

Cost of Health Inequality to the NHS in Wales

Report 1 Cost Associated with Inequality in Hospital Service Utilisation to the NHS in Wales

December 2021

WHO Collaborating Centre on Investment for Health and Well-being
Public Health Wales



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World Health Organization
Collaborating Centre on Investment
for Health and Well-being

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Introduction | Cost of Health inEquality to the NHS in Wales (CHEW)

- As part of a wider national and organisational commitment to achieving health equity, the WHO CC at Public Health Wales has initiated a project to estimate the **‘Cost of Health inEquality to the NHS in Wales’ (CHEW)**
- This work delivers to a Memorandum of Understanding between the Welsh Government and the World Health Organization (WHO) Regional Office for Europe towards attaining the highest possible level of health, sustainable development and prosperity for all in Wales and beyond
- It contributes to establishing Wales’ as a ‘live innovation site’ and a global influencer for health equity in the context of evidence-driven, sustainable and inclusive COVID-19 recovery
- As an integral part of the Welsh Health Equity Status Report initiative (WHESRi), the project aims to help build the economic case for addressing unmet healthcare need and to strengthen the case for investing in prevention and early intervention towards reducing the health gap in Wales
- It plans to do this through exploring health service utilisation inequality and estimating the associated financial cost, including primary and secondary care data analysed in terms of service category, age, sex and level of deprivation
- **This first CHEW report** focuses on estimating the cost of inequality associated with hospital service utilisation only; further reports plan to expand understanding about health service use inequality, covering primary and community care, and cost associated with disease-specific services
- We hope this would fill an important evidence gap and allow evidence-informed resource prioritisation and policy action to help achieve a Healthier, a More Equal and a Prosperous Wales for the current and future generations

Introduction | Background and rationale

- Population health and wellbeing can be influenced greatly by wider socio-economic and environmental factors and their impact vary considerably across different population groups (as defined by age, sex, level of deprivation, etc.) (*Marmot & Bell, 2012*) resulting in different levels of healthcare need, requiring relevant access to and provision of healthcare services
- Health inequality has been a longstanding issue in Wales: people living in the most deprived areas have a much higher chance of death from avoidable causes (3.7 times for males and 3.8 times for females) (*ONS, 2019*) and much worse health with fewer years of healthy life expectancy at birth (16.9 years for males and 18.3 years for females) (*ONS, 2021*) compared to those living in the least deprived areas
- People living in more deprived areas tend to consume more healthcare at any given age, in terms of volume and cost as they could experience more adverse health conditions (*Cookson, 2016*)
- People living in more deprived areas are more likely to use unplanned care (primary and accident and emergency [A&E]) and are less likely to use specialist and prevention services (*Dixon et al., 2007*)
- Disparities in healthcare service use can have a huge economic impact both in the short and the long-term. For example, the cost associated with inequality of health service use is estimated to be £4.8 billion per year to the NHS in England (*Asaria et al., 2016*)

The economic cost related to inequality in healthcare service utilisation has not been established for Wales and the CHEW project and current report aim to fill in this gap

Policy considerations

- Reducing the health equity gap is a complex multi-faceted multi-level challenge and requires tailored understanding and coherent action across different sectors, as well as across all health services, so we can (a) address the wider determinants of health inequalities; as well as (b) see what the healthcare service (NHS) can do to tackle them
- Local case mix is an important consideration for the planning of healthcare services, as age, sex, and level of deprivation have a significant impact on how and what services are used by the local community, which in turn impacts on the financial cost of delivering them
- Health promotion, primary prevention and community-based early interventions, universal and targeted to those most in need, could improve health outcomes, enable timely access to services, reduce hospital care need and likely reduce inequalities and healthcare costs, particularly associated with emergency and A&E contacts
- The COVID-19 pandemic has exacerbated existing health inequalities and created new vulnerabilities, which requires careful consideration to ensure inequalities in access to, delivery and quality of healthcare services are not amplified further, but reduced as part of the NHS and wider sustainable recovery

We hope, the CHEW project findings will contribute to exploring further the relationship between health status, healthcare needs, health service access, provision and utilisation, and the associated financial cost in order to help decision-makers to tailor services and prioritise investment towards reducing the health equity gap in Wales

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Interactive dashboard

(optimised for desktop devices)

Aim and objectives

Aim

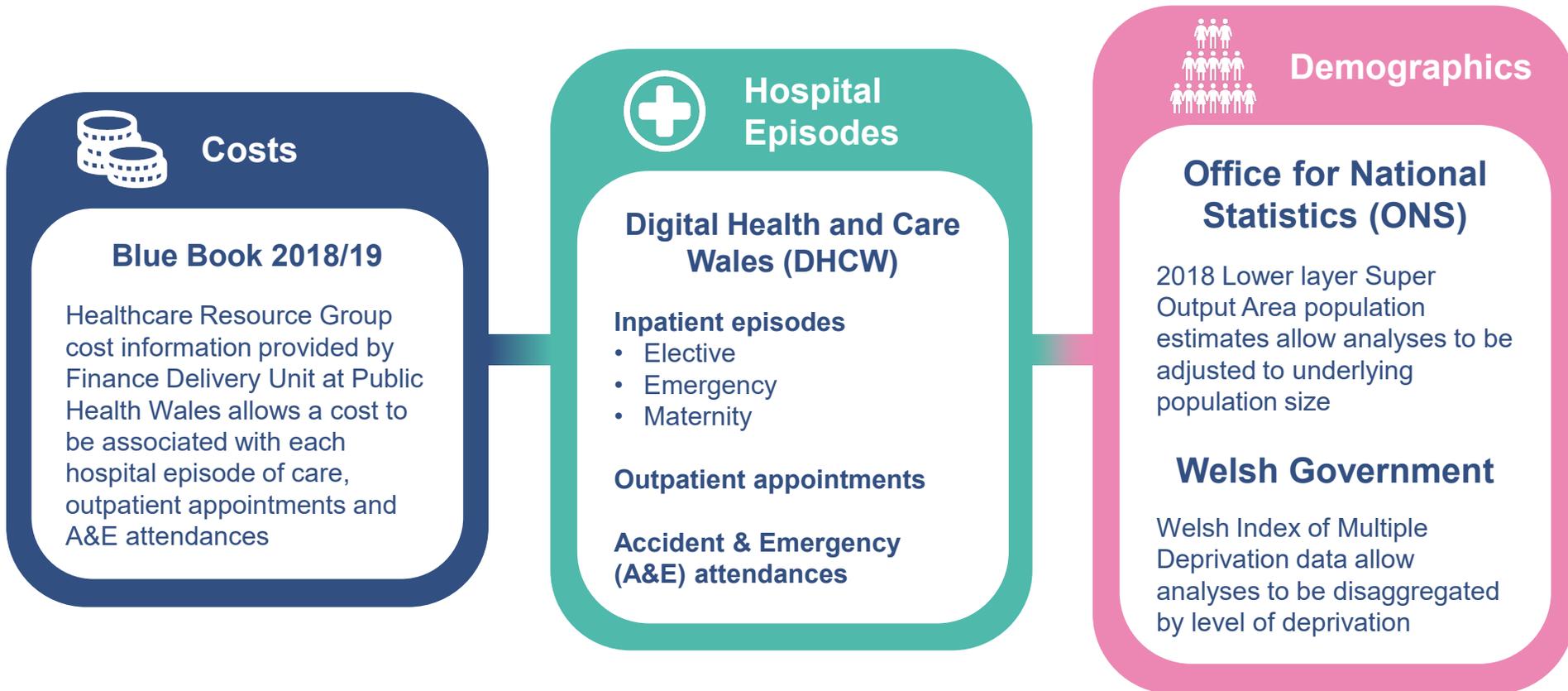
To estimate the financial cost associated with inequality in hospital service utilisation to the NHS in Wales to help inform decision-making and resource prioritisation towards prevention and early intervention through an equity lens, contributing to COVID-19 sustainable and inclusive recovery

Objectives

- To explore the social pattern of hospital inpatient admissions, outpatient appointments, A&E attendances in Wales by age group, sex and level of deprivation
- To estimate the total annual cost associated with inequality in hospital service utilisation in Wales according to and within service categories, by age groups and sex
- To estimate the average annual cost per capita of hospital service utilisation in Wales according to service categories, by age, sex and level of deprivation

Methods | Data sources

- Data and information was retrieved from a range of sources as outlined below for the period **April 2018 - March 2019**
- Detailed methodology with operational definitions and statistical analysis are provided in the annex (*pages 29-34*)



Key messages

- The **total annual cost associated with inequality in hospital service utilisation to the NHS in Wales** is estimated to be **£322 million, equivalent to 8.7% of the total hospital service expenses, in 2018/19**
- **Working age people (16 – 64 years old) experience the highest cost associated with inequality** for all hospital service categories, except for elective inpatient admissions where older males (65 years and over) from the least deprived areas contribute to the majority of the cost
- Overall, there is **no significant difference in the cost associated with inequality between male and female hospital service use** (male: 46%; female: 54% from the total cost)
- Within each service category - **A&E attendances, followed by emergency inpatient admissions, bear the highest proportional (%) cost attributable to inequality** annually, 31% and 23% respectively
- In terms of social pattern of service use - there is a **clear social gradient with a larger inequality gap for A&E attendances, followed by emergency and maternity hospital inpatient admissions**
- **Financial cost associated with inequality is largely driven by disparities in hospital service utilisation** across deprivation quintiles; however, in some cases cost variation cannot be explained by service use only

Key messages

- **The total cost associated with inequality vary considerably by age and hospital service category**, including inpatient admissions, outpatient appointments and A&E attendances:
 - **Emergency inpatient admissions are the largest contributor** to the overall cost associated with inequality, with an additional cost of £247.4 million annually
 - **Maternity inpatient admissions are the smallest contributor** to the overall cost associated with inequality, with an additional cost of £1.8 million annually
- **The average annual cost per capita is higher for both males and females living in the most deprived areas** compared to those in the least deprived across all service categories (including costs for all ages), except for maternity inpatient admissions, showing:
 - **A clear social gradient** across all service categories, except for elective and maternity inpatient admissions
 - **A wider inequality gap for A&E attendances and emergency inpatient admissions** and a **higher cost for younger females (18 - 28 years)** in the same categories
- **Deprivation affects the cost for maternity inpatient admissions differently according to age group** – higher cost is attributed to women in their early reproductive age (15 – 29 years) from the more deprived areas; and to women in their later reproductive age (30 – 44 years) from the least deprived areas

Results are presented in terms of:

I. Social pattern of hospital service use (*pages 12 – 13*)

II. Total cost associated with inequality in hospital service utilisation (*pages 14 – 19*)

- Total cost by sex and service categories
- Overall cost according to hospital service categories by age group and sex: inpatient admissions (elective, emergency and maternity), outpatient appointments, A&E attendances

III. Average cost per capita according to hospital service categories, by age, sex and level of deprivation (*pages 20 – 26*)

- Inpatient admissions: elective, emergency and maternity
- Outpatient appointments
- A&E attendances

Detailed data is available in the accompanying digital interactive [CHEW Dashboard](#) (optimised for desktop devices).

Results I | Social pattern of hospital service use, Wales, 2018/19

Age

- The median age of hospital service use is the highest for elective (63 years) and emergency (62 years) admissions, while the lowest is for A&E attendances (39 years) (*pages 13 & 33*)

Sex

- There is no significant difference between male and female service use across different service categories
- Female service use for outpatient appointments is higher than male, which might be influenced by different factors, such as maternity or socially/culturally related demand (*page 33*)

Social (deprivation) gradient (*pages 13 & 33*)

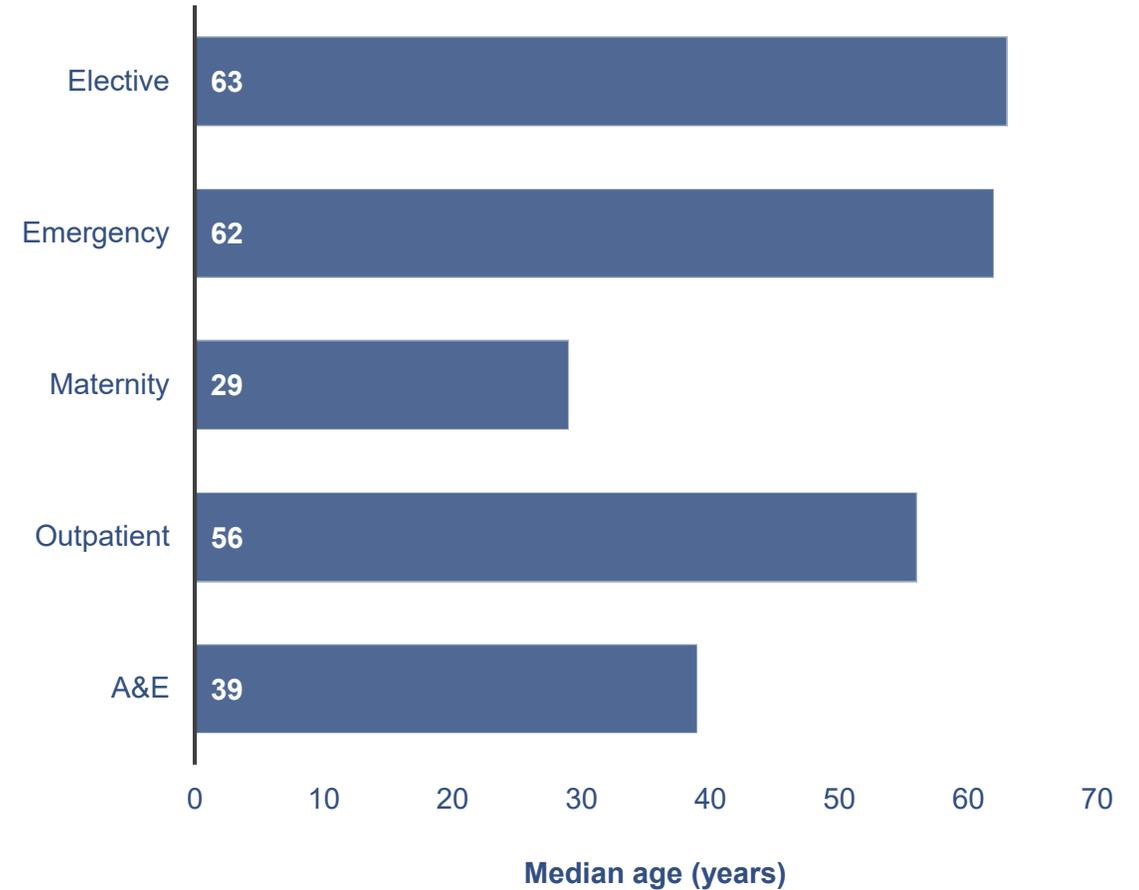
- There are wider differences in hospital service use between people living in the most deprived areas and those living in the least deprived areas for A&E attendances, followed by emergency and maternity inpatient admissions
- There is a clear social gradient for emergency and maternity inpatient admissions, and for A&E attendances, with higher service use in the more deprived quintiles
- There is no clear social gradient for the elective inpatient admissions and outpatient appointments

Results I | Social pattern of hospital service use, Wales, 2018/19

Unadjusted social gradient of hospital service use



Median age of patients for different types of hospital service use



Total cost associated with inequality (deprivation) across all service categories

- **The total annual cost associated with inequality in hospital service utilisation to the NHS in Wales is estimated to be £322 million**, equivalent to 8.7% of the total hospital service expenses, driven largely by **higher service use among people living in the more deprived areas** compared to those living in the least deprived areas
- **Emergency inpatient admissions are the largest contributor to the overall cost associated with inequality**, with an additional cost of £247.4 million annually
- **Maternity inpatient admissions are the smallest contributor to the overall cost associated with inequality**, with an additional cost of £1.8 million annually

Proportional (%) cost associated with inequality (deprivation) within service category

- **A&E attendances, followed by emergency inpatient admissions, bear the highest cost attributed to inequality** annually, accounting for 31% and 23% respectively

Higher overall and proportional (%) costs associated with inequality for emergency inpatient admissions and A&E attendances suggest higher use/demand among people from the more deprived areas, which could be driven by unmet healthcare need suggested by the low use of elective inpatient admissions and outpatient appointments

Elective inpatient admissions have a negative overall and proportional (%) cost associated with inequality, indicating that people from the least deprived areas contribute most to the cost (largely driven by higher use) compared to those in the more deprived areas

Results II | Cost associated with inequality in hospital service utilisation, Wales, 2018/19

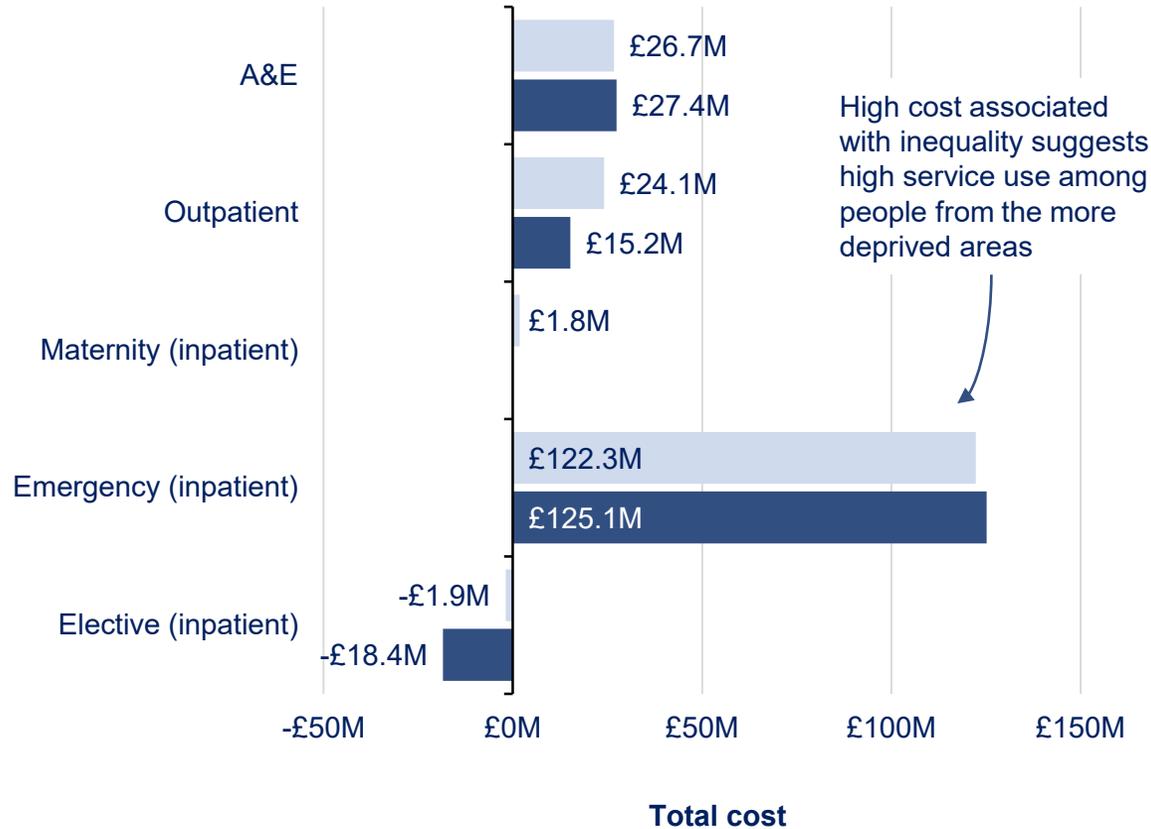
Age and sex distribution

- **For elective inpatient admissions:**
 - **Males aged 65 years and over from the least deprived areas contribute to the majority** of the cost associated with inequality, resulting in an overall negative cost attributed to inequality for this service category
 - There is a substantial **disparity in the cost associated with inequality** between males and females **among the working age group (16 – 64 years) with males contributing substantially higher cost**, compared to the females
- **For emergency inpatient admissions, people aged 16 years and over from the more deprived areas contribute to the majority** of the cost associated with inequality
- **For maternity inpatient admissions**, women at their early reproductive age (15 – 29 years) from the more deprived areas experience higher cost associated with inequality, compared with those from the least deprived areas who experience higher cost associated with inequality in their later reproductive age (30 – 44 years)
- **For outpatient appointments and A&E attendances, the working age group (16 – 64 years) from the more deprived areas contribute to the majority** of the cost associated with inequality

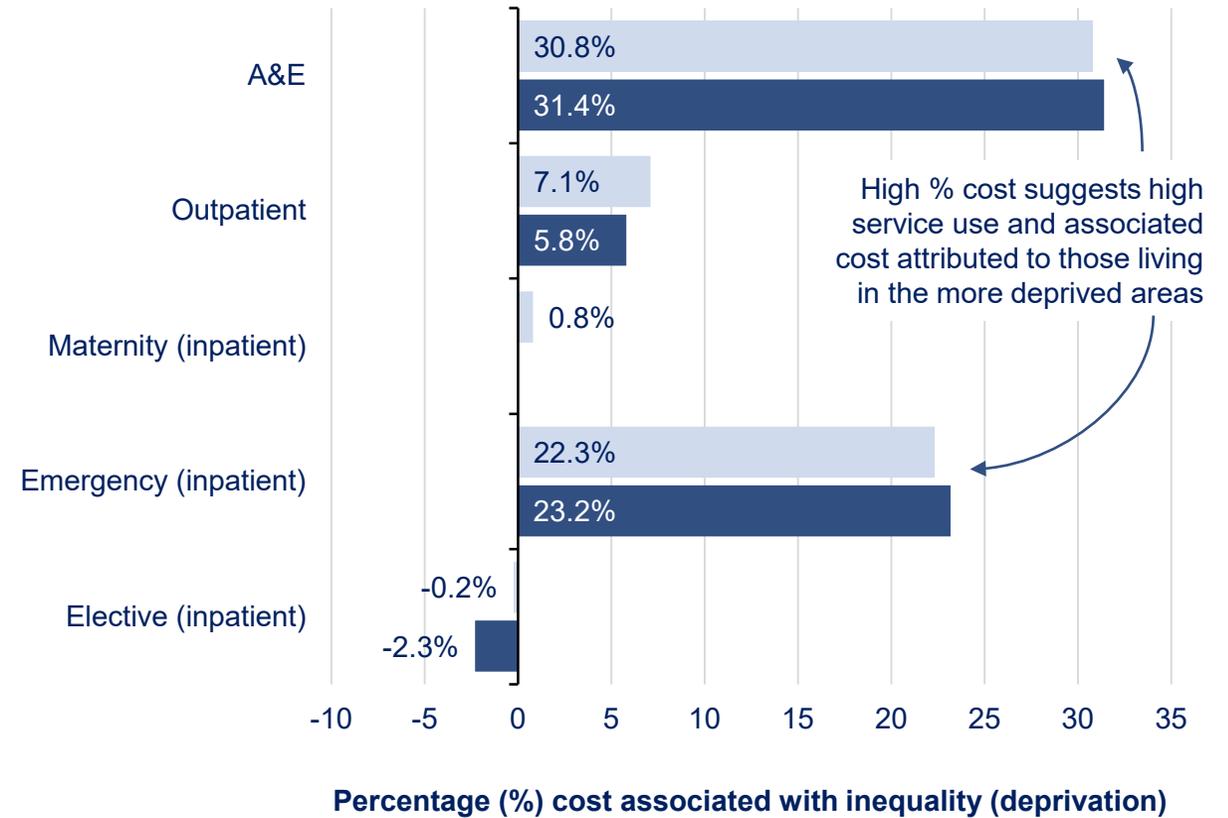
Financial cost associated with inequality is largely driven by disparities in hospital service utilisation between the least deprived quintile and the remaining four deprivation quintiles; however, in some cases cost variation cannot be explained by service use only

Results II | Cost associated with inequality in hospital service utilisation, Wales, 2018/19

Total costs



Cost within service category

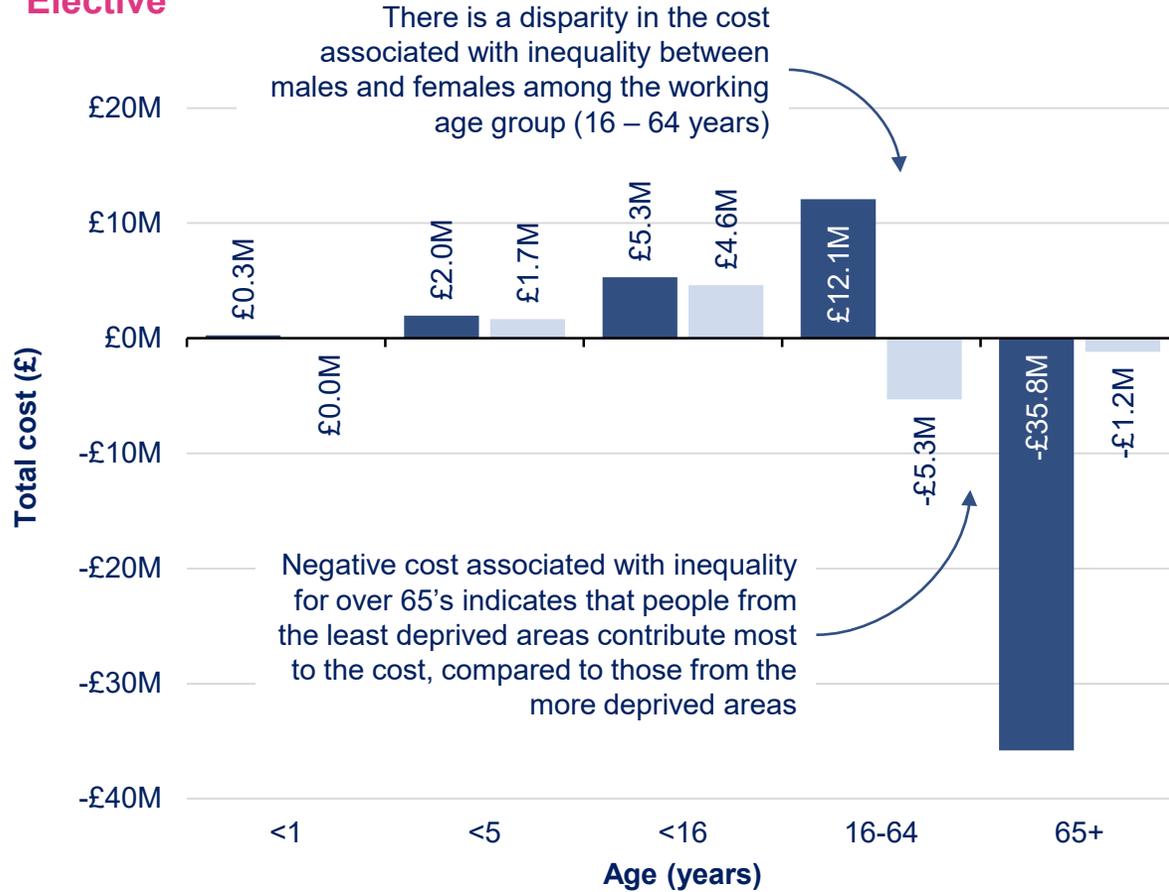


Note: Negative costs (total & %) indicate that people living in the least deprived areas contribute most to the cost of elective admissions

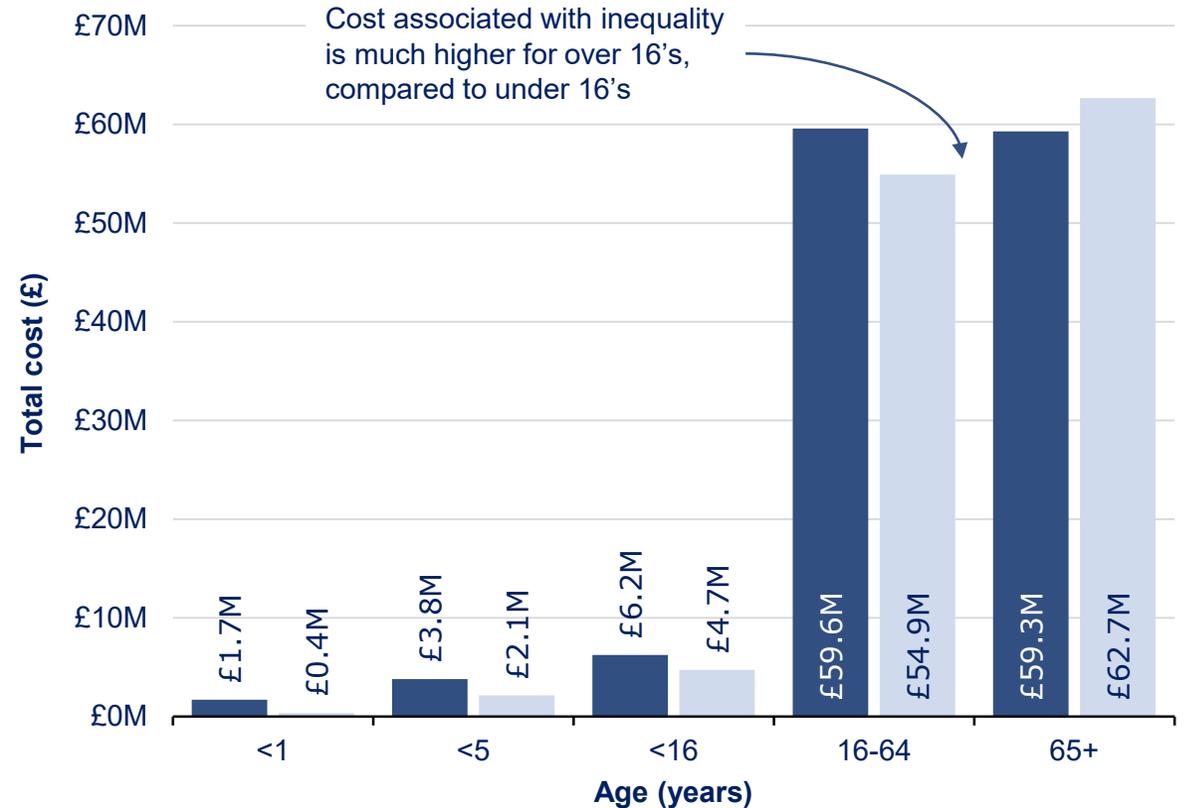
■ Males ■ Females

Results II | Cost associated with inequality in hospital service utilisation, Wales, 2018/19

Elective



Emergency



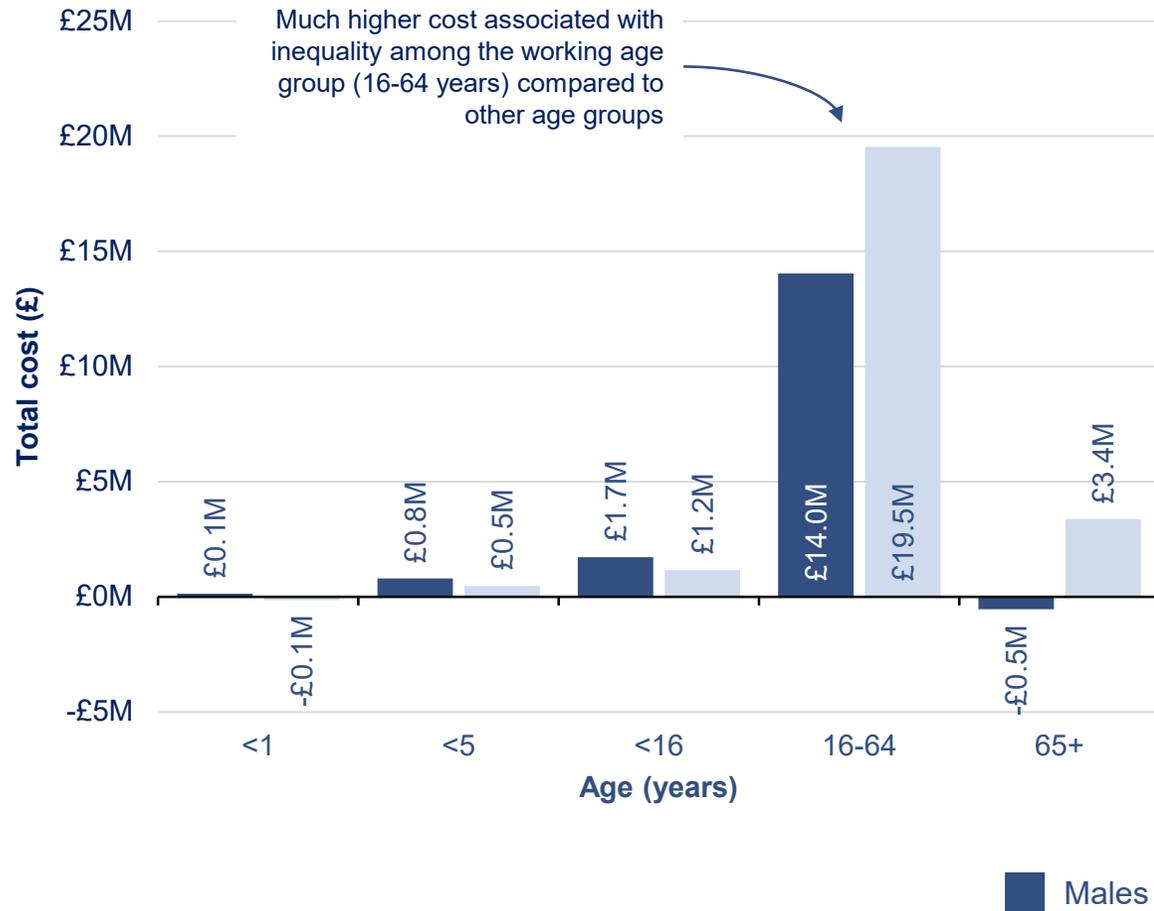
■ Males ■ Females

Results II | Cost associated with inequality according to hospital service category by age and sex: maternity inpatient admissions, Wales, 2018/19

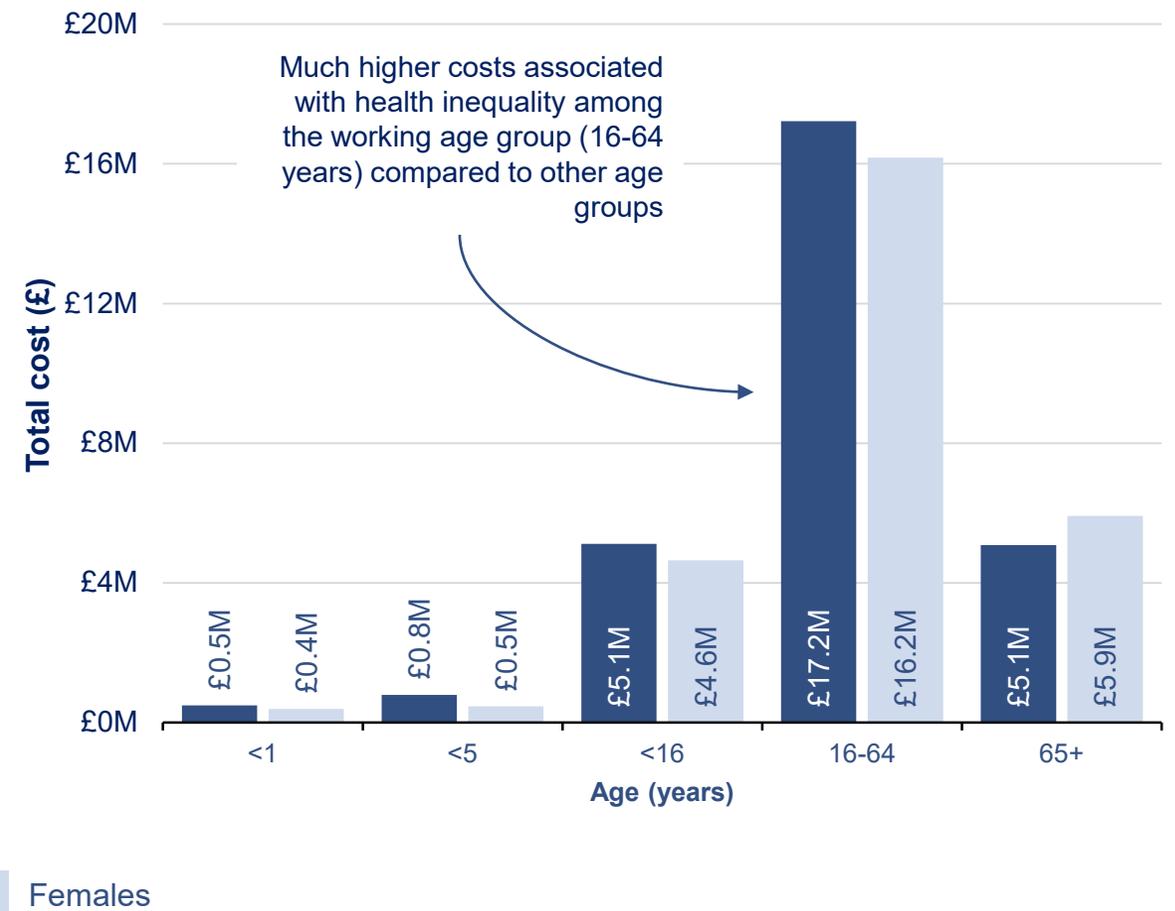


Results II | Cost associated with inequality according to hospital service category by age and sex: outpatient appointments and A&E attendances, Wales, 2018/19

Outpatient appointments



A&E attendances



Results III | Cost per capita associated with inequality according to hospital service categories

Elective inpatient admissions

- The annual cost per capita is slightly higher for both males and females living in the most deprived areas (16.0% and 18.0%, respectively) compared to those in the least deprived areas (including costs for all ages)
- There is **no clear social gradient** across different age groups for both sexes
- The **cost for males in the 75-85 year old group is higher for those living in the least deprived areas**

Emergency inpatient admissions

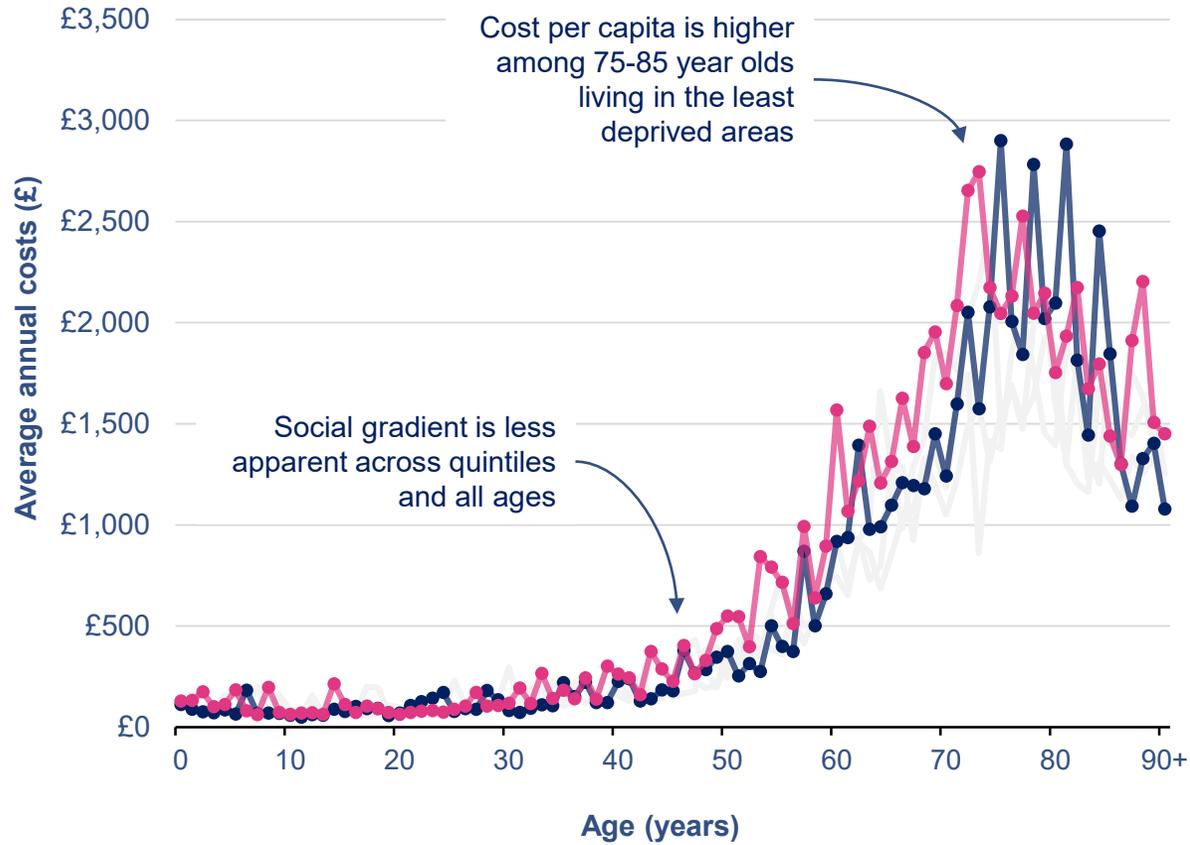
- The annual cost per capita is much higher for both males and females living in the most deprived areas (57.0% and 62.0%, respectively) compared to those living in the least deprived areas (including costs for all ages)
- There is a **clear social gradient for those at the age of 40 and above** for both sexes

Maternity inpatient admissions

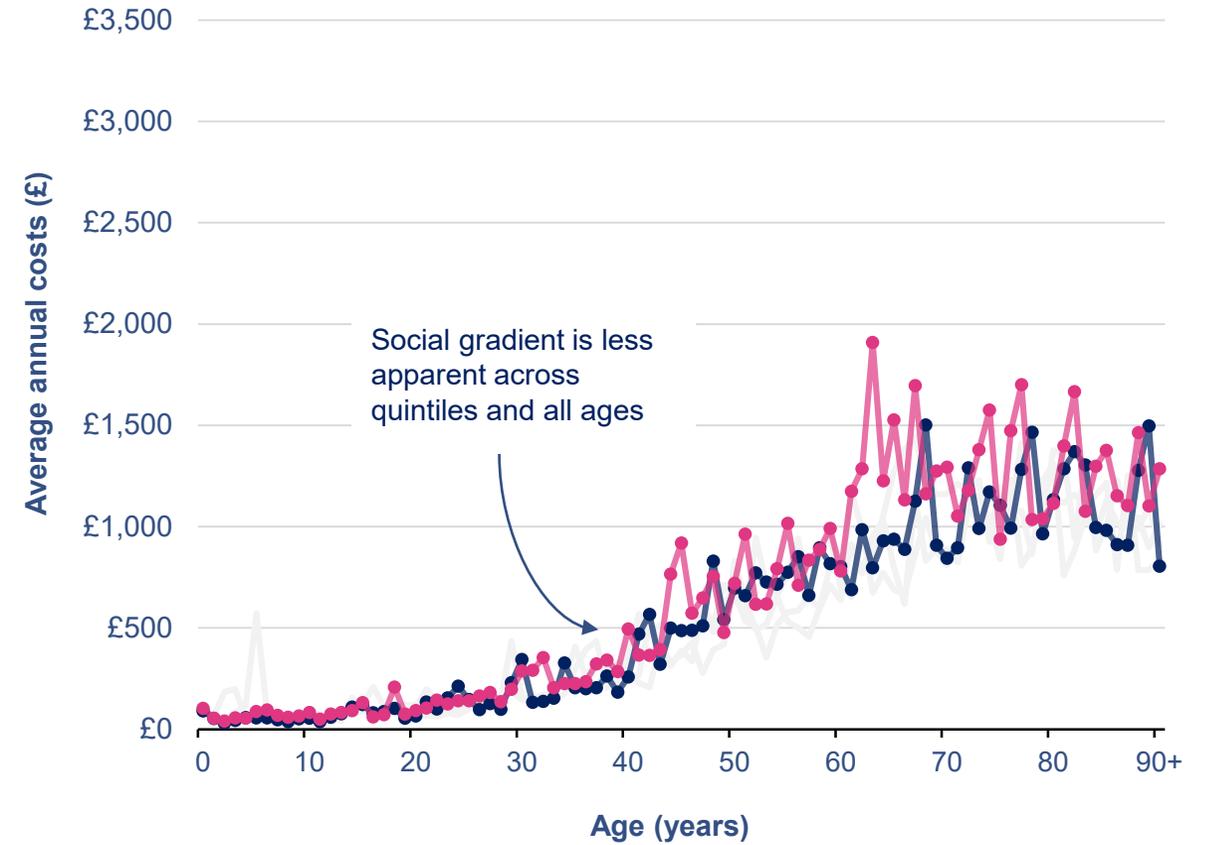
- The annual cost per capita is **almost double (99.9% higher) among women living in the most deprived areas in the early reproductive age group (15-29 years)** compared to those from the least deprived areas
- The annual cost per capita is **31.1% higher among women living in the least deprived areas in the later reproductive age group (30-44 years)** compared with those from the most deprived areas

Results III | Cost per capita associated with inequality for elective inpatient admissions, Wales, 2018/19

Male



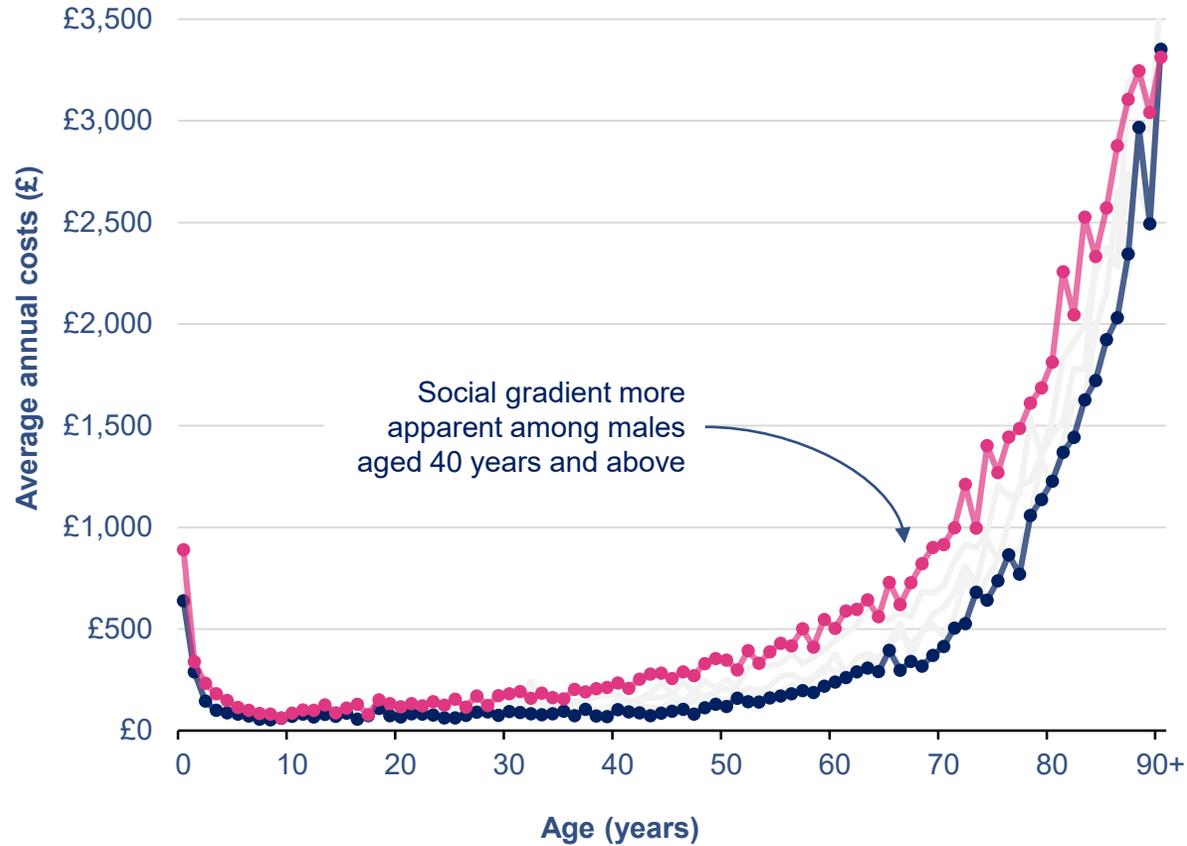
Female



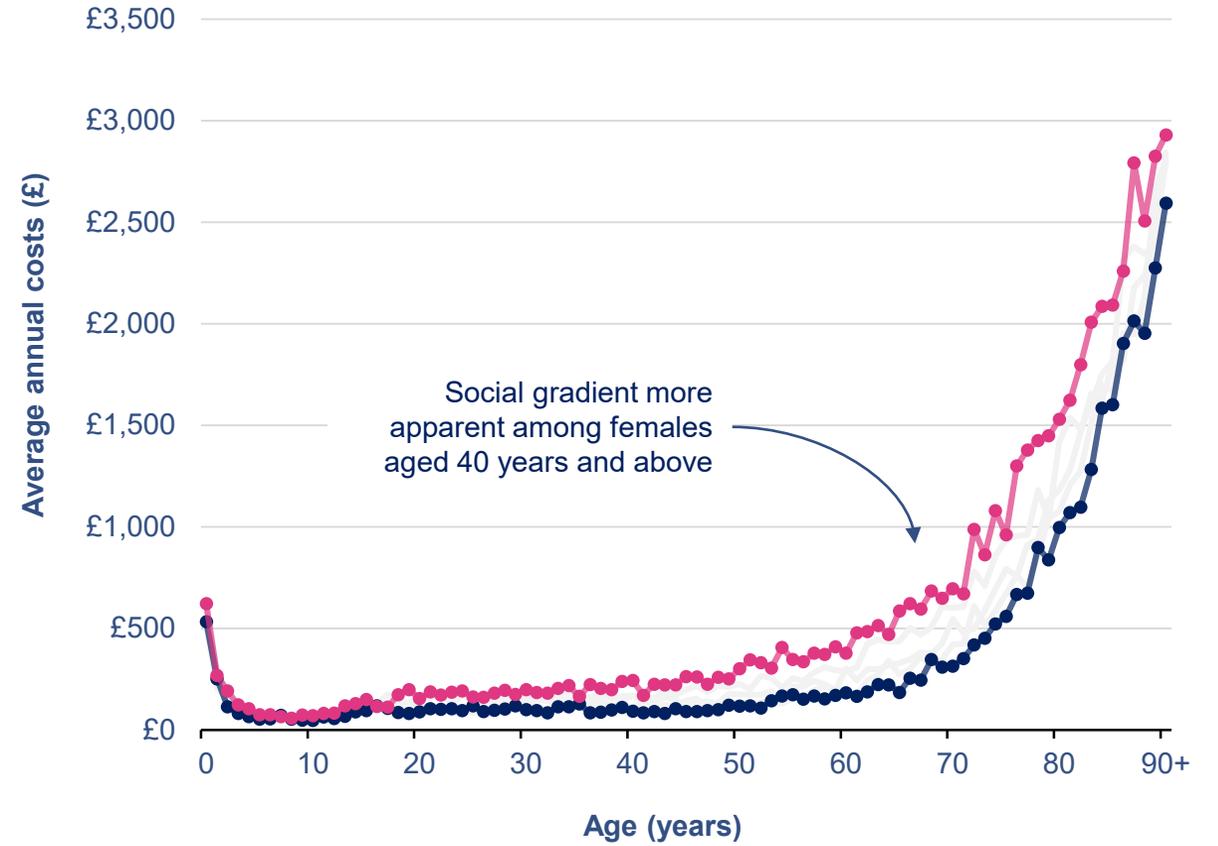
— Least deprived (Q1) — Q2-Q4 — Most deprived (Q5)

Results III | Cost per capita associated with inequality for emergency inpatient admissions, Wales, 2018/19

Male

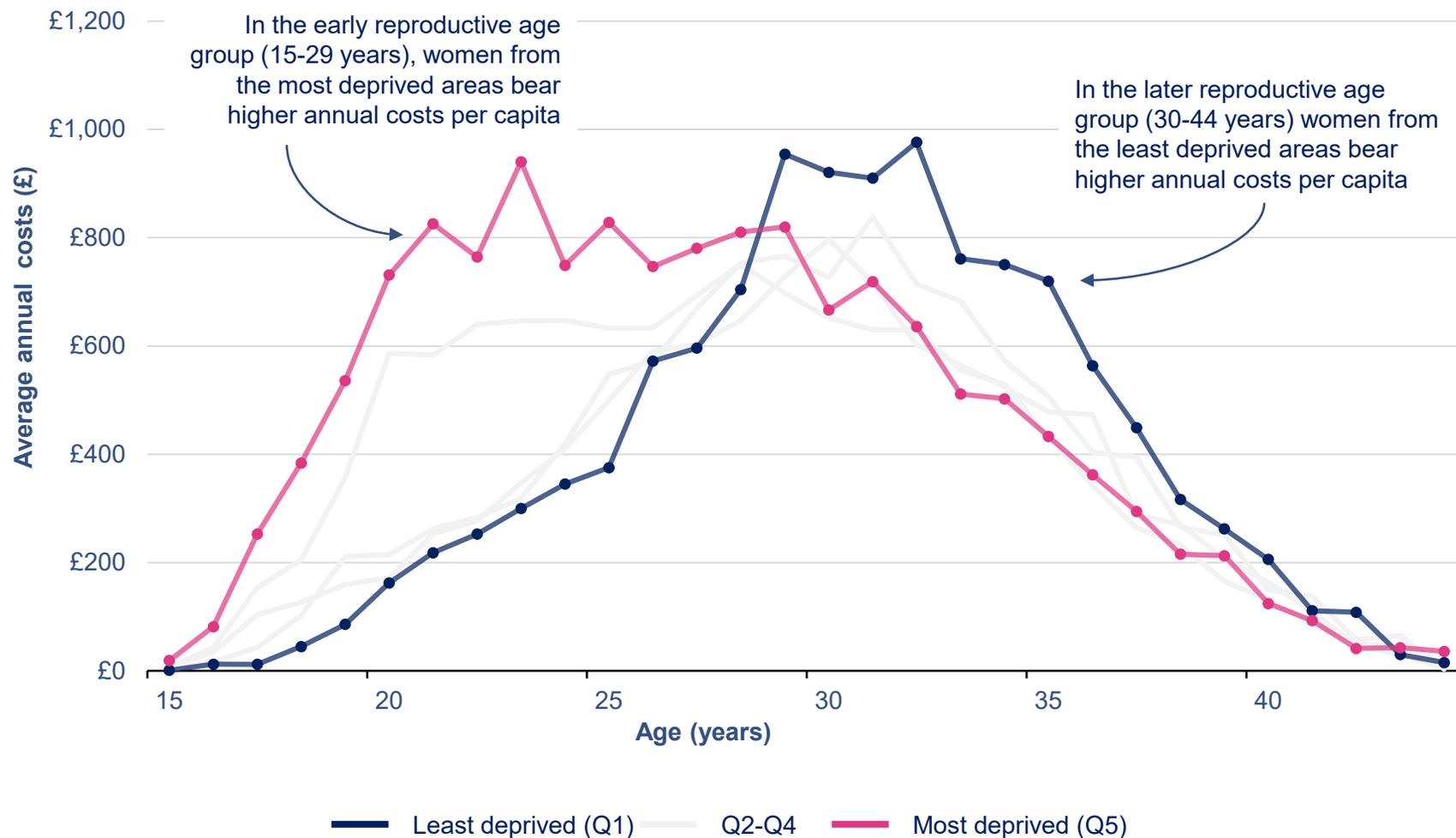


Female



— Least deprived (Q1) — Q2-Q4 — Most deprived (Q5)

Results III | Cost per capita associated with inequality for maternity inpatient admissions, Wales, 2018/19



Results III | Cost per capita associated with inequality according to hospital service categories

Outpatient appointments

- **The annual cost per capita is slightly higher for both males and females living in the most deprived areas (14.0% and 18.0%, respectively) compared to those living in the least deprived areas (including costs for all ages)**
- **There is a clear social gradient in the middle age groups for both sexes**
- **There is a wider difference in cost between the most and the least deprived among younger females (18-28 years) compared to same age males**

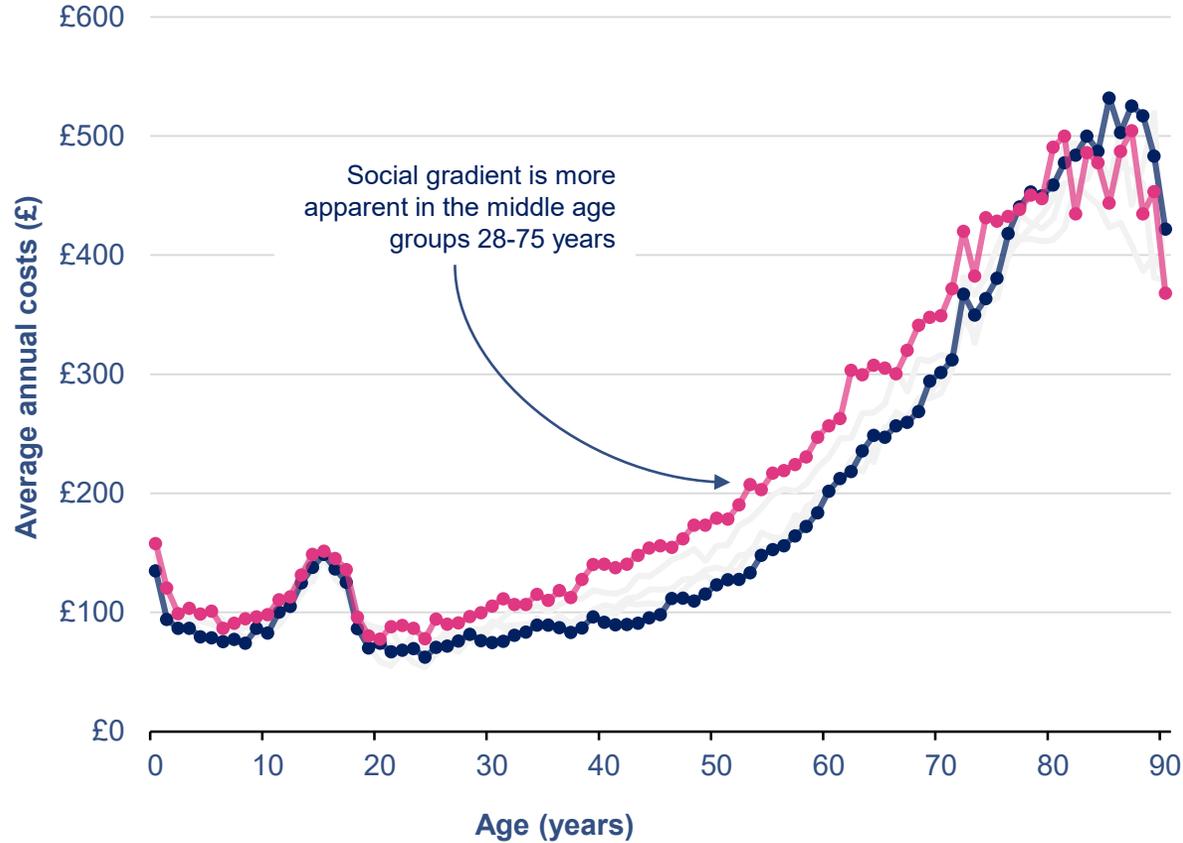
A&E attendances

- **The annual cost per capita is much higher for both males and females living in the most deprived areas (67.0% and 68.0%, respectively) compared to those living in the least deprived areas (including costs for all ages)**
- **There is a more prominent social gradient in the middle age groups for males, compared to same age females**
- **There is a wider difference in cost between the most and the least deprived among younger females (18-28 years) compared to same age males**

Financial cost associated with inequality is largely driven by disparities in hospital service utilisation between the least deprived quintile and the remaining four deprivation quintiles; however, in some cases cost variation cannot be explained by service use only

Results III | Cost per capita associated with inequality for outpatient appointments, Wales, 2018/19

Male



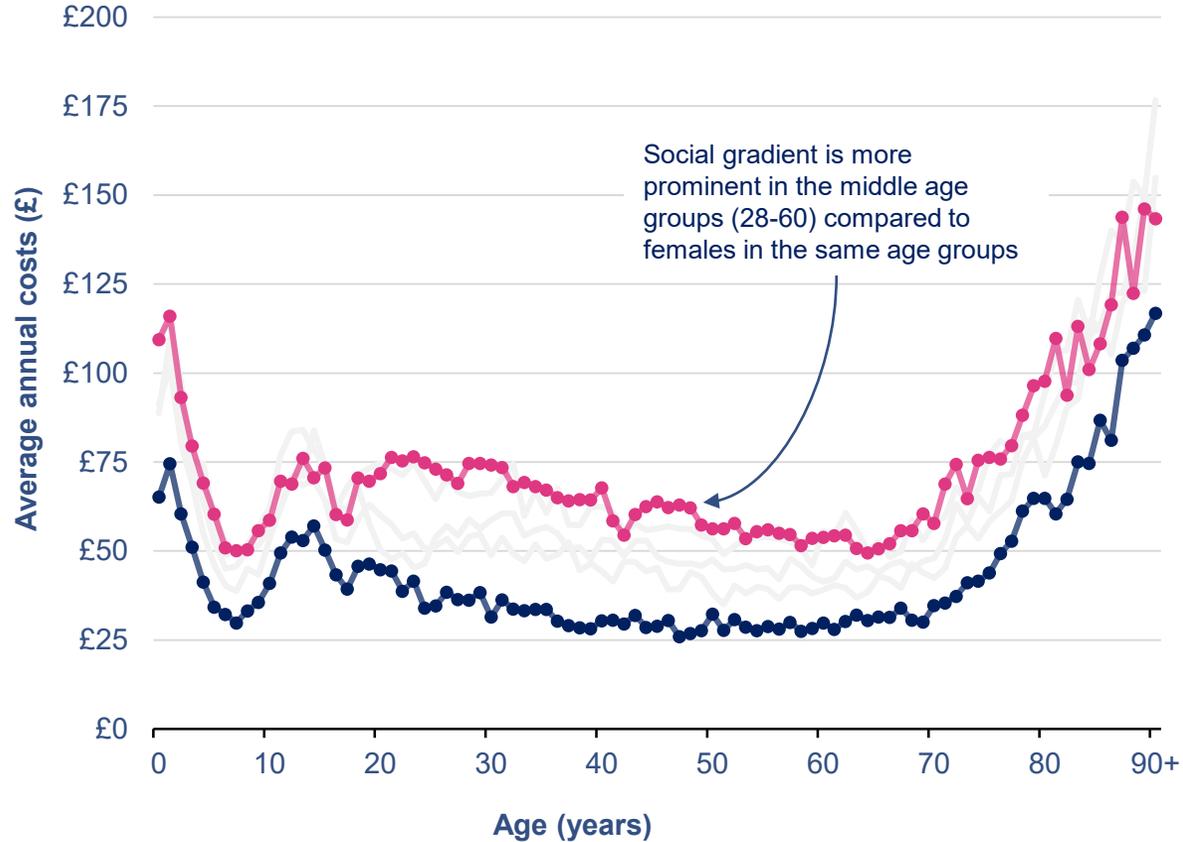
Female



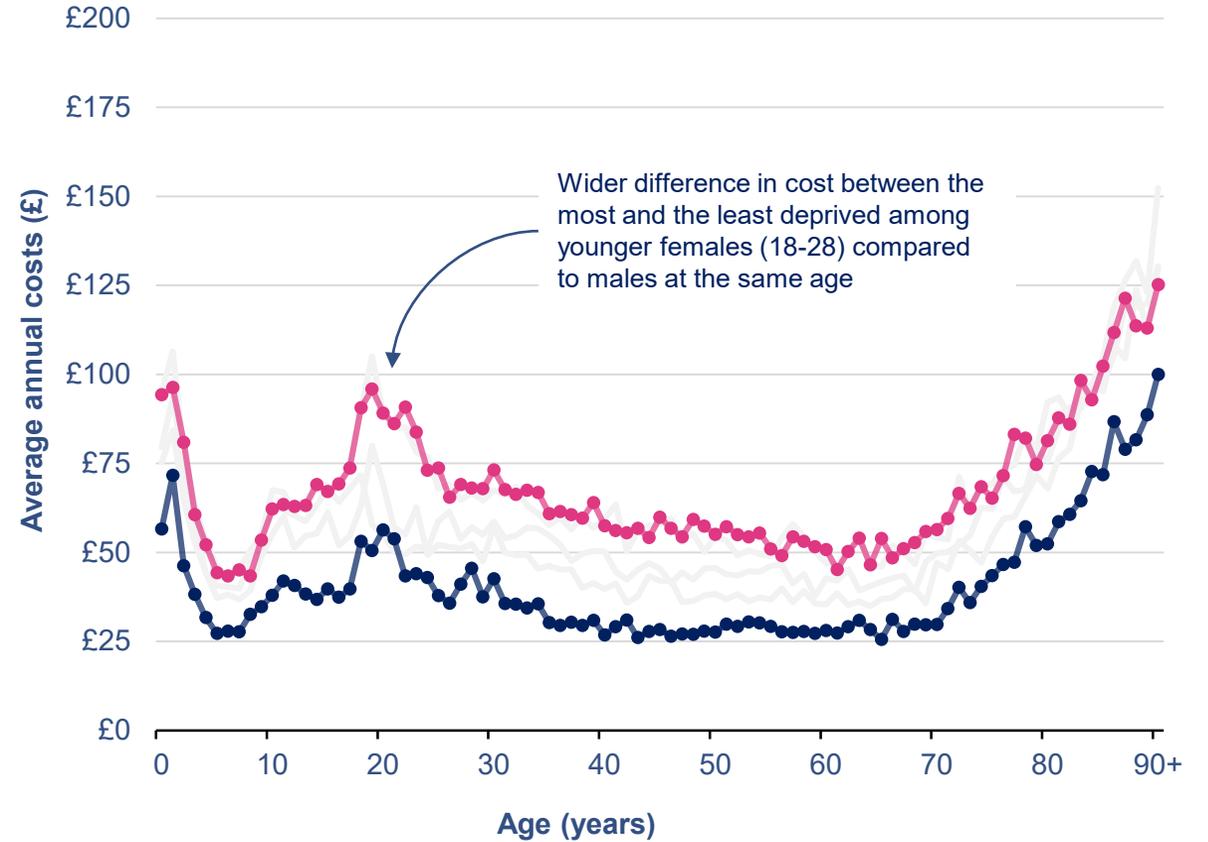
— Least deprived (Q1) — Q2-Q4 — Most deprived (Q5)

Results III | Cost per capita associated with inequality for A&E attendances, Wales, 2018/19

Male



Female



— Least deprived (Q1) — Q2-Q4 — Most deprived (Q5)

Limitations

- The population data used in this study were truncated at 90 years of age, assuming that the healthcare service use remains constant at older age groups (90+)
- This study uses the Welsh Index of Multiple Deprivation (WIMD) to categorise population into five quintile groups. The index is an area-based measure, which means that in this analysis, inferences about the nature of individuals are deduced from inferences about the group, e.g. an individual may live in an area that has a high level of deprivation, but that does not necessarily mean the individual is deprived
- This study focuses on the cost associated with inequality in hospital service utilisation, estimated according to service category and by age, sex and level of deprivation. However:
 - Other services, such as primary and social care, and public health (prevention) programmes might have an impact on the use and economic cost of secondary (hospital) services, as well as incur additional cost associated with inequality, which needs to be explored further
 - Other characteristics such as ethnicity, disability, sexual orientation etc. and their impact on service use and associated economic cost, are not subject of this report and need to be explored further
 - Different diseases/health conditions could incur specific health service use disparities and related economic cost, which need to be explored further
 - Other aspects of the healthcare system could have an impact on inequality and associated economic cost, such as access to, provision of and quality of health services, and need to be considered and explored further

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Annex 1 Methods | Operational definitions of hospital service categories

Hospital Inpatient Admission: A patient/client formally admitted to a hospital with a doctor's order for medically necessary and appropriate care and/or treatment of an illness or other medical issues with the intention of staying in hospital at least one night

Elective Inpatient Admission: A patient/client whose hospital admission date is known in advance thus allowing arrangements to be made beforehand

Emergency Inpatient Admission: A patient/client admitted to hospital when admission is unpredictable and at short notice because of clinical need

Maternity Inpatient Admission: This is an admission of a pregnant or recently pregnant woman to a maternity ward (including delivery facilities) except when the intention is to terminate pregnancy

Outpatient Appointment: An appointment at a hospital outpatient department clinic for the purpose of consultation, examination or treatment by a doctor or independent nurse

Accident & Emergency (A&E) Attendance: A visit made by a patient/client to an Accident and Emergency Department to receive treatment from the Accident and Emergency service

Annex 2 Methods | Data sources

- Data for the analysis was retrieved from the Digital Health and Care Wales (DHCW) data warehouse from April 2018 to March 2019 (*unpublished*)
- For hospital episodes data, a new Finished Consultant Episode (FCE) record is created and the FCE is allocated to a Healthcare Resource Group (HRG), which categorises hospital inpatient cases based on the level of service
- Blue Book cost information (HRG and unit costs) for 2018/19 was collected from the Finance and Delivery Unit (FDU) of Public Health Wales. HRG cost data for different inpatient services were imported into DHCW SQL data server (*unpublished*)
- 2018 mid-year population estimates for Wales were taken from the Office for National Statistics (*ONS, 2019*)
- Welsh residents who visited either NHS hospitals or NHS funded private hospitals – inpatient (elective, emergency and maternity), outpatient, and A&E (including those who visited hospitals in England) were included in the study
- Lower Layer Super Output Area (LSOA) variable for the purpose of obtaining Welsh Index of Multiple Deprivation (WIMD) quintile was taken from the Welsh Government post code to WIMD rank lookup table (*Welsh Government, 2019*)
- The dataset includes information about patients' age, sex, area of residence and their health service use status (e.g. diagnosis, procedures, frequencies)

Annex 3 Methods | Analysis, outcomes and cost measures

- The analysis is using a simplified version of health service use and cost estimation, scales it up using patient population numbers and disaggregated the population-level results according to the social patterns observed in the health care use data
- The (total) annual cost of health inequality is computed by multiplying the difference between total average annual cost and average annual cost of the least deprived group by mid-year population
- The average annual cost per capita is computed by dividing the total age-specific health service use costs with the mid-year population
- Total and specific (disaggregated by hospital service category, age and sex) costs associated with hospital service use inequality to NHS Wales have been the primary outcomes of the study
- Data for inpatient elective, emergency and maternity admissions, outpatient appointments and A&E attendances has been disaggregated by age, sex and level of deprivation
- Average cost per capita (for inpatient elective, emergency and maternity admissions; outpatient appointment and A&E attendances) has been disaggregated by age, sex and level of deprivation
- Age disaggregation is for the age-groups: <1 year (Infants), <5 years (under 5 children), <16 years (under 16 children), 16 – 64 years (working age adults) and 65 years & above (older people); and maternity services are for ages 15 to 44

Annex 4 Methods | Statistical analysis

- SQL queries for each dataset (hospital inpatient episodes including elective, emergency, and maternity; outpatient appointments; and A&E attendances) were developed to analyse health service use and cost data
- In the case of emergency inpatient service use, cost analysis was done separately for short-stay (less than 2 days) and long-stay (2 or more days) episodes and then combined both to estimate the total emergency inpatient costs
- Data from the SQL server were extracted in to excel sheets using SQL queries by age, sex and deprivation quintile
- This study used a simplified version of health service use and cost estimation, scales it up using patient population numbers and disaggregated the population-level results according to the social patterns observed in the health care use data

Statistical analysis formulae:

$$Average\ Costs_{Age, Sex, WIMD} = \frac{\sum Hospital\ Costs_{Age, Sex, WIMD}}{\sum Population_{Age, Sex, WIMD}}$$

$$Cost\ of\ Inequality_{Age, Sex, WIMD} = \sum [Population_{Age, Sex, WIMD} \times (Average\ Costs_{Age, Sex, WIMD} - Average\ Costs_{Age, Sex, WIMD=Q1})]$$

Annex 5 Social pattern of hospital service use by age, sex and level of deprivation (all data), Wales 2018/19

Characteristics	Hospital Inpatient Episodes					Population
	Elective	Emergency	Maternity	Outpatient	A&E	(Mid-Year 2018)
N	564,550	572,667	83,573	4,453,343	870,362	3,138,631
Age (median)	63 Years	62 Years	29 Years	56 Years	39 Years	42.5 Years
Sex						
Male	276,584 (49.0%)	276,043 (48.2%)	N/A	1,941,852 (43.6%)	436,591 (50.2%)	1,547,309 (49.3%)
Female	287,945 (51.0%)	296,607 (51.8%)	83,573 (100.0%)	2,511,491 (56.4%)	433,771 (49.8%)	1,591,322 (50.7%)
Welsh Index of Multiple Deprivation Quintile (2019)						
Q1 (Least Deprived)	114,544 (20.3%)	90,525 (15.8%)	13,950 (16.7%)	860,237 (19.3%)	119,491 (13.7%)	623,358 (19.9%)
Q2	118,585 (21.0%)	105,046 (18.3%)	13,742 (16.5%)	894,317 (20.1%)	164,208 (18.9%)	638,695 (20.4%)
Q3	114,761 (20.3%)	112,173 (19.6%)	14,642 (17.5%)	866,161 (19.5%)	180,290 (20.7%)	643,563 (20.5%)
Q4	110,618 (19.6%)	125,844 (22.0%)	17,403 (20.8%)	910,571 (20.5%)	202,670 (23.3%)	618,030 (19.7%)
Q5 (Most Deprived)	106,021 (18.8%)	139,062 (24.3%)	23,778 (28.5%)	922,057 (20.7%)	203,703 (23.4%)	614,985 (19.6%)

Annex 6 Cost associated with inequality by hospital service categories and sex (all data), Wales 2018/19

Cost category	Elective	Emergency	Maternity	Outpatient	A&E	Total
Male						
Cost of deprivation (£)	-18,435,368	125,104,821	N/A	15,205,362	27,420,038	149,294,853
Total cost (£)	802,435,560	539,806,411	N/A	262,150,020	87,318,200	1,691,710,191
Deprivation proportion*	-2.30%	23.18%	N/A	5.80%	31.40%	8.83%
Female						
Cost of deprivation (£)	-1,892,140	122,301,873	1,812,832	24,064,656	26,741,279	173,028,500
Total cost (£)	813,969,605	548,024,171	226,561,355	339,051,285	86,754,200	2,014,360,616
Deprivation proportion*	-0.23%	22.32%	0.80%	7.10%	30.82%	8.59%
Total						
Cost of deprivation (£)	-20,327,508	247,406,694	1,812,832	39,270,018	54,161,317	322,323,353
Total cost (£)	1,616,405,165	1,087,830,582	226,561,355	601,201,305	174,072,400	3,706,070,807
Deprivation proportion*	-1.26%	22.74%	0.80%	6.53%	31.11%	8.70%

* Within each service category

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