

DM2112: Project Research A S1/22 (S1)

“Why is CVD prevalent amongst those in the England’s deprived areas, and how may we increase the detection of it?”

Word count: 3778

Sinéad Marais 2010672

[04/01/21]

Contents:

Aims & Objectives.....	2
Intro.....	2
Figure 1: Prevalence of CVD, by region.....	3
Methodology.....	3
Findings.....	4
The Interrelationship between areas of deprivation and health inequalities.....	4
Figure 2: Most deprived LSOAs by IMD score (top 20%).....	5
Figure 3: Levels of CVD amongst most deprived areas in England.....	6
Socioeconomic status and the use of risk behaviours.....	6,7
Levels of CVD in the North-East, North-West and West Midlands.....	7
Table 1: BHF – 2019 CVD Compendium.....	8
Overall health and the display of risk behaviours in the North-East, North-West and the West Midlands.....	8
Table 2: Health in the North-East compared with England.....	9
Figure 4: Prevalence of risk behaviours/factors by region, England 2019.....	10
Prevalence and detection of CVD in England.....	11
Discussion/Analysis.....	11
Conclusion.....	11
Recommendations.....	12
Current devices/tools on the market to detect CVD.....	12,13
Reference List.....	14,15,16
Bibliography.....	16,17
Appendix.....	18,19

Aims:

- To help improve and increase the detection of CVD (cardiovascular disease) in lower socioeconomic areas.

Objectives:

- What are the most deprived areas in the UK and how is deprivation measured?
- What are the comparison levels of CVD in those deprived areas?
- The correlation between health inequalities, risk behaviours and CVD
- The correlation between lower socioeconomic areas and CVD

Introduction:

The NHS explains that CVD (Cardiovascular disease) is made up of a collection of health issues that relate to the heart and lungs. However, the four main constituents of which it is made of are: Coronary Heart Disease, Strokes, Arterial Disease and Aortic Disease. (NHS.uk., 2021 'Cardiovascular disease'. NHS.co.uk. [online]).

According to the British Heart Foundation, 'In England today, 5.9m people live with CVD and at least 435,000 of those have heart failure. Many other common LTCs (long-term conditions) also increase the risk of developing CVD.' (British Heart Foundation., 2021. 'The CVD Challenge in England'.BHF.org.uk. [online]).

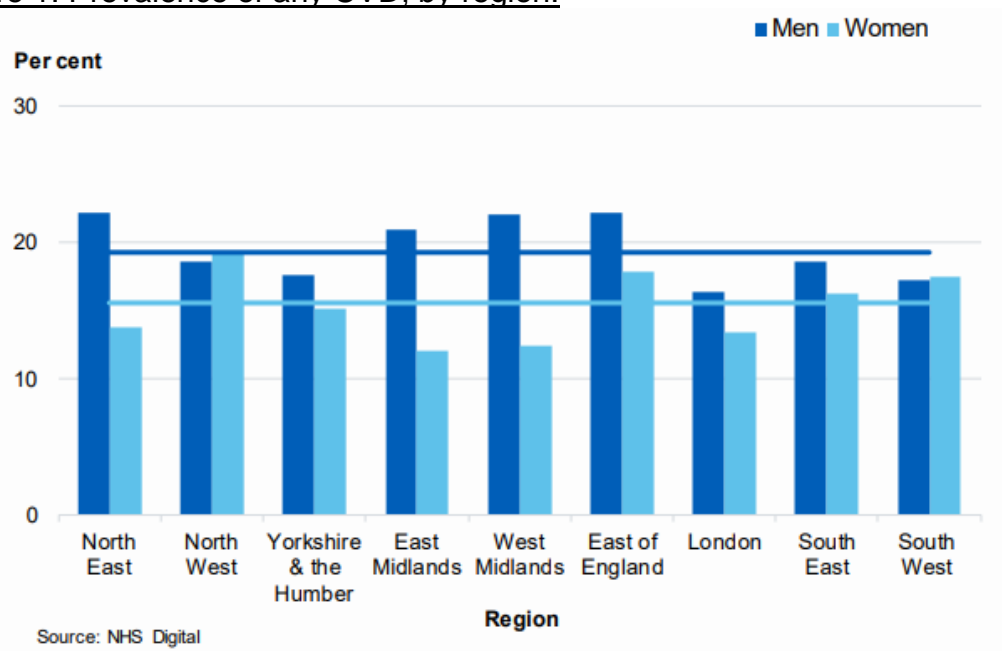
In today's society the wealth divide is larger than ever and those living in the lower economic bracket are more likely to be negatively impacted. It is documented that both in the UK 'longevity has increased with middle and high income, whereas in poorer individuals it has remained unchanged or even decreased in certain demographic groups. The impacts of these differences have been made more evident during the covid-19 pandemic, which has affected socially disadvantaged groups the most.'. (Zhang, Y. Chen, C. Pan, X. Guo, J. Li, Y. Franco, O. Liu, G. Pan, A. February 2021. 'Associations of healthy lifestyle and socioeconomic status with mortality and incident cardiovascular disease: two prospective cohort studies' The BMJ. [online]).

Individuals who fall within the category are more likely to be susceptible to illness and disease. The NHS has created a branch solely dedicated to IT services and gathering the nation's health data to provide the best possible care for patients. They conduct an annual statistical survey, the Health Survey for England (HSE) to collect information regarding 'changes in health and lifestyles of people all over the country'. (Neave, A., December 2018. Health Survey for England - Health, social care and lifestyles - NHS Digital. [online]).

A specific area of research within the HSE study is a report from December 2018 examining the prevalence of CVD in adults. Some variables which are measured against are region and household income. (Healthsurvey., 2018. 'Health Survey for England 2017 Cardiovascular diseases '. hscic.gov.uk. [online]).

Although the table below (Figure 1) shows the difference between the highest levels of CVD amongst males and females, it is particularly useful to see the annual reading showing in which region CVD is most apparent. It is clear to see that the North-East, the Midlands and the East of England suffer the most.

Figure 1: Prevalence of any CVD, by region:



Methodology:

The way in which the primary data used for this study was collected was via public surveys, emailed surveys to Pharmacies and Technology companies, all based in specific locations. As well as this interviews with experts in the medical field were planned, however given difficult circumstances these interviews did not go ahead. The survey questions used to gather all the data collected for primary research proved void in terms of practicality. Although the questions were created to show a link between socioeconomic status and health, none of the results provided any evidence that can be used to support this study; the feedback of 'what is the most used household appliance' was particularly disappointing.

Instead, research was undertaken to find existing data which explained that '99% of all homes in England', have taps to allow for running water. This data was sectioned into locations which was useful to direct the focus back to the deprived areas earlier mentioned. It showed '53,961,251 homes in England and Wales' having water and '14,191,228 in the Northern region'. Proving that those figures relate to the number of houses with at least one tap. (McKibbin, D. 7 November 2021. 'Regional Development'. *Niassembly.gov.uk*. [online]). The statistics referring to the 'North' of England were particularly helpful. Secondary research regarding the focus of these locations will be developed as this study progresses.

Findings:

Although this study mainly focuses on how location can be reflective on an areas level of deprivation, it is important to understand the significance of health inequalities, socioeconomic status, risk behaviours and how these vary based on geographical location.

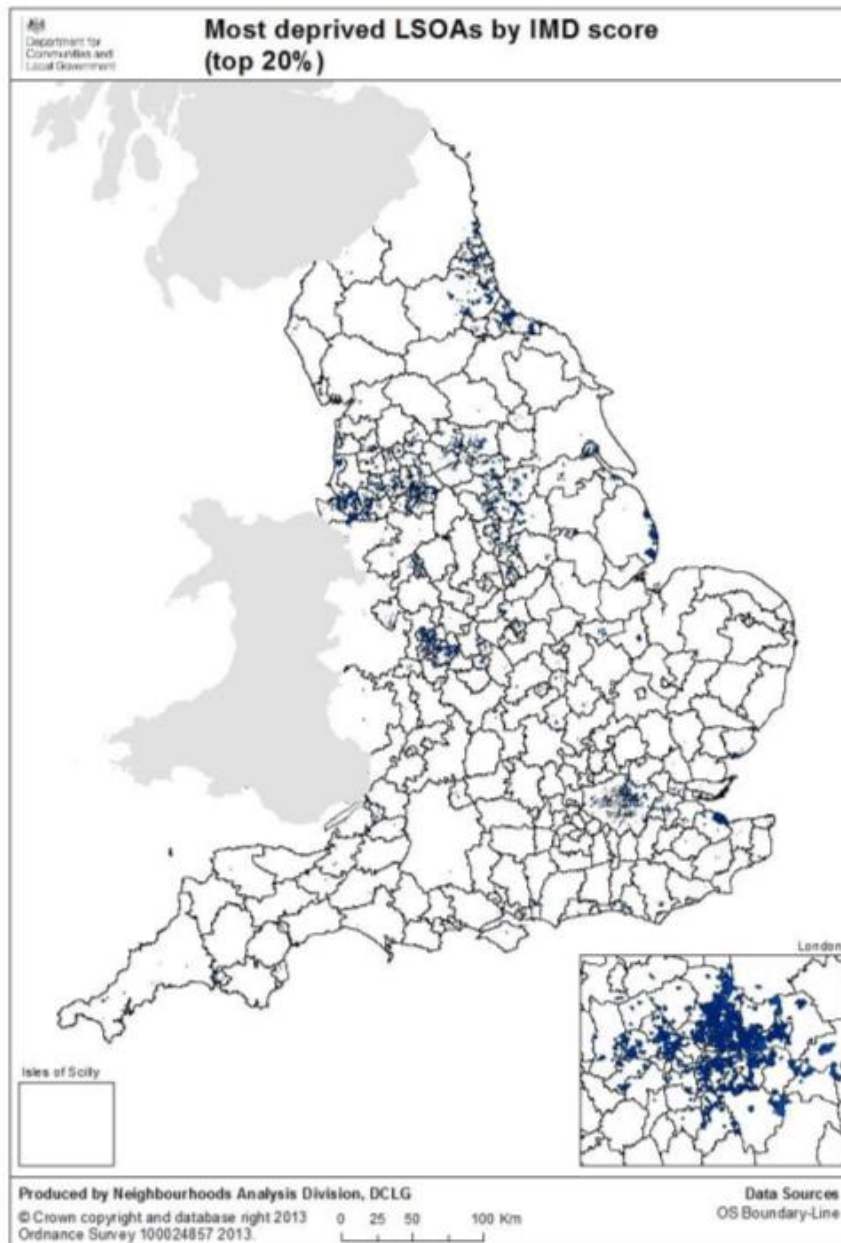
The interrelationship between areas of deprivation and health inequalities:

It is beneficial to this study to understand what defines an 'area of deprivation'. The ERDF Operational Programme have measured levels of deprivation across areas in England, known as Lower Layer Super Output areas (LSOAs) using IMDs ('Indices of Multiple deprivation'). These include lack of employment - therefore income, poor access to services and lack of education; these can otherwise be known as Health Inequalities.

As determined by the NHS, a health inequality is an unjust and 'avoidable difference in health across the population, between different groups within society and location'. They explained that these groups are more likely to experience issues regarding housing conditions, employment, education, location and falling within a minority. (*England.nhs.uk. 2021. 'Definitions for Health Inequalities'. [online]*).

The article takes a study group of between 1000-3000 people from areas in England, it then provides the top 20% of the most deprived locations. From the compilation and based on their IMDs, the areas which suffer the most are made up of predominately the North East, North West and the Midlands. (*See Figure 2, below*). (*Horizon Scanning Programme Team. Sep 2014. 'Top fifth (20%) Most Deprived Areas in England: Local Enterprise Partnership Level Data'. publishing.service.gov.uk. [Online]*). When discussing the 'Midlands' this is inclusive of the West-Midlands, East-Midlands, Yorkshire and Humber unless stated otherwise.

Figure 2: Most deprived LSOAs by IMD score (top 20%):



Supporting that there is a correlation between CVD and deprived areas, an article was analysed whereby medical professionals created a study in which the levels of CVD is observed amongst participants who were separated into groups dependent on age, sex and location; varying from least, to most deprived areas. The variable which most supports this argument is the one regarding levels of CVD in deprived areas. The study shows that regardless of the number varieties of participant variables, there is always an increase in CVD in deprived areas (See Figure 3). (*International Journal of Epidemiology*, December 2012. 'Bayesian spatial analysis, volume 41, Issue 6'. ERDF Operational Programme. [online]).

Given the fact the UK is one of the main countries showing an increasing rate of wealth inequity' a study was conducted between medical professionals to better understand 'Associations of healthy lifestyle and socioeconomic status with mortality and cardiovascular disease'.

The study involved 44,462 US adults and 399,537 UK adults was undertaken to see if 'overall lifestyles mediate associations of socioeconomic status (SES) with mortality and incident cardiovascular disease (CVD) and the extent of interaction or joint relations of lifestyles and SES (social economic status) with health outcomes'.

A participant's social economic status (SES) was measured using 'family income, occupation or employment status, education level, and health insurance' (US' only) and then categorised into low, medium and high to decide the probabilities of contracting CVD.

The results of the study showed that socioeconomic inequity in health in both the US and the UK cannot be solved solely by 'healthy lifestyle promotion' and it would be necessary for other practices to be implemented in order to tackle social determinants of health. Overall, it supports the argument that there is a significant correlation between socioeconomic status and risk behaviours. (Zhang, Y. Chen, C. Pan, X. Guo, J. Li, Y. Franco, O. Liu, G. Pan, A. February 2021. 'Associations of healthy lifestyle and socioeconomic status with mortality and incident cardiovascular disease: two prospective cohort studies' *The BMJ*. [online]).

Heart UK is a non-profit charity who advocates for healthy lives, specifically cholesterol, 'providing support, information and influencing services for families and healthy professionals'. High cholesterol falls within the category of heart disease and therefore, cardiovascular disease.

They explain six risk factors that can have a negative impact on the likelihood of an individual developing CVD. See Appendix 2 for the infographic from another reputable organisation explaining what risk behaviours be described as. (Heartuk.org., 2019. 'State of the nation: Cardiovascular Disease'.[online]).

Levels of CVD in North-East, North-West and West Midlands:

The Public Health of England has studied the causes of CVD, some include: 'alcohol, diet, smoking, physical inactivity, obesity' and more – these are identical to the risk behaviours previously explained. (Public Health of England., 2019. "Cardiovascular disease prevention: state of the North East". [online]).

The government in the UK explains that 'in the North East of England, CVD now accounts for 24% of all deaths. CVD is also a major burden of ill-health, accounting for 15% of all disability-adjusted life years in the region' (Public Health of England., 2019. 'Cardiovascular disease prevention: state of the North East'. Gov.uk. [online]) and they published a document from BMJ Journals stating that the 'prevalence of coronary heart disease is also highest in the North of England', including the North West. (Wickramasinghe, K., Towsen, N., Williams, J. and Rayner, M., 2015, 'The epidemiology of cardiovascular disease in the UK 2014', Gov.uk. [online]).

The Midlands have a have a specialised program directly targeting CVD, 'The West Midlands Cardiovascular (CVD) Clinical Network' (WMCCN). The network closely monitors four disease areas; Cardiac, Diabetes, Renal and Stroke.

The WMCCN run two advisory groups, one being the 'Cardiac EAG'. This is where they work closely with 'Commissioners, Consultant Cardiologists, Consultant Cardiac Surgeons, West Midlands Ambulance Service, British Heart Foundation and other 3rd sector organisation' to tackle this issue that is CVD. See Figure 1 ('Prevalence of any CVD, by region') to better understand the levels of CVD in the Midlands and why this is one of the locations this study is extensively investigating.

See the below Table 1, with statistics from a 2019 compendium by the British Heart Found Foundation.

Table 1: BHF – 2019 CVD Compendium:

[Back to Table of Contents](#)

	ALL AGES								
	Age standardised CHD death rates per 100,000			Total number of CHD deaths 2015/17			Average number of annual CHD deaths for 2015/17		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
East Midlands	158.5	71.7	110.2	9,233	5,666	14,899	3,078	1,889	4,966
East of England	140.4	64.1	97.7	10,998	7,044	18,042	3,666	2,348	6,014
London	143.6	67.1	101.0	10,355	6,473	16,828	3,452	2,158	5,609
North East	168.6	79.5	118.6	5,523	3,545	9,068	1,841	1,182	3,023
North West	175.2	83.4	124.2	15,167	9,729	24,896	5,056	3,243	8,299
South East	131.4	58.0	90.2	14,905	9,525	24,430	4,968	3,175	8,143
South West	144.7	63.4	98.9	11,202	7,144	18,346	3,734	2,381	6,115
West Midlands	163.9	74.0	113.7	11,409	7,128	18,537	3,803	2,376	6,179
Yorkshire and the Humber	180.6	84.1	126.1	11,494	7,473	18,967	3,831	2,491	6,322
England	153.9	70.4	107.2	100,286	63,727	164,013	33,429	21,242	54,671
Wales	175.5	81.3	123.4	7,212	4,551	11,763	2,404	1,517	3,921
Scotland	190.8	95.5	136.9	12,119	8,447	20,566	4,040	2,816	6,855
Northern Ireland	161.3	76.3	112.7	3,067	2,051	5,118	1,022	684	1,706
UK	158.2	73.2	110.6	122,684	78,776	201,460	40,895	26,259	67,153

As shown in the above table, per 100,00 individuals living in the North-East, North-West, West Midlands and Yorkshire and Humber there is a significantly higher percentage of death rates as a result of CHD (Coronary Heart Disease) comparatively to other regions of England.

Overall health and the display of risk behaviours in the North-East, The North-West and the Midlands:

As previously mentioned in this study, a health inequality is an unjust and 'avoidable difference in health across the population, between different groups within society and location'. (*England.nhs.uk. 2021. 'Definitions for Health Inequalities'. [online]*). With this study focusing on CVD in specific locations and having an understanding of what a health inequality is, supportive articles have been found in order to tie these two topics together.

Data made available by the Public Health Outcomes Framework data tool, NHS Digital and the Office for National Statistics presents that the 'North of England, particularly the North-East 'has worse health and higher health inequalities than the rest of England'. (*Corris, V. Dormer, E. Brown, A. Whitty, P. Collingwood, P. Bambra, C. Julia L Newton, J. 28 May 2020. 'Health inequalities are worsening in the North-East of England'. British Medical Bulletin, academic.oup.com/. [online]*). These sources have stated that 'those living in the NE(North-East) of England are more likely to have a shorter lifespan and to spend a larger proportion of their shorter lives in poor health, as well as being more likely to die prematurely from preventable diseases'. The table below (*Table 2, below*) shows that individuals display more risk behaviours than other regions in England.

Table 2 - Health in the North-East compared with England:

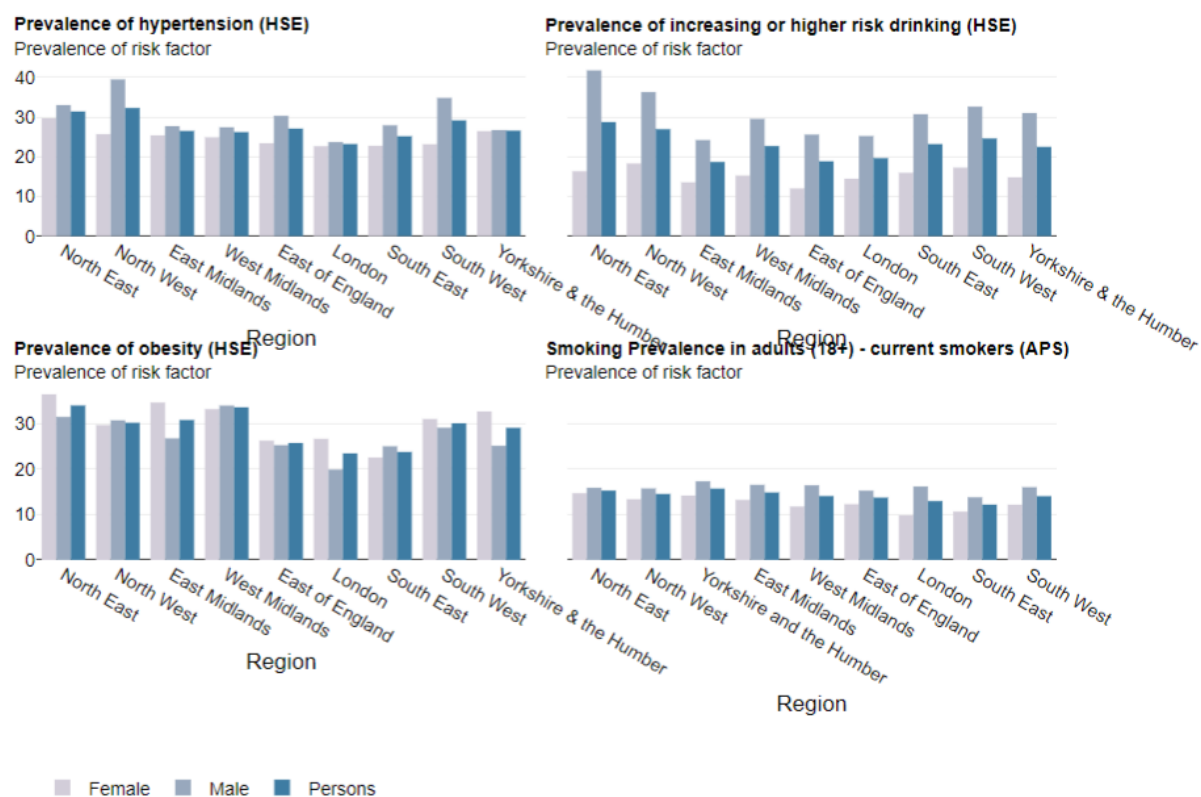
Compared with England ■ Significantly Better ■ Significantly Worse

North East Rank amongst the 9 Regions 1 - Best 9 - Worst

Indicator		North East Value	North East Rank	National Average	Direction of Travel
Life Expectancy	Life Expectancy at Birth (years)				
	Males	77.9	9	79.6	
	Females	81.6	9	83.1	
	Healthy Life Expectancy at Birth (years)				
Preventable Premature Death	Males	59.5	9	63.4	
	Females	60.4	9	63.8	
	Infant Mortality (deaths per 1,000 live births)	3.3	3	3.9	
	Mortality rate from causes considered preventable (per 100,000)	223.4	9	181.5	
	Suicide rate (per 100,000)	10.8	9	9.6	
	Deaths from Drug Misuse	7.6	9	4.3	
	Under 75 Mortality Rate from all Cardiovascular	82.9	8	72.5	
	Under 75 Mortality Rate from Cancer considered	92.8	9	78.0	
	Under 75 mortality rate from liver disease considered	22.2	8	16.3	
	Under 75 mortality rate from respiratory disease	26.8	9	18.9	

Although Infant Mortality is 'significantly better' in the North-East, all other preventable premature deaths are 'significantly worse'. It is clear to see the Cardiovascular related concerns being that the North-East have a nearly 10% higher mortality rates from CVD in those under 75 years of age and a 7.9% higher mortality rate from respiratory disease in those under 75 years of age, compared to the rest of the nation but as well as this, notably the deaths caused by risk behaviours. In this case the risk behaviours include suicide, causing nearly 10% more deaths in the North-East and the 3.3% more deaths in the North-East caused by drug misuse (compared to the national average).

Figure 4 – Prevalence of risk factors/behaviours by region, England 2019:



PHE: Public Health Outcomes Framework (smoking indicator), NHS Digital Health Survey for England (obesity, hypertension and alcohol use). (Public Health of England, 2019. 'Trend in risk factors'. [Fingertips.phe.org.uk](https://fingertips.phe.org.uk). [online]).

The figure above shows that in 2019, smoking prevalence was highest in 'Yorkshire and the Humber (15.7%)' and 'in the most deprived areas it was 1.9 times higher than in the least deprived areas in 2019'. The figure conveys an inequality in the prevalence of smoking dependent on location - leading to an increase in mortality rates and lower life expectancy. The risk behaviours shown in Figure 4 are Hypertension, an increase or higher risk in drinking alcohol, obesity and smoking.

Hypertension is caused commonly by unhealthy lifestyle choices (NHS.uk. 2019. 'High blood pressure (hypertension) - Causes'. [online]), and has a prevalence of 31.4% in the North-East, 32.3% in the North-West and 26.2% in the West-Midlands, some of which are 8.6% higher than the lowest percentage location in England, being London.

Although obesity is high according to the data received by the medical sources above (Public Health Outcomes Framework and NHS Digital Health Survey for England), the locations that are most affected geographically are: the North-East with 34% of the population suffering from obesity, the North-West with 30.2% and the West-Midlands with 33.6% of the population. This is significantly higher than London where only 23.4% of the people living there are affected.

Collectively the percentages combined of the population in those areas for those who either smoke, drinking or do both are 44% for the North-East, 41.4% for the North-East, 36.8% for the West-Midlands and 38.7% for Yorkshire and the Humber.

The location with the highest percentage of residents who smoke is Yorkshire and Humber with 15.7% of their population using the risk behaviour and the North-East is responsible for the highest percentage of people drinking alcohol with 28.7%.

Prevention and detection of CVD in England:

Due to the fact that CVD can be brought on by living an unhealthy life, the most common forms of prevention are healthy lifestyle choices. As explained by the NHS for those who do not have a history of CVD within their family the steps to prevent it are; 'eat a healthy, balanced diet, be more physically active, keep to a healthy weight, reduce your alcohol consumption', keep your blood pressure under control, manage your diabetes and avoid smoking. (NHS.uk., 2020. 'Coronary heart disease – Prevention'. NHS England. [online]).

The prevalence of CVD in England is significant enough that the NHS has put a plan into place called 'CVDPREVENT' to 'tackle obesity, alcohol and smoking' with the aim of reducing 150,000 strokes in the UK across the next ten years. (NHS.uk., 2021. 'CVDPREVENT'. NHS England. [online]). As well as this, they state that 'approximately 20,000 lives could be saved per annum in England if mortality rates were reduced to the levels of the best in Europe. By diagnosing conditions early and treating before conditions worsen, lives can be saved'. (NHS.uk. 2021. 'NHS England Midlands and East » Cardiovascular'. NHS England. [online]). It is essential for this study to mention that they focus on 'looking at inequity and gaps in services and how care can be improved'. Currently there are several medical procedures that can be used to diagnose and detect CVD within England's health system. (NHS.uk 'Coronary heart disease- diagnosis'. 2021. [online]). These include electrocardiogram (ECG), exercise stress tests, X-rays, echocardiogram, coronary angiography, radionuclide tests, MRI scans and CT scans - however these tests will be carried out only if an individual seeks medical assistance. (BHF.org. 2021. 'Tests for heart and circulatory conditions'. [online]).

Discussion/Analysis:

With this study using only secondary research it is what creates the whole argument and connects topics. After the areas of deprivation were chosen using the Multiple indices of deprivation it became apparent that these locations are more likely to show signs of health inequalities and increased risk behaviours. This was particularly evident in the North-East and the North-West in terms of increased 'risk drinking'. Obesity levels being high in the North-East, North-West, West Midlands and Yorkshire and Humber. The location with the highest levels of smoking is Yorkshire and Humber.

This study has concluded that individuals living in areas where they are more likely to experience health inequalities such as 'housing conditions, employment, education, location and falling within a minority'. (England.nhs.uk. 2021. 'Definitions for Health Inequalities'. [online]) are more likely to show risk behaviours and therefore have higher levels of CVD.

Conclusion:

This case study explores the levels of CVD in England and specifically why it is more prevalent amongst England's most deprived areas. With a now solid understanding of how deprivation is defined it is evident that a huge cause of CVD is the lack of services, amenities and opportunities individuals in certain locations have access to. As previously discussed, a health inequality is an 'avoidable difference in health across the population, between different groups within society and location'. (NHS.uk. 2021. 'Definitions for Health

Inequalities'. [England.nhs.uk](https://www.england.nhs.uk). [online]) and there is often a strong association between a health inequality and a risk behaviour (Gov.uk. 2021. 'Risk behaviours and negative outcomes'. [Publishing.service.gov](https://www.publishing.service.gov.uk). [online]). Due to the above factors people living in less socioeconomical areas are more likely to be predisposed to illness such as CVD.

Recommendations:

Current devices/tools on the market to detect CVD:

Initially it proved far more difficult when researching household tools which increase and aid the detection of CVD, directing the research to amenities individuals already have in their home.

A project to create a mobile, non-invasive device to detect CVD, was funded by the British Heart Foundation, Chest Heart, Stroke Scotland (CHSS). They were able to determine that 'a smartphone-based ECG device is five times more effective at detecting previously unexplained arrhythmias than standard care, according to research part-funded by the BHF'. (Chan, S. 7 March 2019. 'Smartphone-based ECG device 'raises arrhythmia detection fivefold'. [BHF.org](https://www.bhf.org.uk). [online]). The device, known as The AliveCor Kardi-Mobile involves ECG pads that stick to the back of a smart phone (See Image 1 below) and then connects to its app, with the aim to help to diagnose the underlying symptom-causing arrhythmias more often than standard care in emergency departments.



Image 1: (Chan, S. 7 March 2019. 'Smartphone-based ECG device 'raises arrhythmia detection fivefold'. [BHF.org](https://www.bhf.org.uk). [online]).

Additionally, there are many versions of a Smart Watch. According to Harvard Medical School, these devices have the capability to detect Atrial Fibrillation and rapid or irregular heart rhythms and are approved by the FDA. This acts as an aid for your doctor as they can take these readings, alongside a basic formula which takes some personal details into account and from there is able to estimate an individual's likelihood of stroke. (Health.harvard.edu. December 2020. 'Can a smart watch diagnose a heart attack?'. [Harvard Medical School](https://www.harvard.edu). [online]).

A device which takes heart rate readings passively whilst users are carrying out daily activities would significantly reduce the unknown number of CVD cases as well as allowing those who are aware of their own health concerns to be more vigilant. The data received would be sent to a website where the user would be able to see their daily results, depending on how many times the device was used. This device could be implemented into something like a tap in a bathroom or kitchen in individual's homes.

A non-invasive mobile device that is built into the home as a standard could have the potential to fill the gap in this current market as after undertaking research it is seemingly the first of its kind. In terms of viability, the device (Heartbeat Tap) would have a production cost, as well as the cost of labor to install it into homes around England. This is currently a concept idea but large organisations such as the Royal Society of Arts have a strong passion for tackling issues around better health and well-being. An in-depth article like this case study may be a 'kick-start' to creating a campaign to gain investors. Although this alone would not radiate all Cardiovascular related deaths, it would make those who have the device implemented constantly aware of their Cardiovascular health, ideally this would be every household in England. The device would create awareness that an individual's health is at risk and therefore encourage medical assistance to be sought, as well as choosing to make healthier lifestyle choices.

The United Nations have created 17 Development Goals which are encouraged globally – their ultimate goal is to create a higher quality of life and more sustainable future for all. Goal 3, 'Good Health and well-being for all' is notably interesting to this study. They explore how living today can have an enormous impact on an individual's mental and physical health all around the world. A device which is installed into homes across England and implemented into a person daily routine such as a 'Heartbeat Tap', which increases the detection of the England's 'largest killer' could have a hugely positive impact on people in England's physical health. It supports their aim of 'reducing the global mortality rate'. (*THE 17 GOALS | Sustainable Development, 2021[online]*).

A prototype of this device has been created using a laser printer and the programming configured using an Arduino Board (See *Appendix 3*). The next step for this study would be to contact the Royal Arts Society, using this case study as a brief.

Reference List:

Assets.publishing.service.gov.uk. 2021. [online] Available at: <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/452169/data_pack_risk_behaviours_and_negative_outcomes.pdf> [Accessed 23 November 2021].

Assets.publishing.service.gov.uk. 2021. Top fifth (20%) Most Deprived Areas in England: Local Enterprise Partnership Level Data. [online] Available at: <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/442823/ERDF_OP_Annex_on_CLLD_FINAL_070715.pdf> [Accessed 23 November 2021].

British Heart Foundation. 2021. Smartphone-based ECG device 'raises arrhythmia detection fivefold'. [online] Available at: <<https://www.bhf.org.uk/for-professionals/healthcare-professionals/blog/2019/smartphone-based-ecg-device-raises-arrhythmia-detection-fivefold>> [Accessed 7 March 2019].

British Heart Foundation. 2021. Smartphone-based ECG device 'raises arrhythmia detection fivefold'. [online] Available at: <<https://www.bhf.org.uk/for-professionals/healthcare-professionals/blog/2019/smartphone-based-ecg-device-raises-arrhythmia-detection-fivefold>> [Accessed 29 December 2021].

British Heart Foundation. 2021. Tests for heart and circulatory conditions. [online] Available at: <<https://www.bhf.org.uk/information-support/tests>> [Accessed 23 December 2021].

British Heart Foundation. 2021. The CVD Challenge in England. [online] Available at: <<https://www.bhf.org.uk/for-professionals/healthcare-professionals/data-and-statistics/the-cvd-challenge/the-cvd-challenge-in-england>> [Accessed 23 November 2018].

East, N., 2021. NHS England Midlands and East » Cardiovascular. [online] England.nhs.uk. Available at: <<https://www.england.nhs.uk/mids-east/west-midlands-clinical-network/our-networks/cardiovascular/>> [Accessed 23 December 2021]. <<https://www.nhs.uk/conditions/coronary-heart-disease/prevention/>> [Accessed 23 December 2021].

England, N., 2021. NHS England » CVDPREVENT. [online] England.nhs.uk. Available at: <<https://www.england.nhs.uk/ourwork/clinical-policy/cvd/cvdprevent/>> [Accessed 2 March 2021].

England, N., 2021. NHS England » Definitions for Health Inequalities. [online] England.nhs.uk. Available at: <<https://www.england.nhs.uk/itphimenu/definitions-for-health-inequalities/>> [Accessed 23 November 2021].

Eurohealthnet.eu. 2021. [online] Available at: <https://eurohealthnet.eu/sites/eurohealthnet.eu/files/CHAIN_infographic%20_covid19_and_inequalities_final.pdf> [Accessed 24 October 2021].

Fingertips.phe.org.uk. 2021. Trends in risk factors. [online] Available at: <https://fingertips.phe.org.uk/static-reports/health-profile-for-england/hpfe_report.html#risk-factors-associated-with-ill-health> [Accessed 23 December 2021].

GOV.UK. 2021. Cardiovascular disease prevention: state of the North East 2019. [online] Available at: <<https://www.gov.uk/government/publications/cardiovascular-disease-prevention-state-of-the-north-east-2019>> [Accessed 25 November 2021].

GOV.UK. 2021. Chapter 5: inequalities in health. [online] Available at: <<https://www.gov.uk/government/publications/health-profile-for-england-2018/chapter-5-inequalities-in-health>> [Accessed 24 October 2021].

GOV.UK. 2021. Health matters: preventing cardiovascular disease. [online] Available at: <<https://www.gov.uk/government/publications/health-matters-preventing-cardiovascular-disease/health-matters-preventing-cardiovascular-disease>> [Accessed 24 October 2021].

Healthsurvey.hscic.gov.uk. 2018. [online] Available at: <<http://healthsurvey.hscic.gov.uk/media/78646/HSE17-CVD-rep.pdf>> [Accessed 17 December 2018].

academic.oup 2021. [online] Available at: <[Living Wage Commission. 2021. The Poorest UK Places | UK Living Wage Commission. \[online\] Available at: <<http://livingwagecommission.org.uk/poorest-uk-places/>> \[Accessed 4 November 2021\].](https://watermark.silverchair.com/dys151.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAtcwggLTBqkqhkiG9w0BBwagggLEMIICwAIBADCCArkGCSqGSib3DQEHATAeBgIghkgBZQMEAS4wEQQM_9mRSOSfRY5e2JWHAgeQgIICirgo3woCmCJap-f0cyrNfuYy1flvZWUAOijtwXGst0fg9m21dl4Qe8yny84IJ9xI2Ltdlo24cX881nd2APCpGRAZoO9SVPrQVqeE_3eyzKEjmtv6hkiKj_ErdvJA6YqoPNXaCCw2Jhlh9Mksbcyfl1I4IHi1HR1myOrDmGkXsTellhBxSTmZuzuYzHli5sltNrWv8flz_2YBOZsPRTXhXwfxoIq5UpKHXPmH2rirJSFPA9zFGcOLzee4BlbrkO-CZ9efLUgUd9PLfWb2Dn9bFVukzTJ9wMfshM1Kxv-mqV-UEW9iDAmi3KUGXIZMRdY23pl98O2eGBqbDDhSRhy8XYUC5Cle-1paKhILMaNYLBRsrsxg7P5hHB4s--DvEjr2fwsWUrLKdJDmVTKFDK3fiFTmtrVrGoFQ_-37ol4zb4JgmVaKKKwi8iNlffyB4IRwmkDqrjh7GotV4jvOQxwSDG9vV5zte297p5jM5T9BTJp7gpa1b16yVV8KCApNLMXQ25I0rR0oNWmM2GMqr4xIDyU0WVlt4n2PiHob7W8Zb5vgLRxOq3LnUS8dSlhZAA1Gk1cxGnU72BSQ7dbErO9Ak6yB_U7E0anaV5q_hg6qeLa1J1VasioTMgZQ_zNKOXEzm_Li8Nxno10f4RxL0HmG8w2a2tK3kicLQiXVxuunuSgzRaUBJq7U1jgHkVtzCIM0e1J9LBitbSk9M-BvLCjQqM9bEzHX-wa0N8JsfueJNRungSa50p0phyoqFPKMvwji-epycTQUW6GbL_LQFgs1UiYRAq4BgbuSx4oUbwbc42GYNsHd8LBPYwR-BXzJKIjXdeTab9yst46afVXyHb9dG2KkZJbv0FQ6M> [Accessed 2 January 2013].</p></div><div data-bbox=)

Neave, A., 2021. Health Survey for England - Health, social care and lifestyles - NHS Digital. [online] NHS Digital. Available at: <<https://digital.nhs.uk/data-and-information/areas-of-interest/public-health/health-survey-for-england---health-social-care-and-lifestyles>> [Accessed 17 December 2018].

nhs.uk. 2019. High blood pressure (hypertension) - Causes. [online] Available at: <<https://www.nhs.uk/conditions/high-blood-pressure-hypertension/causes/>> [Accessed 23 December 2021].

nhs.uk. 2021. Cardiovascular disease. [online] Available at: <<https://www.nhs.uk/conditions/cardiovascular-disease/>> [Accessed 18 November 2021].

nhs.uk. 2021. Coronary heart disease - Diagnosis. [online] Available at: <<https://www.nhs.uk/conditions/coronary-heart-disease/diagnosis/>> [Accessed 23 December 2021].

Niassembly.gov.uk. 2021. [online] Available at: <<http://www.niassembly.gov.uk/globalassets/documents/raise/publications/2010/regional-development/11310.pdf>> [Accessed 7 November 2021].

Sdgs.un.org. 2021. THE 17 GOALS | Sustainable Development. [online] Available at: <<https://sdgs.un.org/goals>> [Accessed 2 December 2021].

Statista. 2021. Great Britain: kitchen appliances owned at home 2017 | Statista. [online] Available at: <<https://www.statista.com/statistics/557369/kitchen-appliances-owned-at-home-uk-united-kingdom/>> [Accessed 7 November 2021].

The Health Foundation. 2021. Money and resources | The Health Foundation. [online] Available at: <<https://www.health.org.uk/evidence-hub/money-and-resources>> [Accessed 24 October 2021].

Wickramasinghe, K., Towsen, N., Williams, J. and Rayner, M., 2015. [online] Gov.uk. Available at: <<https://heart.bmj.com/content/heartjnl/early/2015/05/06/heartjnl-2015-307516.full.pdf>> [Accessed 25 June 2015].

Bibliography:

<http://livingwagecommission.org.uk/poorest-uk-places/>

<http://www.niassembly.gov.uk/globalassets/documents/raise/publications/2010/regional-development/11310.pdf>

<https://academic.oup.com/ije/article/41/6/1737/744530?login=true>

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/442823/ERDF_OP_Annex_on_CLLD_FINAL_070715.pdf

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/837332/State_of_the_North_East_2019_CVD_prevention.pdf

<https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-11638-3>

<https://www.bhf.org.uk/for-professionals/healthcare-professionals/data-and-statistics/the-cvd-challenge/the-cvd-challenge-in-england>

<https://www.bmj.com/content/313/7070/1434.short>

<https://www.cv-library.co.uk/recruitment-insight/revealed-richest-poorest-cities-uk/>

<https://www.escardio.org/Journals/E-Journal-of-Cardiology-Practice/Volume-4/vol4n19-Title-Early-detection-of-cardiovascular-disease-the-future-of-cardi>

<https://www.examinerlive.co.uk/news/west-yorkshire-news/what-uks-most-used-household-12665254>

<https://www.gov.uk/government/publications/health-profile-for-england-2018/chapter-6-wider-determinants-of-health>

<https://www.health.harvard.edu/heart-health/can-a-smart-watch-diagnose-a-heart-attack>

<https://www.health.org.uk/evidence-hub/money-and-resources/income/relationship-between-income-and-healthy-life-expectancy-by-neighbourhood>

<https://www.health.org.uk/publications/long-reads/living-in-poverty-was-bad-for-your-health-long-before-COVID-19>

https://heart.bmj.com/content/100/Suppl_2/ii1.short

<https://www.heartuk.org.uk/downloads/heart-uk-state-of-the-nation-report-2018.pdf>

<https://www.kingsfund.org.uk/publications/what-are-health-inequalities#life>

[https://www.nhs.uk/conditions/cardiovascular-disease/#:~:text=Cardiovascular%20disease%20\(CVD\)%20is%20a,increased%20risk%20of%20blood%20clots.](https://www.nhs.uk/conditions/cardiovascular-disease/#:~:text=Cardiovascular%20disease%20(CVD)%20is%20a,increased%20risk%20of%20blood%20clots.)

<https://www.nhs.uk/conditions/high-blood-pressure-hypertension/causes/>

<https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Northumberland-Knowledge/NK%20place/Indices%20of%20deprivation/Indices-of-Deprivations-2019-Summary-Report.pdf>

<https://www.pnas.org/content/pnas/114/18/4643.full.pdf>

<https://www.proquest.com/docview/2412470650/fulltext/7A7AB2CAABA14611PQ/1?accountid=27803>

<https://pubmed.ncbi.nlm.nih.gov/19770848/>

<https://sdgs.un.org/goals>

<https://www.simplypsychology.org/qualitative-quantitative.html>

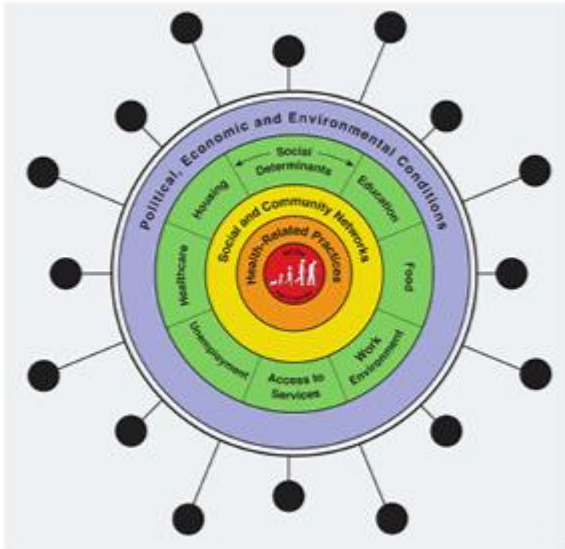
<https://www.statista.com/statistics/557369/kitchen-appliances-owned-at-home-uk-united-kingdom/>

<https://www.turn2us.org.uk/About-Us/Media-Centre/Press-releases-and-comments/Millions-across-the-UK-are-living-without-househol>

Appendices:

Appendix 1:

(Centre for Global Health inequalities research., 2021. 'Research on the COVID-19 pandemic and health inequalities shows: We are not all in it together'. Eurohealthnet.eu. [online]).



Appendix 2:

(Heart UK Cholesterol Charity., 2019. 'State of the nation: Cardiovascular Disease'. Heartuk.org. [online]).

CAUSES OF CVD

Whilst the exact cause of CVD is not yet known, there are a number of significant risk factors which contribute to a person's risk of being diagnosed:

 <p>High blood pressure (also known as hypertension, is an important risk factor for stroke)</p>	 <p>Smoking and other tobacco use (which can damage and narrow blood vessels)</p>	 <p>High cholesterol (which can cause blood vessels to narrow and increase the risk of developing a blood clot)</p>
 <p>Diabetes (a condition that causes a person's blood sugar glucose level to become too high)</p>	 <p>Obesity (which increases the risk of developing diabetes and/or high blood pressure)</p>	 <p>Genetics (inherited conditions such as familial hypercholesterolaemia can cause high cholesterol)</p>

Appendix 3:

Image of laser printed prototype of a mobile device that can be implemented into homes (heartbeat tap).

