UK - Death and Disability Trends for Cardiovascular Diseases, Ages 15-44

Date: 10 August 2023

Carlos Alegria

Summary

In this study we investigate the UK trends in death rates and disabilities for diseases of the cardiovascular system for individuals aged 15 to 44. We compute excess death rates and excess disability claims, which are the difference between observed deaths/disability rates and a given baseline for expected death/disability rates.

We measure changes in the behaviour of morbidity and mortality before the Covid-19 pandemic with the post-pandemic period for diseases of the cardiovascular system. We show a large increase in morbidity (disabilities) and mortality due to diseases of the cardiovascular from 2021. The increase in disability claims is consistent with the increase in excess deaths, and both are highly statistically significant (black swan events). The results indicate that from 2021 a novel phenomenon leading to increased cardiovascular deaths and disabilities appears to be present in individuals aged 15 to 44 in the UK.

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 and morbidity due to diseases of the cardiovascular system. 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 sudden deaths occurring in athletes, media personalities and in many other sectors. 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.

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

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)

2.3. Disability Claims

For investigating the changes in disability claims, we use data from the Personal Independence Payment (PIP) system of the Department of Work and Pensions (DWP). We analyse changes in PIP clearances for new claims to the system, as explained in our previous analysis, published on our website[2].

Source for PIP data (from DWP): Personal Independence Payment statistics

Stat-Xplore system for DWP data: Stat-Xplore databases

[2] https://phinancetechnologies.com/HumanityProjects/PIP%20Analysis-Systems.htm

3. Methodology

In this study, we investigate the trends in **death rates** and **disability claims** for the selected cause: "diseases of the circulatory system or cardiovascular diseases". 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 â and û are the estimated coefficients of the death rate trendline from 2010 to 2019. It should be noted that for the UK disability data (Personal Independence Payment (PIP) system) the estimation period we use is from 2016 to 2019 as the data before 2016 is unreliable due to the transition from a prior system Disability Living Allowance (DLA) to the PIP system in 2013, which only stabilised after 2015.

3.2. ICD10 code list of selected causes of death for: Cardiovascular Diseases

For this analysis we selected all the ICD10 codes from category I, namely I00 to I99 which refer to deaths attributed to diseases of the circulatory system. Note that throughout this report we use cardiovascular system and circulatory system interchangeably.

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 I03 with the generic description of "DISEASES OF THE CIRCULATORY SYSTEM" 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 the diseases of the circulatory system.

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.

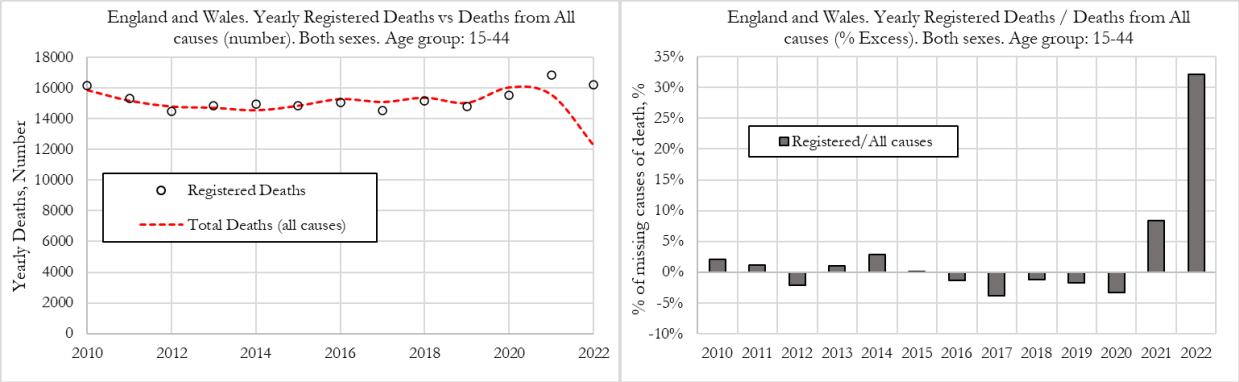

Figure 1- England and Wales, registered deaths versus deaths from all causes in the ONS deaths by cause data table for age group 15 to 44. Left: Yearly numbers. Right: % missing cause of death relative to registered deaths.

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 diseases of the circulatory system (cardiovascular diseases), with ICD10 codes ranging from I00 to I99. 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 Cardiovascular Causes (I00-I99)

The first analysis that we perform is the analysis of the unadjusted (raw) deaths from cardiovascular diseases. 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 cardiovascular diseases, 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 cardiovascular 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 cardiovascular deaths in both 2021 and 2022.

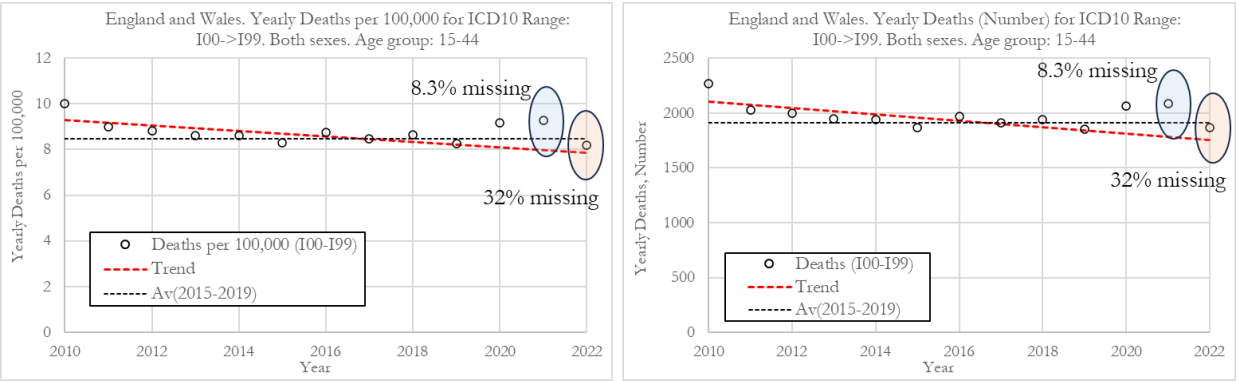

Figure 2 - Yearly unadjusted (raw) deaths for diseases of the circulatory system in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Deaths per 100,000. Right: Deaths (number).

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 cardiovascular diseases. 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.

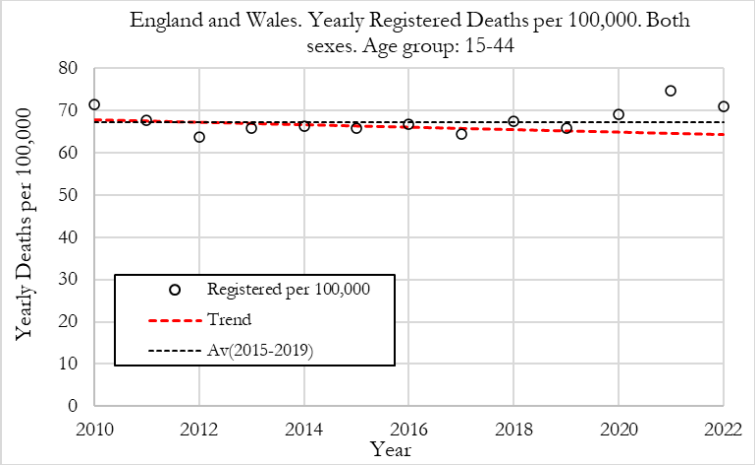

Figure 3 - Yearly registered deaths per 100,000 for England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate.

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 I00 to I99 (Cardiovascular).

We now investigate adjusted[4] deaths for all cardiovascular diseases (ICD10 codes I00 to I99). Figure 4 (left) shows the death rate per 100,000 individuals for cardiovascular deaths (adjusted for under-reporting) in England and Wales from 2010 to 2022. We can observe that deaths per year from cardiovascular diseases have been trending lower from 2010 to 2019, with a significant downward slope. In 2010 the deaths rate was 10 per 100,000, in 2019 it was around 8 per 100,000, a 20% drop.

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

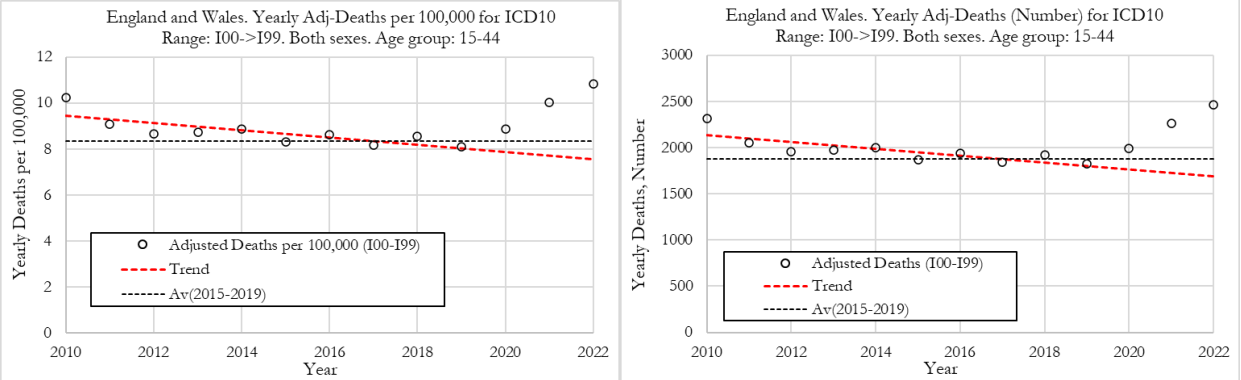

Figure 4 - Yearly adjusted deaths for diseases of the circulatory system in England and Wales. The red dashed line shows the average from 2010 to 2019. The dotted line shows the 2015-2019 average death rate. Left: Adj-Deaths per 100,000. Right: Adj-Deaths (Number).

The death rate increased in 2020 to about 9 per 100,000 and then again in 2021 to 10 per 100,000. In 2022 the death rate increased again to about 11 per 100,000, a level that is 10% higher than observed in 2010. The death rate in 2022 was about 3 deaths per 100,000, higher than the 2015-2019 average.

When translating these numbers into the absolute number of deaths for diseases of the circulatory system, shown in Figure 4 (right), we can observe that the 5-year average deaths from 2015 to 2019 was about 1800 deaths. In 2020, cardiovascular deaths were about 2,000, 200 more than the prior 5-year average. In 2021 there were about 2300 deaths (500 more than the 2015-2019 average) and in 2022, 2500 (700 more than the 2015-2019 average).

4.2.4. Relative Deaths from ICD10 codes I00 to I99 (Cardiovascular) vs All Causes.

In our study we also analyse the trends in the relative incidence of cardiovascular 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 the circulatory system. We observe that there was a declining trend in deaths due to the circulatory system from 2010 to 2019. In 2010, deaths attributed to the circulatory system account for 14% of total deaths, while in 2019, the fraction was only 12%.

In 2020 the fraction of deaths due to the circulatory system increased to about 13% of total deaths. The fraction increased to 13.5% in 2021 and then again to above 15% in 2022, which is above the 2010 level.

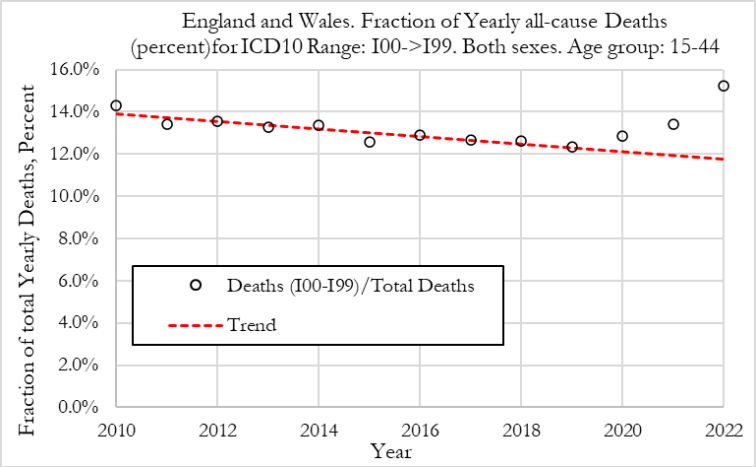

Figure 5 – Fraction of all causes for yearly deaths attributed to the circulatory system, for England and Wales. The red dashed line shows the average from 2010 to 2019.

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 diseases of the circulatory system (cardiovascular diseases), with ICD10 codes ranging from I00 to I99. We also compare excess deaths for males and females.

4.3.1. Excess Adjusted Deaths from ICD10 codes I00 to I99 (Cardiovascular).

Figure 6 compares the excess death rate for cardiovascular deaths (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.

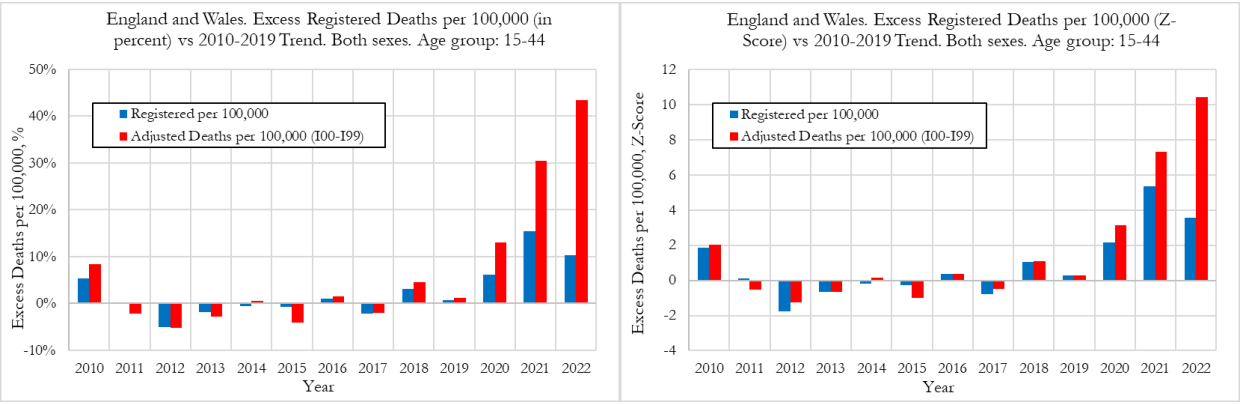

Figure 6 - Excess adjusted deaths rates for diseases of the circulatory system versus excess death rates for all registered deaths in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

In Figure 6 (left) we can observe that the excess deaths rates from cardiovascular diseases rose by about 13% in 2020, 30% in 2021 and about 44% 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 cardiovascular deaths. The opposite occurred, with a sharp acceleration in excess deaths due to cardiovascular diseases.

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 for cardiovascular diseases, the Z-score in 2020 was around 3, indicating that prior to the start of the vaccinations there was already a signal pointing to an increase in cardiovascular deaths. That trend however accelerated substantially in 2021 and 2022 where we observe Z-scores of around 7.5 and 10.5, 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 cardiovascular deaths.

4.3.2. Excess Relative Deaths from ICD10 codes I00 to I99 (Cardiovascular) vs all causes.

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

We observe that in similarity with excess death rates, the fraction of circulatory system deaths relative to all other causes increased consecutively in 2020, 2021 and 2022. However, in percentage terms, the changes were lower than those observed for deaths rates with a 5% rise in 2020, 12% in 2021 and 29% in 2022. Interestingly, when looking at the statistical significance of the signals, we observe that in 2020 and 2021 the strength of the excess deaths rates and fraction of all deaths due to the circulatory system were of similar magnitudes at 3 and 7 for 2020 and 2021, respectively. However, in 2022, the fraction of excess deaths due to the circulatory system had a Z-score of 16, higher than for excess deaths alone. This reinforces the fact that deaths related to the circulatory system 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)

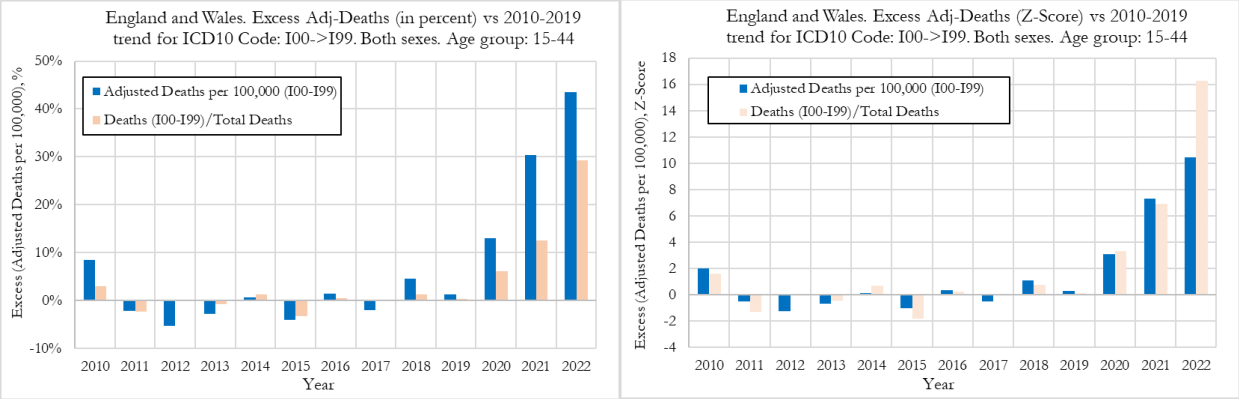

Figure 7 – Excess adjusted deaths rates for diseases of the circulatory system versus excess fraction of all deaths in circulatory system, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

4.3.3. Excess Adjusted Deaths for Cardiovascular System for Males and Females.

When looking at deaths attributed to the circulatory system for males and females, shown in Figure 8, we observe that in 2020 and 2021 both had similar outcomes in excess mortality (deviation from trend) as well as the respective Z-scores (statistical significance). However, we also observe that in 2022 men suffered much worse outcomes than women, with men experiencing a 56% deviation from trend, compared to about 28% for women.

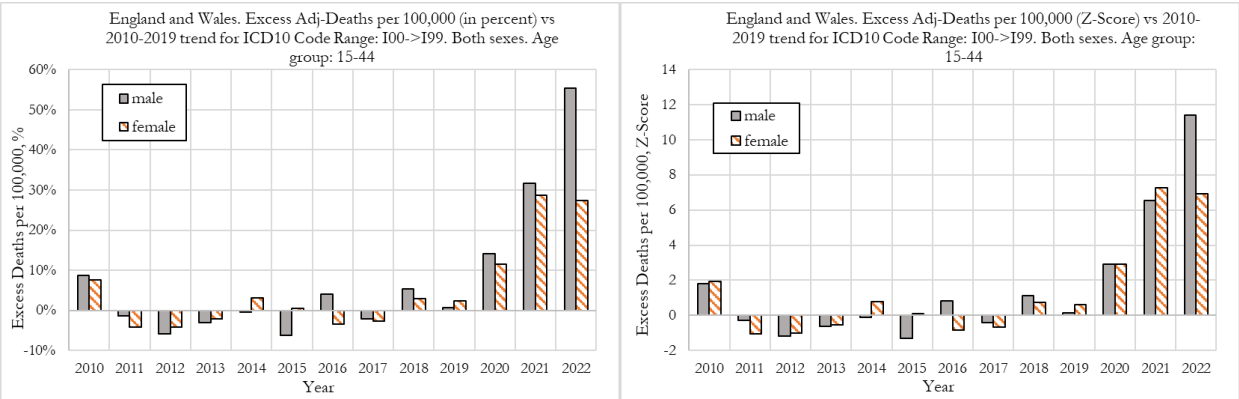

Figure 8 - Excess adjusted deaths rates for diseases of the circulatory system for males and females, in England and Wales. Left: Relative deviation from trend, percent. Right: Deviation from trend Z-Score.

4.4. Summary of the Analysis of Death Rates

We started our analysis of excess death rates due to diseases of the cardiovascular system 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 cardiovascular diseases relative to all classified causes of death (Figure 7). The results show that the rise in deaths from cardiovascular causes in 2021 and 2022 was similar to the relative rise in cardiovascular diseases in relation to all other causes. We also analyse raw unadjusted deaths (Figure 2) which show that even without accounting for the missing records, 2021 and 2022 already show significant above-trend deaths.

Our analysis shows that the excess death rates from cardiovascular diseases rose by about 13% in 2020, 30% in 2021, and about 44% 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 (Figure 6 - left). The drop in excess mortality for all registered deaths from 2021 to 2022 was not matched with a drop in cardiovascular deaths as the opposite occurred, with a sharp acceleration in excess deaths due to cardiovascular diseases in 2022.

The excess mortality from cardiovascular deaths in 2021 and 2022 are highly statistically significant with Z-scores of 7.5 and 10.5, 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 cardiovascular diseases relative to all other deaths with classified causes.

When comparing outcomes for men and women, we observe that they had similar rises in deaths from cardiovascular diseases in 2020 and 2021. However, in 2022, men suffered much worse outcomes than women, with men experiencing a 56% deviation from trend, compared to about 28% for women. We speculate that one of the factors contributing to this difference may be men doing more physical exercise than women, which increases the probability of fatal outcomes, once the heart muscle has suffered prior (mild) injury. We expand on these observations in section 5.4.

When translating these numbers into the absolute number of deaths for diseases of the circulatory system, shown in Figure 4 (right) we can observe that in 2020, cardiovascular deaths were about 2,000, 200 more than the prior 5-year average. In 2021 there were about 2300 deaths, 500 more than the 2015-2019 average, and in 2022, 2500 (700 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 cardiovascular system (ICD10 codes I00-I99) that were responsible for the acceleration in these deaths.

5. Analysis of UK Disabilities (PIP System)

In this section we investigate the trends in disability claims in the UKs Department of Work and Pension (DWP) Personal Independence Payment (PIP) system that replaced the previous Disability Living Allowance (DLA) system from 2013 onwards.

The analysis we present here refers to clearances from **new claims** to the system. It should be noted that clearances refer to decisions made, which can be positive or negative. The fraction of positive clearances (that lead to a grant allowance) is shown to be stable over time at a rate of about 40%.

One must be aware that PIP replaced the UK's previous Disability Living Allowance (DLA) system in 2013 and therefore we observe sharp increase in cases/claims in the few years following the initiation of PIP, which has been explained as "capacity issues" by the DWP. For this reason, only cases after January 2016 are included in this set of analyses.

We perform the analysis for PIP clearances related to the cardiovascular system to compare these trends with the previous chapter on excess mortality due to the cardiovascular system. On our website, we present the analysis of trends in PIP clearances for the different body systems[6] which include interactive charts where the user/researcher can change body system, age of the individuals and trend metric.

5.1. Methodology

The methodology we use to estimate excess clearances of new claims in the PIP system is similar to that on measuring excess mortality, described previously in section 3. We compare the 2016 to 2019 trendline in PIP clearances with actual claims and compute the deviation from trend in relative terms (percentage deviation).

5.2. Baseline PIP Clearances for New Claims for the Cardiovascular System.

Figure 9 shows the monthly PIP clearances for the cardiovascular system from January of 2016 to January of 2023. The dotted line refers to the cumulative Covid-19 vaccine doses as a percentage of the 16-44 age group.

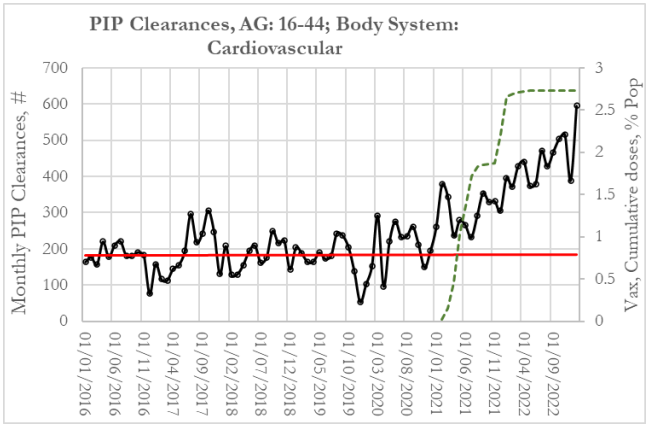

Figure 9 –Monthly clearances (decisions) for new claims to the Personal Independence Payment (PIP) system in the UK, for the cardiovascular system. The red line shows the 2016-2019 trend and the dotted line refers to the cumulative vaccinations for the 15-44 age group.

[6] https://phinancetechnologies.com/HumanityProjects/PIP%20Analysis-Systems.htm

From 2016 to 2019 we observe that there was an average of about 200 new PIP clearances per month. During 2020, there was no noticeable change in new claims. However, from early 2021, we observe a systematic rise in the PIP clearances, reaching a peak of 600 in January of 2023.

The results above seem to corroborate the prior findings of increases deaths attributed to the cardiovascular system. However, the results can be better compared by performing a yearly analysis of the PIP clearances.

5.3. Excess Yearly PIP Clearances for New Claims for the Cardiovascular System.

When we compute the yearly PIP clearances from new claims for the cardiovascular system, shown in Figure 10, we observe that PIP clearances were very stable from 2016-2019, at around 2100 per year.

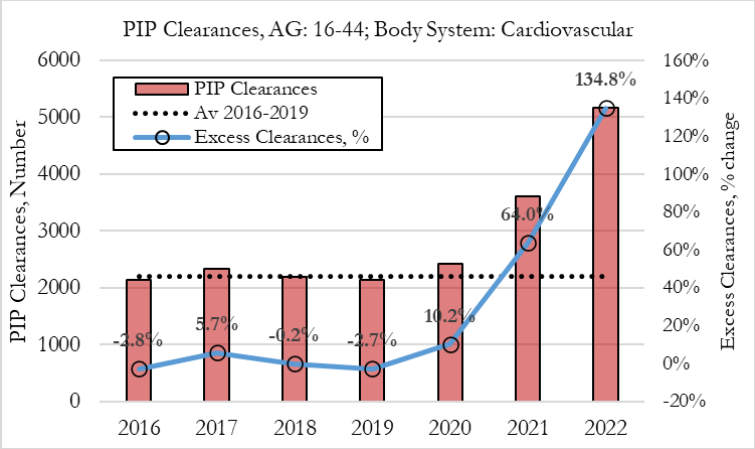

Figure 10 - Yearly excess clearances for new claims to the Personal Independence Payment (PIP) system in the UK for the cardiovascular system for ages 16 to 44. The dotted line refers to the 2016 to 2019 average yearly number of new claims.

In 2020 PIP claims increased by about 10%, which was a slight increase from the 2016-2019 average. In 2021 however, PIP clearances increased by 64% and in 2022 by about 135%, relative to the baseline. We should recall that for excess deaths for the cardiovascular system, we observed deviations from trend of 13% in 2020, 30% in 2021 and 44% in 2022.

We should note that there was a backlog in PIP clearances peaking in August of 2021 which led to claims taking up to 26 weeks to clear. The DWP mentions that the situation was normalised from early 2022 with PIP claims clearing in about 14 weeks[7]. Consequently, we must observe caution when directly comparing the timing of excess deaths with excess disability claims. However, on a yearly basis, these differences are smoothed out, as observed by the similarity of the trends in both excess deaths and excess disability claims for diseases of the cardiovascular system.

5.4. Summary of the Analysis of PIP Clearances for New Claims

The analysis of PIP clearances for new claims where the underlying cause is the cardiovascular system is in agreement with the analysis of excess deaths.

[7] https://www.gov.uk/government/statistics/personal-independence-payment-statistics-to-january-2023/personal-independence-payment-statistics-april-2013-to-january-2023#clearance-and-outstanding-times

We also show that the rise in disability claims was greater than the equivalent rise in excess deaths, both in percentage terms as in absolute numbers, especially in 2022.

The results suggest that there is an underlying phenomenon that is causing large rises in mortality and morbidity due to cardiovascular diseases. The explosion in cardiovascular deaths and disabilities occurred from 2021, at the same time as the rollout of the Covid-19 vaccines. A recent paper[8] from Buergin et al. shows that myocarditis rates after the vaccine booster was about 2.8%, which provides medical evidence for a plausible mechanism leading to a cardiovascular event. The study was performed on 777 participants with a median age of 37.

A prior study from Denmark[9] showed that absolute rates of myocarditis or pericarditis rates after vaccination were 1.6 per 100,000 after the Pfizer vaccine and 5.7 per 100,000 after the Moderna vaccine for individuals aged 12-39. A study from Korea[10] shows vaccine related myocarditis rates of 2.17 for 18 to 29 year-olds and 1.36 to 30 to 39 year olds. A population study published in December 2022 from Japan also shows increased mortality risk from myocarditis after vaccination, for all age groups[11].

These are much lower rates of incidence than reported in the Buergin investigation. The difference is attributed that the Buergin study was an active surveillance for myocardial damage after vaccinations while previous studies in Denmark and Korea refer to passive surveys.

Furthermore, the paper from Fraiman et al[12], shows that the combined rate of serious adverse events during the 2 to 3 months unblinded period of the Pfizer and Moderna clinical trials was 13.2 in 10,000 (vaccine arm relative to placebo arm of the clinical trial)[13]. This translates to vaccinated individuals having a rate of serious adverse events of about 1 per 760. This is an extraordinary signal which was present in the original clinical trials, and that we've shown in our US disabilities research[14], is on the scale of the rise in disabilities we observe at the population level.

It is also possible that the rise in disabilities and deaths from cardiovascular diseases originates from other underlying damage to the circulatory system. We have plans to research the trends in the main types of deaths and disabilities from individual ICD10 codes within the circulatory system, in order to have insights into the underlying phenomenon of action.

[8] N. Buergin et al, "Myocardial injury after COVID-19mRNA-1273 booster vaccination", European Journal of Heart Failure, 2023. Link: https://onlinelibrary.wiley.com/doi/epdf/10.1002/ejhf.2978
[9] BMJ 2021;375:e068665. http://dx.doi.org/10.1136/bmj-2021-068665
[10] *European Heart Journal*, Volume 44, Issue 24, 21 June 2023, Pages 2234–2243. https://doi.org/10.1093/eurheartj/ehad339
[11] https://www.medrxiv.org/content/10.1101/2022.10.13.22281036v2
[12] J. Fraiman et al, "Serious adverse events of special interest following mRNA COVID-19 vaccination in randomized trials in adults", Vaccine, Vol. 40, Issue 40, 22 September 2022, pp 5798-5805.
[13] We analyse the paper on our website: https://phinancetechnologies.com/HumanityProjects/SAE%20mRNA%20Clinical%20Trials.htm
[14] https://phinancetechnologies.com/HumanityProjects/US%20Disabilities%20-%20Part5.htm

6. Concluding Remarks

Table 1 summarises the yearly excess PIP claims for the circulatory system and compares them with the equivalent numbers of excess deaths. In the absolute number of deaths for diseases of the circulatory system, shown in Figure 4 (right) we can observe that the 5-year average deaths from 2015 to 2019 was about 1800 deaths. In 2020, cardiovascular deaths were about 2,000, 100 more than the prior 5-year average. In 2021, there were about 2300 deaths (500 more than the 2015-2019 average) and in 2022, 2500 (700 more than the 2015-2019 average).

	Baseline (Av 2015-2019)	**2020**	**2021**	**2022**
PIP Clearances	N=2,100	N=2,200 (+100) (+10%)	N=3,600 (+1,500) (+64%)	N=5,100 (+3,000) (+135%)
Excess Deaths	N=1,800	N=2,000 (+200) (+13%)	N=2,300 (+500) (+30%)	N=2,500 (+700) (+44%)

Table 1 - Summary for excess deaths and disabilities for diseases of the cardiovascular system in England and Wales (deaths) and the UK (PIP claims).

The results shown in Table 1 indicate that there was a significant rise in both disability claims and deaths in the 15-44 age group in the UK.

We also observe that the relative changes in disabilities were more than double the equivalent rises in deaths, which points towards the risk of higher cardiovascular deaths in the coming years as these conditions remain unresolved.

The previous statement is furthermore supported by our analysis of excess mortality in the UK, by analysing the time series of weekly registered deaths[15]. The current **annualised** excess mortality for 2023 is around 20% for the 15-44 age group, which is a substantial rise from the prior level in 2022, which was slightly above 10%. To us, this is a warning sign that we will observe yet another rise in excess mortality due to cardiovascular deaths when the 2023 numbers are released.

We are currently in the process of pursuing further investigations into this issue in more detail. In particular, we aim to analyse the trends in deaths and disabilities for the most common individual ICD10 causes within the circulatory system, in order to have insights into the underlying phenomenon of action.

6.1. The Overall Scenario for Cardiovascular Events

In addition to finding a relationship between disability claims and deaths related to the cardiovascular system, it is of interest to build an image of the whole phenomenon to be able to understand the coming challenges to the resources of the health sector and to the risks for the overall population health.

[15] https://phinancetechnologies.com/HumanityProjects/yearly%20Excess%20Death%20Rate%20Analysis%20-%20UK.htm

For this purpose, in similarity to our macro analysis of all-cause excess mortality, disabilities and injuries, which we denominate as the V-Damage Project, in Table 2 we try to map the landscape of cardiovascular damage, this is, V-Damage Project – Cardiovascular.

The paper by Buergin et al. provided us an estimate of the incidence rate of myocardial damage in vaccinated individuals, for Switzerland. We use their estimate of 2.8% of individuals (2,800 per 100,000) having myocardial injuries as a base rate for the damage in the cardiovascular system in vaccinated individuals. We understand that this is not a precise estimate, and there are reasons to believe it is an underreporting as well as over-reporting of the true estimate for the population aged 15-44 "at risk".

	Incidence Rates (Buergin paper)	**Excess events in 2021**	**Excess events in 2022**
Incidence rates for myocarditis. Buergin et al. paper[16]	Rate = 2.8% **(+2,800 per 100,000)**		
PIP Clearances		N=+1500 **(+6.6 per 100,000)**	N=+3,000 **(13.2 per 100,000)**
Excess Deaths		N=+500 **(2.2 per 100,000)**	N=+700 **(3.08 per 100,000)**

Table 2 – Overall picture for cardiovascular damage. Estimated rates for excess deaths and disabilities for diseases of the cardiovascular system in England and Wales (deaths) and the UK (PIP claims). Incidence rates are based on a Swiss population investigation.

We observe that there was a 6.6 per 100,000 excess rate of disability claims, and only a rate of 2.2 per 100,000 excess deaths in 2021. These rates rose in 2022 with 13.2 per 100,000 disability claims and 3.08 per 100,000 excess deaths. This compares with a baseline pool of possible injured individuals of 2,800 per 100,000.

The observations above point to a worrying picture that we might see an even greater acceleration of cardiovascular deaths and disabilities in the coming years, which makes the investigation of the underlying causes of upmost importance.

[16] N. Buergin et al, "Myocardial injury after COVID-19mRNA-1273 booster vaccination", European Journal of Heart Failure, 2023. Link: https://onlinelibrary.wiley.com/doi/epdf/10.1002/ejhf.2978

7. Appendixes

7.1. Appendix 1 – ICD10 code list for the circulatory system (I00-I99)

ICD10 Code	Cause
I00	Rheumatic fever without heart involvement
I01	Rheumatic fever with heart involvement
I02	Rheumatic chorea
I03	DISEASES OF THE CIRCULATORY SYSTEM
I04	DISEASES OF THE CIRCULATORY SYSTEM
I05	Rheumatic mitral valve diseases
I06	Rheumatic aortic valve diseases
I07	Rheumatic tricuspid valve diseases
I08	Multiple valve diseases
I09	Other rheumatic heart diseases
I10	Essential (primary) hypertension
I11	Hypertensive heart disease
I12	Hypertensive chronic kidney disease
I13	Hypertensive heart and chronic kidney disease
I14	DISEASES OF THE CIRCULATORY SYSTEM
I15	Secondary hypertension
I16	Hypertensive crisis
I17	DISEASES OF THE CIRCULATORY SYSTEM
I18	DISEASES OF THE CIRCULATORY SYSTEM
I19	DISEASES OF THE CIRCULATORY SYSTEM
I20	Angina pectoris
I21	Acute myocardial infarction
I22	Subsequent ST elevation (STEMI) and non-ST elevation (NSTEMI) myocardial infarction
I23	Certain current complications following ST elevation (STEMI) and non-ST elevation (NSTEMI) myocardial infarction (within the 28 day period)
I24	Other acute ischemic heart diseases
I25	Chronic ischemic heart disease

I26	Pulmonary embolism
I27	Other pulmonary heart diseases
I28	Other diseases of pulmonary vessels
I29	DISEASES OF THE CIRCULATORY SYSTEM
I30	Acute pericarditis
I31	Other diseases of pericardium
I32	Pericarditis in diseases classified elsewhere
I33	Acute and subacute endocarditis
I34	Nonrheumatic mitral valve disorders
I35	Nonrheumatic aortic valve disorders
I36	Nonrheumatic tricuspid valve disorders
I37	Nonrheumatic pulmonary valve disorders
I38	Endocarditis, valve unspecified
I39	Endocarditis and heart valve disorders in diseases classified elsewhere
I40	Acute myocarditis
I41	Myocarditis in diseases classified elsewhere
I42	Cardiomyopathy
I43	Cardiomyopathy in diseases classified elsewhere
I44	Atrioventricular and left bundle-branch block
I45	Other conduction disorders
I46	Cardiac arrest
I47	Paroxysmal tachycardia
I48	Atrial fibrillation and flutter
I49	Other cardiac arrhythmias
I50	Heart failure
I51	Complications and ill-defined descriptions of heart disease
I52	Other heart disorders in diseases classified elsewhere
I53	DISEASES OF THE CIRCULATORY SYSTEM
I54	DISEASES OF THE CIRCULATORY SYSTEM
I55	DISEASES OF THE CIRCULATORY SYSTEM
I56	DISEASES OF THE CIRCULATORY SYSTEM

I57	DISEASES OF THE CIRCULATORY SYSTEM
I58	DISEASES OF THE CIRCULATORY SYSTEM
I59	DISEASES OF THE CIRCULATORY SYSTEM
I5A	Non-ischemic myocardial injury (non-traumatic)
I60	Nontraumatic subarachnoid hemorrhage
I61	Nontraumatic intracerebral hemorrhage
I62	Other and unspecified nontraumatic intracranial hemorrhage
I63	Cerebral infarction
I64	Cerebrovascular diseases
I65	Occlusion and stenosis of precerebral arteries, not resulting in cerebral infarction
I66	Occlusion and stenosis of cerebral arteries, not resulting in cerebral infarction
I67	Other cerebrovascular diseases
I68	Cerebrovascular disorders in diseases classified elsewhere
I69	Sequelae of cerebrovascular disease
I70	Atherosclerosis
I71	Aortic aneurysm and dissection
I72	Other aneurysm
I73	Other peripheral vascular diseases
I74	Arterial embolism and thrombosis
I75	Atheroembolism
I76	Septic arterial embolism
I77	Other disorders of arteries and arterioles
I78	Diseases of capillaries
I79	Disorders of arteries, arterioles and capillaries in diseases classified elsewhere
I80	Phlebitis and thrombophlebitis
I81	Portal vein thrombosis
I82	Other venous embolism and thrombosis
I83	Varicose veins of lower extremities
I84	DISEASES OF THE CIRCULATORY SYSTEM
I85	Esophageal varices
I86	Varicose veins of other sites

I87	Other disorders of veins
I88	Nonspecific lymphadenitis
I89	Other noninfective disorders of lymphatic vessels and lymph nodes
I90	DISEASES OF THE CIRCULATORY SYSTEM
I91	DISEASES OF THE CIRCULATORY SYSTEM
I92	DISEASES OF THE CIRCULATORY SYSTEM
I93	DISEASES OF THE CIRCULATORY SYSTEM
I94	DISEASES OF THE CIRCULATORY SYSTEM
I95	Hypotension
I96	Gangrene, not elsewhere classified
I97	Intraoperative and postprocedural complications and disorders of circulatory system, not elsewhere classified
I98	DISEASES OF THE CIRCULATORY SYSTEM
I99	Other and unspecified disorders of circulatory system