Poor housing, deprivation and the prevalence of asthma in residents of all ages in Portsmouth

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Abstract

Introduction: There is a strong body of evidence on the many ways that non-decent housing adversely impacts the health of residents. Portsmouth has a high level of deprivation and there is evidence to suggest that those who are financially vulnerable are more likely to be exposed to inadequate housing conditions. There is currently no available literature that has investigated the association between poor housing, deprivation and health in Portsmouth.

Aim: Explore the association between income, poor housing and the prevalence of asthma in residents of all ages in Portsmouth.

Study design: Cross sectional analysis of secondary data.

Methodology: Secondary data was gathered for the diagnosis of asthma - all ages, average income per household and housing tenure per ward/Clinical Commissioning Group (CCG). Due to the distribution of GP practice groups and boundaries of CCG's, 6 GP practice groups and 4 Wessex CCG's were excluded from this study. Correlational analysis was used to explore the association between income, the prevalence of asthma and housing tenure.

Results: No significant relationship was observed between asthma and income (*r= +.19, p = n.s),* owner occupied housing (*r = +.26, p = n.s),* local authority housing (r = - .06, p = n.s) and housing association homes (*r= -.11, p = n.s).*

A moderate negative relationship was observed between asthma, 'other' housing *(r=-.47, p = n.s)* and privately rented housing *(r= - .40, p = n.s*). However, these results are not statistically significant.

Results at Wessex CCG level also found no association between deprivation, poor housing and the prevalence of asthma among residents.

Conclusion: No significant association was observed between deprivation, poor housing and the prevalence of asthma in residents of all ages in Portsmouth.

Due to high levels of data loss at both ward and CCG levels, results in this study should be viewed with caution. Further research using regional data is recommended, in order to explore any associations between poor housing and ill health among vulnerable population groups such as children and those aged 65+ years.

Contents

Abbreviations

BRE – Building Research Establishment

CCG – Clinical Commissioning Group

DCLG - Department of Communities and Local Government

EHS – English Housing Survey

GP – General Practice

HHSRS – Housing Health and Safety Rating System

IMD - Indices of Deprivation

LA – Local authority

NeSS – Neighbourhood Statistics

NHS – National Health Service

NICE – National Institute for Health and Care Excellence

ONS – Office for National Statistics

PHE – Public Health England

POST - Parliamentary Office for Science and Technology

QOF - Quality and Outcome Framework

WHO – World Health Organisation

Figures and tables summary

1 Introduction

There is a substantial body of evidence on the many ways that non-decent housing adversely impacts the health of residents (e.g. Braubach, Jacobs & Ormandy, 2011 & Prevalin, Taylor & Todd, 2008) [see appendix A].

Evidence from the English Housing Survey (EHS) found that around 3 in 10 people are living in bad housing: 3.6 million children, 9.2 million working age adults and 2 million pensioners (Barnes et al., 2013, p.1). Improving housing standards would be of huge economic benefit as the Building Research Establishment (BRE) estimates that avoidable disease and injuries caused by non-decent housing costs the National Health Service (NHS) at least £1.6 billion a year (Nicol, Roys & Garrett, 2015, p.6).

Healthwatch Portsmouth - an organisation that helps to influence local services based on the evidence that they gather (Healthwatch, 2016), identified poor housing and its impact on health as a topic that requires further investigation in Portsmouth.

1.2 Poor housing and health – A European perspective

In a study of 45 countries in the European region, the World Health Organisation (WHO) identified housing hazards and paired them with an associated health outcome [see appendix B]. The results from this report identified a strong association between the prevalence of asthma in children and damp/mouldy households (Braubach, Jacobs & Ormandy, 2011, p.5). WHO estimates that inadequate housing accounts for over 100,000 deaths per year in the European region (WHO, 2012).

1.3 What is a decent home?

According to the Housing Health and Safety Rating System (HHSRS) a home is assessed as being decent if it meets all of the following criteria: is free from category 1 hazards (Fig 1), is in a reasonable state of repair, has reasonably modern facilities and provides a reasonable degree of thermal comfort (Parliamentary Office of Science and Technology (POST), 2011, p.2).

Fig 1. HHSRS Category 1 hazards

This is a tool used to grade the danger from 29 housing hazards based on the likelihood of harm and probable consequences. It uses hazard scores to allow long-term exposure risks to be compared with hazards with potential immediate consequences. Each hazard score is allocated to a hazard category of which Category 1 is the most serious.

Physiological hazards	Accident hazards
Damp or mould	Falls associated with bathrooms
Excessive cold	Falls on the level
Excessive heat	Falls associated with stairs and steps
Asbestos and MMF	Falls between levels
Biocides	Poor electrical wiring
Carbon monoxide and fuel combustion products	Fire risks
	Hot surfaces and materials
Lead	Collision and entrapment risks
Radiation (e.g. radon)	Explosion risk
Uncombusted fuel gas	Poor position and operability of amenities
Volatile organic compounds	Risk of structural collapse and falling elements
Psychological hazards	**Infection hazards**
Overcrowding	Poor domestic hygiene and/or pests
Entry by intruders	Poor facilities for food safety
Poor lighting	Poor sanitation and drainage
Excess noise	Poor water supply for domestic purposes

(Source: POST, 2011, p.3)

1.4 Funding for decent homes – equal rights for all?

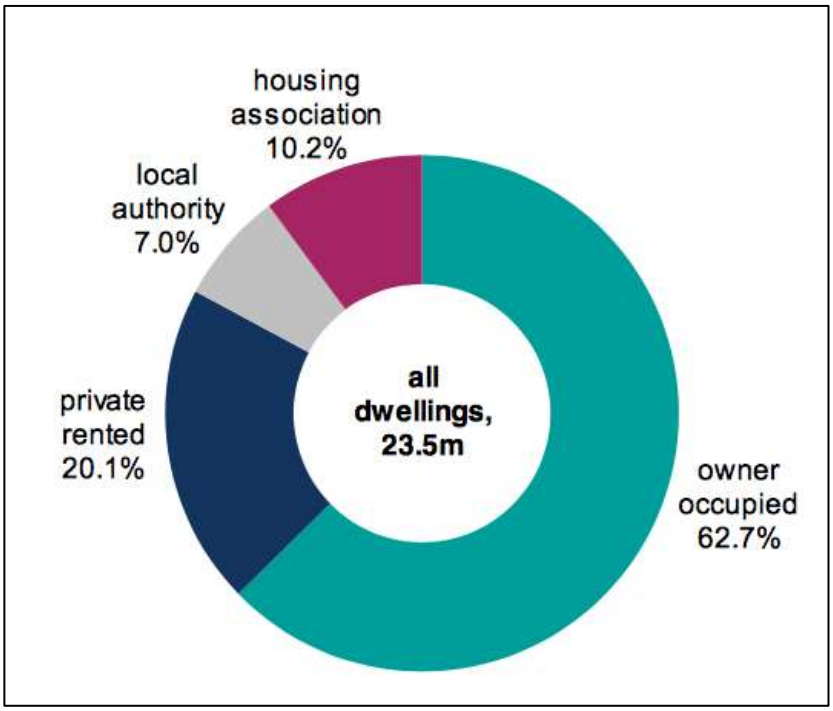
The Decent Homes Standard was introduced in 2000 and is led and funded by the Department of Communities and Local Government (DCLG). The programme is designed to bring all council and housing association homes up to a minimum standard. (POST, 2011, p.2). The target to improve social housing remains at 100%

and in 2010 the total funding to this sector was £38 billion. At the beginning of April 2011, there were 217,000 council houses that didn't meet this standard. To help local councils the government provided £1.7 billion to the Decent Homes programme for the period 2011 to 2016 (DCLG, 2015a).

Private sector homes account for approximately 83% of all households in England (Fig 2). In 2002 the Decent Homes standard was extended to include the private sector with the focus on reducing the proportion of financially vulnerable people living in non-decent homes (DCLG, 2006, p. 23).

In 2010 funding for the private sector was £2 billion, however, the Building Research Establishment estimates that it would cost £17.6 billion to achieve 100% decency in this sector. The target to improve homes in the private sector was downgraded to an optional local target in 2007 and there is now no central target for improving these homes (POST, 2011, p.4).

Fig 2. Housing tenure in England



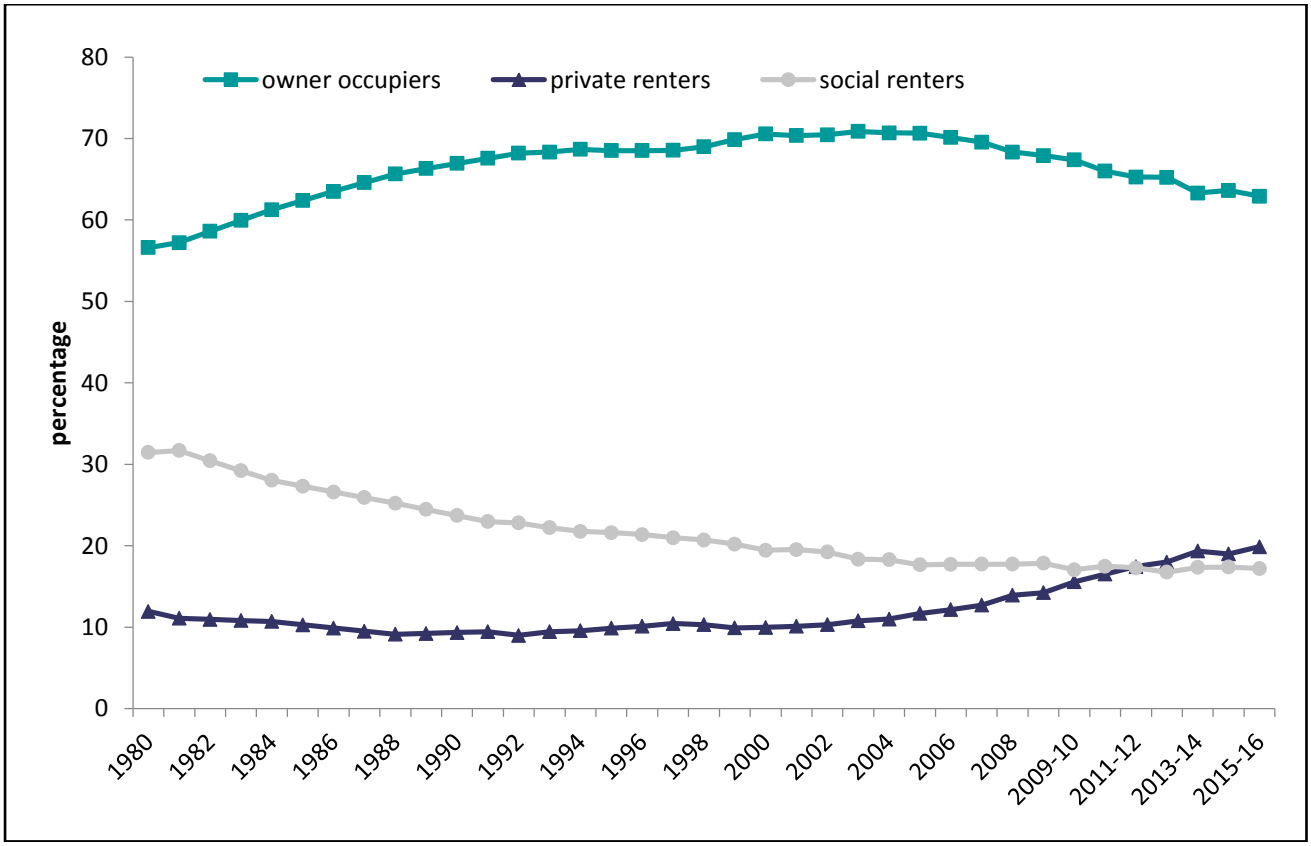
(Source: DCLG, 2016, p. 24)

1.5 Who is most at risk?

Housing is used by the whole population, but certain groups such as young children, the unemployed, the disabled and the elderly, make greater use of it than others. The exposure to inadequate housing conditions will be greater for these groups than for the rest of the population (Braubach, Jacobs, & Ormandy, 2011, p.1)

The proportion of households renting in the private sector has increased dramatically in recent years (fig 3). The high cost of buying a home and a shortage of social housing means that many financially vulnerable families have no choice but to rent privately (Gousy, 2014, p.4). As a result, the number of households renting privately has overtaken the number living in social rented properties for the first time since records began (Shelter, 2013).

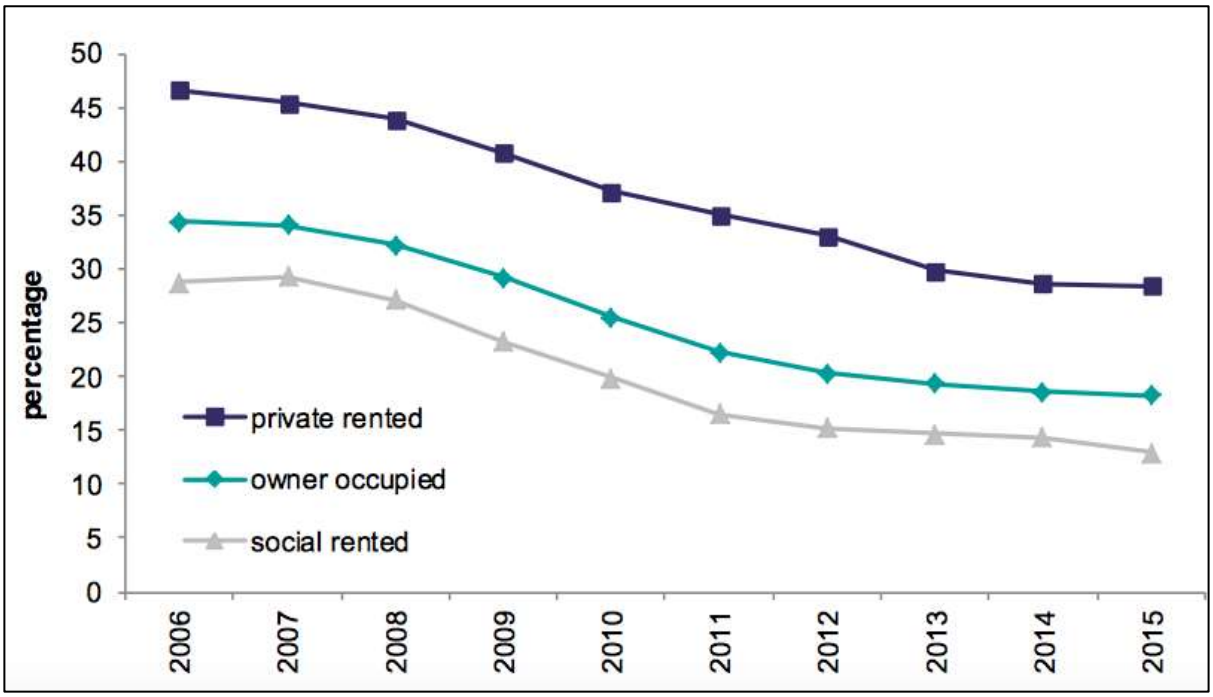
Fig 3. Trends in tenure in percent 1980 – 2015/16



(Source: DCLG, 2016, p.6)

The private rented sector contains the highest proportion of non-decent homes (Fig 4). The most common reason why these properties fail the Decent Homes Standard is that they do not meet the minimum requirements set out by the HHSRS. (Gousy, 2014, p,8). Despite high levels of poor conditions in this sector, the numbers of private renters reporting problems remain relatively low with as little as 8% having complained to their local council (Gousy, 2014, p.13).

Fig 4. Houses failing the Decent Homes Standard, by tenure, in percent 2006-2015



(Source: DCLG, 2016, p.30)

1.6 Healthy homes – just what the doctor ordered.

Healthy housing is now recognised as a multi-sectorial responsibility and new directives for the NHS relating to housing are beginning to emerge. National institute for Health and Care Excellence (NICE) guidance on 'Excess winter deaths and morbidity and the health risks associated with cold homes' recommends a collaborative approach between housing and healthcare teams in order to identify and support those most at risk from living in cold homes (Merron et al., 2015).

Clinical Commissioning Groups (CCG's) are also beginning to tackle the issue of

inadequate housing. In partnership with housing firm Gentoo, a pilot project funded by Sunderland CCG allowed General Practitioners (GP's) to prescribe boilers, double glazing and loft installation to patients with respiratory diseases. Gentoo reported that participants GP appointments fell by 60% (Gentoo, 2016).

1.7 Asthma

Asthma is a chronic respiratory condition associated with airway inflammation, hyper sensitivity, obstruction and mucus hyper-production (Tortora & Derrickson, 2009, p.913). The disease is very diverse with variations in severity and response to treatment (NICE, 2016a).

1.7.1 Symptoms

Symptoms include coughing, wheezing, chest tightness and shortness of breath, Symptoms can be triggered by factors including exercise, allergen or irritant exposure, cold weather and viral respiratory infections (Tortora & Derrickson, 2009, p.913).

1.7.2 Prevalence

Asthma affects more than 300 million people worldwide. In the United Kingdom (UK) 5.4 million people are receiving treatment for asthma, including 1.1 million children (1 in every 11) and 4.3 million adults (1 in every 12). Asthma accounts for 2-3% of primary care consultations at a cost of £52 million each year and the UK continues to have one of the highest rates of asthma in Europe (NICE, 2016b).

1.8 Portsmouth - area profile

Portsmouth is a waterfront city located on the south coast of England. The population density of the city is 5,141 persons per square kilometre making Portsmouth the most densely populated local authority in the UK (Portsmouth CCG, 2014, p.6).

1.8.1 Demographics

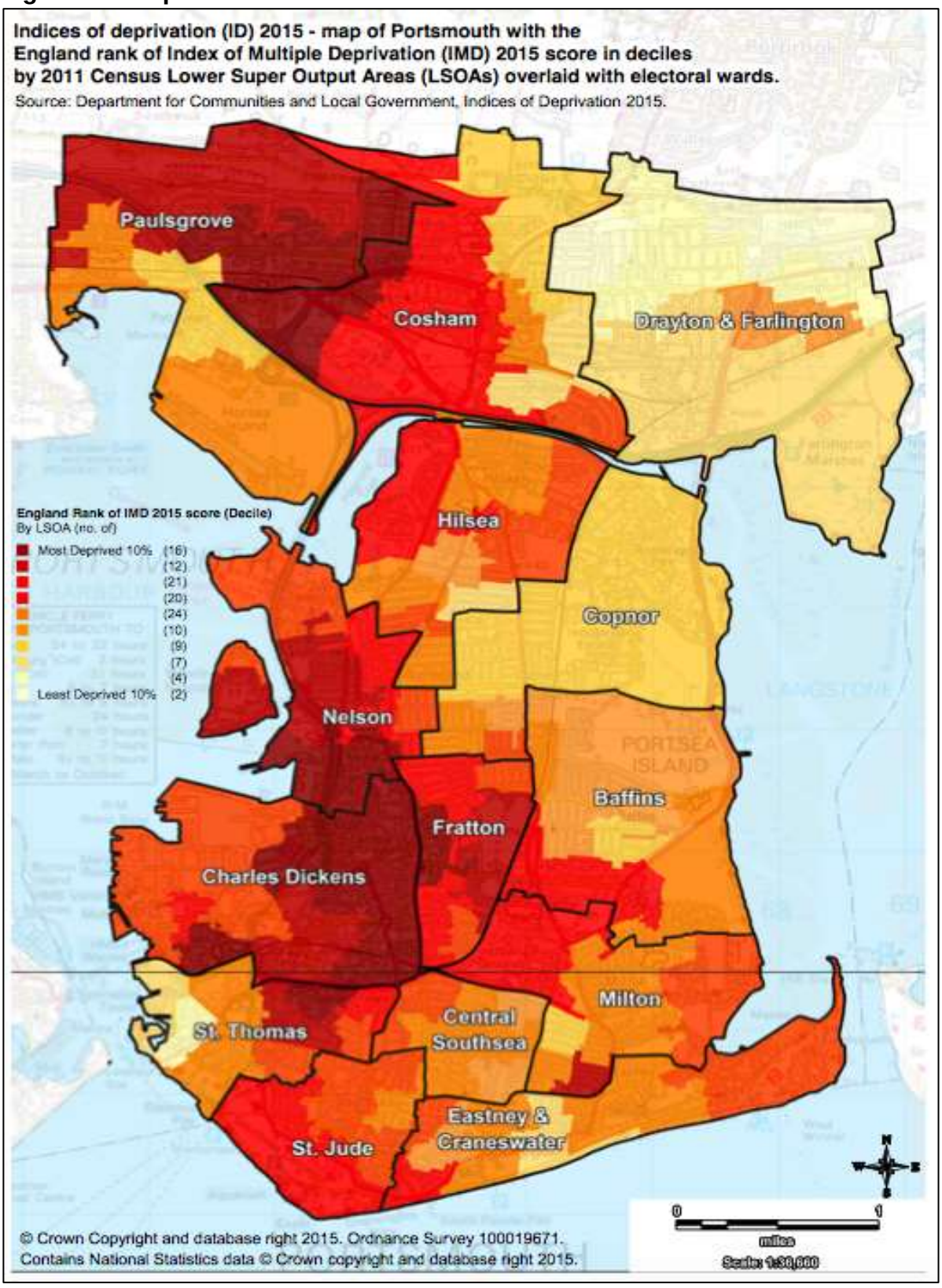
The city is predominately 'White British' in terms of ethnicity with 84% of the population belonging to this group. Portsmouth has nearly twice as many young people in their early 20s as the England average, this is primarily due to the large student population in the city (Portsmouth CCG, 2014, p.6).

1.8.2 Deprivation

The Index of Multiple Deprivation (IMD) brings together a total of 37 indicators which cover specific aspects of deprivation, these include: income, employment, education, health, crime, barriers to housing and services and living environment (DCLG, 2015b).

Within Hampshire and the Isle of Wight, Portsmouth is ranked highest of all the 14 local authorities for its average score and concentration of deprivation. The four most deprived wards in Portsmouth (Fig 6) (Charles Dickens, Paulsgrove, Nelson and St. Thomas) are also amongst the fifth most deprived in England (Health Education England, 2013).

Fig 5. IMD map of Portsmouth overlaid with electoral wards



(Source: Hampshire Hub, 2015)

1.9 Investigation rationale

There is a strong body of literature that supports the association between damp/mouldy homes and the prevalence of asthma (e.g. Oudin et al., 2015 & Norback et al., 1999) [see appendix C]. A high proportion of the literature relating poor housing to health presents only national level statistics and only relatively few studies present local level data in their findings (e.g. Aylin et al., 2001).

Portsmouth has a high level of deprivation and there is evidence to suggest that those who are financially vulnerable are more likely to be exposed to inadequate housing conditions (Turnstall et al., 2013, p.69). There is currently no available literature that has investigated the association between poor housing, deprivation and health in Portsmouth.

Due to the lack of available local literature, Healthwatch Portsmouth requested an investigation into how poor housing and deprivation impacts the health and wellbeing of the residents of Portsmouth.

1.10 Aim:

Explore the association between income, poor housing and the prevalence of asthma in residents of all ages in Portsmouth.

1.11 Objectives:

- Identify the main areas of deprivation and poor housing in Portsmouth in order to explore the association between income, poor housing and the prevalence of respiratory disorders.
- Identify the type(s) of housing tenure most in need of investment in order to explore the association between deprivation and poor housing.
- Compare data at national level with trends in Portsmouth.
- Propose guidelines for developing housing standards in Portsmouth, based on any association with health outcomes in the population group.

1.12 Broad limitations

Due to the strong association between childhood asthma and poor housing the original population group of interest in this study was children (ages 0-17). However, during data collection, it became apparent that the data for this age range is not available at GP level. Therefore, the population group of interest was changed to ‘all ages’.

The distribution of GP surgeries and the boundaries of CCG’S were also major limiting factors in this study. As a result, 6 GP practice groups and 4 Wessex CCG’s were excluded from this study.
Limitations will be discussed in more detail in the ‘Discussion’ chapter of this study.

2 Methodology

The first section of this chapter will state the design of the study, establish inclusion and exclusion criteria and provide an overview of the websites used for data collection. The second section of this chapter will provide an overview of the software used for data analysis and will discuss the relevant thresholds in relation to correlational analysis. This chapter will then conclude with a discussion of potential confounding variables and ethical issues.

2.1 Study design

This study is a cross sectional analysis of secondary data.

2.2 Inclusion criteria

The population group of interest in this study is patients of all ages with a recorded diagnosis of asthma.

2.2.1 Electoral ward level data:

- Data retrieved from 21 General Practice groups in Portsmouth.
- Total number of patients registered to practices – all ages.
- Total number of patients with a diagnosis of asthma – all ages.
- Average income per household, per electoral ward.
- Housing tenure per electoral ward.

Due to the high level of data loss at ward level, additional data will be collected from Wessex CCG's in order to explore any associations and trends at a regional level.

2.2.2 CCG regional level data:

- Total resident population per CCG.
- Total number of patients with a diagnosis of asthma – all ages.
- Average income per household.
- Housing tenure per local authority.

2.3 Exclusion criteria

- GP practice groups that have surgeries distributed across numerous electoral wards were excluded from this study – 6 practice groups.
- CCG groups whose boundaries are beyond that of it's local authority were excluded from this study – 4 CCG's.

Data loss will be discussed in more detail in the 'discussion' chapter of this study.

2.4 Data collection

Respiratory data retrieved from the following websites:

- Ward level data – NHS Digital.
- CCG level data - Inhale – Interactive Health Atlas of Lung conditions in England (Public Health England).

Income data will be retrieved from the following Office for National Statistics (ONS) websites:

- Ward level data – Neighbourhood Statistics (NESS).
- CCG level data – NOMIS – Official Labour Market Statistics.

Tenure data at both ward and CCG level will be retrieved from the following website:

- NESS.

Population data will be retrieved from the following websites:

- Ward level data – NESS.
- CCG level data – ONS.

2.5 Confounding variables

The broad population group of interest in this study is a potential confounding variable. Respiratory data is retrieved for 'all ages', which includes working age adults and those aged 65+ years. With these population groups in particular there are other unknown variables that could potentially influence the onset of asthma,

such as smoker status and occupational risk factors such as working in the healthcare and construction industries (Delclos et al., 2007, p.1).

Asthma statistics presented at ward level should be viewed with caution. Data from GP practice groups that correspond to multiple electoral wards were excluded from this study, therefore, exact numbers of patients with asthma per ward are unknown.

The IMD is the official measure of deprivation for neighbourhoods in England and uses several factors to build an overall score of deprivation (DCLG, 2015b). Only income is used to assess deprivation in this study which may result in discrepancies between deprivation results in this study and official IMD scores.

2.6 Data analysis – software.

Microsoft excel will be used to organise data into spreadsheets and for visual representation in the in the form of bar charts (Excel, 2017).

For bivariate analysis of the data, Statistical Package for the Social Sciences (SPSS) will be used to generate a correlation matrix (IBM, 2017), in order to explore relationships between asthma, income and housing tenure.

2.7 Analysis thresholds

Pearson correlation is a method measuring the strength of a relationship between two variables. Correlation can take on any value between -1, a perfectly negative relationship, 0 – no relationship and +1, a perfectly positive relationship.
The strength of the relationship will be assessed using the following guidelines:
r = 0.10 – 0.29 (weak), *r = 0.30 - 0.49* (moderate), *r = 0.5 – 1.0* (strong).
Relationships will be classed as statistically significant with a *p-value* at 0.01 level (Mukaka, 2012)

2.8 Ethics

This study poses no risk of harm as all data collected and analysed in this study is freely available in the public domain. This study complies fully with the University of Portsmouth ethics guidelines and has been scientifically reviewed and approved by the School of Health Sciences and Social Work.

2.9 Reporting

This study is being undertaken in collaboration with Healthwatch Portsmouth. Healthwatch Portsmouth is an organisation that provides people with information about local health and social care services (Healthwatch, 2016). Results of this study may be reported by Healthwatch Portsmouth in order influence local services.

3 Results

This chapter will report the key findings of the study and will highlight the key trends that appear in the data.

Results will firstly be reported at electoral ward level and will be divided into 4 sections:

1. Pay per resident household, per ward
2. Tenure per ward
3. Asthma per ward
4. Correlational analysis of asthma, housing tenure and income

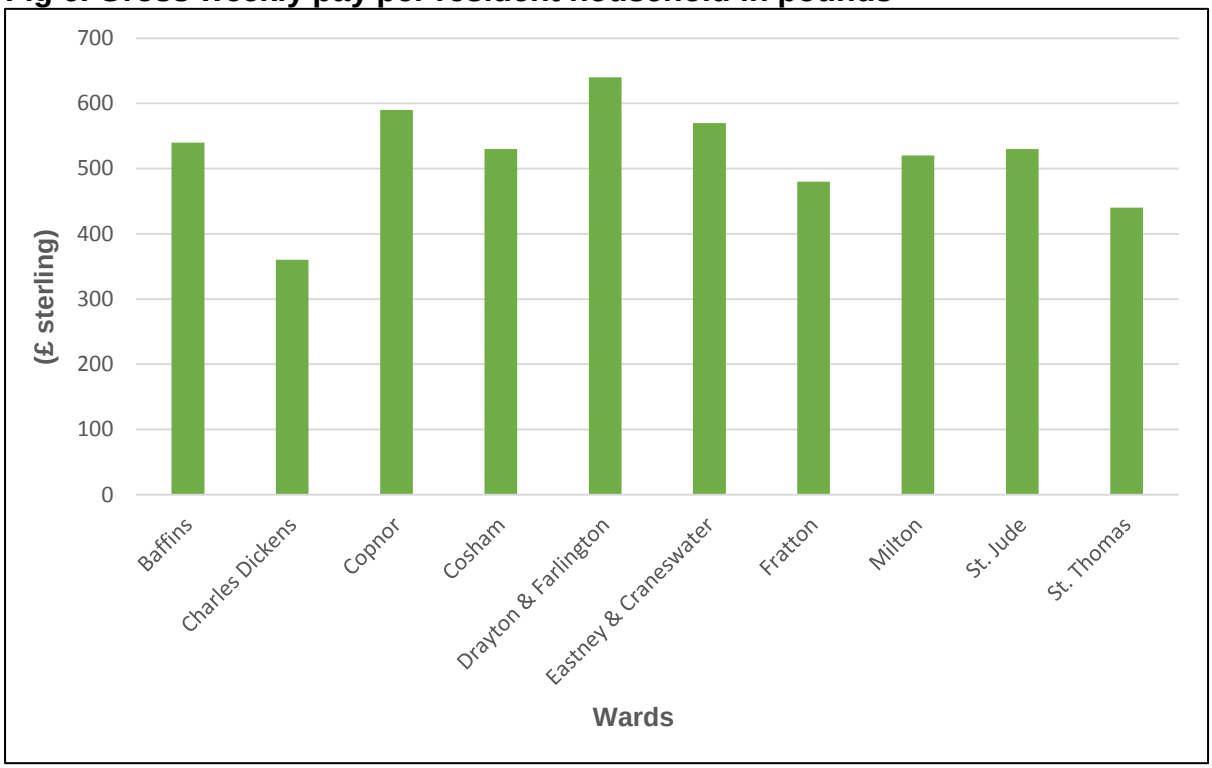
Results will then be reported at CCG region level and will be divided into 3 sections

1. Pay per resident household, per CCG
2. Tenure per CCG
3. Asthma per CCG

To conclude, a summary of the results and key trends will be provided.

N.B. 'Council rented' and' Housing association' homes are referred to together as 'social rented' homes throughout this chapter.

Fig 6. Gross weekly pay per resident household in pounds



(Source: NeSS, 2009)

3.1 Gross weekly pay per resident household, per ward

Drayton and Farlington has the highest gross weekly income of the electoral wards (£640) (Fig.6). Copnor and Eastney and Craneswater are among those in the highest range of average income (£590 & £570). Charles Dickens has the lowest gross weekly income (£360) with St Thomas and Fratton wards also having average incomes in the lower range (£440 & £480).

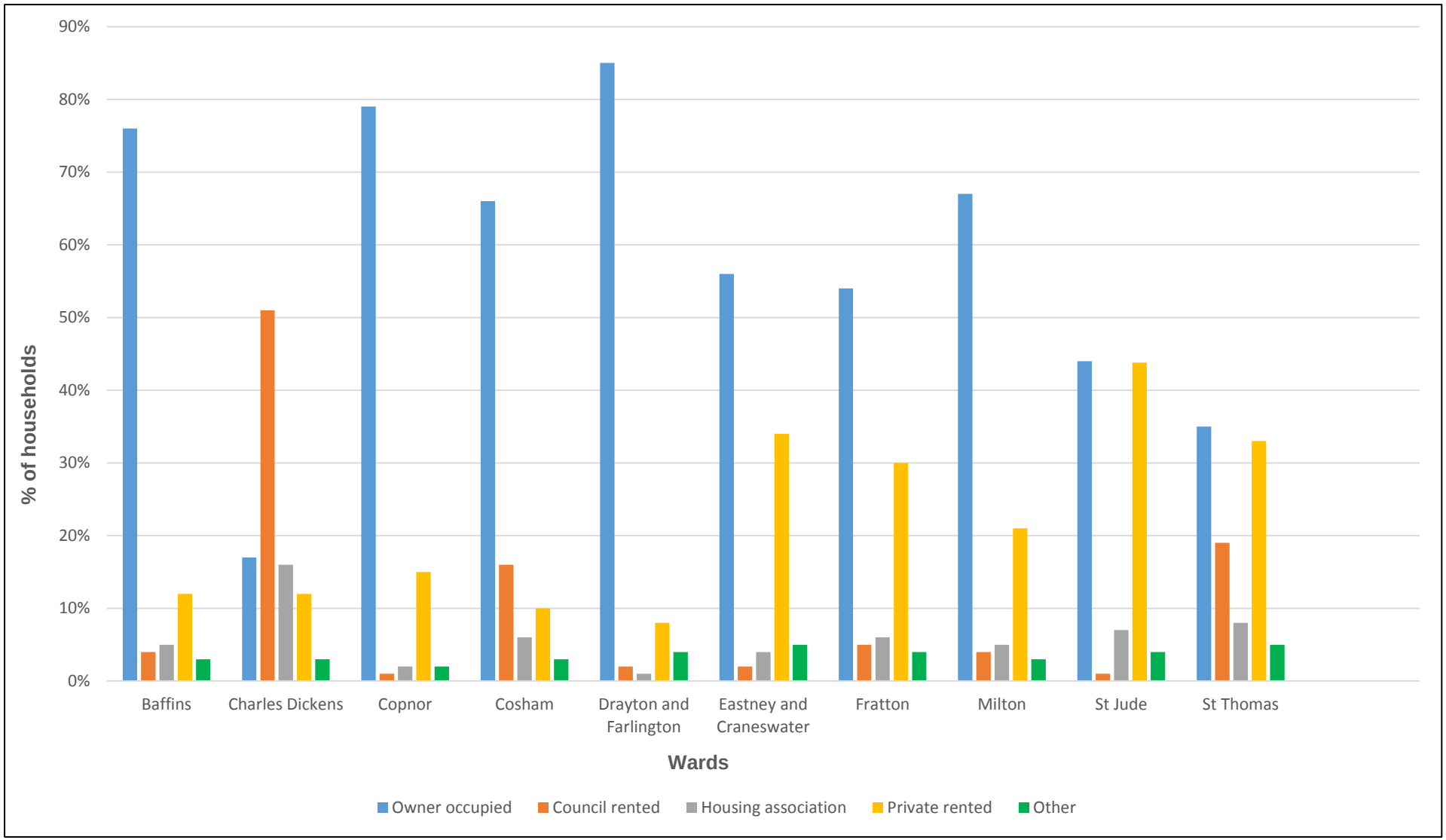


Fig. 7. Housing tenure per ward in percent

(Source Hampshire Hub, 2011)

3.2 Housing tenure per ward

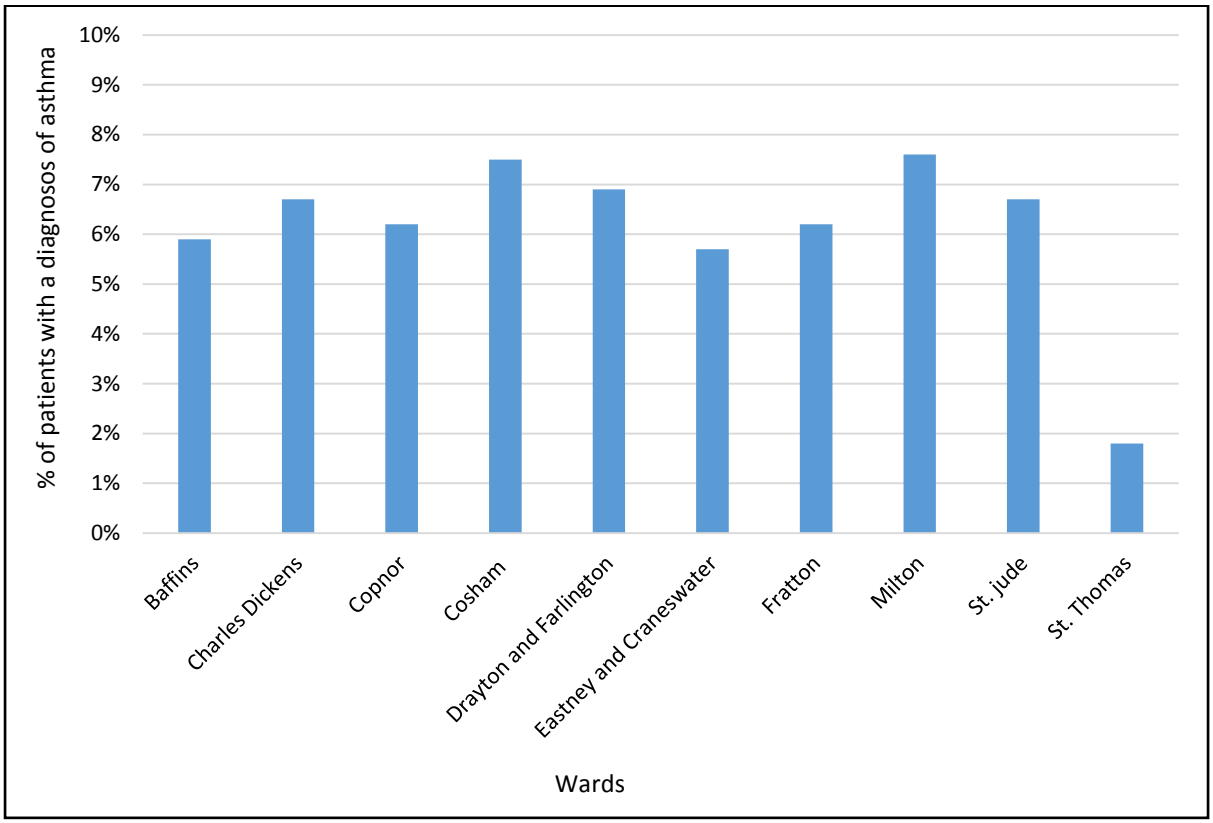
The highest proportion of owner occupied housing is found in Drayton and Farlington (85%), Copnor (79.8%) and Baffins (75.6%) wards (Fig.7).

Drayton and Farlington and Copnor wards also contain the lowest percentage of social rented housing (3%).

Charles Dickens and St. Thomas contain the lowest proportion of owner occupied housing (17.3% & 34.7%) and the highest proportion of social rented housing (67% & 27.2%).

The highest proportion of private rented housing is located in St. Jude (43.8%), Eastney and Craneswater (33.6%) and St. Thomas (33.3%).

Fig. 8. Asthma per ward in percent



(Source NHS Digital, 2016a)

3.3 Prevalence of asthma per ward

The wards with the highest prevalence of asthma are Milton (7.6%) and Cosham (7.5%) (Fig.8). St. Thomas has a substantially lower prevalence of asthma than the other electoral wards (1.8%). There is no significant difference in the prevalence of asthma between the remaining wards with percentages in the range of 5.7 – 6.7%.

Table 1. Correlation matrix

Correlations

		Proportion of people with Asthma	Median income/week (sterling)	Housing: Owner Occupier	Housing: Local Authority	Housing: Housing association	Housing: Private Landlord	Housing: Other
Proportion of people with Asthma	Pearson Correlation	1	.189	.263	-.059	-.105	-.395	-.472
	Sig. (2-tailed)		.483	.325	.827	.697	.130	.065
	N	16	16	16	16	16	16	16
Median income/week (sterling)	Pearson Correlation	.189	1	.941**	-.915**	-.969**	.136	-.130
	Sig. (2-tailed)	.483		.000	.000	.000	.616	.632
	N	16	16	16	16	16	16	16
Housing: Owner Occupier	Pearson Correlation	.263	.941**	1	-.883**	-.949**	-.054	-.374
	Sig. (2-tailed)	.325	.000		.000	.000	.841	.154
	N	16	16	16	16	16	16	16
Housing: Local Authority	Pearson Correlation	-.059	-.915**	-.883**	1	.960**	-.420	.067
	Sig. (2-tailed)	.827	.000	.000		.000	.105	.806
	N	16	16	16	16	16	16	16
Housing: Housing association	Pearson Correlation	-.105	-.969**	-.949**	.960**	1	-.219	.109
	Sig. (2-tailed)	.697	.000	.000	.000		.416	.687
	N	16	16	16	16	16	16	16
Housing: Private Landlord	Pearson Correlation	-.395	.136	-.054	-.420	-.219	1	.595*
	Sig. (2-tailed)	.130	.616	.841	.105	.416		.015
	N	16	16	16	16	16	16	16
Housing: Other	Pearson Correlation	-.472	-.130	-.374	.067	.109	.595*	1
	Sig. (2-tailed)	.065	.632	.154	.806	.687	.015	
	N	16	16	16	16	16	16	16

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

(Source: Hampshire Hub, 2011, NeSS, 2009 & NHS Digital, 2016a)

3.4 Correlation matrix

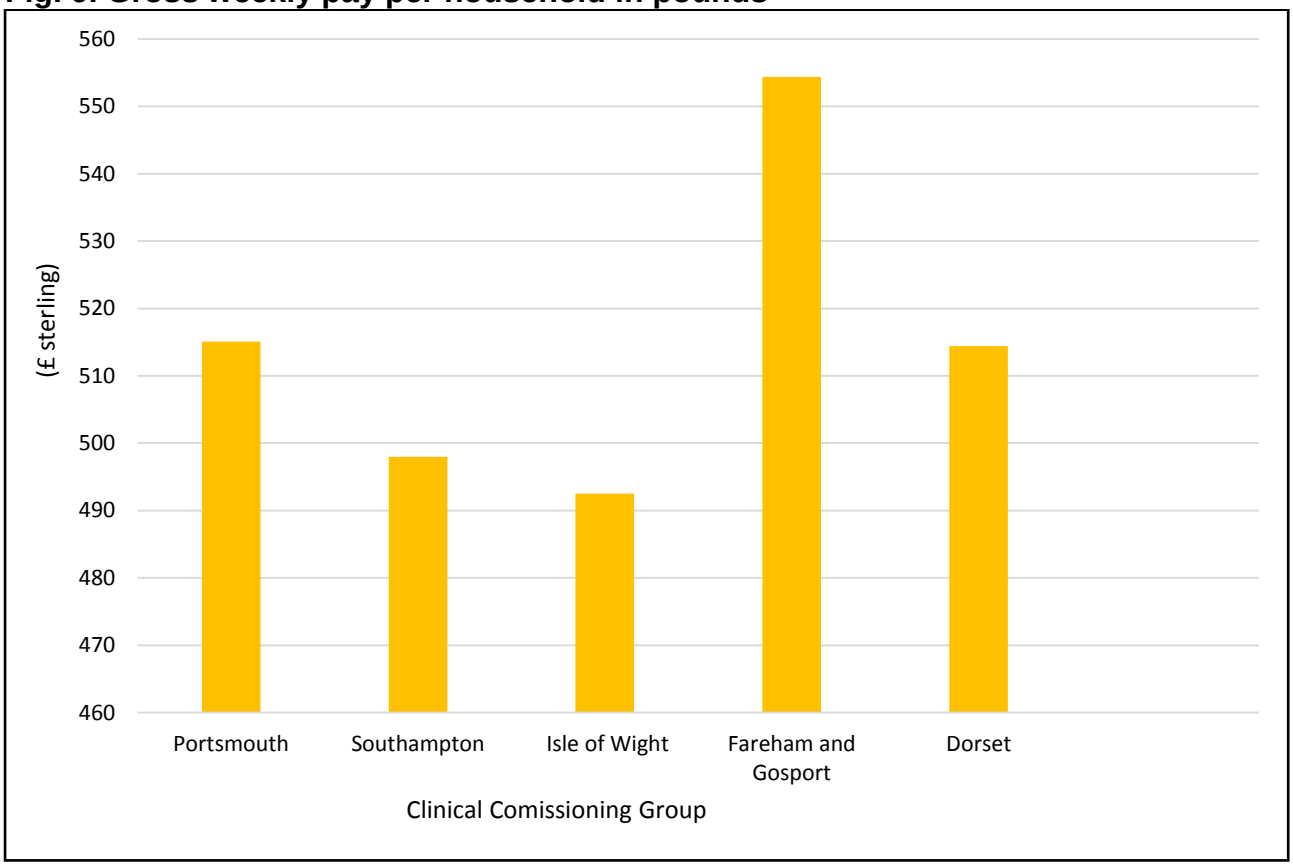
Correlational analysis was used to examine the relationships between asthma, income and housing tenure (Table. 1). Results indicate a positive relationship between income and owner occupied housing (*r = +.94, p< .0.1)* This result indicates that residents with a higher average income are more likely to live in owner occupied homes. An inverse relationship was observed between income, council rented housing (*r = -.92, p< .0.1)* and local authority housing (*r = -.97, p< .0.1).* This suggests that those with a higher average income are less likely to live in social rented housing.

No significant relationship was observed between asthma and income (*r= +.19, p = n.s).*
No significant relationship was observed between asthma and owner occupied housing (*r = +.26, p = n.s),* local authority housing (r = - .06, p = n.s) and housing association homes (*r= -.11, p = n.s).*

A moderate negative relationship can be observed between asthma and the category of housing classified at 'other' *(r=-.47, p = n.s)* and privately rented housing *(r= - .40, p = n.s*). These results indicate that those living in this category are less likely to have asthma, however, with a non-significant *p-value* these results can not be classed as statistically significant.

Overall, these results suggest that there is no significant statistical relationship between the prevalence of asthma, income and housing tenure.

Fig. 9. Gross weekly pay per household in pounds

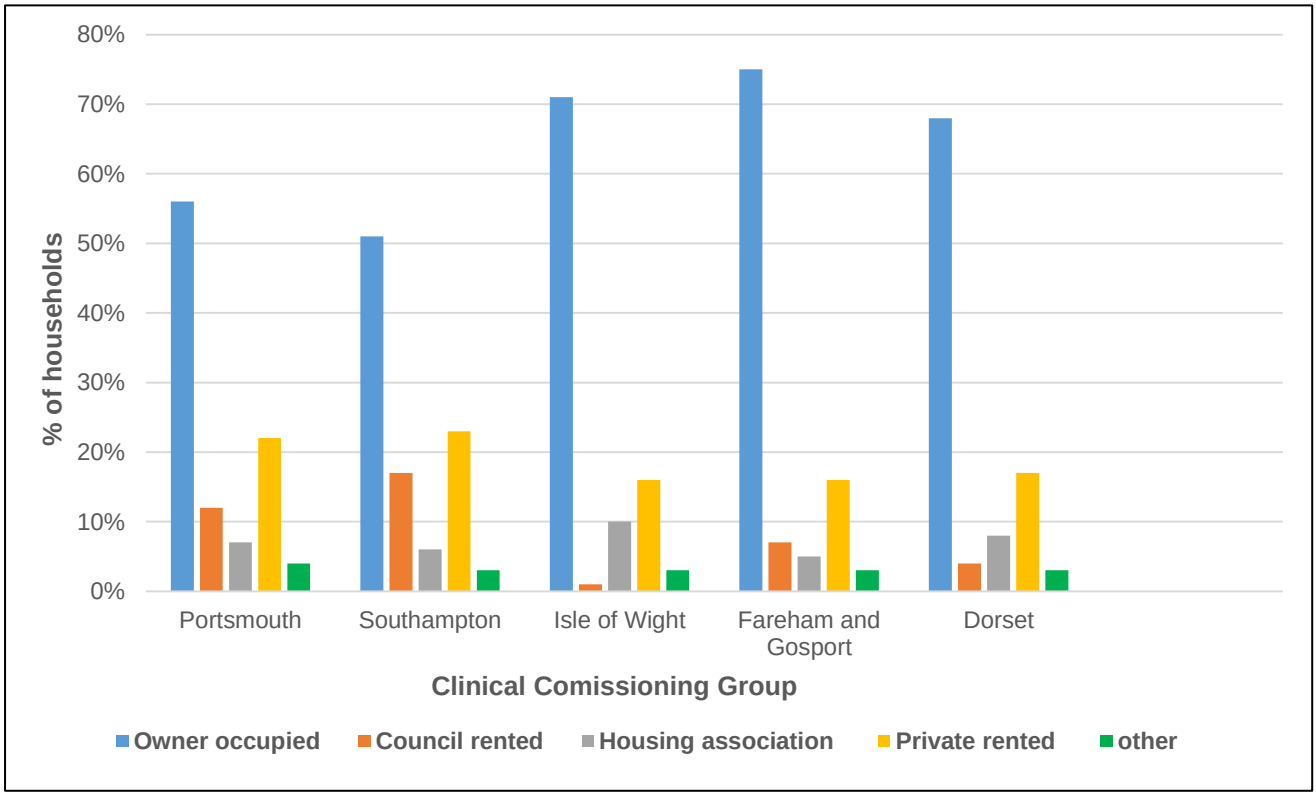


(Source: NOMIS, 2016)

3.5 Gross weekly pay per household per CCG

Fareham and Gosport has the highest gross weekly income (£554) of the CCG's (Fig.9). The Isle of Wight and Southampton have average incomes in the lowest range (£492 and £498). Portsmouth and Dorset CCG's have very similar average incomes with less than £1 difference in household weekly pay (£515 & £514).

Fig 10. Housing tenure per CCG in percent



(source: NeSS, 2013)

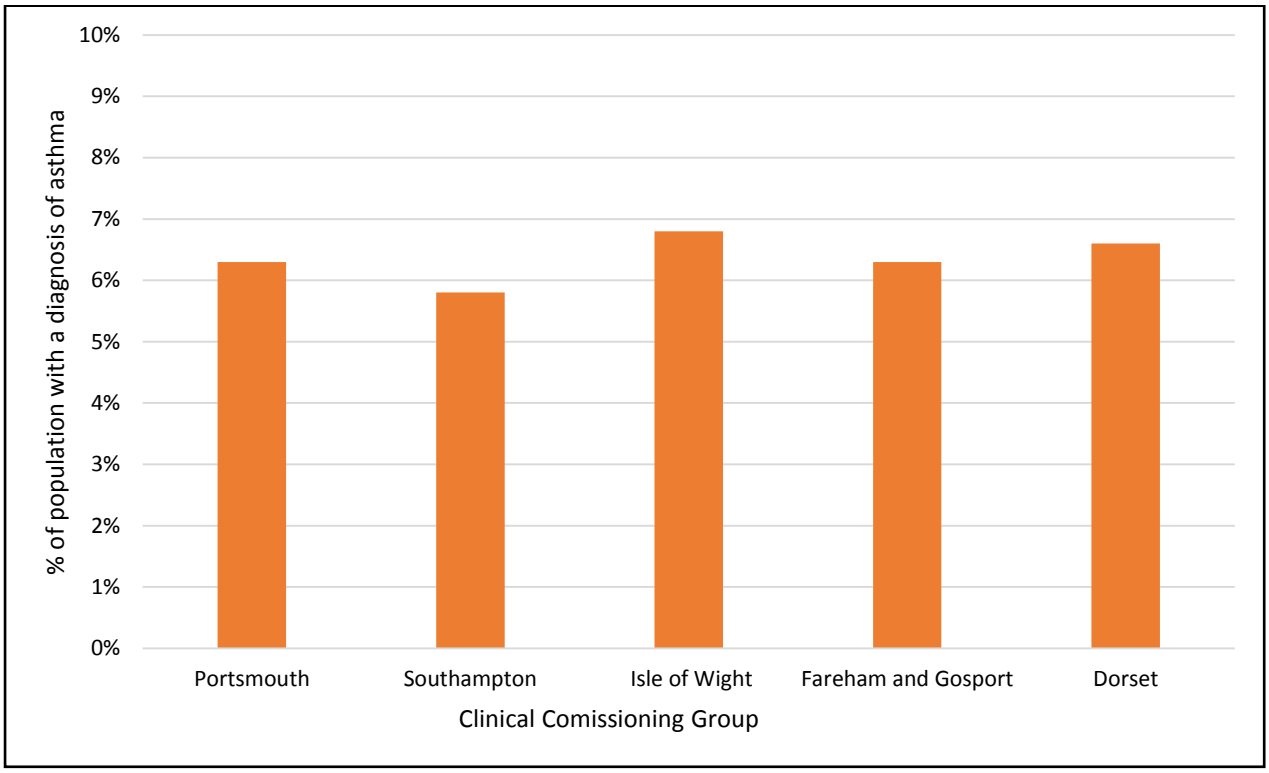
3.6 Housing tenure per CCG

CCG's with a highest proportion of owner occupied homes **(**Fareham and Gosport (75%, the Isle of Wight 71% and Dorset 68%) also contain the lowest proportion of social rented homes (11% and 12%) (Fig. 10).

Portsmouth and Southampton CCG's contain moderately higher proportions of privately rented properties compared to the other CCG's (23% and 22%).

In the ward level data analysis, a significant negative relationship was observed between income and social rented housing. Here, the Isle of Wight has the lowest gross weekly pay of all the CCG's yet has one of the highest proportions of owner occupied homes (71%) and the lowest proportion of social rented housing (11%).

Fig. 11. Asthma per CCG in percent



(Source: INHALE, 2016 & NeSS, 2013)

3.7 Prevalence of asthma per CCG

There is no significant difference in the prevalence of asthma between the CCG's with percentages in the range of 5.8 – 6.8% (Fig.11).

Despite differences in income and tenure distribution, the results at Wessex regional level suggest that there is no association between income, the prevalence of asthma and housing tenure.

3.8 Summary

3.8.1 Ward level key trends

- No statistically significant relationship between income, housing tenure and asthma.
- Positive relationship observed between income and owner occupied housing.
- Negative relationship observed between income and social rented housing.
- Negative relationship observed between asthma, 'other' and private rented housing. However, this not statistically significant.

- St. Thomas ward has substantially lower prevalence of asthma compared to the other electoral wards.

3.8.2 CCG level key trends

- No association observed between income, housing tenure and asthma.
- Isle of Wight has the lowest income of the CCG's and the highest prevalence of asthma, however, this is not statistically significant.

4 Discussion

The primary aim of this study was to explore the association between income, poor housing and the prevalence of asthma in residents of all ages in Portsmouth. After analysis of results, no statistically significant association was observed between the prevalence of asthma, housing tenure and income, at both ward and CCG levels. This chapter will begin by discussing the results of the study in relation to the 4 study objectives. Limitations will be discussed throughout this section and will be summarised at the end of the chapter. To conclude, recommendations for further research will be provided.

4.1 Objective 1

'Identify the main areas of deprivation and poor housing in Portsmouth in order to explore the association between income, poor housing and the prevalence of respiratory disorders'.

Charles Dickens and St. Thomas wards have the the lowest average income of the electoral wards analysed in this study. These findings are in line with official IMD scores. Similar local level studies assessing deprivation and asthma (Poyser et al., 2002 & Salmond et al.,1999) identified an association between the two variables. However, no association between asthma and deprivation was observed in this study. This may be attributable to high levels of data loss. In order to gather the most accurate statistics for the prevalence of asthma per ward, it was decided that GP practice groups with practices across multiple electoral wards [see appendix D] should not be included his study. As a result, for 7 out of 10 wards included in this study, the exact statistics for asthma diagnosis are unknown.

St Thomas ward has a high level of deprivation and a surprisingly low prevalence of asthma. This result does not fit with trends seen in other wards. Differences in demographics and difficulties in practice reporting may have influenced this result. In terms of demographics, St. Thomas has the highest proportion of Asian/Asian British residents in Portsmouth (Local Government Association, 2011). It is possible that ethnic and cultural barriers account for lower asthma rates in this population group (Partridge, 2002, p.176). However, it is unlikely that demographic differences alone

account for the low rates in asthma in this ward. Asthma statistics were gathered using data collected by the Quality and Outcome Framework (QOF), a primary care performance measure (NHS Digital, 2016b). It is possible that the University Surgery in St. Thomas may have experienced difficulties in picking up and recording asthma data compared with other GP surgeries in Portsmouth.

At Wessex region level, the Isle of Wight has the lowest average income of the CCG's and the highest prevalence of asthma which is in line with current knowledge (Poyser et al., 2002 & Salmond et al.,1999). However, due to similarities of asthma diagnosis across the CCG's this result cannot be regarded as statistically significant. Overall, there was no association between income, tenure and the prevalence of asthma at both ward and CCG level. However, due to high levels of data loss in this study results should be viewed with caution.

N.B. The relationship between asthma and tenure will be discussed in detail in objective 3.

4.2 Objective 2

'Identify the type(s) of housing tenure most in need of investment in order to explore the association between deprivation and poor housing'.

In this study, a significant association was observed between income and housing tenure. That is to say that those with higher incomes are more likely to live in owner occupied homes and those with lower incomes are more likely to live in social rented homes. These results are as expected and in line with current literature (Belfield, Chandler & Joyce, 2015, p.14). Surprisingly, data from the Isle of Wight suggests that despite an average low income, a high proportion of the residents own their own properties. The Isle of Wight has a high proportion of those aged 65+ years compared to other regions in the South East and England (Joint Strategic Needs Assessment, 2013, p.1) which may account for this relationship.

Despite the associations observed between deprivation and housing tenure, the exact proportion of houses failing the Decent Homes Standard in Portsmouth is

unknown. The English Housing Survey (EHS) is the main source of information about the condition of homes in England (DCLG, 2015c). The EHS is designed to be a national survey and as a result sub-region data is not available. As there was no significant association observed between asthma and housing tenure (see objective 3), it is not possible to identify which type of housing tenure contains the highest proportion of poor housing. Therefore, recommendations for investment and improvement cannot be made.

4.2 Objective 3

'*Compare data at national level with trends in Portsmouth'.*

National trends indicate that, with the exception of London, the privately rented sector contains the highest proportion of poor housing (Fig.12). If Portsmouth is representative of the national average, it would be expected to see the greatest prevalence of asthma in wards with the highest proportion of privately rented housing.

Fig 12. Percentage of people living in bad housing, by tenure and region

(Source: Barnes et al., 2013, p.23)

No significant relationship was observed between asthma and tenure at ward and CCG level in this study. In fact, a moderately negative relationship was observed between asthma, the private rented and 'other' housing sectors at ward level. Tenure classed as 'other' includes accommodation that is privately rented, not from a private

landlord or letting agency (Hampshire Hub, 2011). This relationship should be viewed with caution. Due to non-significant *p-values* it cannot be ruled out that these relationships have occurred by chance.

There are a number of possibilities as to why results in Portsmouth conflict with national trends. Firstly, it is not known which type of housing tenure in Portsmouth contains the highest proportion of inadequate housing. It is possible that housing quality in Portsmouth is diverse, and that the privately rented sector does not contain the highest proportion of poor housing. Secondly, statistics relating to the diagnosis of asthma per ward in this study are largely incomplete. A total of 6 GP practice groups with a combined list size of 67,891 (5749 with a diagnosis of asthma) were excluded from this study, and the loss of this data may have influenced the outcome of results.

4.4 Objective 4

'Propose guidelines for developing housing standards in Portsmouth, based on any association with health outcomes in the population group'.

Results in this study found no association between deprivation, poor housing and the prevalence of asthma among residents in Portsmouth. Therefore, recommendations for the development of housing standards cannot be made.

4.5 Summary of limitations

4.5.1 Asthma as an indicator for poor housing standards

Despite a strong association between asthma and poor housing, this disease has multi-factorial causes (Delclos et al., 2007, p.1). Therefore, the prevalence of this disease cannot be attributed to poor living conditions alone.

4.5.2 Lack of available data

Current evidence suggests that due to spending more time in the home, children and those aged 65+ years are at a higher risk of ill health from poor housing conditions (Braubach, Jacobs, & Ormandy, 2011, p.1). Data regarding the prevalence of asthma in children and those aged 65+ years is not available at ward level.

Therefore, it was not possible to assess the impact of poor housing standards in these vulnerable populations.

4.5.3 Unknown housing standards

In this study, the prevalence of asthma measured against housing tenure was used to try and identify housing tenure that contains the highest proportion of poor housing. However, as asthma cannot be attributed to poor housing conditions alone, it was not possible to accurately assess this association. It is necessary to identify which type of tenure contains the greatest proportion of poor housing. However, the EHS does not present local level data regarding the condition of homes in their annual report. Therefore, the exact number of homes in Portsmouth that do not meet the Decent Homes Standard is unknown.

4.5.4 Data loss

In order to generate accurate results, large GP practice groups that have surgeries across multiple electoral wards were excluded from this study. After exclusion of the Portsdown Group, a surgery with over 38,000 patients, there was no respiratory data available for Central Southsea, Nelson, Paulsgrove and Hilsea wards. These wards were therefore excluded from analysis in this study.

Similar issues occurred with the collection of data at Wessex regional level. Income and tenure are recorded per local authority. The boundaries of 4 CCG's were outside that of there local authority and were therefore excluded from this study.

4.6 Recommendations

Assessing the prevalence of asthma in vulnerable population groups may generate more substantive results and more accurately highlight trends in housing tenure in relation in poor housing.

As this data is only available at regional level, it would be advisable for future studies to use national survey data in order to compare Portsmouth to other similar cities and regions. This may help to uncover any broad trends that, due to high levels of data loss, were not evident in this study.

4.7 Conclusion

The relationship between poor housing and ill health is multi-factorial and complex in nature. No significant association was observed between deprivation, poor housing and the prevalence of asthma in residents of all ages in Portsmouth.

Due to high levels of data loss at both ward and CCG levels, results in this study should be viewed with caution. Further research using regional data is recommended, in order to explore any associations between poor housing and ill health among vulnerable population groups such as children and those aged 65+ years.

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Appendix A – Sample of evidence relating inadequate housing to poor health outcomes.

Authors/date of publication/country or origin	Study design	Aim	Population group	Conclusion
Aylin et al., (2001). UK.	Cross sectional study at electoral ward level.	Examine the associations between temperature, housing, deprivation and excess winter mortality	Men and women aged 65 and over.	Lack of central heating was associated with higher excess winter mortality.
Blackman et al., (2001). UK.	Prospective cohort study.	Examine the impact of housing and neighbourhood renewal on health.	All ages	Damp and draughts had a significant impact on respiratory health. Perceived community safety was associated with mental health problems. Renewal work had no impact on respiratory health but did improve mental wellbeing.
Braubach, M., Jacobs, M., & Ormandy, D. (2003). Europe (WHO).	Systematic literature review.	Explore the impacts of poor housing on health. Identify high risk groups in the population and identify any health gains that housing development could	All ages	Significant associations seen between: Damp/mouldy households and the prevalence of asthma in children. Household crowding and tuberculosis. Indoor cold and excess winter deaths.

		provide.		Housing quality and mental health.
Clark, M., Riben, P., & Nowgesic, E. (2002). Canada.	Cross sectional study.	Explore the association between housing density, isolation and the occurrence of tuberculosis (TB).	All ages	Significant association between housing density, isolation and TB.
García-Esquinas et al., (2016). Spain.	Cross sectional study.	Assess the association between housing conditions and physical function limitations in older adults.	Adults aged >60 years.	Poor housing conditions, particularly living in a walk-up building and lacking heating, are independently associated with limitations in physical function in older adults.
Jones-Rounds, M., Evans, G., & Braubach, M. (2014). Europe.	Cross sectional study.	Explore the association between housing and neighbourhood quality of psychological wellbeing.	Working age adults.	Substandard housing quality and poor neighbourhood quality each contribute to lower psychological well-being.
Khatib et al., (2003). Palestine.	Cross sectional study.	Explore the relationship between poor housing conditions at a refugee camp and the prevalence of upper respiratory tract diseases.	All ages.	Cold housing, presence of dampness and moulds, dust and smoke, burning of biomass fuel, crowding and poor ventilation all commonly found in refugee camp. Significant association observed between poor

				housing conditions and prevalence of respiratory tract diseases, especially in children.
Mora et al., (2016). USA.	Cross sectional study	Assess the impact of poor housing on mental health	Adult migrant farm workers.	Those who suffer from overcrowded sleeping conditions, had no secure space to store belongings and who did not have access to a key to the residence had higher depression and anxiety scores.
Polyzois et al., (2016). USA.	Cross sectional study	Explore the relationship between respiratory health and housing conditions.	School aged children.	A child's respiratory health is significantly associated with self-reported visible mould in the home.
Prevalin, D., Taylor, M., & Todd, J. (2008). UK.	Cross sectional study.	Explore the relationship between poor housing and health over time.	Adults 16+	Worsening housing conditions are associated with a deterioration in physical and mental health, especially in women.

Appendix B

Housing hazards related to health outcomes (Braubach, Jacobs & Ormandy, 2011, p.5).

Exposure	Health outcome	Exposure–risk relationship	PAF	EBD from housing per year
Mould	Asthma deaths and DALYs in children (0–14 years)	RR = 2.4	12.3%	45 countries of the European Region: 83 deaths (0.06 per 100 000) 55 842 DALYs (40 per 100 000)
Dampness	Asthma deaths and DALYs in children (0–14 years)	RR = 2.2	15.3%	45 countries of the European Region: 103 deaths (0.07 per 100 000) 69 462 DALYs (50 per 100 000)
Lack of window guards	Injury deaths and DALYs (0–14 years)	RR = 2.0	33–47%	European Region: ~10 deaths (0.007 per 100 000) ~3310 DALYs (2.0 per 100 000)
Lack of smoke detectors	Injury deaths and DALYs (all ages)	RR = 2.0	2–50%	European Region: 7523 deaths (0.9 per 100 000) 197 565 DALYs (22.4 per 100 000)
Crowding	Tuberculosis	RR = 1.5	4.8%	EURO B and EURO C subregions:[d] 15 351 cases (3.3 per 100 000) 3518 deaths (0.8 per 100 000) 81 210 DALYs (17.6 per 100 000)
Indoor cold	Excess winter mortality	0.15% increased mortality per °C	30%	11 European countries: 38 203 excess winter deaths (12.8 per 100 000)
Traffic noise	Ischaemic heart disease including myocardial infarction	RR = 1.17 per 10 dB(A)	2.9%	Germany only: 3900 myocardial infarcts (4.8 per 100 000) 24 700 ischaemic heart disease cases (30.1 per 100 000) 25 300 DALYs (30.8 per 100 000)
Radon	Lung cancer	RR = 1.08 per 100 Bq/m^3	2–12%	Three western European countries: France: 1234 deaths (2.1 per 100 000) Germany: 1896 deaths (2.3 per 100 000) Switzerland: 231 deaths (3.2 per 100 000)
Residential SHS	Lower respiratory infections, asthma, heart disease and lung cancer	Risk estimates range from 1.2 to 2.0 OR = 4.4	PAF estimates range from 0.6% to 23%	European Region: 64 700 deaths (7.3 per 100 000) 713 000 DALYs (80.7 per 100 000)
Lead	Mental retardation, cardiovascular disease, behavioural problems	Case fatality rate 3%;	66%	European Region: 694 980 DALYs (79.2 per 100 000)
Indoor carbon monoxide	Headache, nausea, cardiovascular ischaemia/insufficiency, seizures, coma, loss of consciousness, death	DNS/PNS incidence 3–40%	50–64%	EURO A subregion:[e] 114–1545 persons with DNS/PNS (0.03–0.4 per 100 000) 114 ± 97 deaths (0.03 ± 0.02 per 100 000)
Formaldehyde	Lower respiratory symptoms in children	OR = 1.4	3.7%	EURO A subregion:[e] 0.3–0.6% of wheezing in children
Indoor solid fuel use	COPD, ALRI, lung cancer	RR = 1.5–3.2	6–15%	European Region: 8490 ALRI deaths in children < 5 years (16.7 per 100 000) 293 600 ALRI DALYs in children < 5 years (577 per 100 000) 5800 COPD deaths in adults ≥ 30 years (1.1 per 100 000) 100 700 COPD DALYs in adults ≥ 30 years (19.3 per 100 000)

Appendix C - Sample of evidence relating poor housing quality to the the onset and exacerbation of asthma.

Authors/date of publication/country or origin	Study design	Aim	Population group	Conclusion
Dixon et al., (2009). USA.	Prospective cohort study.	To determine if housing structural repairs, and education in low-income households with children would reduce housing-related respiratory health and injury hazards.	Children aged 5-16.	96% of parents reported that the respiratory health of their asthmatic children improved. A tailored healthy homes improvement package significantly reduces respiratory health and injury hazards.
Hughes et al., (2016). USA.	Cross sectional study.	To explore the association between paediatric asthma, material hardship and home ownership.	Children aged 6-17.	Poor housing quality is strongly associated with asthma morbidity. Housing quality improvement are a potential means of reducing asthma disparities.
Jaakkola et al., (2002). Sweden.	Case control study.	To assess the effects of indoor dampness problems and moulds at work and at home on development of asthma in adults.	Adults aged 21-63 years.	The risk of asthma was related to the presence of visible mould and/or mould odour in the workplace but not to water damage or damp stains alone.
Jaakkola et al.,	Prospective	To explore the	Children aged	Association observed

(2005). Sweden.	cohort study	association between mould in households and the development of asthma in children.	1-7 years.	between exposure to moulds and the development of asthma in children.
Koskinen et al., (1999). Finland.	Cross sectional study.	To explore the relationship between the presence of moisture or mould in the home and the health of occupants.	Adults > 16 years	Exposure to building-related moisture or mould in the home is a significant risk factor for respiratory infections, respiratory symptoms and non-respiratory illnesses in adults.
Oudin et al., (2015). Sweden.	Cross sectional study.	To explore housing conditions and their association with child health in a disadvantaged immigrant population.	Children aged 0-13.	Significant association observed between dampness and onset of asthma.
Norback et al., (1999). Sweden.	Case control study.	To assess the effect of building dampness in dwellings on the occurrence of current asthma, and biochemical signs of inflammation.	Adults aged 20-45 years.	Current asthma was more common among subjects living in damp dwellings, particularly with dampness in the floor construction.
Williamson et al.,	Case control	To explore the	Ages 5-44.	Patients living in homes with

1997. UK.	study.	association between damp households and the prevalence of asthma.		confirmed areas of dampness had greater evidence of airflow obstruction than those living in dry homes. Action to improve damp housing conditions may positively influence asthma morbidity.

North Harbour Medical Group.
Cosham Park Avenue (Part of the Portsdown Group Practice).
The Wootton Street Surgery (Part of the Drayton Surgery Group).
Northern Road Surgery (NOW CLOSED and part of the Portsdown Group Practice)

Paulsgrove surgery (Part of the Portsdown Group Practice).

The Drayton Surgery.

Hanway Medical practice (Part of the Hanway Group).

Kingston Crescent Surgery (Part of the Portsdown Group).
Derby Road Surgery (Part of the Derby Road Group Practice).

The Kirklands Surgery.
Copnor Surgery (Part of the Derby Road Group Practice).

Guildhall Walk Healthcare Centre.
Hanway Medical Practice (Part of the Hanway Group).
John Pounds Surgery.
Somerstown Surgery (Part of the Portsdown Group Practice).
Lake Road Practice.
Southsea Medical Centre

Baffins Surgery (Part of East Shore Partnership).

The Devonshire Practice.
Sunnyside Medical Centre.
The Eastney Practice.
Milton Park Surgery (Part of East Shore Partnership)

The Osbourne Road Surgery (Part of the Trafalgar Medical

Heyward Road

Queens Road

Waverly Road Surgery.
Salisbury Road Surgery (Both surgeries part of the Craneswater

Un
Su

Group

Practice)

Appendix D: Map of GP surgeries in Portsmouth overlaid with electoral wards