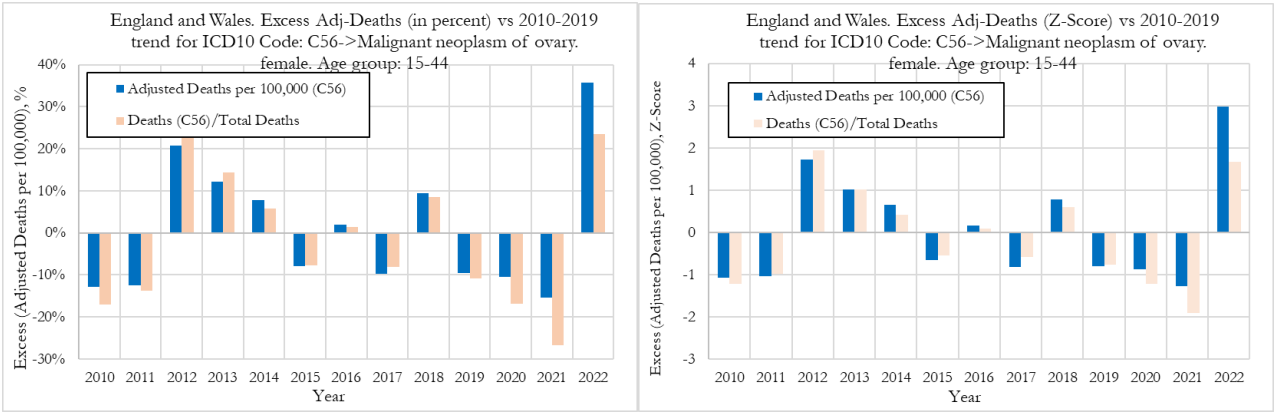


Figure 38 - Excess adjusted deaths rates for ICD10 code C56 (Malignant neoplasm of ovary) versus excess fraction of all deaths for C56 deaths, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 38 (left) we can observe that the excess death rates from malignant neoplasms of ovary were about -10% in 2020, -15% in 2021, and about +35% in 2022. In terms of statistical significance of the excess deaths, we observe from Figure 38 (right) that for cancers of ovary, in 2020 and 2021 the Z-scores for excess adjusted death rates were

close to -1 (low statistical significance). In 2022 the Z-score was around 3, which is a signal and indicates that the excess deaths from cancers of the ovary are statistically significant deviations from the 2010-2019 trend.

When looking at changes in the fraction of all deaths attributed to cancers of ovary, we observe that the fraction of deaths for these cancers was 17% below trend in 2020 and 27% below trend in 2021 (but with low statistical significance in 2020 and some degree of statistical significance in 2021). In 2022, the fraction of deaths for these cancers jumped about 23% above trend, with a Z-score close to 2, indicating some degree of statistical significance.

Compared to other cancers reported previously, including cancers of the breast, cancers of the ovary did not show such impressive increases in death rates in 2021 or 2022. Cancers of the ovary show a similar pattern to the one observed with cancers of the cervix uteri, discussed in section 5.11.

6. Concluding Remarks

The results shown in Table 2 summarise the death rates and excess death rates for malignant neoplasms. It compares the death rates for some of the most common malignant cancers for both males and females, and additionally, shows the overall death rates from all malignant neoplasms. Note that estimates for total excess deaths or excess death rates are not equal to the sum of those rates for men and women because the linear estimates were performed independently.

	Adj Death rate, per 100,000				Abs deviation, per 100,000			Rel deviation from trend, %			Excess Deaths, Number		
	2019	2020	2021	2022	2020	2021	2022	2020	2021	2022	2020	2021	2022
All Malignant Neoplasms													
Total	12.85	12.31	13.94	17.29	-0.17	1.66	5.21	-1.4%	13.5%	43.2%	-38.9	374.4	1187.5
Men	11.31	10.69	12.38	15.97	-0.17	1.68	5.44	-1.6%	15.7%	51.7%	-19.7	191.9	611.7
Women	14.54	13.84	15.40	18.03	-0.38	1.39	4.24	-2.7%	9.9%	30.8%	-42.7	155.3	489.9
Malignant neoplasm of breast													
Total											-11.6	65.6	173.2
Men											-1.0	2.3	-0.8
Women	4.12	3.76	4.32	4.86	-0.21	0.44	1.06	-5.2%	11.3%	27.8%	-23.0	48.9	122.0
Malignant neoplasm of cervix uteri													
Total											13.3	31.1	55.2
Men											0.0	0.0	0.0
Women	1.33	1.27	1.39	1.46	0.08	0.24	0.34	7.2%	20.8%	30.9%	9.4	26.6	39.7
Malignant neoplasm of ovary													
Total											-5.9	-9.2	34.7
Men											0.0	0.0	0.0
Women	0.61	0.59	0.55	0.85	-0.07	-0.10	0.22	-10.5%	-15.4%	35.8%	-7.7	-11.1	26.0
Malignant neoplasm without specification of site													
Total	0.53	0.55	0.68	0.78	0.01	0.16	0.29	2.7%	32.0%	58.6%	3.3	37.0	65.4
Men	0.56	0.58	0.62	0.89	-0.01	0.05	0.34	-1.7%	9.4%	60.6%	-1.1	6.1	37.7
Women	0.49	0.52	0.73	0.66	0.03	0.27	0.23	7.1%	58.7%	53.9%	3.8	30.0	26.6
Malignant neoplasm of brain													
Total	1.30	1.33	1.45	1.78	-0.10	0.02	0.36	-6.9%	1.7%	25.3%	-22.0	5.5	81.7
Men	1.55	1.67	1.84	2.29	-0.04	0.14	0.60	-2.4%	8.2%	35.2%	-4.6	16.0	66.9
Women	1.06	0.98	1.04	1.28	-0.16	-0.09	0.14	-13.7%	-8.3%	12.5%	-17.3	-10.5	16.4
Malignant melanoma of skin													
Total	0.40	0.38	0.41	0.53	0.00	0.07	0.23	-0.1%	19.8%	74.0%	-0.1	15.4	51.7
Men	0.40	0.43	0.44	0.62	0.05	0.11	0.34	12.7%	32.4%	118.1%	5.5	12.3	37.8
Women	0.40	0.33	0.38	0.44	-0.05	0.02	0.11	-13.7%	6.6%	33.8%	-5.9	2.6	12.9
Malignant neoplasm of bronchus and lung													
Total	0.77	0.74	0.78	0.92	0.04	0.10	0.27	5.0%	15.1%	42.4%	8.0	23.0	62.1
Men	0.82	0.82	0.84	1.00	0.08	0.16	0.36	11.5%	22.7%	55.3%	9.5	17.8	40.0
Women	0.74	0.67	0.71	0.82	-0.02	0.04	0.17	-2.9%	6.0%	26.7%	-2.2	4.4	20.0
Malignant neoplasm of pancreas													
Total	0.34	0.37	0.40	0.55	0.04	0.07	0.23	10.7%	21.4%	70.7%	8.0	15.8	52.0
Men	0.40	0.43	0.54	0.60	0.04	0.16	0.22	10.6%	40.6%	58.9%	4.7	17.7	24.9
Women	0.28	0.31	0.26	0.50	0.03	-0.02	0.23	10.2%	-6.1%	83.9%	3.2	-1.9	26.2
Malignant neoplasm of esophagus													
Total	0.28	0.28	0.31	0.43	0.01	0.06	0.18	3.2%	21.9%	74.8%	1.9	12.7	41.8
Men	0.43	0.43	0.45	0.75	0.01	0.05	0.37	2.2%	11.3%	94.1%	1.0	5.2	41.1
Women	0.13	0.12	0.17	0.13	0.01	0.07	0.03	11.2%	69.0%	35.1%	1.3	7.8	3.9
Malignant neoplasm of stomach													
Total	0.39	0.46	0.45	0.60	0.10	0.10	0.26	26.6%	29.1%	76.2%	21.5	23.0	58.8
Men	0.42	0.48	0.44	0.80	0.14	0.12	0.50	41.8%	36.7%	162.6%	16.1	13.5	55.9
Women	0.37	0.43	0.46	0.40	0.05	0.08	0.03	12.4%	22.0%	7.5%	5.2	9.2	3.2
Malignant neoplasm of colon													
Total	0.86	0.81	1.01	1.37	-0.05	0.13	0.45	-5.6%	14.8%	49.7%	-10.7	29.4	103.5
Men	0.86	0.83	1.07	1.44	-0.04	0.17	0.51	-4.2%	18.8%	54.4%	-4.1	19.2	56.9
Women	0.86	0.78	0.96	1.28	-0.07	0.08	0.37	-8.0%	9.3%	41.1%	-7.5	9.1	42.8

Table 2 - Summary for excess deaths from malignant neoplasms in England and Wales for ages 15 to 44. The table compares death rates and excess deaths for all malignant neoplasms and the most common individual cancers, by ICD10 code classification.

From Table 2 we can observe that for all malignant neoplasms, there were no significant absolute deviation from the 2010-2019 trend in death rates for both men and women.

The deviation from trend was -0.17 per 100,000 in 2020 for men and women combined (corresponding to -1.4% in relative terms). For men the deviation from trend was -0.17 per 100,000 (corresponding to -1.6% in relative terms) while for women it was -0.38 per 100,000 (corresponding to -2.7% in relative terms).

The deviation from trend was 1.66 per 100,000 in 2021 for men and women combined (corresponding to 13.5% in relative terms). For men the deviation from trend was 1.68 per 100,000 (corresponding to 15.7% in relative terms) while for women it was 1.39 per 100,000 (corresponding to 9.9% in relative terms). In terms of the number of 15 to 44 year-olds in the UK that died in excess from malignant neoplasms in 2021 these rates equated to 374.4 total excess deaths of which 191.9 were in men and 155.3 in women.[7]

The deviation from trend was 5.21 per 100,000 in 2022 for men and women combined (corresponding to 43.2% in relative terms). For men the deviation from trend was 5.44 per 100,000 (corresponding to 51.7% in relative terms) while for women it was 4.24 per 100,000 (corresponding to 30.8% in relative terms). In terms of the number of 15 to 44 year-olds in the UK that died in excess from malignant neoplasms in 2022 these rates equated to 1187.5 total excess deaths of which 611.7 were in men and 489.9 in women. As shown in Figure 6 and Figure 8, the excess deaths from malignant neoplasms have very high Z-scores (above 12 for both males and females) that point to strong signals with very high statistical significance.

The detailed analysis of the summary results shown in Table 2 are not the scope of this report and should be investigated with detailed care by medical doctors that work in the field. However, some noticeable patterns are obvious at first glance.

Breast Cancer dominates in women. The most common cause of cancer is that of the breast which had a 1.06 per 100,000 excess death rate in 2022, represents about 25% of the total excess death rate (of 4.24 per 100,000) in 2022 for malignant neoplasms in women. Other cancers that most contributed to excess death rates in women were cancer of the colon (with 0.37 per 100,000 excess death rate in 2022) and cancer of the cervix uteri (with 0.34 per 100,000 excess death rate in 2022).

Men more impacted than women. The results in Table 2 show that men saw a disproportionate rise in malignant neoplasm deaths when compared to women. We also observe that for men there is no dominant cancer (such as breast cancer in women) which means that the deaths in men are spread out among a variety of cancers. Of the 5.21 excess deaths per 100,000 in 2022, the cancers that most contributed were brain cancers (0.6 per 100,000 rise), colon cancers (0.51 per 100,000 rise) and stomach cancers (0.5 per 100,000). These three cancers accounted for 30.9% of the rise in death rates from malignant neoplasms in men in 2022. Another cancer type that is noticeable is the rise in skin cancers in men that was 118% in 2022. Even though these cancers do not account for a large proportion of all cancers, it's rise from prior trends is noteworthy.

Digestive tract. The results in Table 2 show that some cancers saw explosive changes in 2021 and 2022 relative to the 2010-2019 trend. Of particular notice are cancers of the colon (C18), stomach (C16) and esophagus (C15). These cancers related to the digestive tract appear to have risen substantially in importance, and we also notice that they seem to be affecting men in a disproportionate manner.

[7] Please note that estimates for total excess deaths or excess death rates are not equal to the sum of those rates for men and women because the linear estimates were performed independently.

Cancers without specification of site are exploding ("turbo cancers"?). Another observation that we find is of interest for further investigation by medical professionals is the rise in cancers without the specification of site. These cancers saw very large rise in both women (in 2021 and 2022) and men (in 2022) and were likely metastasized already once they were identified. As the individuals refer to younger individuals who do not require early screening, these cancers were likely of rapid growth.

Cancer of the pancreas. These cancers saw very large rise in both women (in 2022) and men (in both 2021 and 2022). Why these cancers rose so dramatically and why they rose first in men than women is one of the questions that we believe warrants investigation.

7. Appendixes

7.1. Appendix 1 – ICD10 code list for malignant neoplasms (C00-C99)

ICD10 Code	Cause
C00	Malignant neoplasm of lip
C01	Malignant neoplasm of base of tongue
C02	Malignant neoplasm of other and unspecified parts of tongue
C03	Malignant neoplasm of gum
C04	Malignant neoplasm of floor of mouth
C05	Malignant neoplasm of palate
C06	Malignant neoplasm of other and unspecified parts of mouth
C07	Malignant neoplasm of parotid gland
C08	Malignant neoplasm of other and unspecified major salivary glands
C09	Malignant neoplasm of tonsil
C10	Malignant neoplasm of oropharynx
C11	Malignant neoplasm of nasopharynx
C12	Malignant neoplasm of pyriform sinus
C13	Malignant neoplasm of hypopharynx
C14	Malignant neoplasm of other and ill-defined sites in the lip, oral cavity and pharynx
C15	Malignant neoplasm of esophagus
C16	Malignant neoplasm of stomach
C17	Malignant neoplasm of small intestine
C18	Malignant neoplasm of colon
C19	Malignant neoplasm of rectosigmoid junction
C20	Malignant neoplasm of rectum
C21	Malignant neoplasm of anus and anal canal
C22	Malignant neoplasm of liver and intrahepatic bile ducts
C23	Malignant neoplasm of gallbladder
C24	Malignant neoplasm of other and unspecified parts of biliary tract

C25	Malignant neoplasm of pancreas
C26	Malignant neoplasm of other and ill-defined digestive organs
C27	Malignant neoplasms
C28	Malignant neoplasms
C29	Malignant neoplasms
C30	Malignant neoplasm of nasal cavity and middle ear
C31	Malignant neoplasm of accessory sinuses
C32	Malignant neoplasm of larynx
C33	Malignant neoplasm of trachea
C34	Malignant neoplasm of bronchus and lung
C35	Malignant neoplasms
C36	Malignant neoplasms
C37	Malignant neoplasm of thymus
C38	Malignant neoplasm of heart, mediastinum and pleura
C39	Malignant neoplasm of other and ill-defined sites in the respiratory system and intrathoracic organs
C40	Malignant neoplasm of bone and articular cartilage of limbs
C41	Malignant neoplasm of bone and articular cartilage of other and unspecified sites
C42	Malignant neoplasms
C43	Malignant melanoma of skin
C44	Other and unspecified malignant neoplasm of skin
C45	Mesothelioma
C46	Kaposi's sarcoma
C47	Malignant neoplasm of peripheral nerves and autonomic nervous system
C48	Malignant neoplasm of retroperitoneum and peritoneum
C49	Malignant neoplasm of other connective and soft tissue
C4A	Merkel cell carcinoma
C50	Malignant neoplasm of breast
C51	Malignant neoplasm of vulva
C52	Malignant neoplasm of vagina

C53	Malignant neoplasm of cervix uteri
C54	Malignant neoplasm of corpus uteri
C55	Malignant neoplasm of uterus, part unspecified
C56	Malignant neoplasm of ovary
C57	Malignant neoplasm of other and unspecified female genital organs
C58	Malignant neoplasm of placenta
C59	Malignant neoplasms
C60	Malignant neoplasm of penis
C61	Malignant neoplasm of prostate
C62	Malignant neoplasm of testis
C63	Malignant neoplasm of other and unspecified male genital organs
C64	Malignant neoplasm of kidney, except renal pelvis
C65	Malignant neoplasm of renal pelvis
C66	Malignant neoplasm of ureter
C67	Malignant neoplasm of bladder
C68	Malignant neoplasm of other and unspecified urinary organs
C69	Malignant neoplasm of eye and adnexa
C70	Malignant neoplasm of meninges
C71	Malignant neoplasm of brain
C72	Malignant neoplasm of spinal cord, cranial nerves and other parts of central nervous system
C73	Malignant neoplasm of thyroid gland
C74	Malignant neoplasm of adrenal gland
C75	Malignant neoplasm of other endocrine glands and related structures
C76	Malignant neoplasm of other and ill-defined sites
C77	Secondary and unspecified malignant neoplasm of lymph nodes
C78	Secondary malignant neoplasm of respiratory and digestive organs
C79	Secondary malignant neoplasm of other and unspecified sites
C7A	Malignant neuroendocrine tumors
C7B	Secondary neuroendocrine tumors

C80	Malignant neoplasm without specification of site
C81	Hodgkin lymphoma
C82	Follicular lymphoma
C83	Non-follicular lymphoma
C84	Mature T/NK-cell lymphomas
C85	Other specified and unspecified types of non-Hodgkin lymphoma
C86	Other specified types of T/NK-cell lymphoma
C87	of which malignant neoplasm of lymph/haematopoietic tissue
C88	Malignant immunoproliferative diseases and certain other B-cell lymphomas
C89	of which malignant neoplasm of lymph/haematopoietic tissue
C90	Multiple myeloma and malignant plasma cell neoplasms
C91	Lymphoid leukemia
C92	Myeloid leukemia
C93	Monocytic leukemia
C94	Other leukemias of specified cell type
C95	Leukemia of unspecified cell type
C96	Other and unspecified malignant neoplasms of lymphoid, hematopoietic and related tissue
C97	Malignant neoplasms