



What causes poverty and how does this contribute to respiratory inequality?

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Many thanks for your comments, I've added the definitions of poverty and inequalities as recommended and removed the unnecessary heading! I have also changed the section on 'at risk' households and updated the reference list.

For Review Only-ERS

What causes poverty and how does this contribute to respiratory inequality?

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Summary (max 160 words)

Levels of poverty and socioeconomic inequality impact everyone in a society, rich or poor. Countries with higher levels of relative poverty are more like to have lower life expectancy, higher neonatal mortality rates, higher levels of obesity, higher rates of homicide and worse mental health. Whilst most health outcomes are adversely affected by living in poverty, respiratory inequalities are particularly shaped by living in deprivation and societal inequality. Poverty causes poor lung health directly by limiting material and societal resource for good health, and through increased exposures to risk factors including air pollutants, climate change, and poor nutrition (including obesity and malnutrition). Poverty is also associated with worse respiratory disease outcomes: adverse exposures and limited access to healthcare persistently increases respiratory disease morbidity and mortality.

Take home message (max 256 characters)

Poverty is pervasive across the world and is caused by historical and modern-day political and societal drivers. It is both a causation for respiratory ill health and adversely augments respiratory disease outcomes.

Introduction

Poverty encompasses deprivation of material resources, opportunities and capabilities(1). (UN def) Levels of poverty and socioeconomic inequality impact everyone in a society, rich or poor. Countries with higher levels of relative poverty are more likely to have lower life expectancy, higher neonatal mortality rates, higher levels of obesity, higher rates of homicide and worse mental health(2). Whilst most health outcomes are adversely affected by living in poverty(3), respiratory inequalities are particularly shaped by living in deprivation and societal inequality(4). Poverty causes poor lung health directly by limiting material and societal resource for good health, and indirectly through increased exposures to risk factors(5). Worldwide, exposure to air pollutants, climate change, and poor nutrition (including obesity and malnutrition) are more likely if you are poor(6). Poverty is also associated with worse respiratory disease outcomes: persistent adverse exposures and limited access to healthcare increases morbidity and mortality(7).

The first half of this chapter will examine the definitions and global causes of poverty, using the UK as an example for drivers of poverty in High Income Countries (HICs). The second half of this chapter will explore how poverty contributes to respiratory inequalities and outlines a recommended framework to understand the mechanistic pathways.

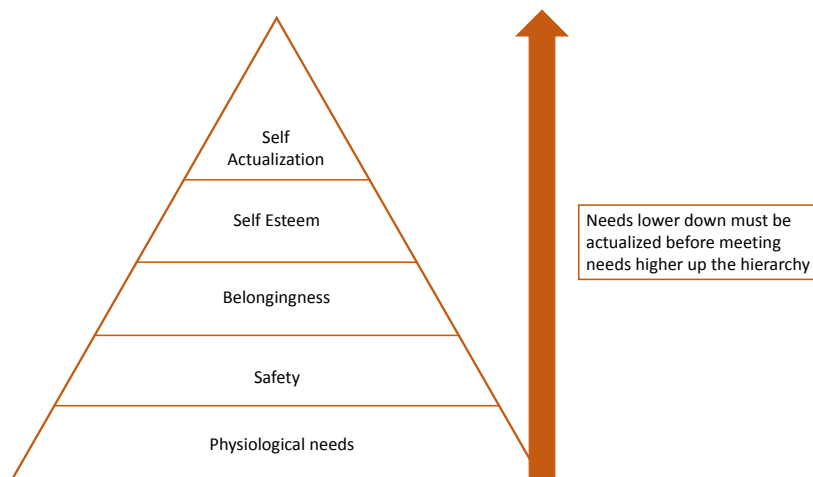
What causes poverty?

What is poverty?

Whilst many definitions of poverty relate to financial hardship, living in poverty is far more multifaceted, going beyond just not having enough money. At an individual level, those who do not have access to sufficient resources to meet their needs and participate in wider society are living in poverty(8).

Poverty is a driver of social exclusion and seeps into every aspect of life; the United Nations (UN) identify poverty as being 'the root cause' of many forms of human rights violations across the world(9). The Poverty & Social Exclusion survey in the UK found that respondents who were at risk of poverty struggle to access private and public services both from limited availability and cost, have less social support and are less likely to engage in decision-making processes such as voting(10). Those whose basic needs are unmet due to poverty face difficulties in achieving crucial life experiences such as a sense of community and self-actualisation (Maslow's Hierarchy of needs, figure 1) and poverty can impact a person's sense of powerlessness and dignity(8). Poverty is also intersectional with other dimensions of social exclusion: discrimination due to gender, ethnicity, religion and disability can occur simultaneously and are 'mutually reinforcing' in failing communities and individuals beyond financial hardship(11,12).

Figure 1 Maslow's hierarchy of needs(13)

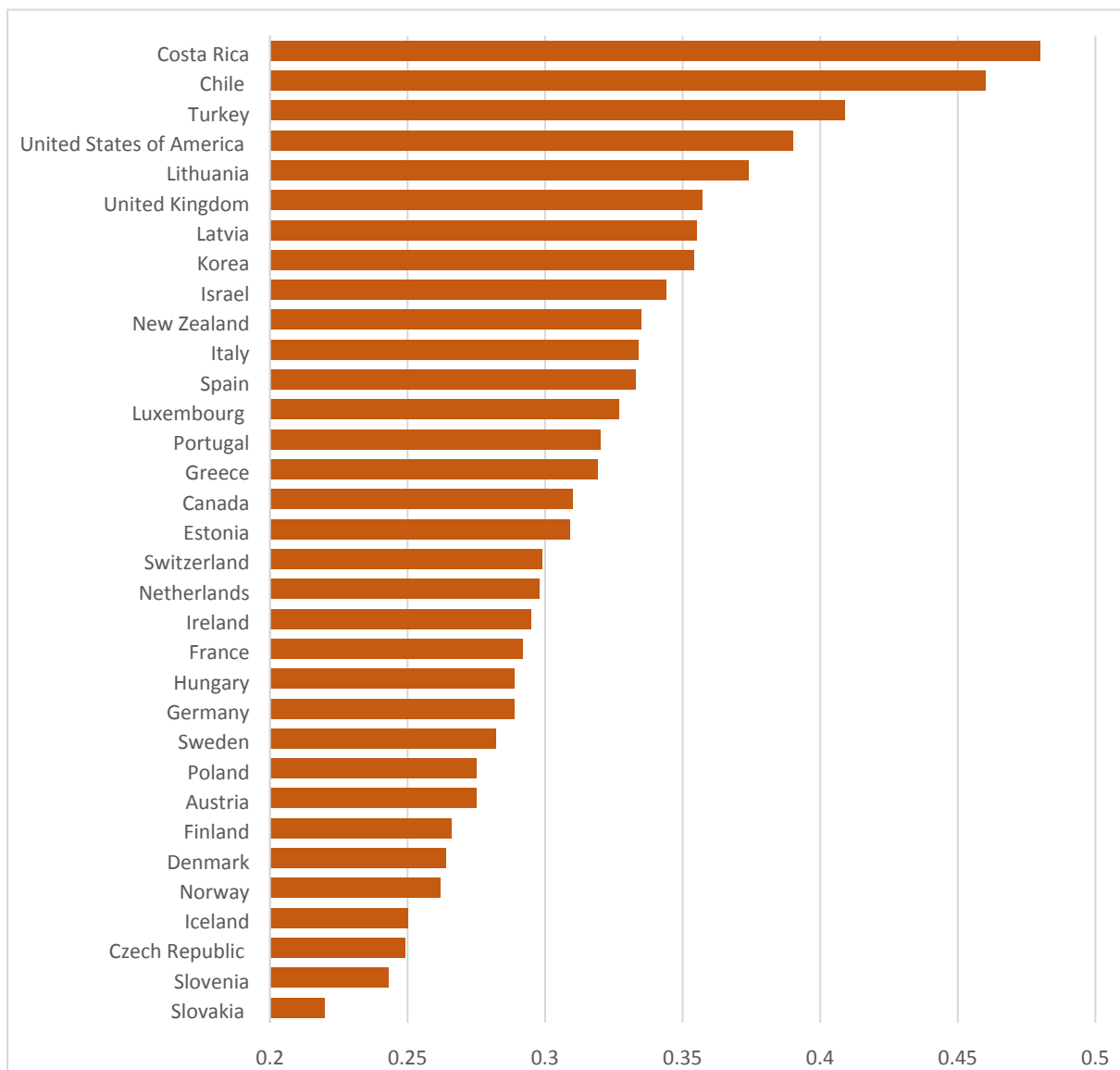


Global definitions and levels of poverty:

Globally, extreme poverty is defined by the World Bank as a person living on \$1.90 or less per day(9). Roughly 736 million people, 10% of the world's population, were living in extreme poverty in 2015. People living in Sub Saharan Africa and South Asia are most at risk of living in extreme poverty and over half of the 736 million live in just 5 countries (India, Bangladesh, Nigeria, the Democratic Republic of Congo and Ethiopia) (14). Living in such extreme poverty limits access to basic necessities such as clean water, shelter and food and is a major cause of morbidity and early mortality world-wide. In 2000, the United Nations (UN) made eradicating extreme poverty its number one goal both in the Millennium Development Goals (and the updated Sustainable Development Goals) (15). Whilst the Millennium Development Goals can be criticised for defining symptoms of global inequality rather than focussing on underlying causes(16), progress was made and rates of extreme poverty falling from 36% in 1990 to 10% in 2015(17). However, rates of extreme poverty have risen for the first time in decades in the aftermath of COVID-19, which threatens to push over half a billion more people into extreme poverty(15).

Inability to participate in society is, as highlighted, a defining feature of poverty. This means that many people across the world who live on significantly more than \$1.90 per day can also experience poverty; this is called relative poverty. Relative poverty reflects inequality within a society and is the most useful way to assess poverty in High Income Countries (HICs). Indeed, when looking at the health and social outcomes of HICs, the degree of income inequality within a country is much more important than the national average income(2). One way of examining inequalities within societies or countries is the Gini coefficient, a calculation which reflects unequal household income within a defined community – the lower the Gini coefficient value, the more even distribution of wealth within said community(18). Figure 2 demonstrates income inequality for the member states of the Organisation for Economic Cooperation and Development (OECD), where 0 equates to 'perfect equality' and 1 equates to 'perfect inequality'(19).

Figure 2 OECD countries by Gini Coefficient, 2017 (source OECD(19))



Most countries use a percentage of median income to be able to measure national relative poverty. In the European Union, the poverty threshold is recognised as 60% of median equivalised income for the member state, and households below this threshold are deemed 'at risk' of poverty(20). In Northern America (both Canada and the United States of America), the poverty threshold is set at 50% of median equivalised income. However, these cut offs are often seen as arbitrary and other measures of poverty have been identified by different organisations. For example, the Minimum Income Standard (MIS) is often used to assess poverty in the United Kingdom (UK). The MIS is based on public opinion on what a household needs to not only survive with bare essentials but to 'live in dignity'(21). In Canada, low income is not only assessed by a percentage of median income but also on having to spend 20% more of their income than the average household on essentials including food and housing(22).

What causes poverty in the 21st century?

“The reason that the rich were so rich...was because they managed to spend less money” (Men at Arms, Terry Pratchett)

The simplest explanation of poverty is when an individual or household experience inadequate income and high financial outgoings. However, poverty is also a reflection of unjust societies and a consequence of political decisions.

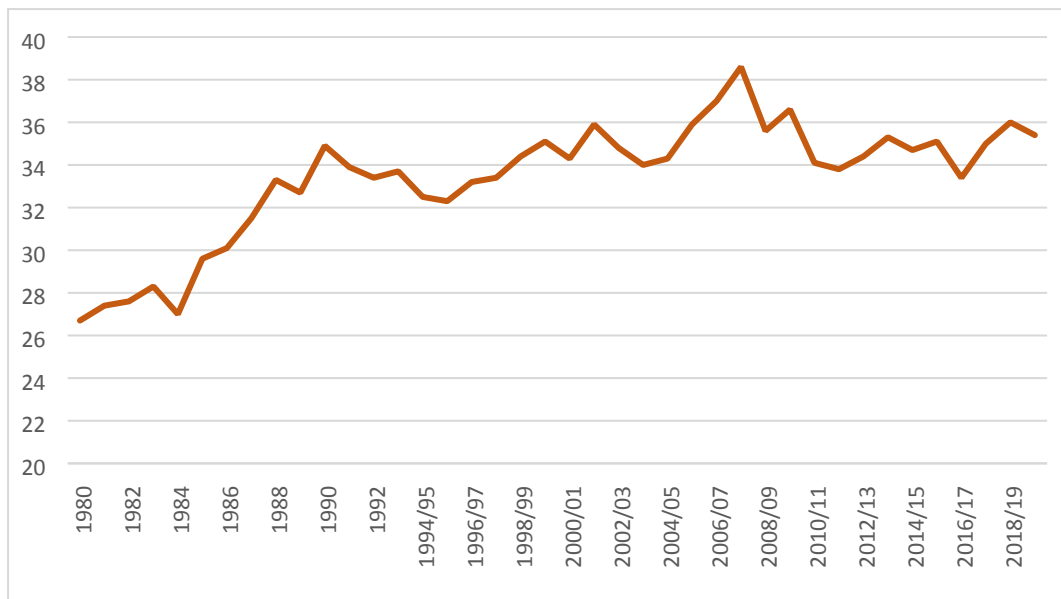
Extreme poverty in Low- and Middle- Income Countries (LMICs) has roots in the slave trade and colonialism, whereby European countries sought to control many countries across the global South, exploiting their human and material resources(23). This exploitative relationship between HICs and LMICs is continued today through neo-colonial trade markets and structural adjustment policies, which are supposed to improve economic outputs but often do the opposite; in 2017, HICs appropriated resources (material and labour) equal to \$2.2 trillion from the global South(24). British companies alone own \$1 trillion of African assets through mining companies(16). Chronic drain of resources and income amplifies pre-existing inequalities in health and economic outcomes, causes dependency on wealthier nations and slows infrastructure development(16). Many LMICs also face political instability and shoulder the burden of extreme climate crises, which both further compound economic progress and limits development(25).

In HICs, poverty is once again an avoidable consequence of governmental policies. Inequitable tax systems and insufficient social security systems drive inequality in wealth and relative poverty, and for decades in countries such as the USA and UK aggregation of wealth for the richest has corresponded to worsening deprivation for the poorest(26). Research from the London School of Economics studied the trend of tax cuts for the rich in 18 HICs over 50 years and found that tax cuts are associated with increasing income for the wealthiest, but do not improve overall economy(27). On top of this, the richest 1% can protect their extreme wealth through tax havens, with estimations of up to \$7.6 trillion kept in offshore accounts(28). Whilst in many HICs accrue their wealth, a robust welfare system is crucial in protecting those who cannot earn enough money through work(29). Regrettably, in many HICs welfare systems are often inadequate and/or inaccessible, and the European Union recognises that reforms in welfare systems contribute significantly to poverty in Europe(30). Many governments in HICs chose austerity measurements in the wake of the 2008 financial crisis, shrinking vital welfare systems when they were needed the most. By 2012, millions more people in HICs were living in poverty(31). In short, for many countries the rich have got richer, and the poor have become poorer.

The UK as a case example of drivers of poverty

Despite having one of the richest economies by Gross Domestic Product in the world, the UK has had a persistently high Gini coefficient and pre-Brexit had the second highest level of inequality within the European Union (see figure 3)(32). 13.4 million people, 20% of the population, were living in relative poverty after housing costs in 2021 and most recent data from 2019/20 shows that 27.7% of the population were living below the MIS(33,34). We will therefore use the UK as a case study to examine some of the causes of poverty in HICs.

Figure 3 Gini coefficient for disposable income as % for the UK 1980-2020 (source ONS(35))



Inadequate income:

Income comes from wages and social benefits. Median income has been rising by 2.2% over 5 years in the UK, but this mostly reflects an increase in wages for the richest 20% of households whilst the poorest fifth have actually seen their overall income fall by 1.6%(36).

One of the impacts on income and poverty in recent years (both for working and non-working households) is changes to the benefits system. In 2013, Universal Credit was introduced with the apparent aim to simplify the benefits system, however, has led to increased rates of poverty and debt, particularly for low-income working age families already at high risk of poverty(37,38). In 2016, rises in working age benefits were frozen for 4 years, causing 400,000 people to move into poverty as inflation surpassed their income(39). At the same time, limits and regulations were being placed on other social benefits, including restrictions for child benefits and housing allowances(40). Analysis from Child Poverty Action Group found that in total, the changes to benefits in the UK between 2013-2016 pushed an additional 1 million children and 900,000 working aged adults into relative poverty (after housings costs)(40). In April 2020, the working age benefits freeze ended but the increase to benefits only reflected inflation for 2020(41) without accounting for previous years of inflation and therefore remained inadequate. During the COVID-19 pandemic the UK government implemented a £20 per week uplift to Universal Credit, which was a key to reducing relative poverty during this period and a lifeline for many families but was rolled back in October 2021. At the time of writing this chapter, there is still no government decision on whether benefits will increase in line with inflation in the wake of the 2022 'cost of living' crisis.

Alongside cuts to social benefits, wages in the UK have not recovered for over a decade since 2010(37). Many in work adults are increasingly finding themselves in low paid and insecure jobs, and the percentage of in work adult poverty in the UK is at its highest since records began with the highest increases seen in health and social services industry(42,43). This is due to a combination of inadequate wages, cuts to social benefits and underemployment (a reduction in working hours that has disproportionately affected households with low income and has never recovered following the 2008 recession)(43). As well as slow to recover wages, the rates of working aged adults moving repeatedly between work and unemployment in the UK has increased by 60% since 2006, with unemployment being another significant risk factor for poverty(42).

High outgoings:

Whilst income for the poorest households in the UK has stagnated, outgoings required to participate in society have continued to increase, and disproportionately affect those on lower incomes. Housing costs are the most significant outgoings for most households, and housing affordability has worsened over the past 20 years, with average house owner spending 18% of income on mortgage and renters having to spend 27-31% of their income (including benefits) on rent in 2021(44). This has increased during 2022, with 1 in 3 renters reporting an increase in their rent over the last 6 months in March 2022(45).

Alongside increasing rent and mortgages, consumer price inflation in the UK is soaring. UK government target rates for inflation are 2% per year, yet in August 2022 inflation had risen by 8.6%(46). Even before 2022, higher-than-target inflation rates were impacting the cost of essentials: between 2010-2021, only 30 common food and non-alcohol products either at or below inflation target, compared to 112 for which increase in cost was more(47). Out of 24 commodities measured for housing, water and electricity, all except the price of replacing shower heads were over target inflation(47). This inflation disproportionately affects those on lower incomes as poorer households spend more of their budget on basic goods and services (see figure 4)(48). As a result of inflation and worsening housing affordability, 34% of adults living in the most deprived areas of England found paying their household bills difficult or very difficult in March 2022 compared to even a year ago(45).

Figure 4: Inflation rates for equivalised disposable income deciles, UK, October 2022 (source ONS(49))



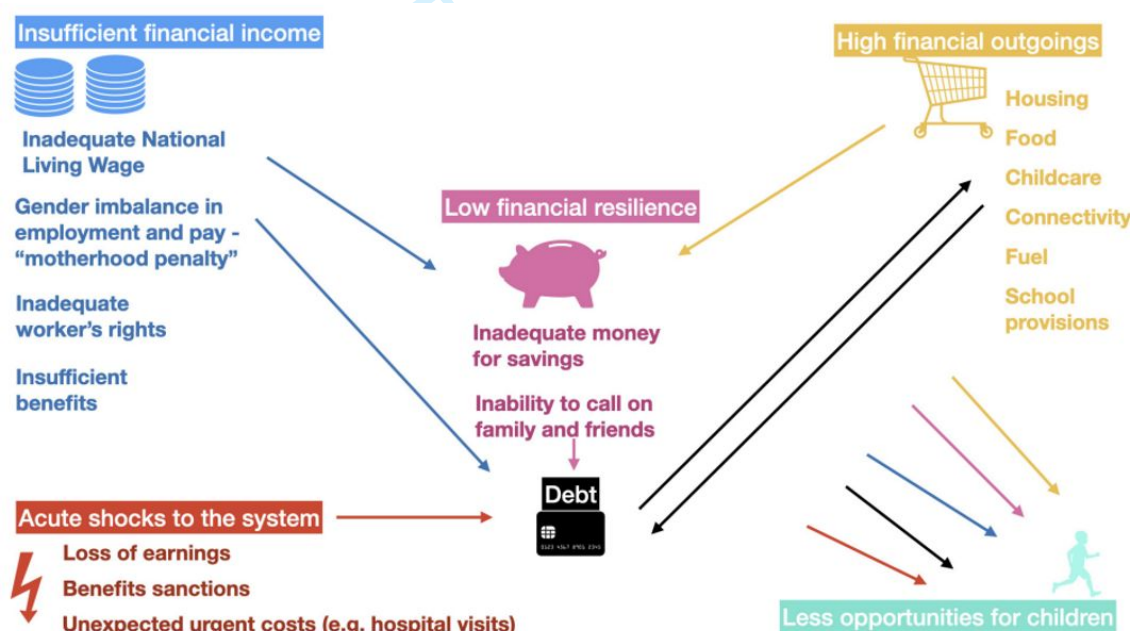
On top of a generalised increase in cost of living there is a recognised 'poverty premium' in the UK whereby low-income households are faced with barriers to cheaper services and goods(50). For example, households able to afford direct debit payment for energy are often quoted lower tariffs than those paying by pre-pay meter(51). Similarly, insurance costs are higher for households in poorer neighbourhoods than their wealthier counterparts(50,52). Living in poverty also prices households out of 'money saving' shopping as they are unable to buy supplies in bulk and often must 'buy cheap and buy twice'. In Greater Manchester, the poorest households are paying £1096 more a

year on basic services and goods, and a basic 'basket of food' costs 10% more from convenience stores in deprived areas compared to the regional average(52).

Those most at risk

Certain households in the UK are more susceptible to cycles of inadequate income and high outgoings. Households which include children, those living with disabilities, Black and Minority Ethnic communities and single women are at most risk of falling into poverty(53). Figure 5 demonstrates the structural financial drivers of child poverty(5). Whilst the diagram focuses on child poverty, similar patterns can be seen for other 'at risk' households, all of whom are at risk of systemic discrimination when seeking employment(54,55). Working aged adults living with disabilities may also have limited access to income through work and rely on inadequate benefits, with high costs associated with additional healthcare needs(56). Working aged adults from BAME communities are more likely to be trapped in low-income jobs, provide unpaid carer work, and are often paid less for the same jobs compared to their White British counterparts(57).

Figure 5 The Low financial resilience model of family poverty(5)



How does poverty affect respiratory inequalities?

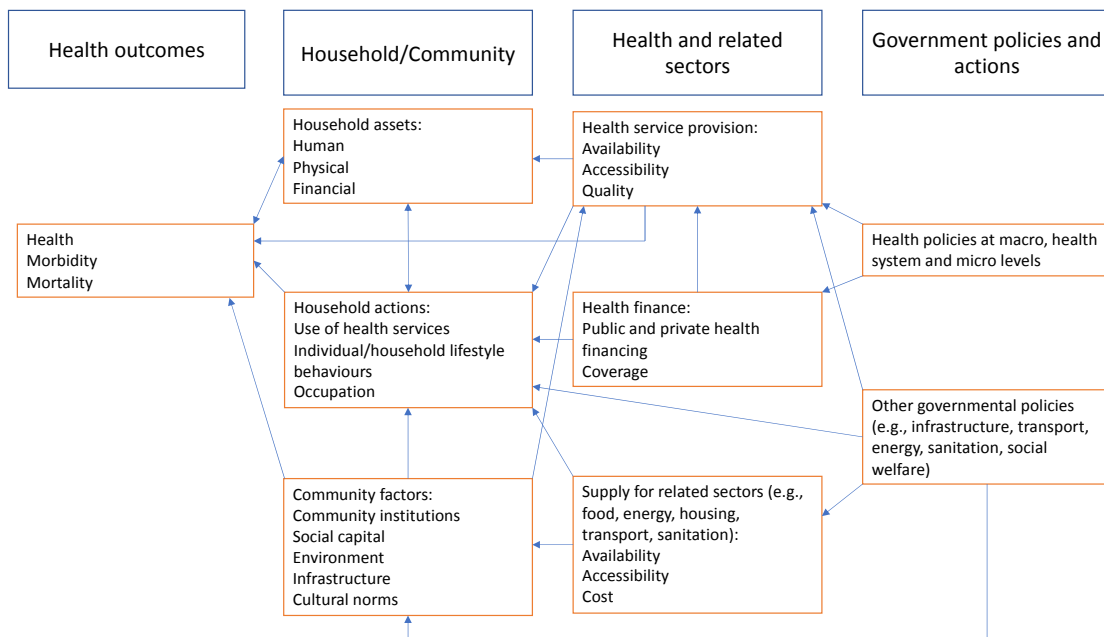
Inequalities in respiratory health are defined as "avoidable, unfair and systematic differences" in outcomes between groups of people (58). This section of our chapter will examine existing evidence for the relationship between poverty and respiratory inequalities, and lay out a framework for understanding the root causes behind this relationship.

Poverty is a precursor for illness, especially respiratory disease:

People living in poverty are more likely to live in poor health and die younger. The material and social deprivation associated with poverty determine poor health outcomes (see figure 6), which in turn limits income potential and increases risk of further poverty, creating a vicious cycle of poverty and ill health(59). In the UK, average life expectancy for those living in the poorest areas is 8.6 years less than their most affluent counterparts(37), and for every increase in decile of deprivation, risk of

child mortality increases by 10%(60). As well as early death, living in worsening deprivation in the UK also increases time spent living in ill health by an average of 17 years(3). A review of 118 LMICs in 2019 similarly found that health outcomes were significantly impacted by levels of political stability, national economy, effective policy governance and levels of poverty(61). Moreover, international intervention through imposed structural adjustment policies is associated with worse outcomes in health access and neonatal mortality(62).

Figure 6 Socioeconomic determinants of health outcomes (adapted from Wagstaff (59))



Respiratory health is particularly susceptible to social determinants of health in figure 6, and therefore particularly influenced by poverty. Indeed, many illnesses such as lung cancer, COPD, tuberculosis and other respiratory infections are often viewed as diseases of poverty(63). In England, admission to hospital for respiratory disease is more strongly correlated to deprivation than all other common health conditions both for adult and paediatric populations (see figures 7 and 8)(64).

Figure 7 adult hospital admissions per Index of Multiple Deprivation (IMD) decile in England(65)

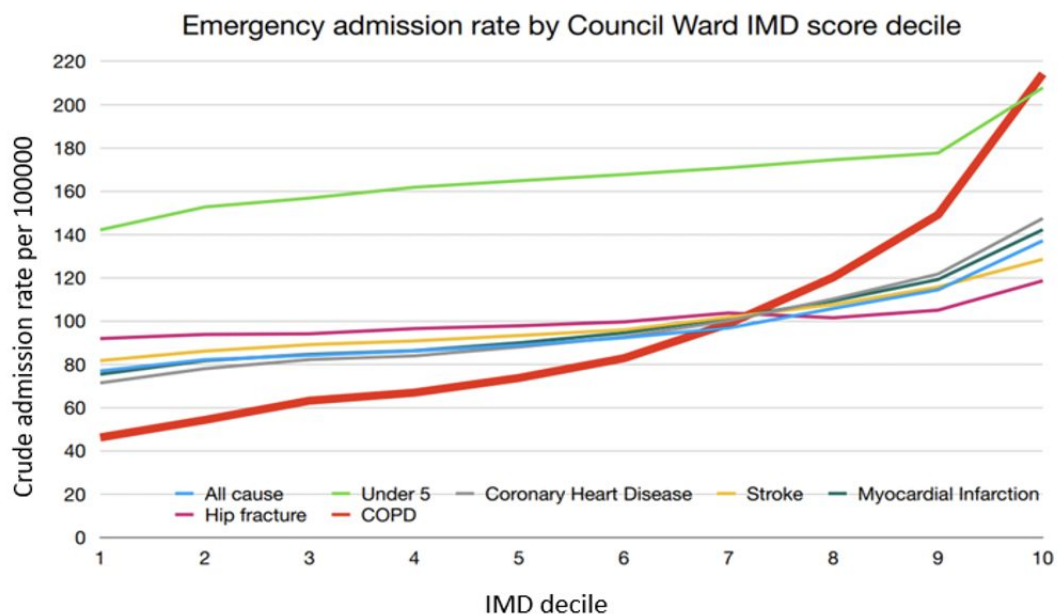
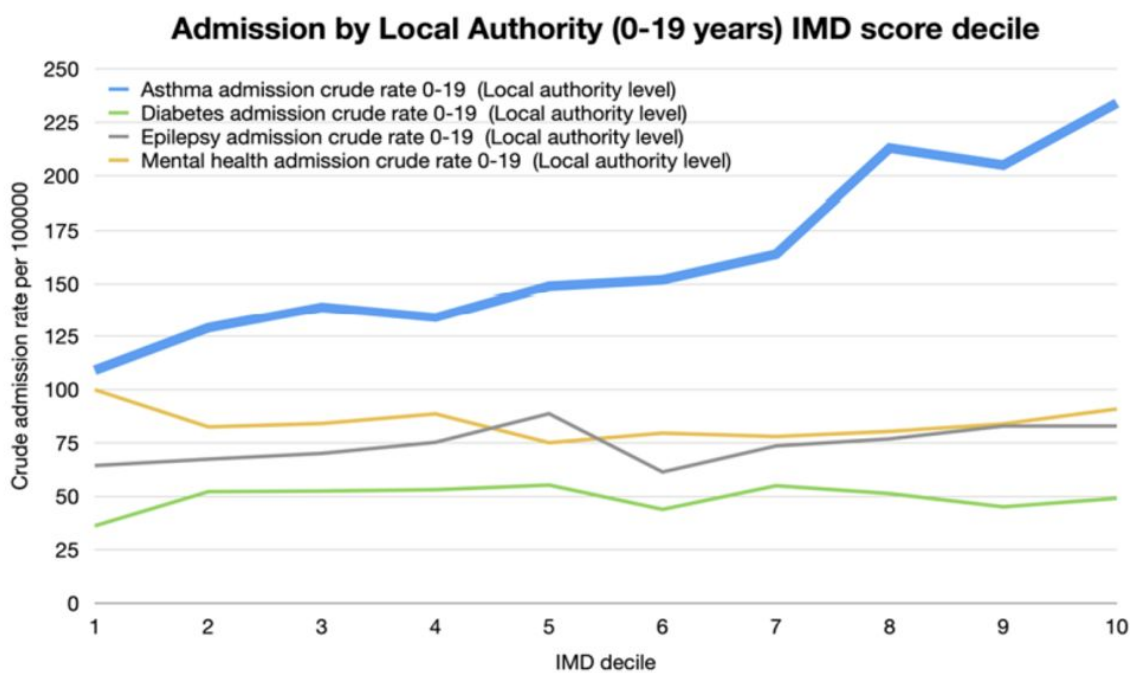


Figure 8 paediatric hospital admissions per Index of Multiple Deprivation (IMD) decile in England (65)



Poverty is both a causation for respiratory ill health and adversely augments disease outcomes. Environmental exposures such as outdoor air pollution(7), tobacco smoke(66), indoor air pollution(67) and mould(68), and overcrowding(69) are all more likely in when living in higher levels of poverty. This means that respiratory diseases with environmental causation, such as asthma, COPD, lung cancer and respiratory infections are much more prevalent in deprived communities compared to their wealthy counterparts:

- In the UK, deprived communities have a 36% higher incidence rate of asthma than the least deprived and worse asthma outcomes with increased healthcare utilisation(7).
- A systematic review of lung cancer incidence found that there was a 37-61% increase in incidence associated with lower socioeconomic status, and this association between deprivation and lung cancer persisted even when adjusted for smoking(70).
- Adverse outcomes for lower respiratory tract infections are higher in the most deprived communities across the world. This was keenly felt during the COVID-19 pandemic(69), but inequalities in infection rates existed long before 2020. In LMICs, pneumonias are the leading cause of both child mortality and adult hospitalisation(71). In the UK, rates of hospitalisation for bronchiolitis are higher in localities with higher levels of poverty(72).
- Systematic reviews consistently find that lower socioeconomic status is associated with at least a 2 to 3- fold increase in incidence and worse health outcomes for COPD(73,74).

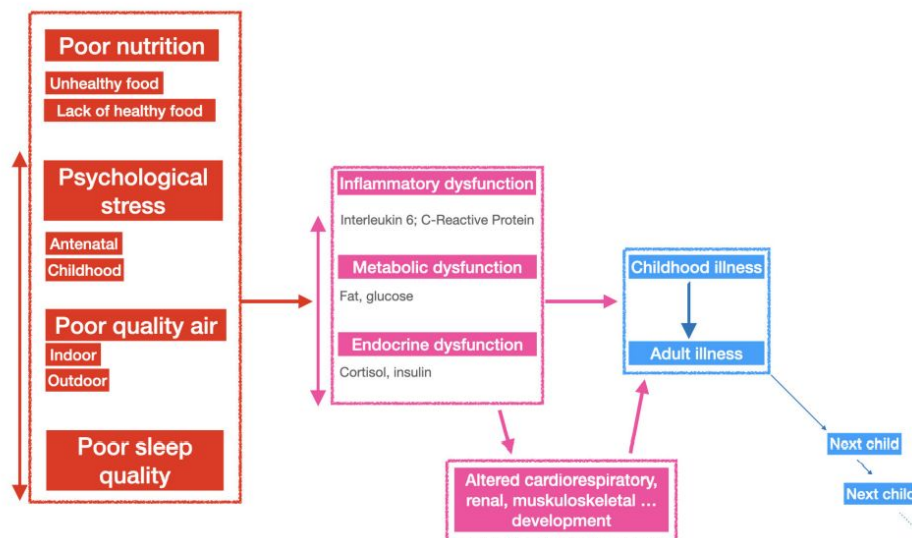
Even for cystic fibrosis (CF), a monogenic respiratory disease which has no environmental causation, poverty adversely impacts outcomes. In the USA, a study looking at all 23 817 CF patients on the CF registry found a 44% increased risk of death for those in the lowest income category compared to the highest(75). Studies in the UK have found similar inequalities in relation to socioeconomic status, and furthermore, despite advances in CF treatment, these inequalities have not significantly improved for decades(76).

How does poverty cause poor respiratory health?

There is a myriad of pathways of how poverty drives respiratory ill health, many of which are covered in detail throughout this monograph. As discussed during this chapter, poverty both causes respiratory ill health from direct and indirect exposures and is associated with worse outcomes for disease. This section will focus on the broader mechanistic pathways between poverty and respiratory inequalities, adapted from recent work with the Royal College of Paediatrics and Child Health(5):

1. Those living in poverty are priced out of healthy behaviours and opportunities:
As discussed in further detail throughout this monograph, households living in poverty are priced out of good lung health. Protective factors, such as optimal indoor(77) and outdoor(7) air quality, access to a good diet rich with antioxidant fruit and vegetables(78,79), and access to safe work(80) are all far less accessible for those living in deprivation. In the UK, living in the most deprived communities exposes an individual to the highest levels of outdoor air pollution(7), less local access to shops with fresh produce, and increased access to fast food shops(81).
2. Poverty gets under your skin and in your DNA:
Poverty causes chronic stress and increases the risk of harmful exposures for respiratory health such as smoking, infections, and air pollution. This causes immune, inflammatory, and metabolic dysfunction (see figure 9) which can contribute to developing respiratory diseases including as asthma, respiratory tract infections and COPD(5). Not only does poverty drive these adverse respiratory health outcomes for an individual, but the exposome of poverty affects respiratory health for future offspring(82,83). As discussed in greater detail in the chapter "Antenatal determinants of child lung development", adverse exposures associated with poverty can cause differential DNA methylation, genetically predisposing future generations to respiratory disease(84).

Figure 9 the pathobiology of poverty(5)



3. The inverse care law:

The inverse care law was first described in the 1970s by Julian Tudor Hart, highlighting that those who need healthcare services the most are the least likely to receive them(85). This perverse relationship impacts respiratory health outcomes for those living in poverty. In a case control study using the CF foundation patient registry in the USA, adult patients facing increasing number of socioeconomic barriers (such as income, education, race, insurance status and employment) were, on average, half as likely to be referred for lung transplants regardless of severity of disease(86). In Denmark, despite a universal healthcare system, a study of over 60,000 asthma patients found that adults on unemployment or disability benefits are less likely to receive a specialist referral for severe asthma than their wealthier counterparts(87). Across the world, refugees and asylum seekers consistently face barriers in accessing healthcare despite being one of the most vulnerable communities to ill health(88).

4. The odds stack up against good respiratory health:

Adverse exposures associated with poverty accumulate and often work synergistically. For example, living in socioeconomic deprivation is associated with an increased rate of maternal smoking in pregnancy(89), which is a recognised risk factor for childhood asthma. Antenatal smoking and deprivation are also both risk factors for preterm delivery, which once again increases risk of childhood asthma(90). Living in poverty also means that the mother and child are more likely to live in a house with damp(68), in an area with high levels of air pollution(7). All these exposures further increase the risk of asthma for the child(91). Whilst the child's adverse exposures 'stack up', protective factors are often removed: access to vitamins C during pregnancy may protect an unborn foetus against tobacco exposure(92), however living in poverty will reduce accessibility to a vitamin rich diet for the pregnant woman(93) whilst the child, once born, is less likely to have access to safe outdoor green space for exercise, another protective factor for child lung function(94).

Conclusion

Poverty is pervasive across the world and is caused by historical and modern-day political and societal drivers. Both extreme global poverty and relative poverty cause morbidity and early

mortality. The relationship between poverty and poor respiratory health is irrefutable, and often the pathways are complex, interlapping and not yet fully understood(95). Many health services spend significant resources on respiratory ill health; the UK spends £11 billion each year on treating lung diseases(96). Whilst some countries begin to reprioritise respiratory disease, matching research funding to the high disease burden(4), as a community of healthcare professionals we must recognise that any commitment to reduce the burden of respiratory disease must also commit to understanding the mechanisms of deprivation and respiratory inequalities, and ultimately commit to reducing poverty(12). This monograph is a step towards this goal, with each chapter focussing on different domains of respiratory health, moving poverty and inequality from the ‘wider determinants’ of health to their rightful place as core determinants of respiratory health.

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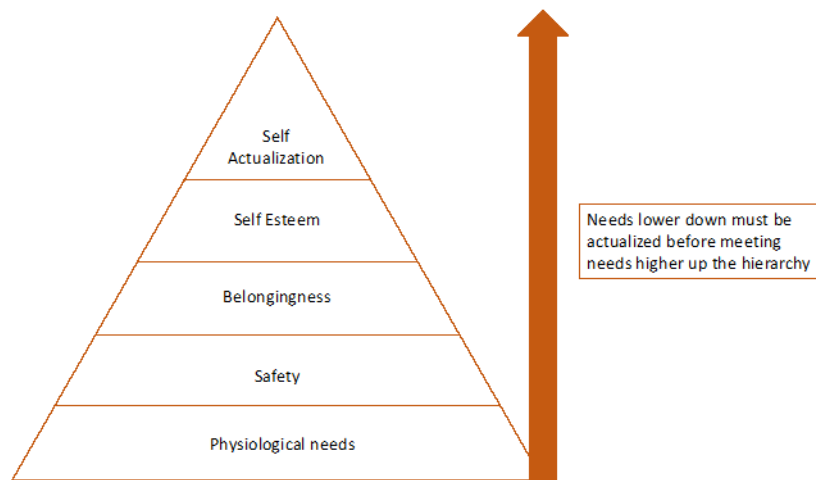
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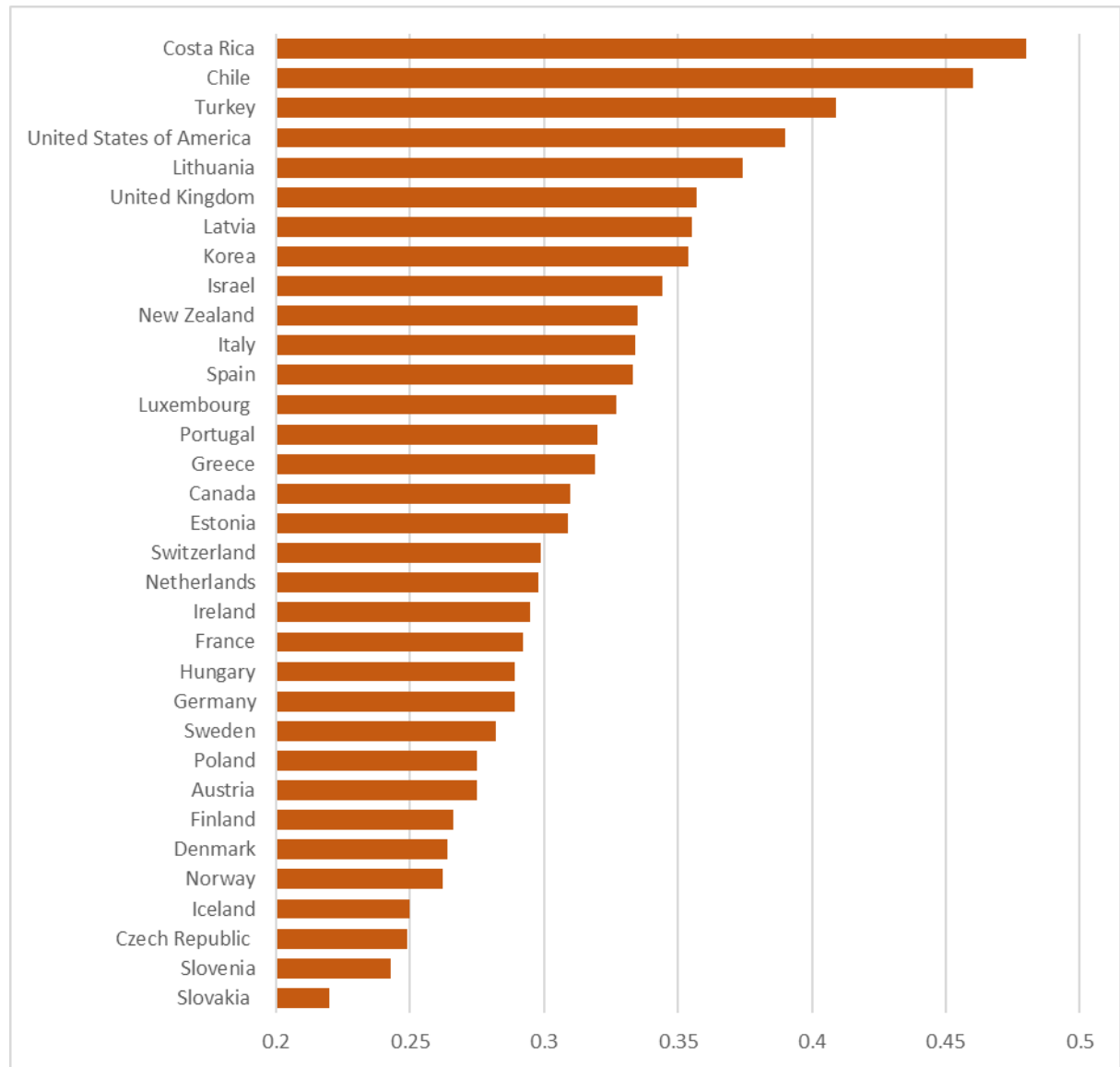
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Figures

Figure 1 Maslow's hierarchy of needs(12)

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Figure 2 OECD countries by Gini Coefficient, 2017 (source OECD(18))



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Figure 3 Gini coefficient for disposable income as % for the UK 1980-2020 (source ONS⁽³⁴⁾)

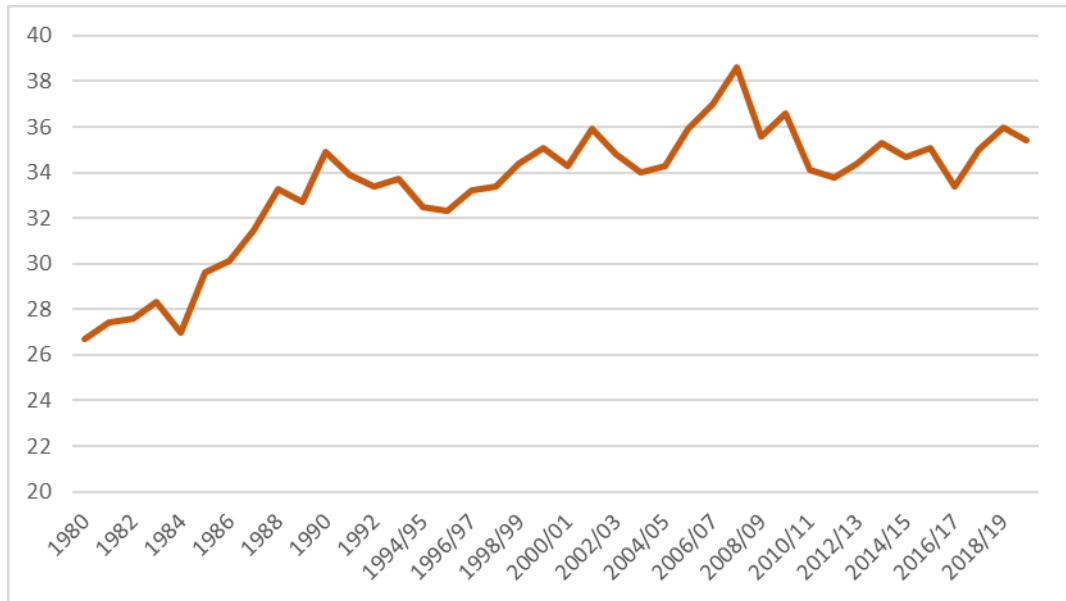


Figure 4: Inflation rates for equivalised disposable income deciles, UK, October 2022 (source ONS(48))



Figure 5 The Low financial resilience model of family poverty(4)

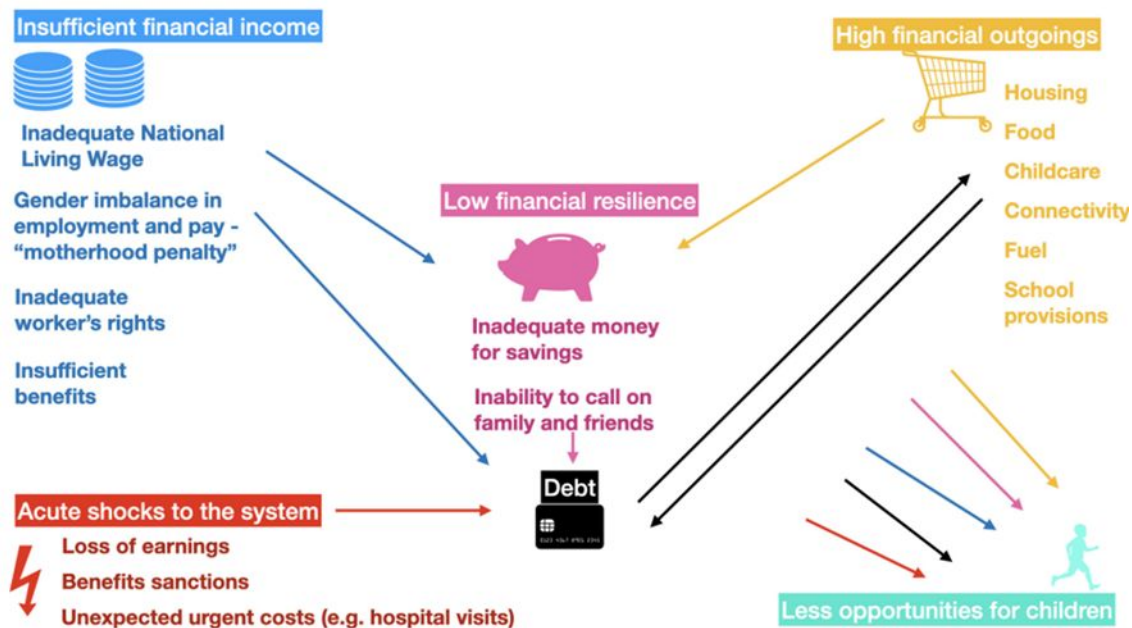


Figure 6 Socioeconomic determinants of health outcomes (adapted from Wagstaff (55))

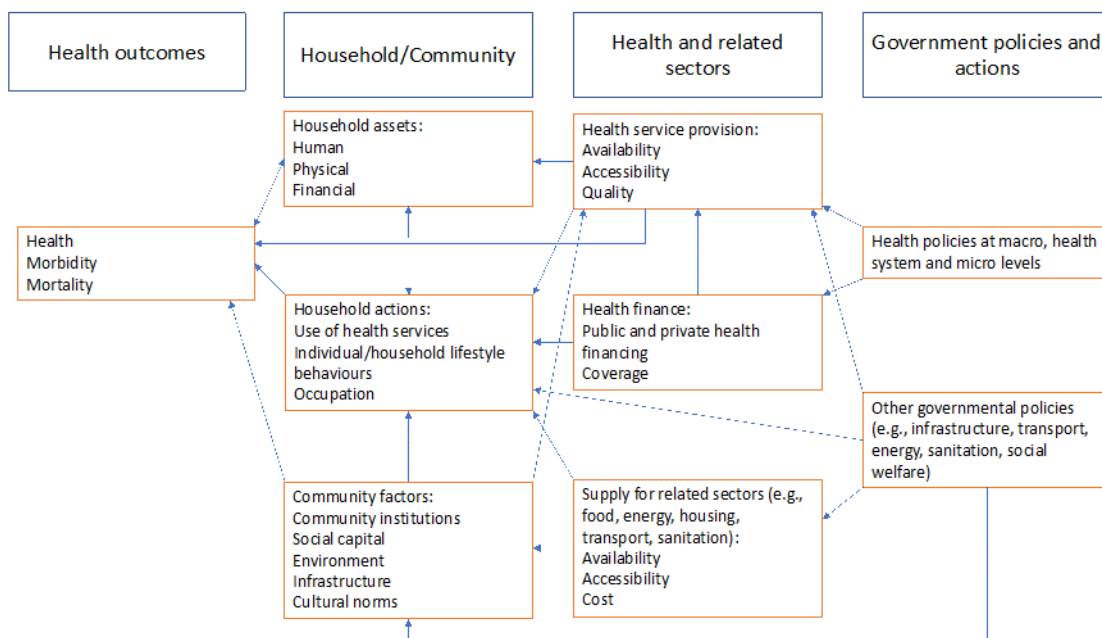


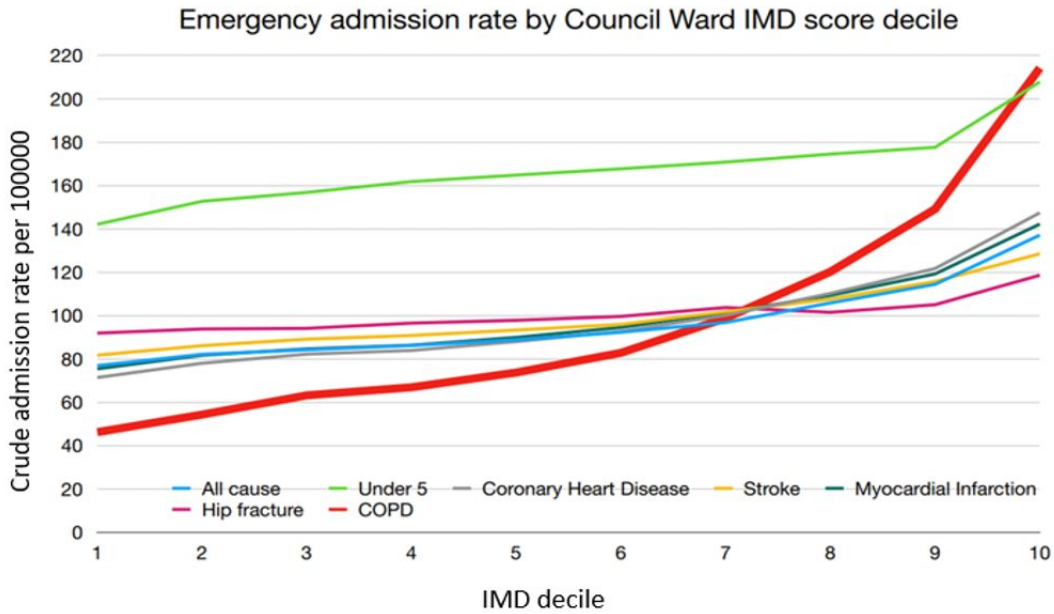
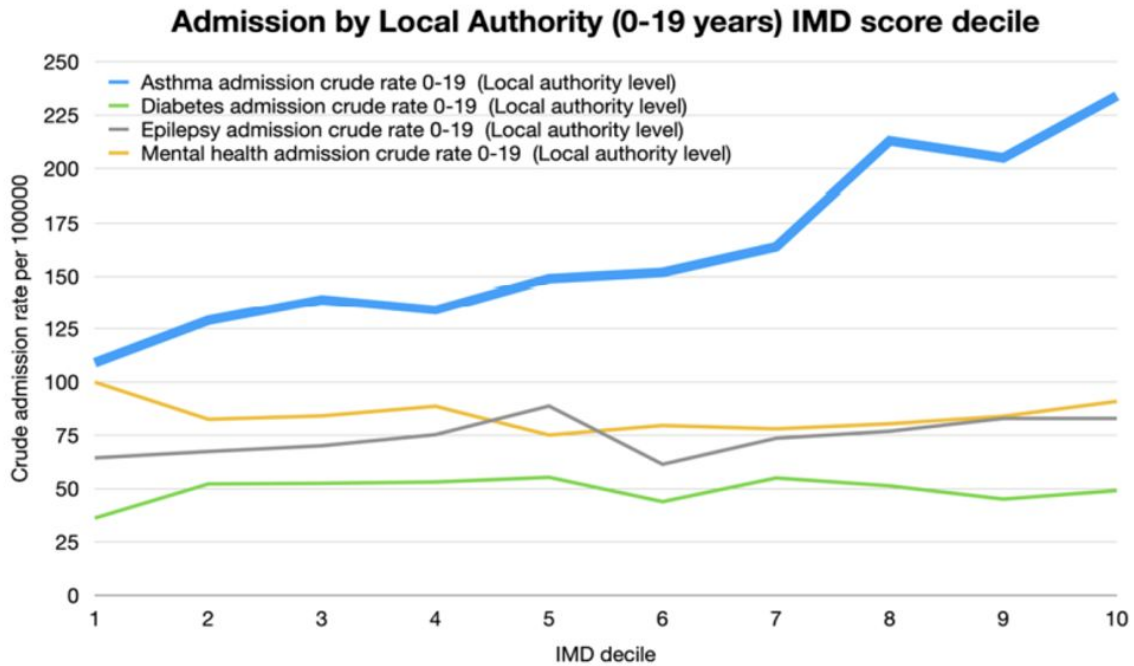
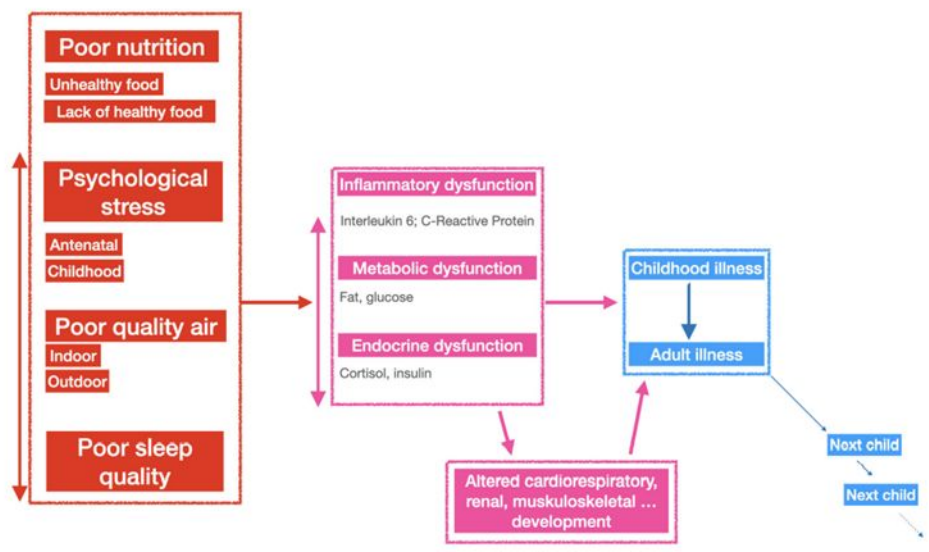
Figure 7 adult hospital admissions per Index of Multiple Deprivation (IMD) decile in England⁽⁶¹⁾Figure 8 paediatric hospital admissions per Index of Multiple Deprivation (IMD) decile in England⁽⁶¹⁾

Figure 9 the pathobiology of poverty(4)



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