



West Midlands
Cancer Intelligence Unit

Where do cancer patients die?

**The varying provision of
end of life care to
cancer patients in the
West Midlands**

R11/02

April 2011

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Executive summary

- Between 2005 and 2007 over 38,000 patients died of cancer in the West Midlands, approximately 13,000 deaths annually.
- The most common place of death is an acute Trust (42% of deaths). 31% of cancer patients who do not survive their disease die at home, and 15% die in a hospice. Note that 'home' in this report includes all usual places of residence, including residential homes.
- The percentage of cancer patients dying in an acute Trust has fallen significantly from 46% of all deaths in 2002 to 40% in 2007. Cancer deaths at home have remained static at around 30% while the percentage of cancer patients dying in a hospice has risen slowly over the same period from 13% to 15%.
- Men are significantly more likely to die in an acute Trust and less likely to die in a hospice than women are, while women are significantly more likely to die in a nursing home than men are.
- Young patients are more likely to die at home. Elderly patients are more likely to die in nursing homes and community Trusts.
- Cancer patients who survive only a short time after diagnosis (less than one month) are more likely to die in an acute Trust, and less likely to die at home or in a hospice.
- Patients with haematological cancers are most likely to die in an acute Trust. Patients with melanoma skin cancer are least likely to die in an acute Trust.
- Patients with hepatobiliary & pancreatic cancers and upper gastro-intestinal cancers are most likely to die at home. Patients with breast, gynaecological, haematological and urological cancers are least likely to die at home.
- The proportion of deaths in acute Trusts and hospices falls with increasing distance to the nearest hospital and hospice. Home deaths are more likely when patients do not live nearby to acute Trusts and hospices.
- Place of death varies significantly with deprivation even when confounding factors are adjusted for. The most deprived cancer patients are more likely to die in an acute Trust while the most affluent cancer patients are more likely to die in a hospice.
- Asian patients are significantly less likely to die in a hospice than White patients. Asian and Black patients are significantly more likely to die in an acute Trust than White patients are, with deprivation being a strong explanatory variable.
- The effect of deprivation on the likelihood of dying in a hospice can be seen by comparing Spearhead PCTs with non-Spearhead PCTs in the West Midlands. Significantly lower proportions of deaths occur in a hospice in Spearhead PCTs compared to non-Spearhead PCTs. This gap appears to be increasing over time.
- Place of death varies significantly between West Midlands PCTs. These differences cannot be fully explained by the factors investigated in this report (age, sex, cancer site, ethnicity, deprivation, and distance to services).

1.0 INTRODUCTION

Each year, there are around 13,000 deaths from invasive cancer in the West Midlands. The number of deaths annually has remained stable over recent years as, despite improving survival rates, the total number of patients diagnosed with cancer continues to rise due to the aging population. Lung cancer is responsible for the greatest number of deaths (over 20% of all deaths). Bowel cancer, upper gastro-intestinal cancer, breast cancer, haematological cancer, hepatobiliary cancer, prostate cancer and urological cancer are also responsible for high numbers of deaths. Together with lung, these sites account for over three quarters of all cancer deaths.

The publication of the *End of Life Care Strategy* in 2008 renewed interest in the debate over the provision and choice of care to life limited patients. This report highlighted the variation in end of life care provision that patients experienced and emphasised the need to ensure that patients could look forward to a 'good death' - a death without pain, with friends and family, with dignity and in familiar surroundings. For the majority of patients, this ideal scenario is likely to be in the home setting.

The present report specifically focuses on the place of death of cancer patients in the West Midlands. It identifies that there is wide variation in the likelihood that a terminally ill patient will be able to die at home, and examines the key factors behind this variation, including age, type of cancer, distance from a hospital, and deprivation. However, this report is limited in that it can only analyse where patients died, and cannot compare this to where patients wished to die. While dying at home may be a reasonable proxy for improved patient choice, the data this report is based on do not include whether the patient died where they wished.

The *End of Life Care Strategy* highlighted the need to avoid unnecessary emergency admissions to hospital to enable more people at the end of their life to live and die in the place of their choice. Some hospital deaths are unavoidable due to the nature of the disease and the needs of the patient, but a lowered likelihood of deaths in an acute Trust may be a proxy for increasing patient choice and improved access to hospices and home care.

The strategy also acknowledged that '*measurement of end of life care provision is a key lever for change and is essential if we are to monitor progress*'. The information held by cancer registry databases can be used to measure trends in where cancer patients die. Place of death information is obtained from death certificates, sent routinely to the WMCIU for all cancer patients. Death certificates are becoming increasingly more detailed and are a rich source of information. However, the continual improvement in death certificate data means that for some data items, historical data comparisons are not possible. In recent years, information on place of death has improved greatly – in 1997 only 60% of cancer deaths had a known place of death, but since 2000 the data have been more robust, with over 95% completeness in 2007.

One area where care is needed in the interpretation of this report (highlighted in the *End of Life Care Strategy, Second Annual Report*) is the classification of a 'death at home'. For many elderly patients, a residential home, care home or nursing home is their usual address of residence, and may constitute the patient's 'real' home. This may be the most appropriate place of death for these patients. However, this produces coding issues for the analysis, as residential homes cannot always be identified from death certificates. In this report, deaths in residential homes have been included in the 'deaths at home' statistics, but deaths in nursing home and care homes have been reported separately. Therefore, comparisons should not be made between this report and others where residential, nursing and care homes have been categorised differently.

This report assumes that the reader has some familiarity with the providers of healthcare in the West Midlands. A detailed guide with maps is provided in Appendix A. A high-level guide to the methodology used in the report can be found in Appendix B.

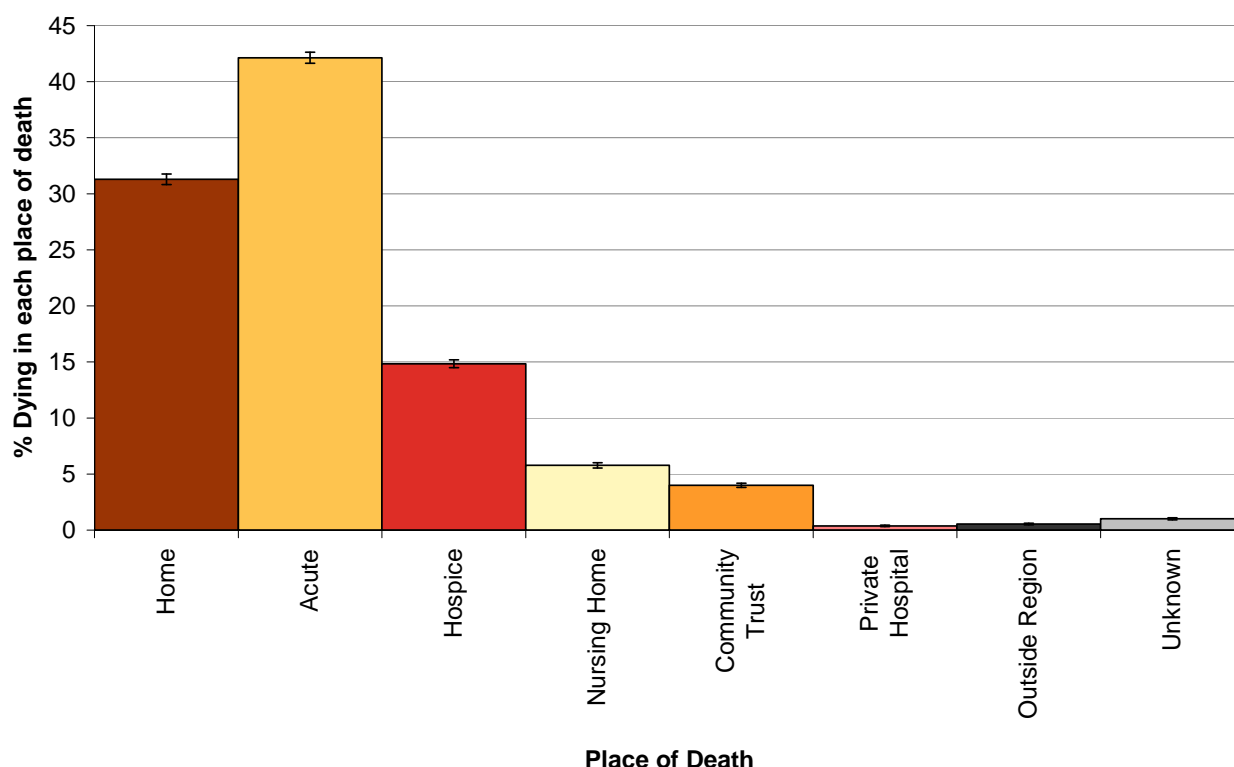
2.0 PLACE OF DEATH OF CANCER PATIENTS IN THE WEST MIDLANDS, 2005- 2007

This section of the report analyses the place of death of all cancer patients in the West Midlands who died of cancer 2005-2007, and broken down by sex, age at diagnosis, survival time, cancer site, distance to services, deprivation and ethnicity.

2.1 Place of Death for All Cancers

Acute Trusts remain the most common place of death in the West Midlands, with over 40% of deaths due to cancer taking place in hospital. Home is the second most common location. Only 15% of deaths occur in hospices.

Figure 2.1.1: Place of death for all deaths due to all cancers, 2005-2007, persons

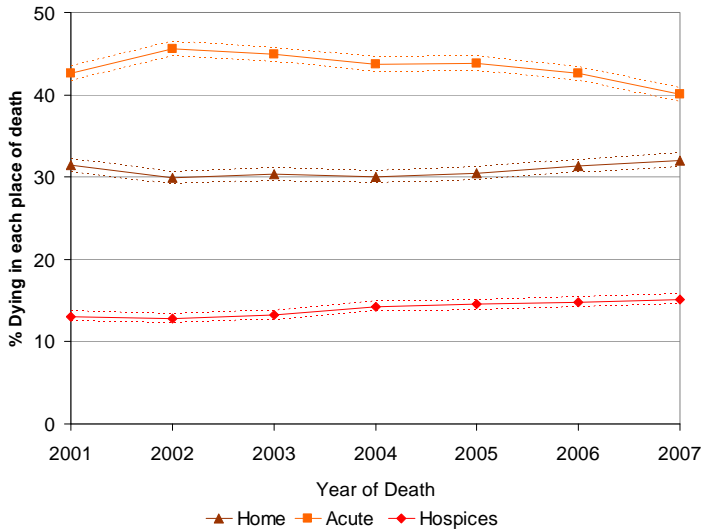


During 2005-2007, over 38,500 people died of cancer in the West Midlands, approximately 13,000 deaths per year. All deaths in the region were categorised into either one of six places of death – home, acute Trust, hospice, nursing home, community Trust or private hospital – deaths outside the region, or place of death unknown. Three locations (acute Trust, home and hospice) accounted for over 85% of all deaths. The largest proportion of deaths occurred in acute Trusts (42%), followed by home (31%) and hospices (15%). The remaining places of death accounted for only 1 in 10 patients. Place of death could not be ascertained for approximately 400 cases (1%).

2.2 Place of Death – Trends Over Time

The proportion of patients dying in an acute Trust is decreasing, and there has been a steady rise in the number of deaths in hospices.

Figure 2.2.1: Place of death for all deaths due to all cancers trends over time, 2001-2007, persons

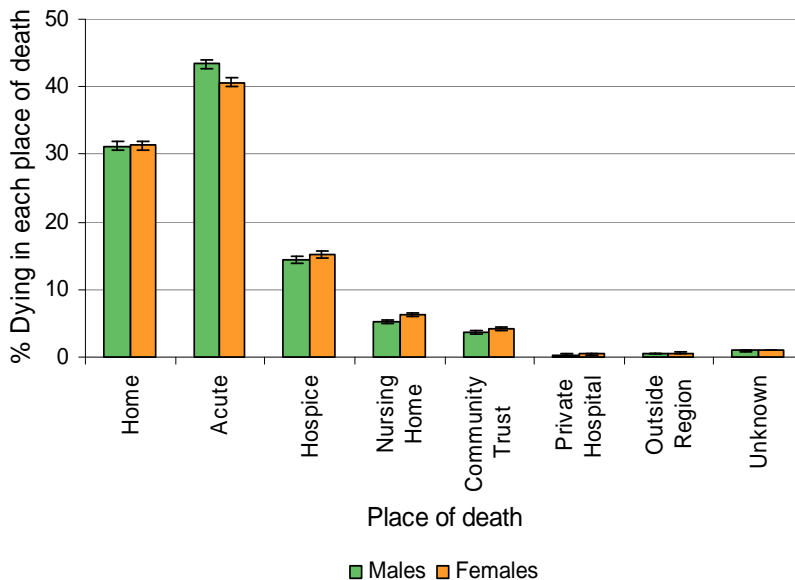


Since 2002, there has been a steady decrease in the proportion of patients dying in an acute Trust, falling significantly from 46% to 40% in 2007. For much of the period, the percentage of deaths at home remained static at approximately 30%, with no significant changes between 2001 and 2007. Hospice deaths have risen slowly, but steadily during the same period, with significantly more deaths occurring in hospices in 2007 (15%) than in 2001 (13%).

2.3 Place of Death by Sex

Men are more likely to die in an acute Trust than women. Women are more likely to die in a hospice or a nursing home.

Figure 2.3.1: Variation in place of death for all deaths due to all cancers, 2005-2007, by sex



Men are significantly more likely to die in an acute Trust than women. This remains true after adjusting for confounding factors such as age, and cancer site – indeed the gap even widens (odds ratio women/men 0.89 when unadjusted, 0.85 when adjusted)

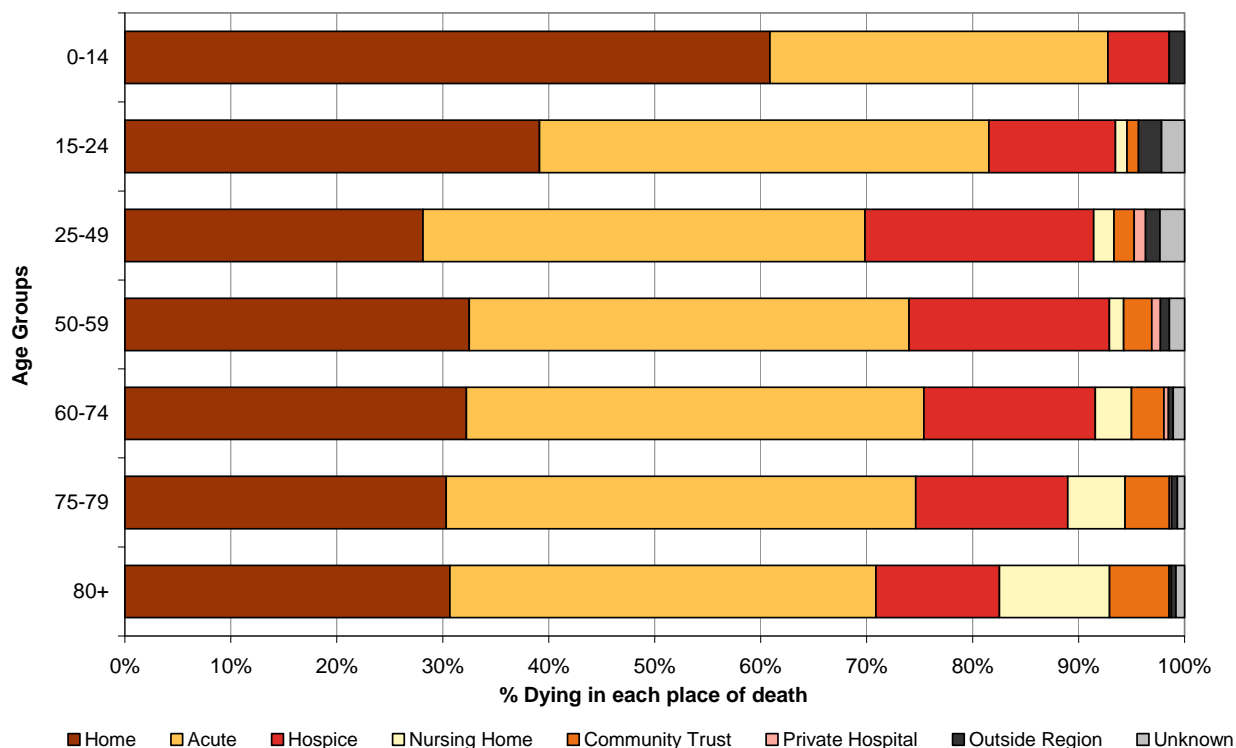
Men are significantly less likely to die in a hospice than women. Again, this gap widens after correction for factors such as age and cancer site (odds ratio women/men 1.06 when unadjusted, 1.12 when adjusted.)

Women are significantly more likely to die in a nursing home than men. This gap narrows once confounding factors are corrected for, as women have a longer life expectancy than men and elderly patients are most likely to die in a nursing home. However a significant gender gap remains.

2.4 Place of Death by Age Group

Young patients are more likely to die at home. Elderly patients are most likely to die in nursing homes and community Trusts. Both hospice deaths and deaths in private hospitals are most common in patients of working age.

Figure 2.4.1: Place of death for all deaths due to all cancers by age group, 2005-2007, persons



Place of death shows clear differences with age group. Young cancer patients (those aged 14 and under) had the highest proportion of home deaths (61%) compared to any other group. Adjusting the analysis for confounding factors such as cancer site does not alter this result. Teenage and young adults (15-24 years) also appeared more likely to die at home, (although this is not statistically significant).

There is no linear relationship between age and the likelihood of dying in an acute Trust, with both the very old (over 80) and very young (under 15) being less likely to die in an acute Trust. Patients in the 75-79 age group are most likely to die in an acute Trust.

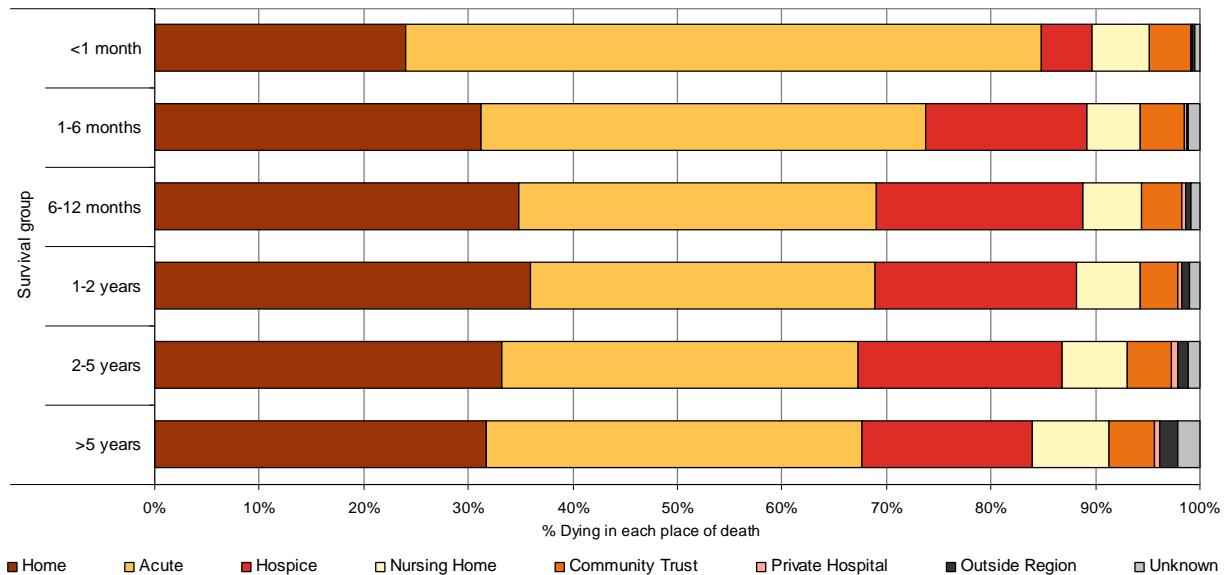
Cancer deaths in 25-29 year olds are significantly more likely to occur in a hospice compared to other age groups. For cancer patients aged over 50, the likelihood of dying in a hospice decreases with increasing age. Less than five under-19 year olds died in a hospice between 2005 and 2007. Adjusting for confounding factors such as sex and cancer site does not significantly alter these findings.

The highest proportion of deaths in nursing homes occurred in the elderly, rising steadily from 3% in the 60-74 age group to 10% in the 80+ age group. These groups also accounted for the highest proportions of deaths in community Trusts. Approximately 150 deaths occurred in private hospitals between 2005 and 2007. Although deaths in private hospitals were most common in the 25-49 age group, patients from every age group except the under-24's died in private hospitals.

2.5 Place of Death by Survival Time

Short-term survivors are most likely to die in an acute Trust. Short-term survivors are less likely to die at home or in a hospice

Figure 2.5.1: Effect of length of survival on place of death for all deaths due to all cancers, cancer deaths between 2005-2007, persons



Short-term survivors (patients who die within a month of their cancer diagnosis) are less likely to die at home or in a hospice. The majority (61%) of patients who die within 1 month of diagnosis die in acute Trusts. This trend is even more pronounced when the analysis is corrected for confounding factors including age, sex, and cancer site.

The deaths of short-term survivors in acute Trusts often follow emergency hospital admissions of late stage cancers. Understanding the reasons behind late diagnosis and emergency admission of these patients is key to improving their treatment, which can both improve survival rates or assist these patients to die in a more appropriate setting.

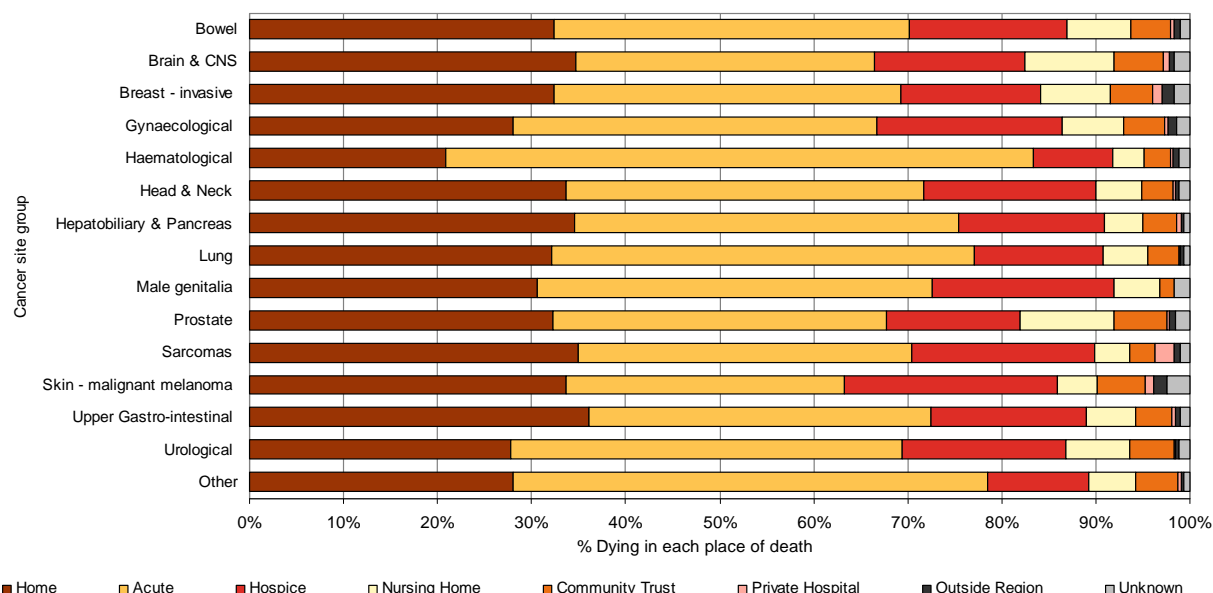
Hospices are an uncommon place of death (5%) for short-term survivors. This may reflect the logistical reality of organising a hospice admission for patients who die within weeks of their cancer diagnosis. Adjustment for confounding factors does not reduce the gap between this group and other survival time groups.

Patients who survived with their cancer for more than 5 years are more likely to have an unknown place of death or to die outside of the region.

2.6 Place of Death by Cancer Site

Place of death varies significantly between cancer sites. Patients with haematological cancers are significantly more likely to die in an acute Trust. Patients with cancers of the brain and central nervous system or with hepatobiliary and pancreatic cancers are least likely to die in an acute Trust.

Figure 2.6.1: Place of death by main cancer site groupings, 2005-2007, persons



“Cancer” is not a homogeneous disease, and the needs of patients at the end of their life will vary greatly according to the type of cancer they are being treated for and the location of any metastases. Haematological malignancies commonly cause acute emergency events, whereas for other cancer sites the disease progression is more predictable. The variation in place of death by cancer site is clear from Figure 2.6.1.

In order to investigate any differences between cancer sites, cancers were grouped into 15 broad cancer sites, and the place of death was analysed using multivariate regression analysis, to adjust for confounding factors such as age, sex and deprivation. Bowel cancer was used as the ‘baseline’ group, and other cancer sites were compared to this.

The likelihood of dying at home was lower for breast, gynaecological, haematological and urological cancers, but higher for hepatobiliary & pancreatic and upper gastro-intestinal cancers compared to bowel cancer even when adjusted for confounding factors.

Haematological, breast, gynaecological, lung and urological cancer deaths were significantly more likely than bowel cancer deaths to occur in an acute Trust, while patients with brain & CNS cancer, melanoma skin cancer and hepatobiliary & pancreatic cancer were least likely to die in an acute Trust. It may be that for cancer sites where survival is poor, such as pancreatic cancer and brain cancer, management of end of life care is a priority and so deaths in acute Trusts can be minimised.

The proportion of deaths occurring in hospices does not vary greatly between cancer sites, with the exception of haematological cancers. The likelihood of dying in a hospice was significantly lower for breast, haematological, lung and prostate cancer compared to bowel cancer, but significantly higher for hepatobiliary & pancreatic cancer. Only 8% of deaths due to haematological cancers took place in a hospice.

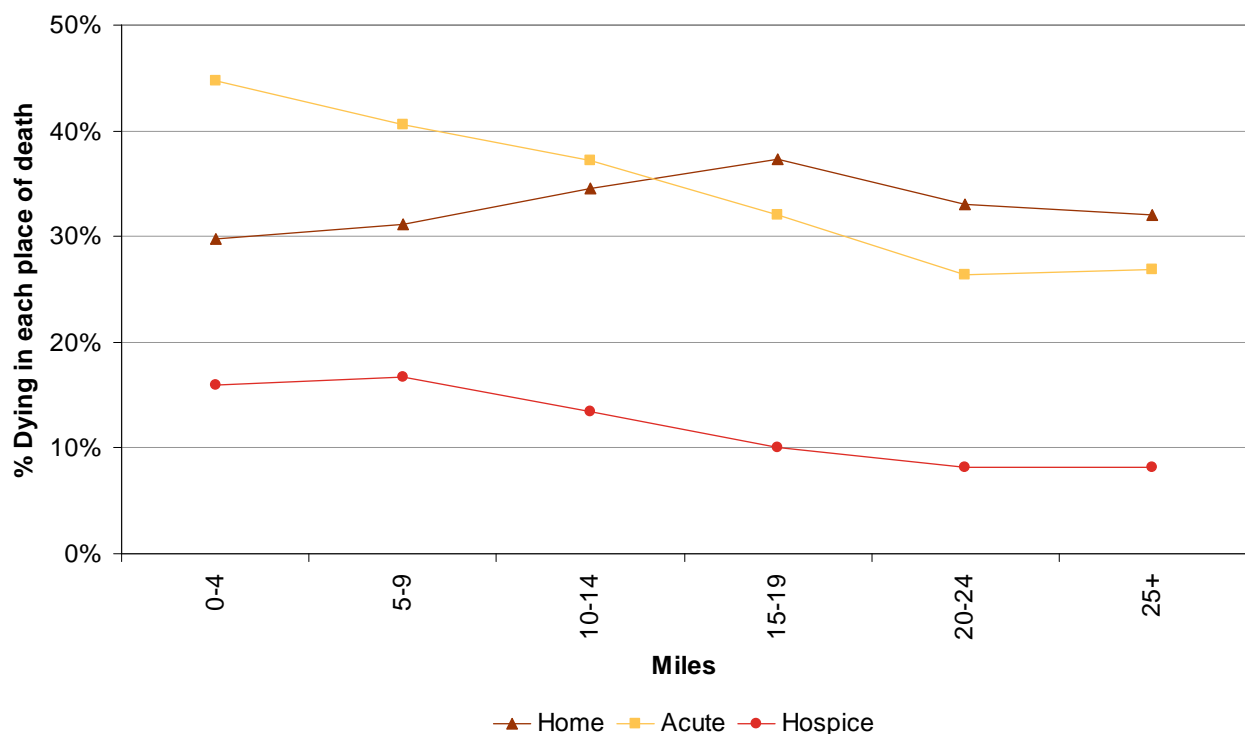
2.7 Place of Death by Access to Services

2.7.1 Distance to acute Trust

Patients are less likely to die in an acute Trust the further away they live from an acute Trust. The increased likelihood of death at home and in alternative settings for patients in rural communities may represent poor access to services rather than improved patient choice.

The West Midlands is a varied geographical area of England, ranging from densely populated inner city urban areas to very sparsely populated rural areas. The following analysis looks at the proportions of cancer deaths based on the distance to the nearest hospital offering acute level care.

Figure 2.7.1: Place of death by distance to acute Trust, 2005-2007, persons



Although many West Midlands residents live in urban settings near to acute Trusts, residents in rural communities, particularly in the Shire counties, may live over 25 miles from an acute Trust. Figure 2.7.1 shows that the proportion of deaths in an acute Trust falls as the distance to the nearest Trust increases. The same pattern is also noticeable for hospice deaths. The majority of hospices in the West Midlands are based in the same urban population centres as the acute Trusts, so distance to an acute Trust is strongly correlated with distance to a hospice.

There is an indication that, as distance from acute hospital increases, so too does the proportion of deaths at home. However, this relationship reverses for distances of 20 miles or more. Patients who live over 25 miles away from an acute Trust are less likely to die in a hospice, in an acute Trust, or at home than patients who live between 15 and 20 miles away. This apparently contradictory trend is explained by an increasing number of deaths in other settings, most noticeably community hospitals.

Multivariate analysis was conducted on the data to investigate the effect of confounding factors:

Figure 2.7.2: Logistic regression analysis of distance from nearest acute trust and place of death for deaths in hospital due to all cancers between 2005-2007, persons

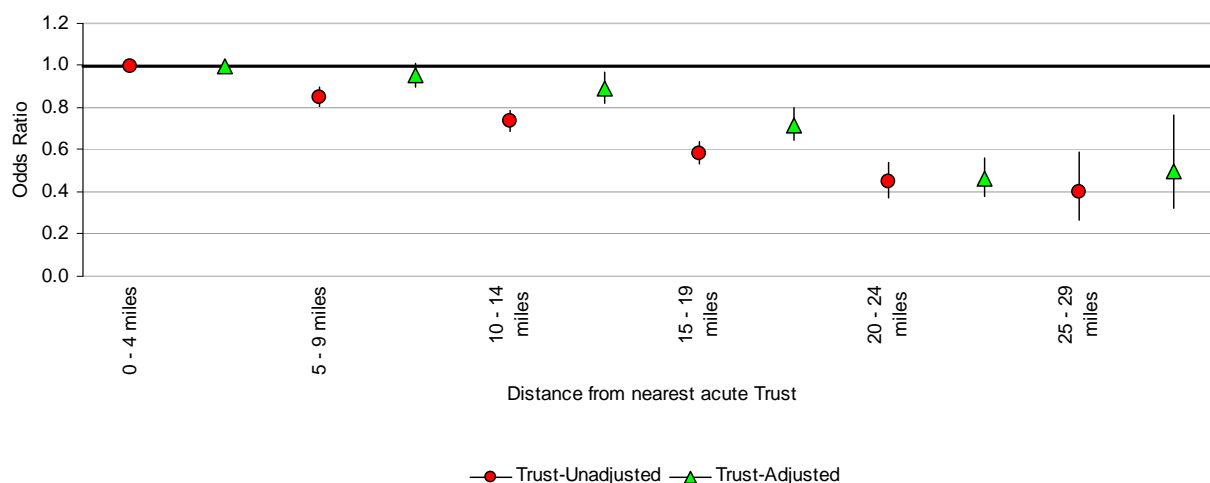
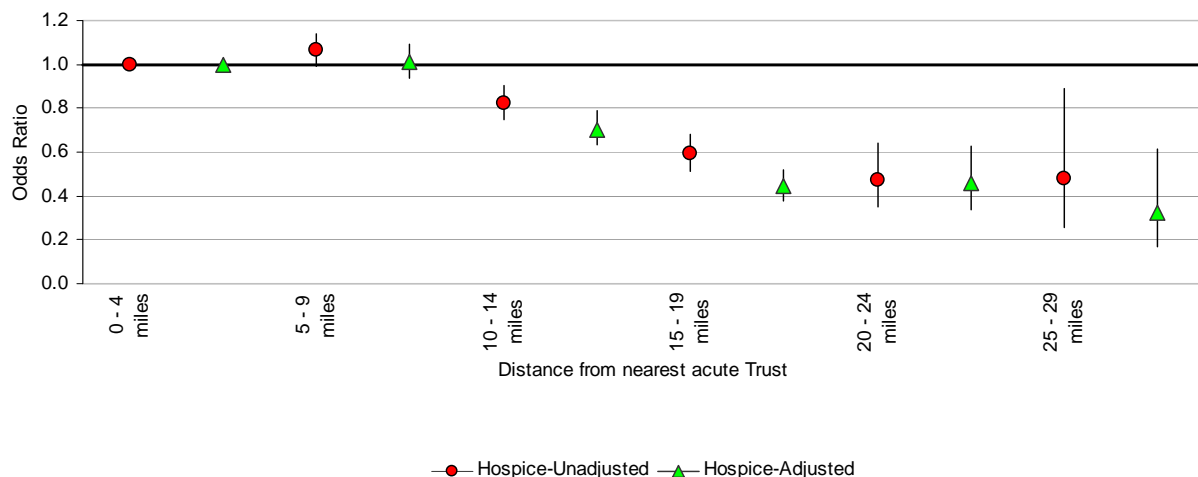


Figure 2.7.2 shows how the odds ratio of the likelihood of dying in an acute Trust varies with distance to the nearest acute Trust, compared to the baseline group of 0-4 miles. Patients living further away from a Trust were less likely to die in a Trust (the red dots on the graph). However, once the findings were adjusted for confounding factors such as age, sex, cancer site and deprivation, this trend mostly disappeared for patients living within 15 miles of a Trust (the green triangles). One major factor affecting this was that patients living very near to acute Trusts are often living in deprived inner city communities, and their likelihood of dying in an acute Trust is increased by their deprivation as well as by their location. The variation for patients who lived more than 15 miles from a Trust could not be explained by confounding factors.

Figure 2.7.3: Logistic regression analysis of distance from nearest acute trust and place of death for deaths in a hospice due to all cancers between 2005-2007, persons



Patients living more than 10 miles away from an acute Trust were much less likely to die in a hospice. Once confounding factors such as age, sex, cancer site and deprivation were taken into account, this trend was seen even more clearly (the adjusted odds ratio (green triangles) is even less than the unadjusted odds ratio (red circles) for patients who lived more than 10 miles from a Trust).

2.7.2 Distance to hospice

Patients are less likely to die in a hospice the further away they live from a hospice, and are more likely to die at home.

As discussed in the previous section, the West Midlands is a varied geographical area of England. Many patients live in urban centres within 5 miles of a hospice, but for some patients the nearest hospice was over 30 miles away.

Figure 2.7.4: Place of death by distance to hospice, 2005-2007, persons

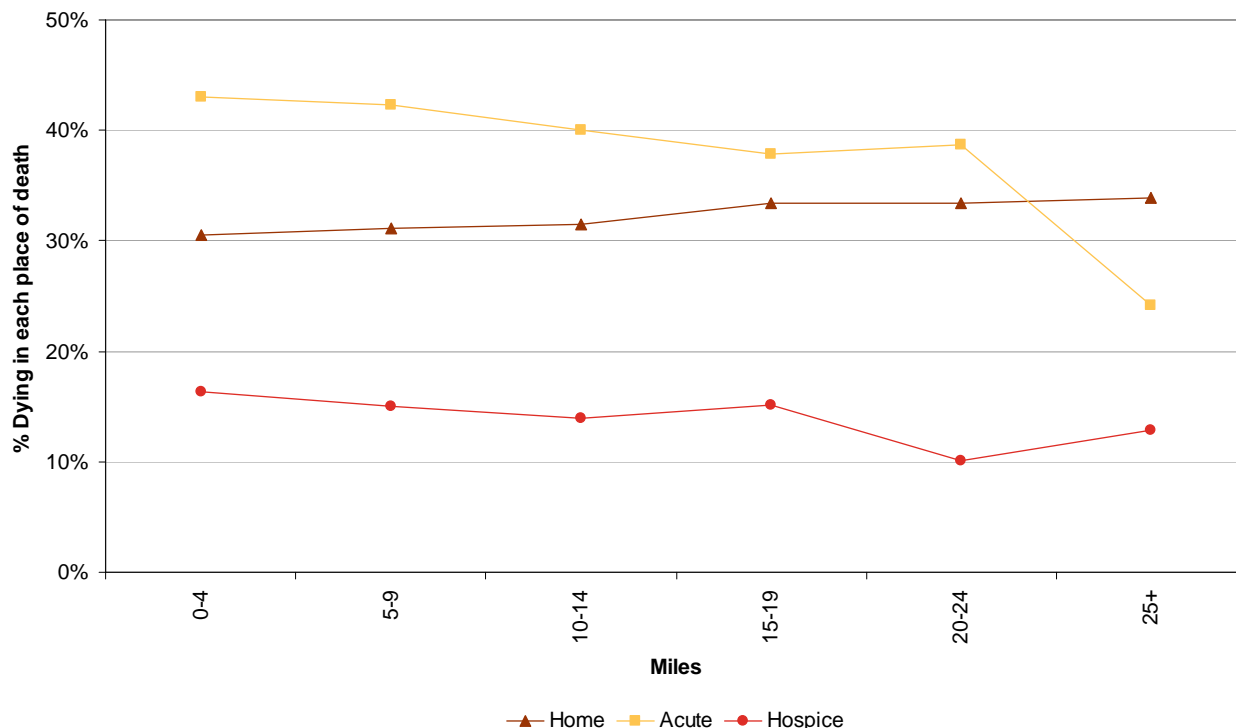


Figure 2.7.4 shows that the further away a patient lives from a hospice, the lower the proportion of cancer deaths taking place in a hospice. The proportion of deaths in acute Trusts also decreases with increasing distance from a hospice – steadily between 0 and 25 miles, and sharply when the distance is greater than 24 miles. The distance to an acute Trust is closely correlated with the distance to a hospice, as both are often found in the major towns and cities of the West Midlands.

The proportion of deaths at home increases with increasing distance to nearest hospice. This trend is similar to, but clearer than, the trend in an increasing proportion of deaths at home with increasing distance to the nearest Trust.

These analyses show that patients who live in rural areas are less likely to die in a hospice or acute Trust. For these patients, death at home may not reflect improved patient choice, but instead may be due to reduced access to services. Alternatively, PCTs with very rural populations may have invested more infrastructure in supporting patients to die at home.

2.8 Place of Death by Deprivation

Place of death varies clearly with deprivation. The least deprived patients are more likely to die in a hospice, while the most deprived are more likely to die in an acute Trust. Analyses adjusting for confounding factors such as age and cancer site show that these cannot fully explain the deprivation gap.

Figure 2.8.1: Place of death by deprivation quintile
All cancer deaths between 2005-2007, persons, all places of death

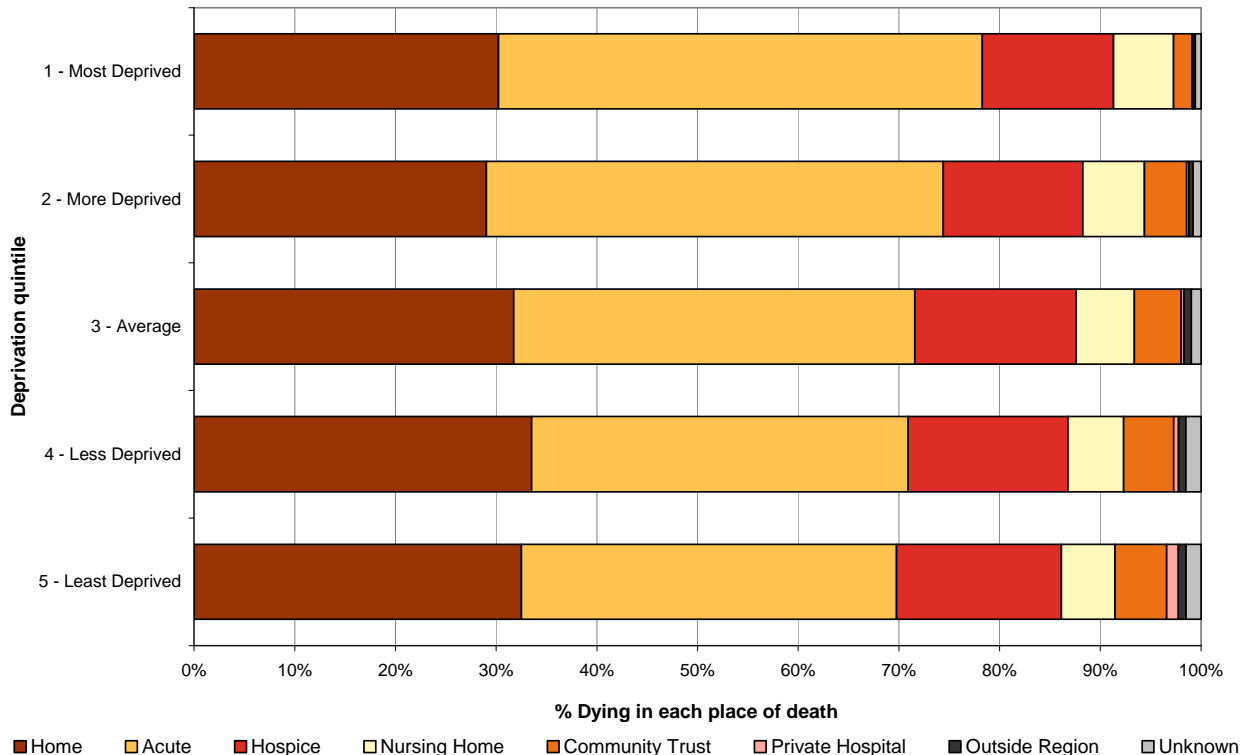


Figure 2.8.1 shows that there is an increased likelihood of dying in an acute Trust with increasing deprivation; higher proportions of the most deprived population died in acute Trusts and in nursing homes compared to more affluent patients.

Patients in the least deprived quintile are most likely to die in a hospice, with the likelihood of dying in a hospice increasing with increased affluence. Similarly, the likelihood of dying in a private hospital also increases with relative affluence. Similar proportions (~30%) of deaths occur at home in patients in all quintiles. The likelihood of dying at home shows no clear trend with deprivation.

There is a clear trend between increased deprivation and the increased likelihood of dying in an acute Trust. However, there are known confounding factors affecting this analysis. Deprived patients on average live nearer to acute Trusts, are younger, and are more likely to develop certain cancers such as lung cancer.

Figure 2.8.3 shows how adjusting for these confounding factors reduces this trend from an odds-ratio of 1.4 to an odds ratio of 1.2 (most deprived: average), implying that age, cancer site and distance to acute Trust do drive some of the observed differences. However, there remain significant differences between the most deprived quintiles and the average quintile even after this adjustment.

Other factors may also be driving these inequalities, such as late stage at presentation or the likelihood of presenting as an emergency admission rather than through an elective route. As these data items were not available for all patients, the adjusted analysis does not take them into account.

Figure 2.8.3: Logistical regression analysis of all cancer deaths in acute Trusts by deprivation 2005-2007, persons

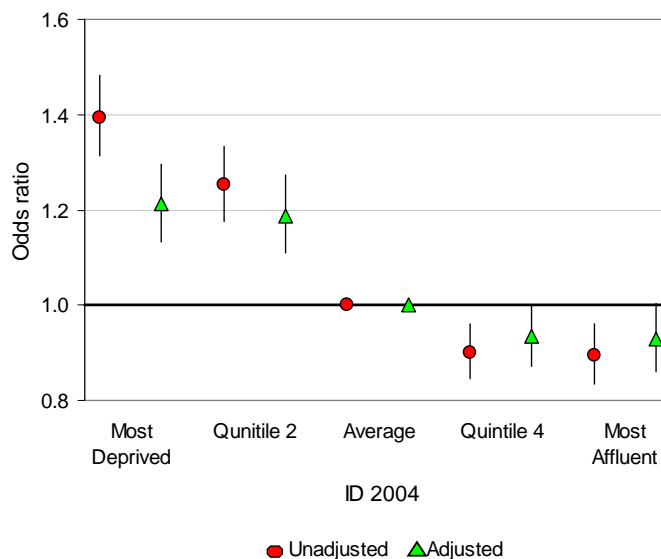
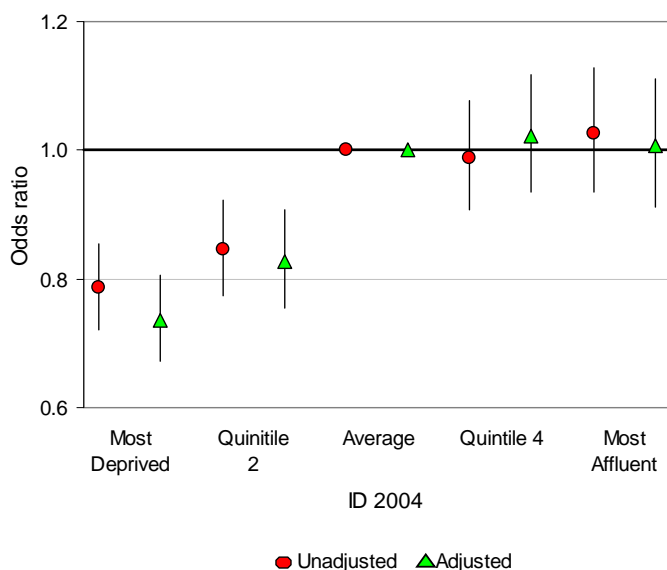


Figure 2.8.4: Logistical regression analysis of all cancer deaths in hospices by deprivation 2005-2007, persons



There is a clear trend that increasing affluence increases the likelihood of dying in a hospice. Figure 2.8.4 shows that the people in the most deprived quintiles are less likely to die in a hospice compared to other quintiles. Increasing affluence beyond quintile 3 does not increase the likelihood of dying in a hospice.

Correcting for confounding factors including age, survival time, cancer site, distance to a hospice and sex *increases* the gap between the most deprived quintile 1 and the average quintile 3 slightly from an odds ratio of 0.79 to 0.74 (most deprived : average). This shows that the differences cannot be explained by these factors.

2.9 Place of Death by Ethnicity

Place of death varies with ethnicity, with Black and Asian patients most likely to die in acute Trusts. For Black patients the difference can be explained by confounding factors such as deprivation and age, but the difference remains statistically significant for Asian patients even after adjustment for confounding factors.

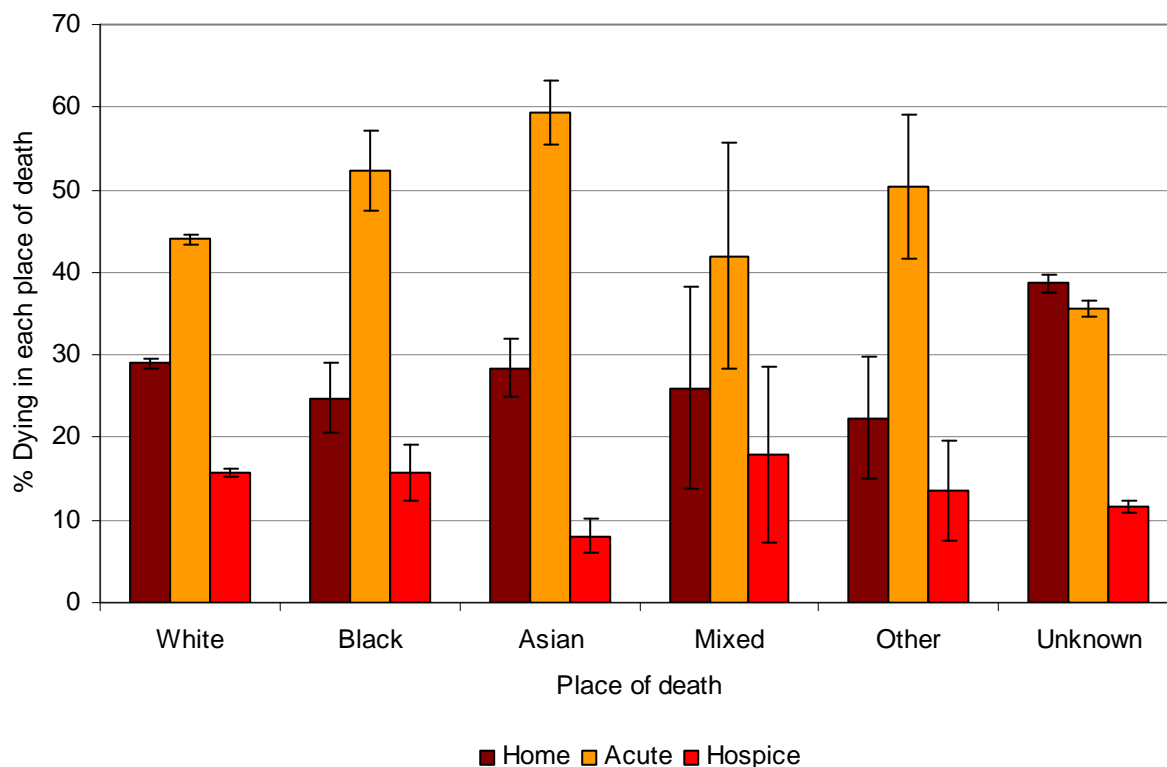
Ethnicity for each cancer patient was derived by matching patient demographics to the Hospital Episode Statistics. This is the best available source of ethnicity for cancer registries but still leads to substantial missing data, with over 20% of cases having no known ethnicity.

Although the West Midlands is one of the more ethnically diverse regions of the UK, there are still only small numbers of non-White patients diagnosed with cancer annually (see Table 2.9.1). Because of this, the numbers in the following analyses are very small, and many apparent differences are not statistically significant.

Table 2.9.1: Ethnic group breakdown of the West Midlands, deaths due to all cancer, 2005-2007

Ethnic group	Total	
	No.	%
White	29,255	75.8
Black	419	1.1
Asian	633	1.6
Mixed	50	0.1
Other ethnic group	125	0.3
Unknown/ not stated	8,095	21.0
Total	38,577	100.0

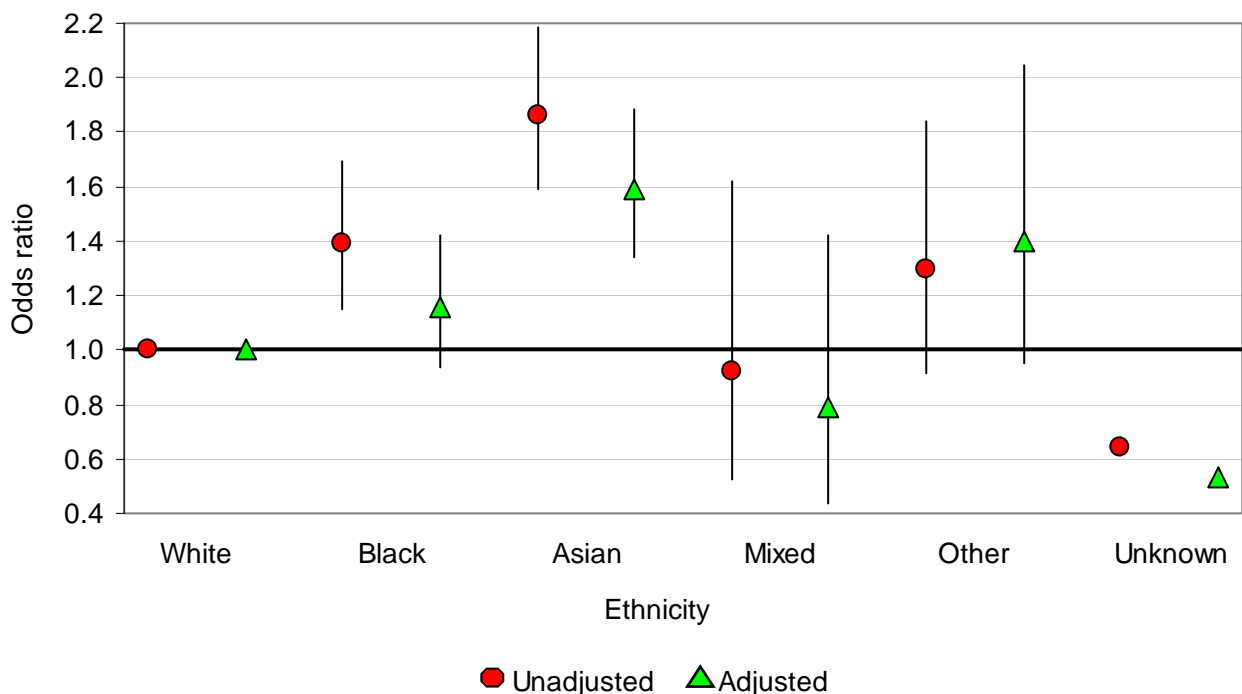
Figure 2.9.1: Place of death by ethnic group of all deaths due to all cancers, 2005-2007, persons



Asian and Black patients are significantly more likely to die in an acute Trust compared to White patients. When multivariate analysis is used to adjust for key confounding factors such as age, sex and deprivation, the increased likelihood of dying in a Trust for Black patients is no longer statistically significant, but it remains significant for Asian patients (Figure 2.9.2). The key driver for the difference between Black patients and White patients was deprivation – Black patients are more likely to be deprived than White patients, and deprived patients are more likely to die in an acute Trust. Distance to a Trust was also a contributing factor, with Asian patients on average living closer to acute Trusts than White patients.

There is no statistically significant difference in the likelihood of dying at home between White patients and patients from ethnic minorities. This remains true when multivariate analysis for confounding factors is run. Asian patients are significantly less likely to die in a hospice than White patients are. This difference remains when multivariate regression analysis is run in order to correct for confounding factors. There is no significant difference for other ethnic groups.

Figure 2.9.2: Logistical regression analysis of all deaths due to all cancers in acute Trusts by major ethnic group 2005-2007, persons



Patients of unknown ethnicity are statistically more likely to die at home and less likely to die in an acute Trust. This is an artefact of data collection – as the ethnicity data come from the Hospital Episode Statistics, the fewer hospital admissions a patient has had the less likely it is that their ethnicity will be recorded. If the patient’s death took place in hospital, they are more likely to have a record in the Hospital Episode Statistics and thus a recorded ethnicity.

3.0 PLACE OF DEATH IN WEST MIDLANDS PCTS

3.1 Dying in an Acute Trust - Variation Between PCTs

There are wide variations in the likelihood of dying in an acute Trust between West Midlands PCTs. These cannot be fully explained by confounding factors such as age, sex and deprivation. Sandwell has the greatest percentage of patients dying in an acute Trust, and Herefordshire has the lowest.

Figure 3.1.1: All deaths due to all cancers dying in an acute Trust between 2005-2007, persons

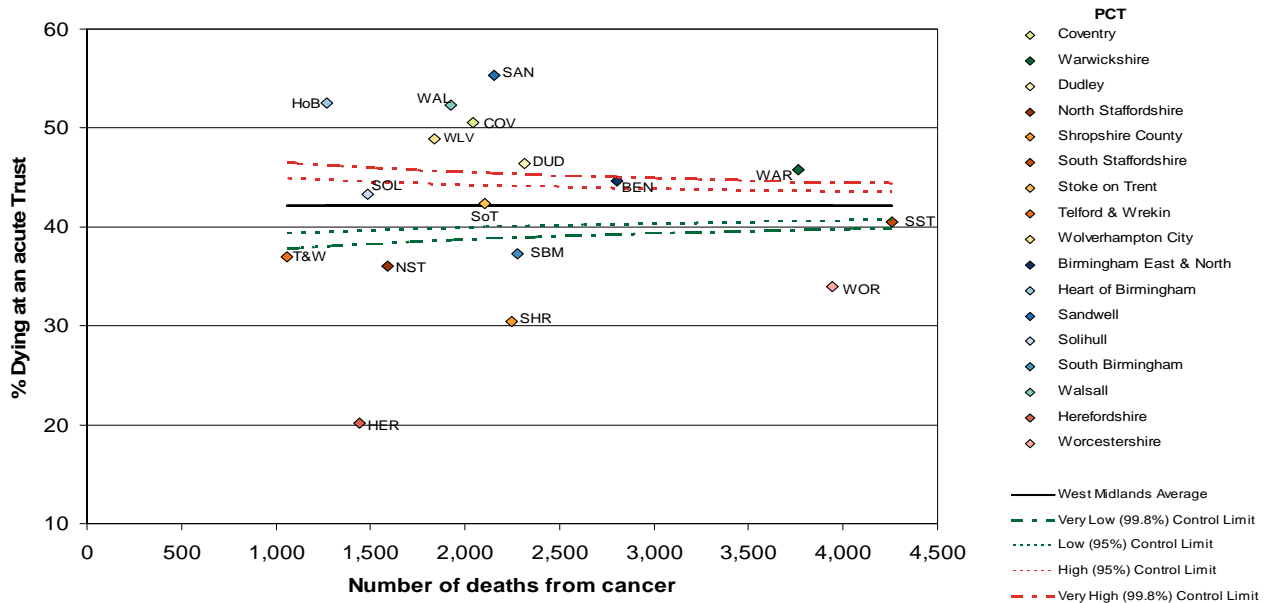
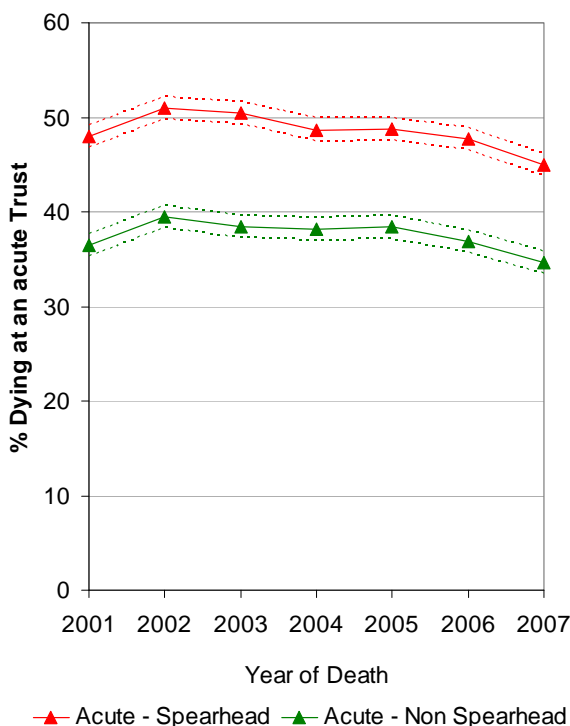


Figure 3.1.1 shows the proportion of deaths occurring in acute Trusts for each PCT in the West Midlands. The observed pattern cannot be explained by random variation - the majority of PCTs lie outside the control limits, showing a significant difference from the West Midlands average.

Figure 3.1.2: Deaths due to all cancers in acute Trusts in Spearhead and non-Spearhead PCTs



The highest proportions of deaths occur in the more deprived areas of the West Midlands including Sandwell PCT, Heart of Birmingham PCT and Walsall PCT. Conversely, the lowest proportions of acute Trust deaths occur in more affluent areas, including Herefordshire PCT, Shropshire County PCT and Worcestershire PCT.

Figure 3.1.2 shows the difference in the percentage of patients dying in acute Trusts between Spearhead PCTs and non-Spearhead PCTs. Significantly higher proportions of deaths occur in acute Trusts in Spearhead PCTs compared to non-Spearhead PCTs. The proportion of deaths in acute Trusts has fallen since 2001 in both Spearhead and non-Spearhead PCTs. Although the proportions are falling in both groups, there is no evidence of the gap between groups closing.

Figure 3.1.3: Logistical regression analysis of deaths in an acute Trust due to all cancers, 2005-2007, persons

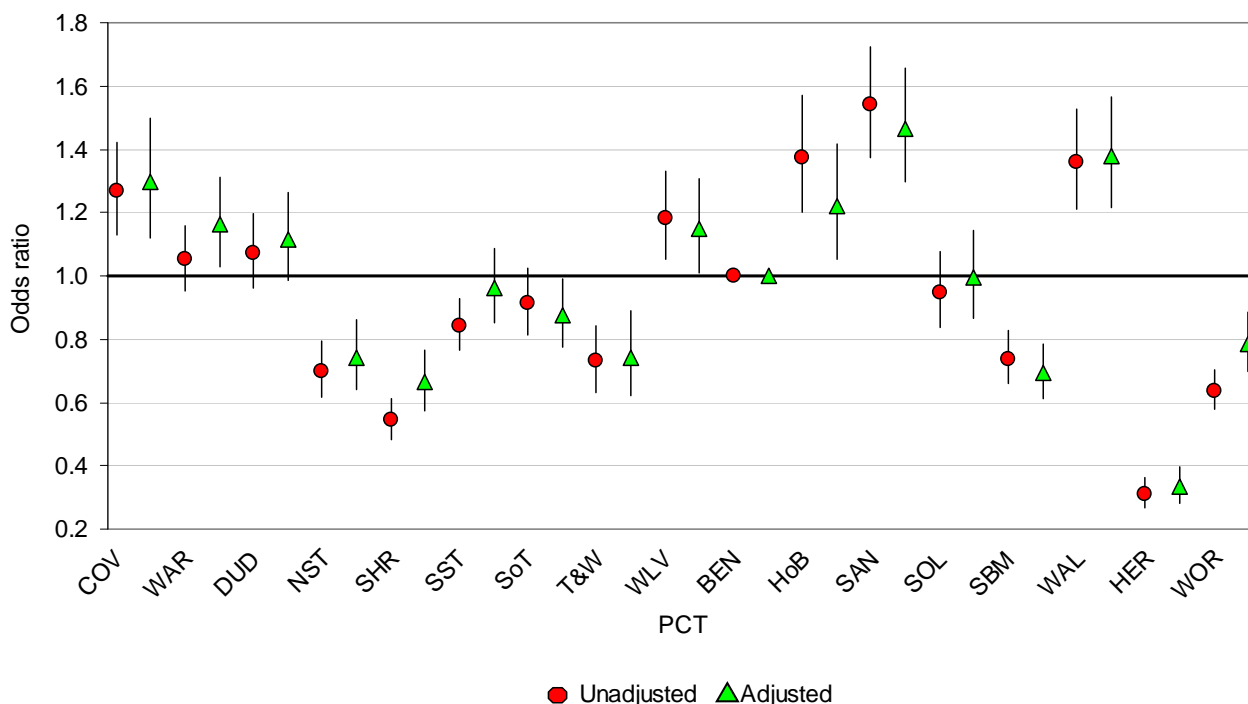


Figure 3.1.4: Map showing resident address of patients dying in acute Trusts

Figure 3.1.3 shows the likelihood of dying in an acute Trust by PCT compared to Birmingham East & North PCT. The red circles show the unadjusted risk, and the green triangles show the risk adjusted for key confounders such as age, sex, cancer site, deprivation, and distance from services.

Adjusting for these confounding factors closes the gap slightly for some PCTs such as Worcestershire PCT and Heart of Birmingham tPCT, but does not make a statistically significant difference for any PCT. The variation in the likelihood of dying in an acute Trust across the West Midlands cannot be fully explained by these variables.

Figure 3.1.4 shows the resident address of patients who died in acute Trusts in the West Midlands. In general, patients die in the acute Trust which is nearest to their home. Large specialist cancer centres such as the University Hospitals Birmingham NHS Foundation Trust and the University Hospitals Coventry and Warwickshire NHS Trust have a larger catchment area.

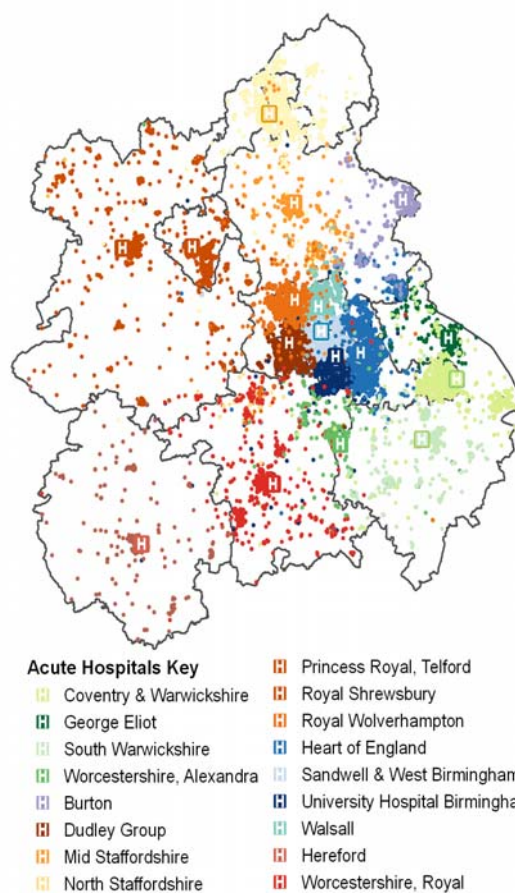


Figure 3.1.5: Cancer deaths in West Midlands Trusts by residents of West Midlands PCTs during 2005-2007, persons

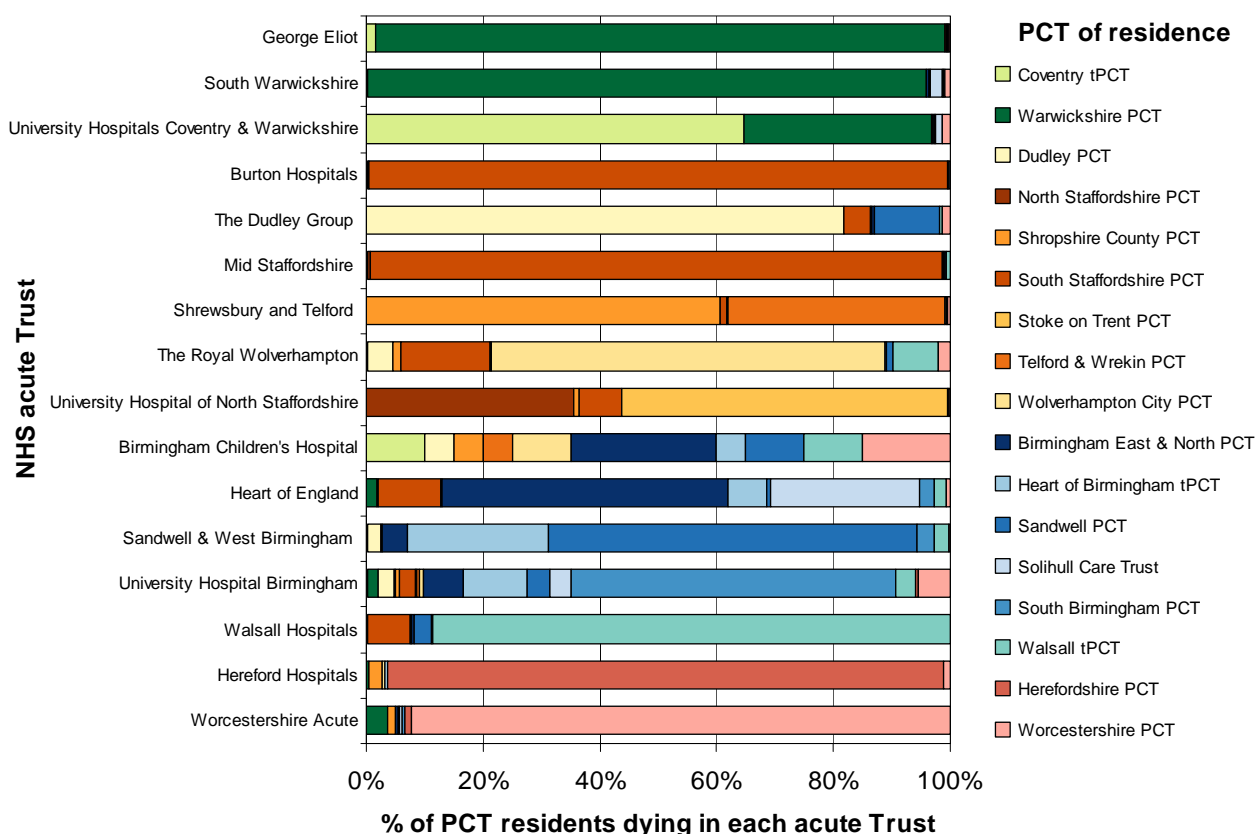


Figure 3.1.5 shows the PCT of residence of patients dying in each acute Trust for deaths occurring between 2005-2007. As expected, the majority of patients die in a Trust located within their PCT. This is most clearly seen in rural settings – nearly all West Midlands patients dying at the Hereford Hospitals NHS Trust were resident in Herefordshire PCT, the majority of patients dying at the Mid Staffordshire NHS Foundation Trust and the Burton Hospitals NHS foundation Trust were resident in South Staffordshire PCT and the majority of patients dying at the South Warwickshire NHS Foundation Trust were resident in Warwickshire PCT.

This pattern is less clear in the urban Trusts in Birmingham. Sandwell & West Birmingham Hospitals NHS Trust has hospital sites in two PCTs, and so provides end of life care for patients from both Heart of Birmingham tPCT and Sandwell PCT. A similar pattern is observed for Heart of England NHS Foundation Trust, which treats patients from Birmingham East & North PCT, Solihull Care Trust, and Heart of Birmingham PCT.

The University Hospitals Birmingham NHS Foundation Trust is a large cancer centre with a wide catchment area. Patients from all 17 PCTs in the West Midlands were recorded as dying in the University Hospitals Birmingham NHS Foundation Trust. The Birmingham Children's Hospital NHS Trust had the fewest cancer deaths of all the Trusts (n=20). Like University Hospitals Birmingham, the Children's hospital saw a diverse referral pattern from PCTs across the West Midlands. This is a reflection not only of the small number of cases, but also their status as one of the leading paediatric care centres in England.

3.2 Dying in a Hospice - Variation Between PCTs

There are wide variations between West Midlands PCTs in the likelihood of dying in a hospice. These cannot be fully explained by confounding factors such as age, sex and deprivation. Herefordshire PCT has the greatest percentage of patients dying in a hospice, and Sandwell PCT has the lowest. The gap between Spearhead and non-Spearhead PCTs appears to be widening.

Figure 3.2.1: All deaths due to all cancers dying in a hospice between 2005-2007, persons

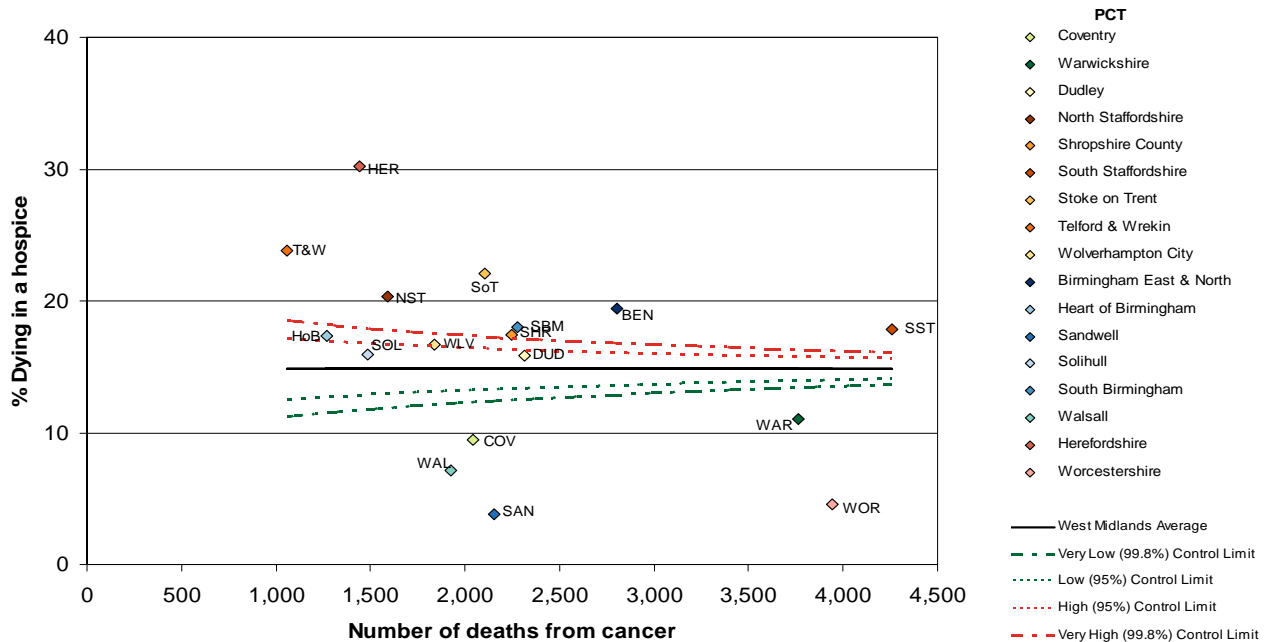
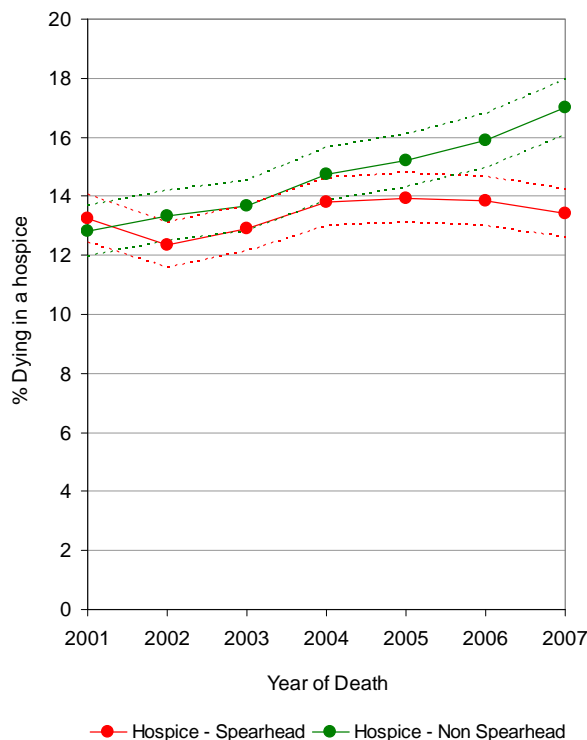


Figure 3.2.1 shows the proportion of deaths occurring in hospices for each PCT in the West Midlands. The observed pattern cannot be explained by random variation - the majority of PCTs lie outside the control limits, showing a significant difference from the West Midlands average.

Figure 3.2.2: Deaths due to all cancers in hospices Spearhead and non-Spearhead PCTs



The highest proportion of hospice deaths was recorded in Herefordshire PCT, and the lowest occurred in Sandwell PCT. Although there are links between affluence and deaths in hospice (see Section 2.8), some of the PCTs with a significantly high proportion of deaths in hospice are not traditionally affluent PCTs, including Stoke on Trent, Telford & Wrekin and North Staffordshire. Coventry, Warwickshire, Sandwell, Walsall and Worcestershire PCTs all experience a significantly low proportion of deaths in hospices.

Figure 3.2.2 shows the changing trend in hospice deaths in Spearhead and non-Spearhead PCTs. Since 2006, there have been a significantly lower proportion of hospice deaths in Spearhead PCTs, and the gap appears to be widening.

Figure 3.2.3: Logistical regression analysis of deaths in hospices due to all cancers, 2005-2007, persons

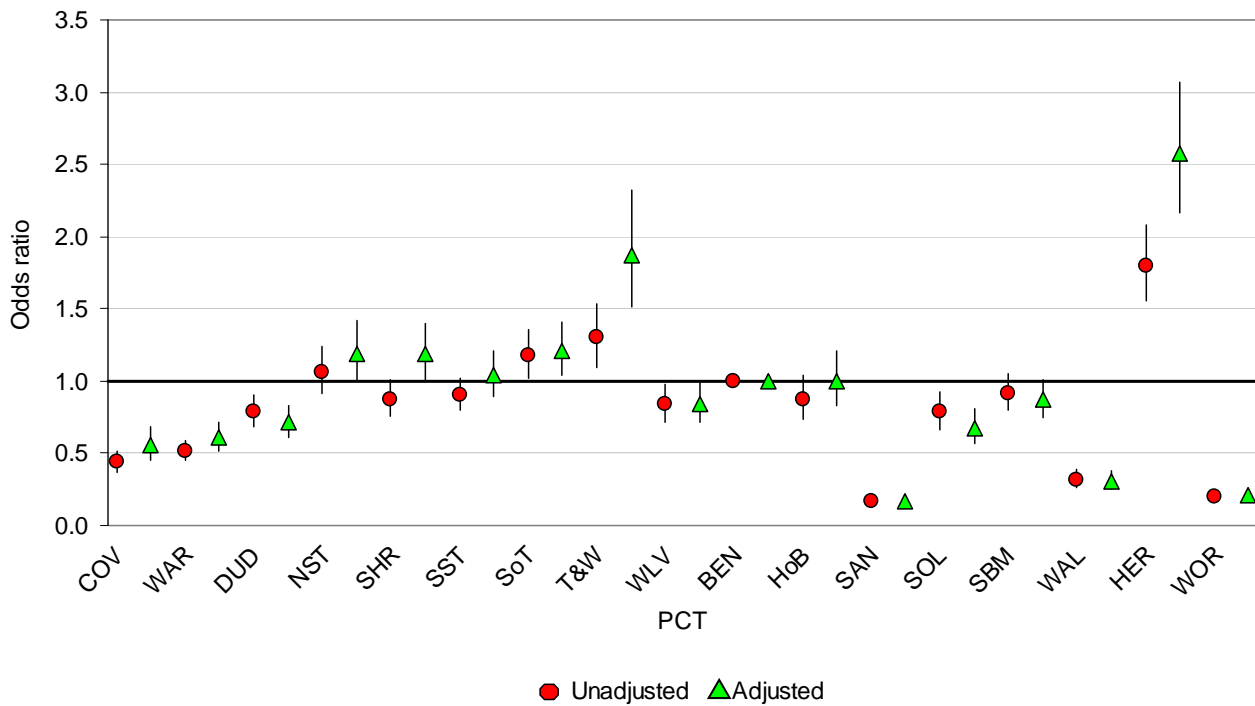


Figure 3.2.4: Map showing resident address of patients dying in a hospice

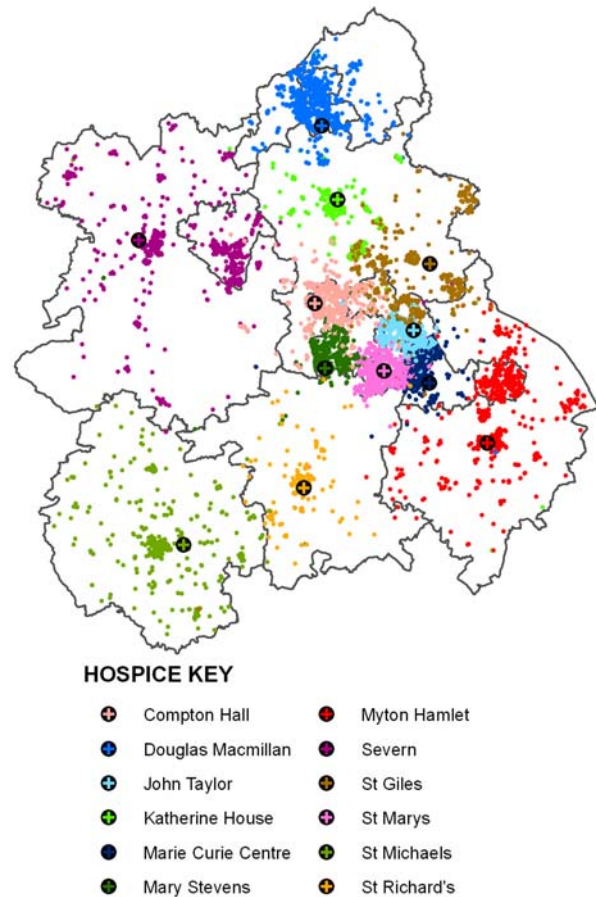


Figure 3.2.3 shows the likelihood of dying in a hospice by PCT compared to Birmingham East & North PCT. The red circles show the unadjusted risk, and the green triangles show the risk adjusted for key confounders such as age, sex, cancer site, deprivation, and distance from services.

Adjusting for these confounding factors closes the gap slightly for some PCTs such as Coventry tPCT and Warwickshire PCT, but significantly *widens* the gap for Telford & Wrekin PCT and Herefordshire PCT. Distance to a hospice is great for residents of rural Herefordshire, and yet they are significantly more likely to die in a hospice. The variation in the likelihood of dying in a hospice across the West Midlands is not explained by these confounding factors.

Figure 3.2.4 shows the resident address of patients who died in hospices in the West Midlands. In general, patients die in the hospice which is nearest to their home. There are fewer hospices than acute Trusts in the West Midlands, and their catchment areas are correspondingly larger. Patients in Herefordshire and Shropshire live a large distance from the hospice where they die.

Figure 3.2.5: Cancer deaths in West Midlands hospices by residents of West Midlands PCTs during 2005-2007, persons

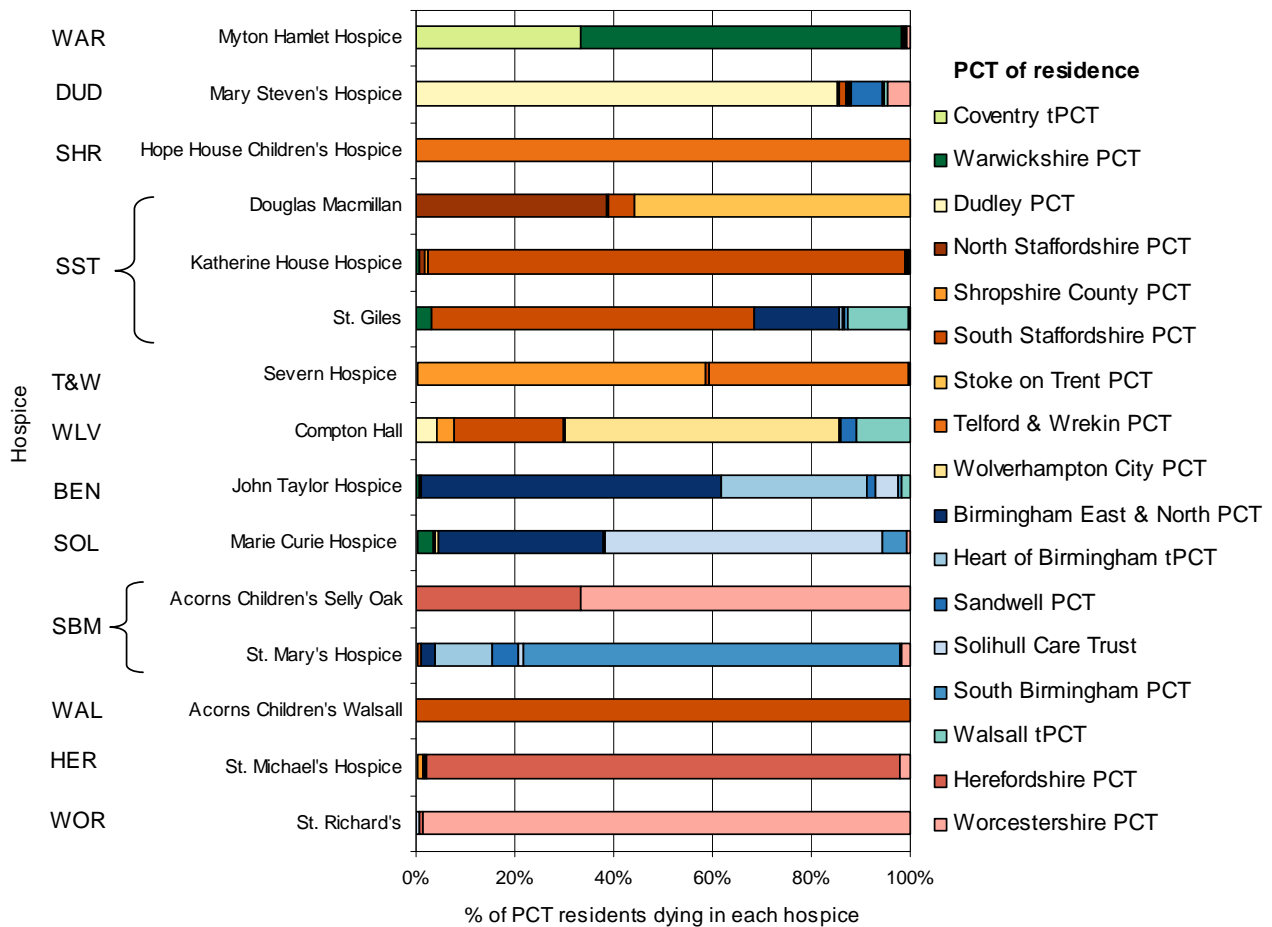


Figure 3.2.5 shows the PCT of residence of patients dying in each hospice for deaths occurring between 2005-2007. There are fewer hospices than acute Trusts in the West Midlands, and correspondingly each hospice serves a wider catchment area. Whereas many acute Trusts only provided end of life care for patients from one or two PCTs, the majority of hospices provided end of life care for the residents of three or more PCTs.

South Staffordshire PCT has an unusually diverse referral pattern, with deaths of residents of South Staffordshire PCT being recorded at 10 separate hospices. The map in Figure 3.2.4 shows how this PCT is served by many nearby hospices. In the case of specialist children's hospices, less than 5 cancer deaths were recorded in each children's hospice. This is likely to be a reflection of the relatively small number of cancers diagnosed in very young people. As seen in Section 2.4 high proportions of young cancer patients die at home.

3.3 Dying at home - variation between PCTs

There are variations in the likelihood of dying at home between West Midlands PCTs. These cannot be fully explained by confounding factors such as age, sex and deprivation. Worcestershire PCT has the greatest proportion of patients dying at home, and Heart of Birmingham tPCT the lowest.

Figure 3.3.1: All deaths due to all cancers dying at home between 2005-2007, persons

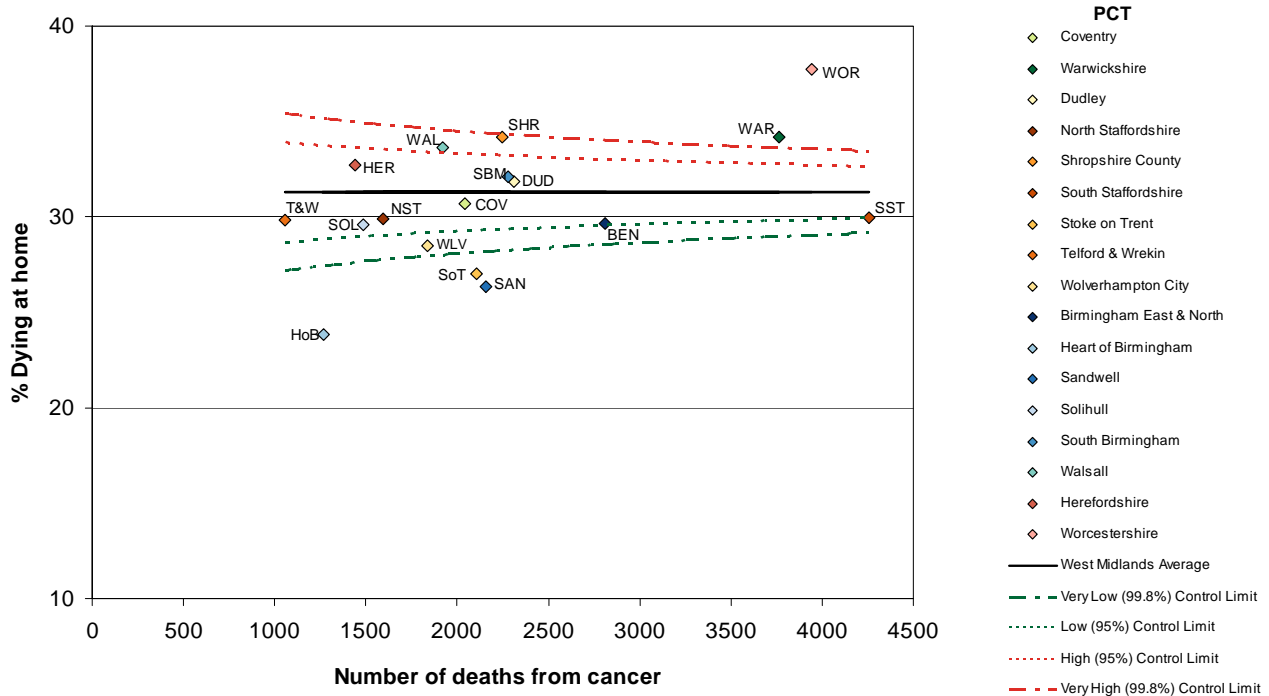
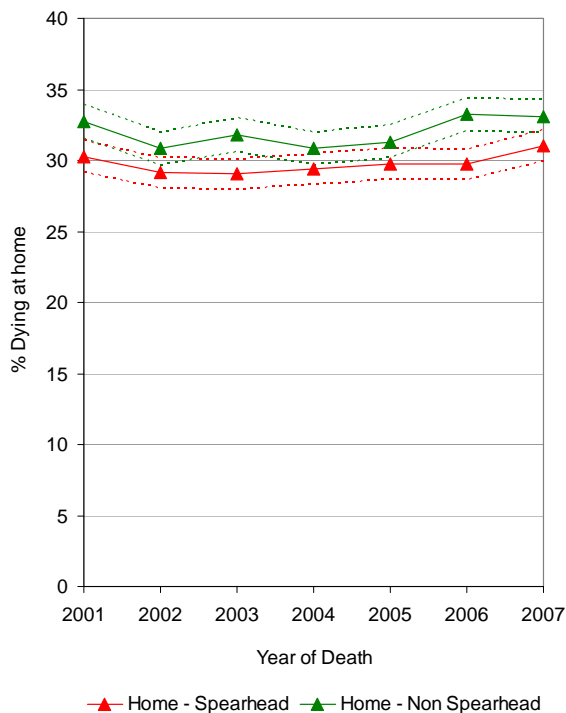


Figure 3.3.1 shows the proportion of deaths occurring at home for each PCT in the West Midlands. These variations are not as pronounced as they were in the previous sections on dying in a Trust or a hospice, with the majority of PCTs falling within the control limits.

Figure 3.3.2: Deaths due to all cancers at home Spearhead and non-Spearhead PCTs



Heart of Birmingham tPCT, Stoke on Trent PCT and Sandwell PCT had significantly lower proportions of home deaths. All three PCTs are characterised by high levels of deprivation. Worcestershire PCT and Warwickshire PCT had significantly higher proportions of home deaths. These PCTs could be viewed as predominantly affluent. However, the analysis in Section 2.8 found no clear trend in the likelihood of dying at home when deprivation was measured at the level of the postcode of the patient.

Figure 3.3.2 shows the trends in the proportion of home deaths in Spearhead and non-Spearhead PCTs. The difference between the groups is small and not significant, although the proportion of home deaths in Spearhead PCTs is lower than in non-Spearhead PCTs throughout the period.

Figure 3.3.3: Logistical regression analysis of deaths at home due to all cancers, 2005-2007, persons

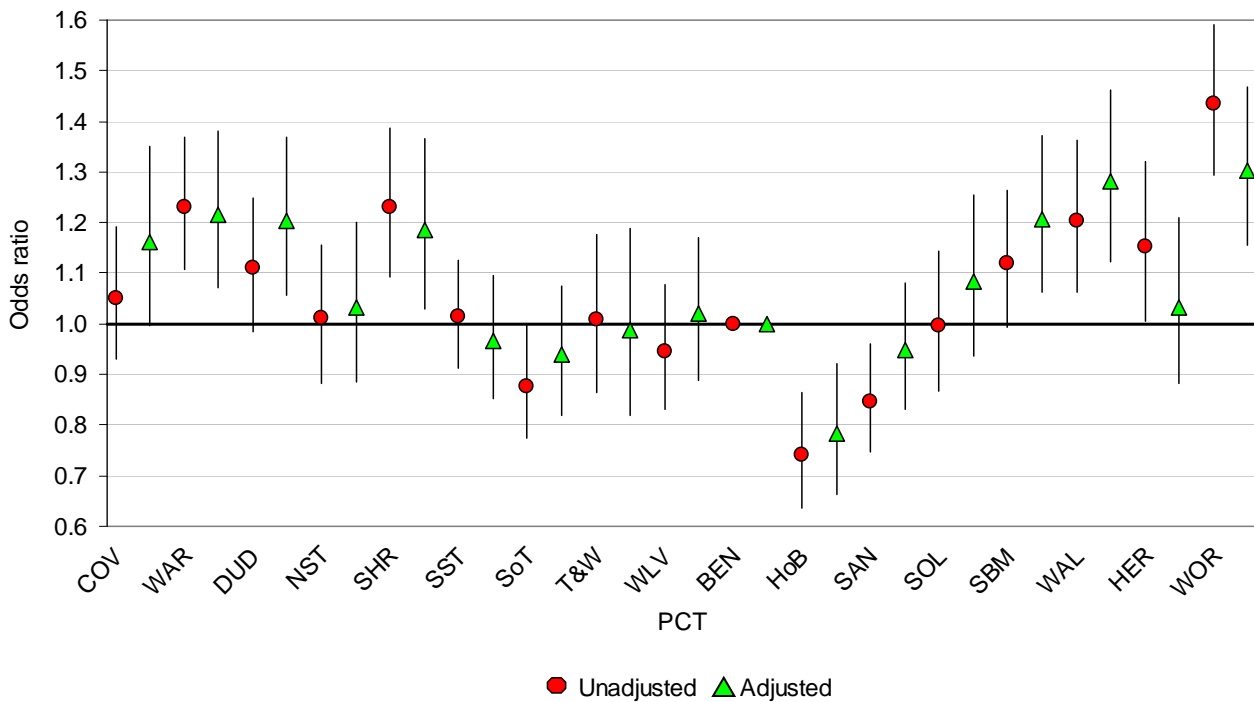


Figure 3.3.4: Variation in home cancer deaths in the West Midlands

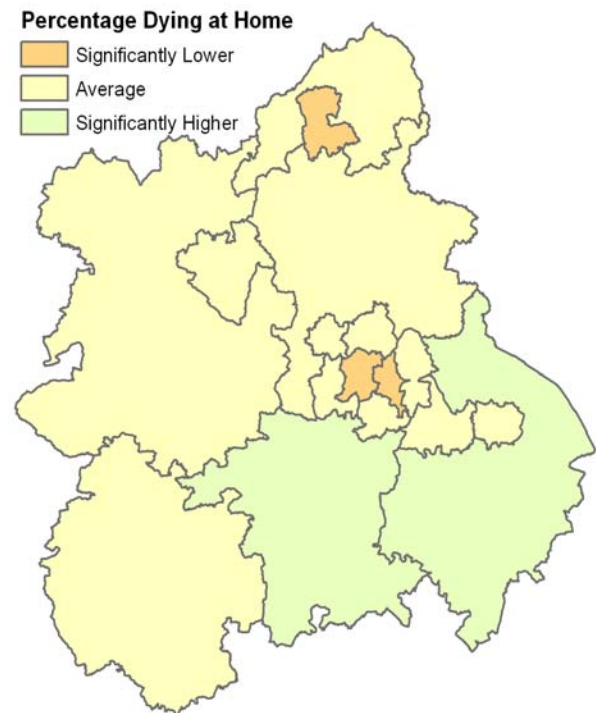


Figure 3.3.3 shows the likelihood of dying at home by PCT compared to Birmingham East & North PCT. The red circles show the unadjusted risk, and the green triangles show the risk adjusted for key confounders such as age, sex, cancer site, deprivation, and distance from services.

Adjusting for these confounding factors closes the gap slightly for some PCTs such as Worcestershire PCT, Shropshire PCT and Hereford PCT, but *widens* the gap for Coventry tPCT, Dudley PCT, South Birmingham PCT and Walsall PCT. The variation in the likelihood of dying at home across the West Midlands is not explained by these variables.

Figure 3.3.4 shows variation in the proportion of home deaths in the West Midlands. For the majority of the West Midlands there is no significant difference between the regional average and the PCT. However, the proportion of patients dying at home is greatest in the rural south-eastern PCTs and lowest in urban areas.

Appendix A

A.1 Providers of healthcare to cancer patients in the West Midlands

This report covers the deaths from all malignant invasive cancers (excluding non-melanoma skin cancer) of West Midlands residents. The West Midlands (WM) is coterminous with the Government Office for the West Midlands and the West Midlands Strategic Health Authority.

Figure A.1.1: English cancer registries, showing the area covered by the WMCIU



The West Midlands region contains a population of over 5 million people and covers over 5,000 square miles. The region is approximately one tenth of England, both in population and area. There are 2.65 million men and 2.73 million women resident in the West Midlands (3% more women than men).

The West Midlands contains:

- 17 Primary Care Trusts (PCTs)
- 19 NHS acute Trusts providing cancer treatment
- 15 Hospices providing overnight care and respite for cancer patients
- 3 cancer networks

A further 2 cancer networks are partially within the region.

Figure A.1.2: Location of cancer networks, PCTs and acute hospital Trusts providing care in the West Midlands Region



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Figure A.1.2 shows the location of cancer networks in the West Midlands. There are 5 cancer networks wholly or partially contained in the West Midlands. Three of the cancer networks (Arden, Greater Midlands and Pan Birmingham) are entirely within the West Midlands. Around half of the 3 Counties Cancer Network is within the region, but 56% of its population is in the region covered by the South West Cancer Registry. The East Midlands Cancer Network is divided into three sub-networks. East Midlands Derby-Burton is the only sub-network with any residents (3% of the network total) within the West Midlands.

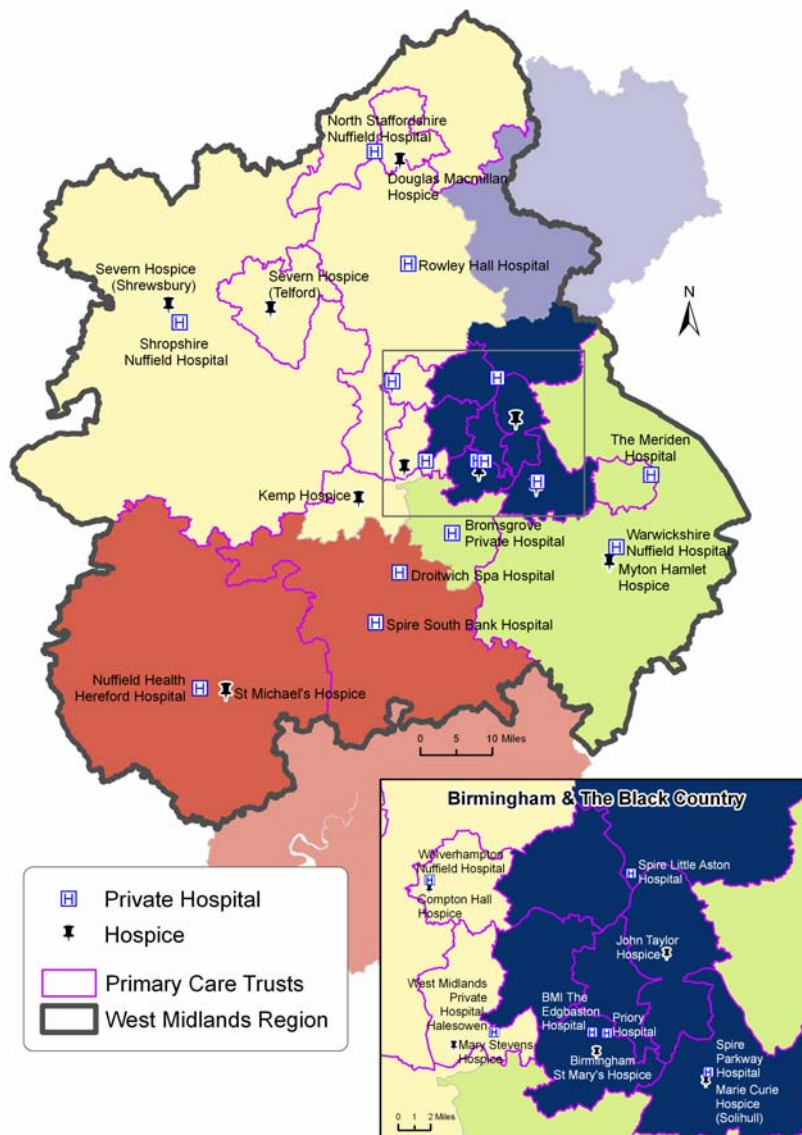
A.2 NHS acute Trust providers of cancer services to West Midlands residents

Figure A.1.2 shows the location of the 19 NHS acute hospital Trusts in the West Midlands which provide cancer services. There are 3 NHS acute Trusts in the Arden Cancer Network, 6 in the Greater Midlands Cancer Network, 7 in the Pan Birmingham Cancer Network, 1 in the 3 Counties Cancer Network, and 1 in the East Midlands Cancer Network. One acute Trust is split between three networks; the Worcestershire Acute Hospitals NHS Trust has hospitals in the Arden Cancer Network (Alexandra Hospital), the Greater Midlands Cancer Network (Kidderminster Hospital) and the 3 Counties Cancer Network (Worcestershire Royal Hospital).

A.3 Non-NHS providers of cancer services to West Midlands residents

Figure A.3.1 shows the location of the 15 overnight hospices and assorted private hospitals in the West Midlands which provide cancer services, including palliative end of life care. Not all PCTs have hospice care provision which means residents must seek care outside of their PCT. South Staffordshire PCT and Worcestershire PCT both have 3 hospices, while other PCTs with hospices only have 1 each.

Figure A.3.1: Location of non-NHS cancer care providers within the West Midlands



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Appendix B

B.1 Data Collection and Methodology

Data were extracted from the West Midlands Cancer Intelligence Unit, March 2010 iteration. Cancer mortality data were collected for the period 2005-2007, this being the most up-to-date and complete data at the point of extraction. A three year period was chosen in order to give added power to the analysis.

The WMCIU receives reliable information on place of death which can be grouped into the following places: Home, acute Trust, hospice, nursing home, community Trusts, and private hospitals. A small number of West Midlands residents die outside the region, while some residents have an incomplete place of death. The majority of this report focuses on the first three places of death since these account for the majority of all places of death for cancer patients.

Analysis of cause of death in this report focuses only on the 'underlying cause of death', i.e. all deaths due to cancer. Where a patient has been diagnosed with two cancers, only the cancer that caused death is included in this report.

Further information was obtained for each cancer death including, cancer site, diagnosis dates, death dates, PCT of residence, deprivation and gender. Cancer sites were grouped into the WMCIU's internal classification system appended in Appendix C. Survival times were calculated from diagnosis and death dates.

Binominal multivariate logistic regression analysis was conducted on the data to calculate odds ratios of dying in a certain place of death and was conducted in Stata v11.1 using the xi: logit command. Binominal regression is used when the dependant variable (in this analysis place of death) is dichotomous. In order to adjust for confounding factors, the following categories were entered into the analysis as independent un-ordered categorical variables; gender, age group, cancer site, deprivation, ethnicity, survival time, distance to nearest hospice, and distance to nearest acute hospital. These variables were used in all adjusted analyses.

Ethnicity was derived by linkage of cancer registry cases to the Hospital Episodes Statistics database, though an ethnicity was not derived for 21% of cases.

The deprivation index used in the analysis was the Income Domain of the Indices of Multiple Deprivation, 2004. The income domain is a measure that looks at population level statistics, this means that the deprivation experienced by an individual is not directly measured – the deprivation score of the area where the individual lives is assumed to be characteristic of the deprivation experienced by all individuals living there.

All maps in this report are based on Ordnance Survey mapping products Crown Copyright 2011. All rights Reserved. OS Licence No. 100020290. Prepared by West Midlands Cancer Intelligence Unit (2011) on behalf of Department of Health.

Diagnosis postcodes were used to calculate distance to nearest hospice/acute Hospital using a dataset based upon the Ordnance Survey Integrated Transport Network (OS ITN). The OS ITN Layer is the most detailed and accurate OS road dataset and is stored as a geodatabase which includes additional survey information. Geographic Information Systems software (ArcGIS and its Network Analyst extension) are used to determine the actual road distance between each origin and destination across the road network based on a hierarchy of roads from motorway, primary routes, A roads, B roads to minor roads.

This analysis looks at the proportions of cancer deaths based on the distance to the nearest residential hospice. Hospices providing day care only were excluded. No patients died in a day care only hospice in the time period analysed.

Appendix C

C.1 Cancer site groupings

Table C.1: Cancer site groupings used in this report

Cancer site grouping	ICD-10	Cancer site
Head & Neck	C00	Lip
	C01	Base of tongue
	C02-C14	Oral cavity and pharynx
	C30	Nasal cavity and middle ear
	C31	Accessory sinuses
	C32	Larynx
	C73	Thyroid gland
Upper Gastro-intestinal (Upper GI)	C15	Oesophagus
	C16	Stomach
Bowel	C17	Small intestine
	C18	Colon
	C19	Rectosigmoid junction
	C20	Rectum
	C21	Anus and anal canal
	C26	Other and ill-defined digestive organs
	C22	Liver and intrahepatic bile ducts
Hepatobiliary & Pancreas (HPB)	C23	Gallbladder
	C24	Other and unspecified parts of biliary tract
	C25	Pancreas
	C33	Trachea
Lung	C34	Bronchus and lung
	C39	Other and ill-defined sites in the respiratory system and intrathoracic organs
	C45	Mesothelioma
	C40	Bone and articular cartilage of limbs
Sarcomas	C41	Bone and articular cartilage of other and unspecified sites
	C46	Kaposi's sarcoma
	C48	Retroperitoneum and peritoneum
	C49	Other connective and soft tissue
	C43	Malignant melanoma of skin
Melanoma skin	C43	Malignant melanoma of skin
Breast - invasive	C50	Breast
Gynaecological	C51	Vulva
	C52	Vagina
	C53	Cervix uteri
	C54	Corpus uteri
	C55	Uterus, part unspecified
	C56	Ovary
	C57	Other and unspecified female genital organs
	C58	Placenta
Male genitalia	C60	Penis
	C62	Testis
	C63	Other and unspecified male genital organs
Urological	C64	Kidney
	C65	Renal pelvis
	C66	Ureter
	C67	Bladder
	C68	Other and unspecified urinary organs
Prostate	C61	Prostate
Brain & Central Nervous System (CNS)	C47	Peripheral nerves and autonomic nervous system
	C69	Eye and adnexa
	C70	Meninges
	C71	Brain
	C72	Spinal cord, cranial nerves and other parts of central nervous system
Haematological	C81-C85	Lymphoma
	C88	Immunoproliferative disease
	C90-C95	Myeloma & leukaemia
	C96	Other and unspecified lymphoid and haematopoietic tissues
Other	C74-C75	Adrenal and other endocrine glands
	C76-C80	Ill-defined, secondary and unspecified sites
	C37	Thymus
	C38	Heart, mediastinum and pleura
	C97	Independent (primary) multiple sites