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England: General Population Health Landscape

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Abstract— **This paper explores the population health of those living within England. With the health of the population facing changes, such as global aging, life expectancies and retirement ages have subsequently increased. Ethnic minorities have been found to be more susceptible to poorer health than their Caucasian counterparts, with minorities developing chronic diseases and disabilities. Therefore, this research delves into health, ethnicity, age and disability data, obtained from the 2021 UK Census, as well as the weekly Coronavirus datasets provided by the Mayor of London. Prior to conducting any analysis, all datasets were cleaned and transformed to exclude any data related to the Welsh population. The datasets were then visualised into graphs, such as bar, line and pie charts to display any relationships, but also frequencies of health across a 5-point Likert Scale: Very Good, Good, Fair, Bad and Very Bad. Overall, the research concluded that the majority of England's population have very good to good health, thus may be considered as healthy. Those living in the capital (London) are relatively healthier than those that live outside. But the health landscape has slightly adjusted since the onset of Coronavirus, with population health marginally decreasing as a consequence. Moreover, the paper possesses an opportunity to delve into the effects of Long Covid on England's population.**

Keywords—health, population, ethnic minorities, age, disability, coronavirus

I. INTRODUCTION

Previous research has demonstrated noteworthy ageing trends, with older people living longer lives [1]. Individuals develop health concerns as they age, with those over 75 facing severe issues [2]. It has also been discovered that ethnic minorities have poorer health than Caucasians, who are more prone to chronic diseases [3]. Since the coronavirus pandemic began, some people have been suffering with "Long Covid" [4, p.1]. As a result, the study attempted to evaluate the population health of people living in England by exploring the following research questions:

RQ1: What is the general health of the population like?
RQ2: What age(s) and ethnic minorities are considered to be more healthy?
RQ3: Is there a relationship between age and disability when it comes to health?
RQ4: How has the health of the population changed since the coronavirus pandemic?

It was uncovered majority of England's population is healthy, with those under the age of 24 being the healthiest. Individuals that identify as White: English, Welsh, Scottish, Northern Irish, or British were found to be the healthiest compared to other ethnic groups. Yet, those under the age of 24 were shown to have higher rates of disability, contradicting previous literary research [3]. However,

coronavirus cases were found to be at an all-time high in 2022, when compared to previous years. The biggest number of instances were reported by people aged 25 to 29, while those over 70 had the fewest.

II. BACKGROUND

A. Changing health across age

The health of the population has undergone significant shifts. Recently, there has been a noticeable trend towards global aging, leading to a larger demographic contribution from older adults [1]. Consequently, life expectancies have risen, as seen in the United Kingdom (UK), where it has grown to 81 years, prompting an increase in the legal retirement age [1; 2; 5; 6; 7].

Despite claims that incidence rates of chronic health conditions rises with age, with certain conditions becoming more prevalent in later adulthood, individuals aged 60 and above often tend to develop noncommunicable diseases like cancer, mental disorders such as dementia and Alzheimer's, as well as heart disease [1; 8]. House et al [2] supports this finding, highlighting significant health issues persisting in those aged 75 and above.

B. Health across the ethnicities

Research further indicates that ethnic minorities have poorer health than Caucasians [3]. Black and Hispanic people are more susceptible to chronic diseases, disabilities and greater mortality rates than Caucasians [3]. While females outlive males on average, they are more prone to experience chronic health issues, disabilities, and comorbidities [3].

Within the UK, however, Calvert et al [9] communicated that South Asians and African-Americans reported of hypertension, arthritis, diabetes, angina and myocardial infarction in their study. Predictions indicate a rise in coronary heart disease, heart failure and atrial fibrillation by 2031 [10]. Meanwhile, communicable disease like tuberculosis (TB) and sexually transmitted infections like HIV have seen declining incidence rates in the last 30 years [6].

C. Coronavirus

Since the onset of the coronavirus (COVID-19) pandemic, the population health has undergone more changes. Globally, the pandemic has resulted in over 600 million cases and 6 million deaths [4]. It has left many individuals grappling with "Long Covid" [4, p.1], where they experience prolonged COVID-19 symptoms. Approximately 2 million people in the UK are dealing with Long Covid [4], with disparities noted among different ethnic groups and marginalised populations.

It has impacted lower-income groups, Hispanics, Latinos, and individuals with pre-existing conditions such as type 2 diabetes and connective tissue disorders [7]. Beyond Long Covid, survivors may endure mental and physical health needs [7].

III. METHODS

The primary dataset was obtained from the Office of National Statistics (ONS) website as part of the Census 2021 data and is labelled 'General Health' [11]. The data was downloaded in XLSX format and included two excel sheets: a Metadata sheet with an overview description and a Dataset sheet with five columns identifying local authorities in England and Wales; General Health categories and observations. Despite detailing rows throughout England and Wales, the research will focus predominantly on authorities within England. Rows below Westminster will be eliminated from this study, as found on the Welsh Government website [12], which lists local Welsh authorities. Despite only incorporating 5 columns, not all columns are necessary for this study, so they will be eliminated in order to present tidy data. The following columns will remain: lower-tier local authorities, general health and observation, with the health of all countries being the population but England's population health being utilised as the sample. Further data cleaning was conducted prior to beginning any data analysis.

The dataset sourced could considered to be credible. This is because the data has been released three times - the initial dataset and 2 further revised releases. The third version will be used. It has also followed the Data Protection Act (2018) [13] by anonymising its data from the original collection on Census Day - the data was aggregated by local authorities, so any personal identifiable information was kept private. The data collection procedure and methods have been explained, including the logic behind each question asked of participants [14].

Despite the data's trustworthiness and integrity, it does not provide a comprehensive view to address the research questions. The data is sufficient to answer RQ1. As a result, multiple datasets will be used to provide a thorough overview and answer each question. The additional datasets that will be used are:
1. Age and general health [15]
2. Disability - equality act disabled and general health [16]
3. Ethnic group and general health [17]
4. Coronavirus (COVID-19) Weekly Update, specifically phe_cases_london_boroughs.csv and phe_cases_age_london.csv [18]

Furthermore, it might be argued that the original dataset and those mentioned above reflect real-world behaviour because data was collected during both the Census and the pandemic, allowing for population generalisation [19]. Because the data is pre-existing, it provides an advantage for this research by eliminating data acquisition and costs, saving time [19; 20]. Despite this, some may question the data's reliability, particularly for the Coronavirus (COVID-19) Weekly Update datasets. Because these databases provide anonymous statistics on the number of new and total coronavirus cases, it is unclear whether individuals contracted the virus repeatedly. Moreover, because of the emergence and novelty of the virus, tracking of cases may have posed difficulty with non-governmental organisations (NGOs) and universities providing governmental aid in COVID-19 data collection, particularly since the UK government faced technical difficulties at times [21]. Even with this, recorded cases, found in datasets, were of those that were confirmed with a laboratory test, which may not have given a complete picture of the population landscape [22; 23]. Therefore, causing potential doubt on data quality found within existing and available COVID-19 datasets.

Table 1 provides an overview of various variables that will be included and used in this study. As evident, all data types were employed, with each providing a particular function.

The following domain concepts are of relevance to the study:
- Population aging: people living longer lives [24].
- Population health: the health of a group of individuals, such as nations, communities, employees, ethnic groups and disabled people [25].
- General Health: A person's assessment of the general state of their health from very good to very bad and is not based on an individual's health over any specified period of time [26].
- Ethnic minorities: All ethnic groups, including White minorities such as Irish travellers, except White British [27].
- Disability: A person's assessment of their daily activities as limited by long-term physical, mental health conditions or illnesses are considered disabled, in accordance with the 2018 Equality Act [28].
- Coronavirus: an infectious disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [29].
- Long Covid: a chronic condition that occurs after SARS-CoV-2 infection and is present for at least 3 months, with symptoms including fatigue, muscle aches and shortness of breath [30; 31].

TABLE I. VARIABLES, USED WITHIN RESEARCH, WITH ITS DATA TYPES AND PURPOSE.

Data Type	Data Definition	
	Variable Names	*Purpose*
Nominal	boroughs	Categorical values representing different boroughs within England, including individual boroughs within London
	ethnic_group	Categorical values representing different racial groups who participated within the Census
Ordinal	health	Individuals ranking their health from 'Very Bad' to 'Very Good'
	disability_status	Individuals selecting their disability status based off three options: 1. Disabled under the Equality Act: Day-to-day activities limited a lot 2. Disabled under the Equality Act: Day-to-day activities limited a little 3. Not disabled under the Equality Act
Ratio	number_of_people	Frequency counts of people, based on the variable(s) in questions
	new_cases, total_cases	Frequency counts of COVID-19 cases, new_cases for recently reported cases while total_cases calculates overall cases
	age, age_band	Age is unique and arbitrary. But for both variables, individuals' age has been grouped together and are arranged in intervals
Interval	date	The difference between dates is meaningful

IV. RESULTS AND DISCUSSION

As seen within Fig. 1, the health of England can be classed to be 'very good' since 27.4M selected this option. Whereas, less than approximately 1M reported to having 'very bad health'. Therefore, it could be inferred that around 95% of the population is healthy.

As evident from Fig. 2, those aged 24 and below represent around 45% of the population who reported to have very good health, followed by those between 35 to 49 years. However, 50 to 64 year olds had the biggest proportion of good health amongst the population; while 65 and over represent the highest proportion of fair, bad and very bad health.
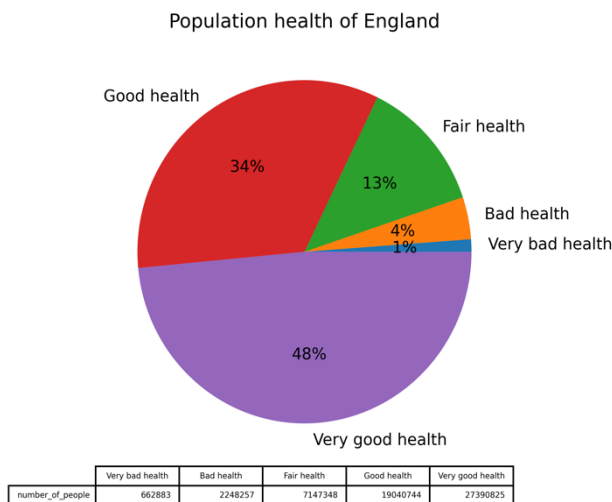

Fig. 1. Pie diagram of population health

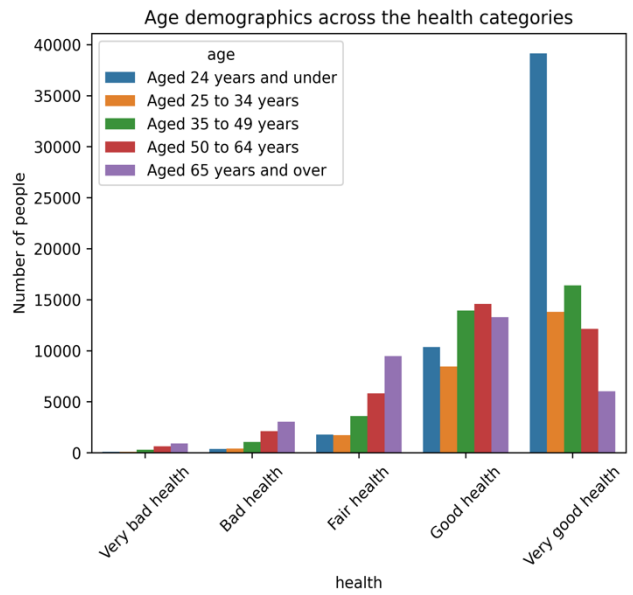|	Very bad health	Bad health	Fair health	Good health	Very good health
number_of_people	662883	2248257	7147348	19040744	27390825

Fig. 2. Bar diagram of population health across age categories

Fig. 3 displays that health amongst different ethnic groups could be considered to be very good. Across all health categories, White: English, Welsh, Scottish, Northern Irish or British individuals seem to represent the highest volume of the population, for example for very good health, there's a plot around 300,000. Similarly, those that identify as Asian, Asian British or Asian Welsh could be said to have very good or good health. Whereas, it seems that there is no data for White: Irish individuals.

From Fig. 4, it could be inferred that those living outside London have poorer health due to around 1M people experiencing very bad health, a contrast to Londoners where approximately 0.5M people are suffering from bad health.
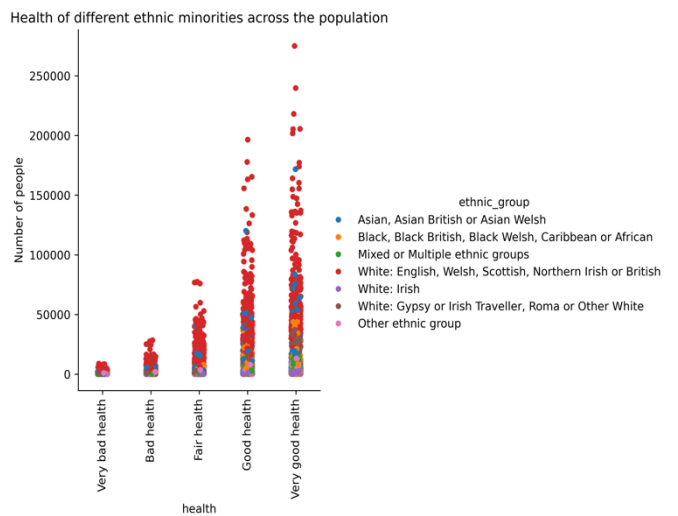

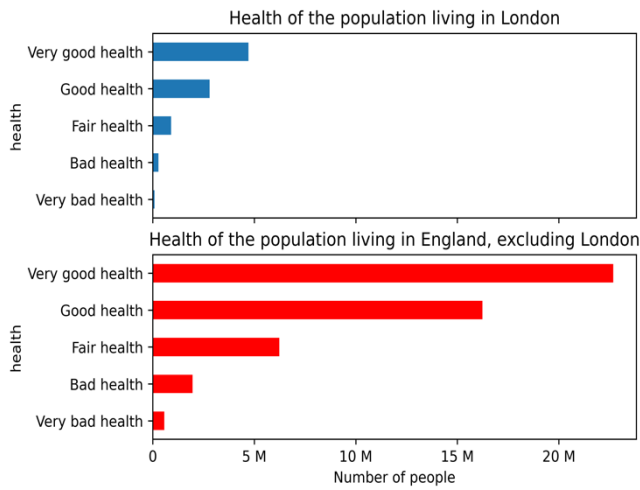Fig. 3. Diagram of population health across ethnic groups

Fig. 4. Bar diagram comparison of population health within London and all other England local authoriites

As depicted in Fig. 5, it can be clearly observed that there is no correlation between disability and age, particularly for those aged 65 and above (bottom scatterplot). But within both scatterplots, it could be suggested that there is a slight correlation between age and disability for individuals 24 years and younger. However, there is no difference across the line graphs.

At first look in Fig. 6, it appears that the ratio of new cases to total cases is relatively low, implying that very few people contracted the disease and contributed to the overall instances. However, because the association between the two variables is small, it is possible that people with the disease suffer from it for a long time.

Furthermore, as shown in Fig. 6, beginning in December 2020, the total number of cases rapidly increases, reaching approximately 10 million by January 2023 before beginning to fall in February.
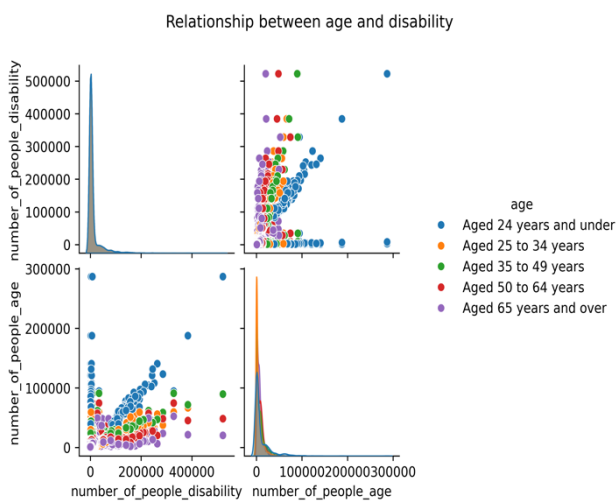

Fig. 5. Diagram exploring the relationship between age and disability across the population
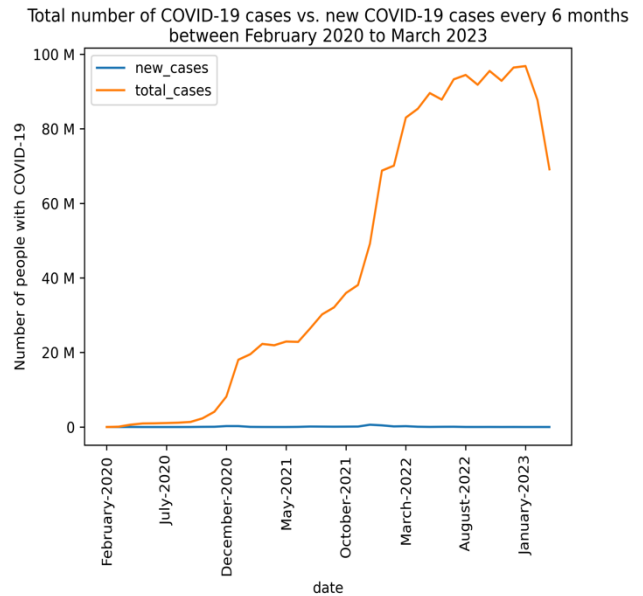

Fig. 6. Line diagram of reported Coronavirus cases between February 2020 to January 2023

As vividly illustrated in Fig. 7, it is evident that the graph troughs and peaks at various points in time. The two most visible peaks are between November to December 2020, as well as December 2021, where cases reached just over 600K. However, there were very few to no reported cases within February 2020 as well as from January 2023 onwards.

From Fig. 8, it is evident that 2020 had the lowest volume of cases, whilst reports rose exponentially by 2022. Between 2021 and 2022, reports rose by approximately 700M before declining by 2023.
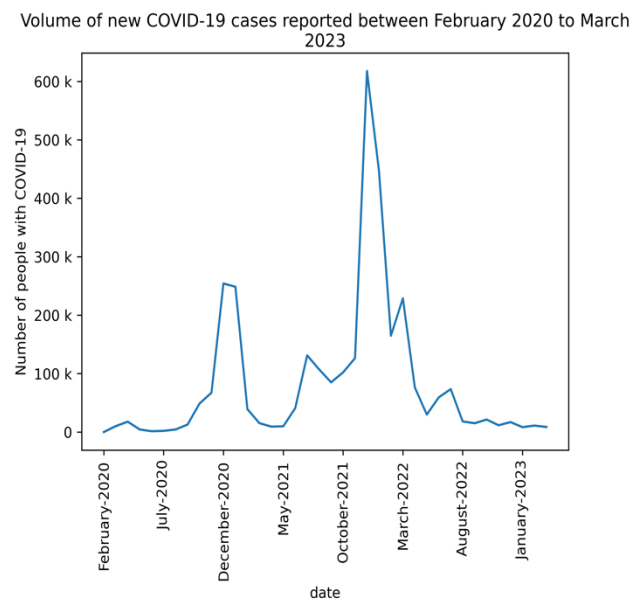

Fig. 7. Line diagram of reported new Coronairus cases between February 2020 to March 2023
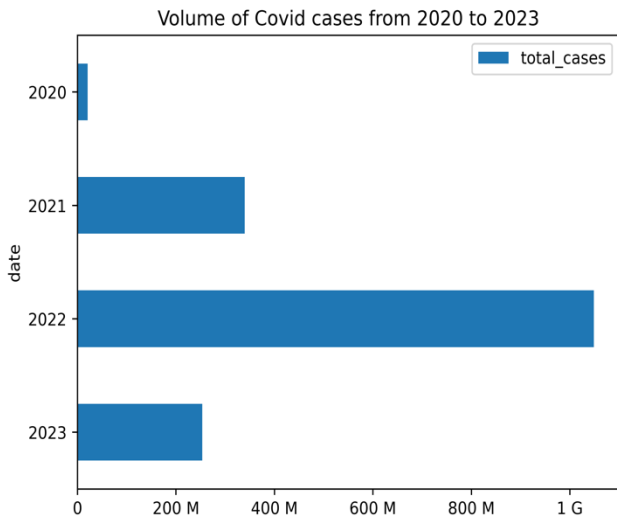
Fig. 8. Bar diagram of reported Coronavirus cases in London from 2020 to 2023

It could be inferred from Fig. 9 that coronavirus cases increase between individuals aged 20 to 24 years to individuals aged 30-34 years, before cases begin to decrease as the age categories increases. An outlier to this trend is those aged between 10 to 14, where around 200K cases were reported. But it can be seen that 25 to 29 years old had the highest volume with just over 370K cases, which is closely followed by 30 to 34 years old (which is around 350K).

The age category with the highest cases (25 to 29 years) saw a peak around January 2022 as depicted in Fig. 10, nearing 90K reports. Whereas, for those aged 90 and above, cases peaked one year earlier within January 2021, with 2K reports.
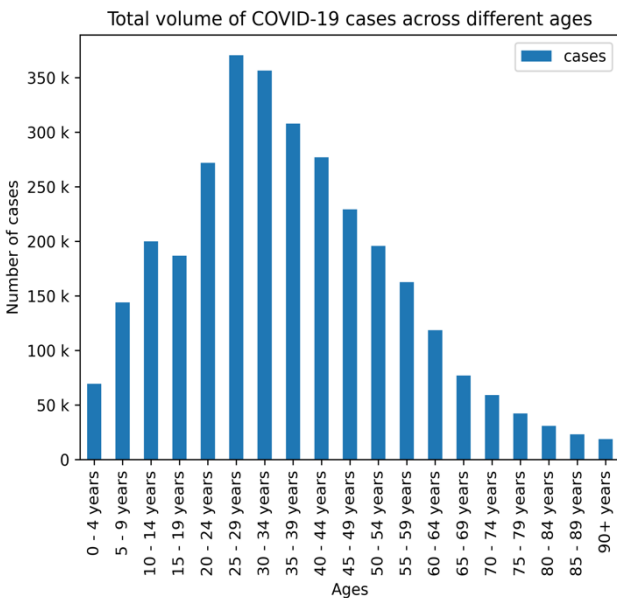

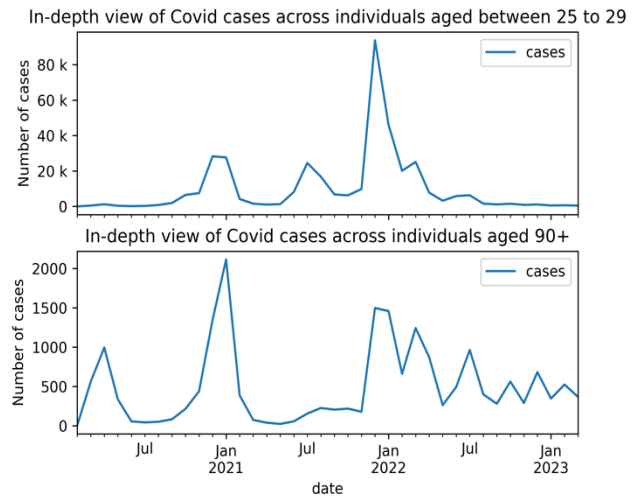Fig. 9. Bar diagram of total Coronavirus cases across age categories

Fig. 10. Line diagram comparison of age category with highest volume of Coronavirus cases against age category with lowest cases

V. Conclusion

The research proposed sought to answer 4 research questions. However, after completing analysis, the questions 'What is the general health of the population like?' and 'What age(s) and ethnic minorities are considered to be more healthy?' will be merged to form research question 1: What is the population's health status, and which age groups and ethnic minorities are thought to be healthier?

RQ1: What is the population's health status, and which age groups and ethnic minorities are thought to be healthier?

The population of England might be considered healthy. As shown in Fig. 1, over 27 million people reported having 'Very good health'. 45% of those with very good health were under the age of 24, while approximately 45% of those in 'Very bad health' were 65 and above. This study supports previous research, which has shown that younger people are generally healthier than older people [8]. In contrast, Fig. 3 shows that individuals who identify as White: English, Welsh, Scottish, Northern Irish, or British are healthier than any other ethnic group. Thus validating prior studies, such as Warner and Brown [3].

Fig. 4, although, suggests that individuals living in London have better health than those living outside. This is because approximately 1% of people reported having 'Very bad health', in contrast to Londoners who had no observations. This contradicts research which suggests that people living in urban areas have worse health than those who do not [32].

RQ2: Is there a relationship between age and disability when it comes to health?

It could be argued that there is a slight relationship between age and disability when it comes to health. Within Fig. 4, it can be seen that a positive relationship could be deduced for individuals aged 24 and under as points (along the scatterplot) move upwards [33]. This refutes literature, which communicates that disabilities traditionally increases with age [1]. However, beyond this, it could further be suggested the other age categories do not show a correlation between

age and disability when it comes to health. This is due to the points (within the scatterplots) being sparse [33]. Despite the sparsity, each age category has anomalies.

RQ₃: How has the health of the population changed since the coronavirus pandemic?

One could argue that the population's health has shifted slightly. Fig. 6, 7, and 8 illustrate how population health has altered since February 2020, when no incidents were reported. It was evident that the number of cases in 2022 was highest. Despite a slight drop by January 2023, the total number of cases remains high, at 70 million. However, given there have been few new coronavirus cases, this is likely to be reduced. With instances remaining high, "Long Covid" may be inferred, but more research is needed [4, p.1].

Individuals aged 25 to 29 had the highest number of cases (about 371,000), which peaked around January 2022. Individuals aged 70 and above, however, had fewer coronavirus infections. This could be attributed to the government's shielding guidance, which classed people over 70 as 'clinically extremely vulnerable' [34].

Consequently, subsequent research should explore the effect of Long Covid on population health within England as individuals tend to report on persistent symptoms and disabilities upon contracting the virus [4]. Moreover, expanding the scope of the research to investigate Welsh data as well as delving into external factors that may influence health disparities are potential areas for future work. Besides this, a more comprehensive view could be provided if further research incorporates primary data on COVID-19 infection firsthand from the population to promote data accuracy and validity.

REFERENCES

[1] Bloom, D.E., Canning, D. and Lubet, A., 2015. Global population aging: Facts, challenges, solutions & perspectives. Daedalus, 144(2), pp.80-92.

[2] House, J.S., Kessler, R.C. and Herzog, A.R., 1990. Age, socioeconomic status, and health. The Milbank Quarterly, pp.383-411.

[3] Warner, D.F. and Brown, T.H., 2011. Understanding how race/ethnicity and gender define age-trajectories of disability: An intersectionality approach. Social science & medicine, 72(8), pp.1236-1248.

[4] Loreche, A.M., Pepito, V.C.F. and Dayrit, M.M., 2023. Long Covid: A call for global action. Public Health Challenges, 2(1), p.e69.

[5] Garin, N., Olaya, B., Miret, M., Ayuso-Mateos, J.L., Power, M., Bucciarelli, P. and Haro, J.M., 2014. Built environment and elderly population health: a comprehensive literature review. Clinical practice and epidemiology in mental health: CP & EMH, 10, p.103.

[6] Cylus, J., Richardson, E., Findley, L., Longley, M., O'Neill, C., Steel, D. and World Health Organization, 2015. United Kingdom: health system review. Available at: https://iris.who.int/handle/10665/330250 [Accessed 28/12/2023]

[7] Flynn, D., Moloney, E., Bhattarai, N., Scott, J., Breckons, M., Avery, L. and Moy, N., 2020. COVID-19 pandemic in the United Kingdom. Health policy and technology, 9(4), pp.673-691.

[8] Piazza, J.R., Charles, S.T. and Almeida, D.M., 2007. Living with chronic health conditions: Age differences in affective well-being. The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 62(6), pp.P313-P321.

[9] Calvert, M., Duffy, H., Freemantle, N., Davis, R., Lip, G.Y. and Gill, P., 2012. Population health status of South Asian and African-Caribbean communities in the United Kingdom. BMC Health Services Research, 12, pp.1-8.

[10] Majeed, A. and Aylin, P., 2005. The ageing population of the United Kingdom and cardiovascular disease. BMJ, 331(7529), p.1362.

[11] Office for National Statistics (2023) General health variable: Census 2021. Available at: https://www.ons.gov.uk/census/census2021dictionary/variablesbytopic/healthdisabilityandunpaidcarevariablescensus2021/generalhealth [Accessed 30/12/2023]

[12] Welsh Government (n.d) Find your local authority. Available at: https://www.gov.wales/find-your-local-authority [Accessed 27/12/2023]

[13] Gov.uk (n.d). Data protection. Available at: https://www.gov.uk/data-protection [Accessed 20/12/2023]

[14] Office for National Statistics (n.d) Health and unpaid care question development for Census 2021. Available at: https://www.ons.gov.uk/census/planningforcensus2021/questiondevelopment/healthandunpaidcarequestiondevelopmentforcensus2021 [Accessed 30/12/2023]

[15] Office for National Statistics (2023). 'Age (c) and general health'. Available at: https://www.ons.gov.uk/datasets/RM069/editions/2021/versions/1/filter-outputs/f43e0ba8-8571-4008-97a1-5eed4772c1ef#toc [Accessed 31/12/2023]

[16] Office for National Statistics (2023). 'Disability – equality act disabled and general health'. Available at: https://www.ons.gov.uk/datasets/RM069/editions/2021/versions/1/filter-outputs/311f8e3a-d1b8-4248-957f-12f76d3d7c3e#get-data [Accessed 31/12/2023]

[17] Office for National Statistics (2023). 'Ethnic group and general health'. Available at: https://www.ons.gov.uk/datasets/RM069/editions/2021/versions/1/filter-outputs/df28e031-8076-477b-8acb-8180f7367d62#get-data [Accessed 31/12/2023]

[18] GLA City Intelligence (2023). 'Coronavirus (Covid-19) Weekly Update'. Available at: https://data.london.gov.uk/dataset/coronavirus--covid-19--cases [Accessed 27/12/203]

[19] Weston, S.J., Ritchie, S.J., Rohrer, J.M. and Przybylski, A.K., 2019. Recommendations for increasing the transparency of analysis of preexisting data sets. Advances in methods and practices in psychological science, 2(3), pp.214-227.

[20] Hulley, S.B., Cummings, S.R., Browner, W.S., Grady, D.G., Newman, T.B, 2007. Designing clinical research. 4th edn. Philadelphia, PA: Lippincott Williams ad Wilkings (LWW). Available at: https://ndl.ethernet.edu.et/bitstream/123456789/43635/1/Stephen%20B%20Hulley.pdf (https://ndl.ethernet.edu.et/bitstream/123456789/43635/1/Stephen%20B%20Hulley.pdf) [Accessed 23/01/2024]

[21] Miller, A.R., Charepoo, S., Yan, E., Frost, R.W., Sturgeon, Z.J., Gibbon, G., Balius, P.N., Thomas, C.S., Schmitt, M.A., Sass, D.A. and Walters, J.B., 2022. Reliability of COVID-19 data: An evaluation and reflection. PLoS One, 17(11), p.1-19

[22] Alamo, T., Reina, D.G., Mammarella, M. and Abella, A., 2020. Covid-19: Open-data resources for monitoring, modeling, and forecasting the epidemic. Electronics, 9(5), p.827.

[23] Freeguard, G. and Shepley, P. (2023). Data sharing during coronavirus: lessons for government. Institute for Government. Available at: https://www.instituteforgovernment.org.uk/sites/default/files/2023-02/Data%20sharing%20during%20coronavirus%20lessons%20for%20government_2.pdf [Accessed 5/10/2024]

[24] Lutz, W., Sanderson, W. and Scherbov, S., 2008. The coming acceleration of global population ageing. Nature, 451(7179), pp.716-719.

[25] Kindig, D. and Stoddart, G., 2003. What is population health?. American journal of public health, 93(3), pp.380-383.

[26] Office for National Statistics (n.d) Health and unpaid care question development for Census 2021. Available at: https://www.ons.gov.uk/census/planningforcensus2021/questiondevel

opment/healthandunpaidcarequestiondevelopmentforcensus2021
[Accessed 30/12/2023]

[27] ONS Service Manual (n.d). Ethnicity and race. Available at: https://service-manual.ons.gov.uk/content/language/ethnicity-and-race#:~:text=Use%20%E2%80%9CEthnic%20minorities%E2%80%9D%20to%20refer,which%20groups%20your%20data%20include. [Accessed 20/01/2024]

[28] Office for National Statistics (2023) Disability variable: Census 2021. Available at: https://www.ons.gov.uk/census/census2021dictionary/variablesbytopic/healthdisabilityandunpaidcarevariablescensus2021/disability [Accessed 20/01/2024]

[29] World Health Organization (n.d) Coronavirus disease (Covid-19) pandemic. Available at: https://www.who.int/europe/emergencies/situations/covid-19 [Accessed 30/12/2023]

[30] Centers for Disease Control and Prevention (2024) Long COVID Basics. Available at: https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/index.html#:~:text=Long%20COVID%20is%20defined%20as,for%20at%20least%203%20months [Accessed 18/06/2024]

[31] NHS England (n.d) Post-COVID syndrome (long COVID). Available at: https://www.england.nhs.uk/coronavirus/post-covid-syndrome-long-covid/ [Accessed 18/06/2024]

[32] Galea, S., Freudenberg, N. and Vlahov, D., 2005. Cities and population health. Social science & medicine, 60(5), pp.1017-1033.

[33] Myatt, G.J. and Johnson, W.P., 2009. Making sense of data II: A practical guide to data visualization, advanced data mining methods, and applications (Vol. 2). John Wiley & Sons.

[34] Gov.uk, (2020). Clinically extremely vulnerable receive updated guidance in line with new national restrictions [Press Release]. Available at: https://www.gov.uk/government/news/clinically-extremely-vulnerable-receive-updated-guidance-in-line-with-new-national-restrictions [Accessed 24/01/2024]