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Cohort Profile: Disability, Household Living Arrangements and COVID-19 Outcomes in a Linked Population-Based Cohort of Scottish Adults

Yusuff Adebayo Adebisi^{1,2,*}, Angela Henderson³, Nick Bailey^{1,2}, Chris Dibben⁴, and Serena Pattaro^{1,2}

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¹ Administrative Data Research Scotland, School of Social and Political Sciences, University of Glasgow, Glasgow, United Kingdom

² School of Social and Political Sciences, College of Social Sciences, University of Glasgow, Glasgow, United Kingdom

³ School of Health and Wellbeing, University of Glasgow, Glasgow, United Kingdom

⁴ Administrative Data Research Scotland, School of Geosciences, University of Edinburgh, Edinburgh, United Kingdom

Abstract

Introduction

Disabled people experienced a disproportionate burden of COVID-19, yet evidence on how household living arrangements shaped these outcomes across disability groups remains limited.

Objective

To describe the creation, content, and baseline characteristics of a population-based linked administrative cohort for studying disability, residential context, and COVID-19 infection, hospitalisation, and mortality in Scotland.

Methods

The cohort was assembled from Community Health Index records for people alive and resident in Scotland on 1 March 2020 whose residential addresses could be linked to Unique Property Reference Numbers. Records for those aged under 16 years at that date were excluded, and the remainder were linked to the 2011 Scottish Census to obtain disability status and sociodemographic characteristics. Disability was classified sequentially into three mutually exclusive groups: intellectual disability, including individuals who may also have reported physical or sensory disability; physical disability, including sensory impairments but excluding intellectual disability; and a comparison group without reported intellectual or physical disability. Household context was characterised by residential setting and household size. Residential setting was classified from Basic Land and Property Unit codes as private dwellings, small communal establishments (fewer than 50 linked residents), or large communal establishments (50 or more linked residents). Household size was grouped as 1, 2–4, 5–7, 8–10, or 11 or more linked residents. Laboratory-confirmed SARS-CoV-2 infection and COVID-19-related hospitalisation and mortality were ascertained from national surveillance and administrative records between 1 March 2020 and 30 April 2022. Age- and sex-adjusted incidence rates were estimated using Poisson regression with log person-time as an offset.

Results

Of 4,132,960 age-eligible Community Health Index records, 3,719,651 adults (90.0%) were successfully linked to the Census and included in the cohort. Of these, 17,354 had intellectual disability, 377,706 had physical disability and 3,324,591 were in the comparison group. During follow-up, 306,343 cohort members had a laboratory-confirmed SARS-CoV-2 infection, 22,945 were hospitalised with COVID-19 and 12,893 died from COVID-19-related causes. The corresponding crude incidence rates were 592 infections, 32 hospitalisations and 16 deaths per 10,000 person-years. Age- and sex-adjusted rates were highest among adults with intellectual disability, at 1,486 infections, 86 hospitalisations and 56 deaths per 10,000 person-years. The corresponding rates were 932, 58 and 33 among adults with physical disability, and 570, 29 and 12 in the comparison group. Across all three outcomes, adjusted incidence rates were higher in communal establishments than in private dwellings and generally increased with household size. Mortality differences were especially pronounced in communal establishments and at addresses with 11 or more linked residents.

Conclusions

This population-based, Census-linked cohort integrates information on disability and residential context with national health and administrative records. Although developed to examine COVID-19 outcomes, it provides a broader platform for investigating how disability and living arrangements shape health inequalities in Scotland.

Keywords

Disability, Intellectual disability, Physical disability, Household living arrangements, COVID-19, Administrative data linkage, Scotland

*Corresponding Author:

Email Address: y.adebisi.1@research.gla.ac.uk (Yusuff Adebayo Adebisi)

Introduction

The COVID-19 pandemic exposed and amplified longstanding social and health inequalities, with disabled people consistently among the populations experiencing the greatest burden internationally [1–3]. Disability is common and heterogeneous, encompassing physical and cognitive impairments that intersect with different patterns of health risk [4]. Excess risks of adverse COVID-19 outcomes among disabled populations reflect overlapping pathways, including a higher prevalence of long-term conditions, barriers to timely and appropriate healthcare, and socioeconomic disadvantage that shapes both exposure and vulnerability [5–7]. Deprivation, reliance on support services, and a limited capacity to reduce interpersonal contact may further shape infection risk and its downstream consequences, particularly where personal or intimate care cannot be delivered at a distance [2, 3, 5]. Disability has consequently emerged as a key axis of inequality in COVID-19 epidemiology, and accounting for it requires approaches that reach beyond individual clinical risk factors.

Household living arrangements are a critical, yet underexamined, determinant of COVID-19 risk among disabled populations. Risks of severe COVID-19 outcomes are substantially elevated among disabled people, and highest among those with intellectual disabilities [8], yet much of this evidence rests on individual-level characteristics rather than on the settings in which disabled people live. Vulnerability may also be shaped by who shares the same address, the number of co-residents, and whether support is provided by household members or by staff entering from outside. Although congregate settings (group living) are widely recognised as high-risk environments [9–12], household-related risks extend beyond formal institutions. Disabled people are more likely to live in shared households, larger family units, or settings where ongoing personal support is required [13–15], each of which can increase contact intensity and the likelihood of within-household transmission. Household socioeconomic conditions, including overcrowding and housing quality, may further constrain the implementation of infection prevention measures [16]. Integrating household structure into analysis is therefore essential to a fuller understanding of disability-related inequalities during the pandemic.

Despite this relevance, population-based evidence that examines disability status and household living arrangements jointly, using linked administrative data, remains limited both in Scotland and internationally [17–21]. Large national analyses in England have documented substantially elevated COVID-19 mortality among disabled people and specifically among people with learning disability [19, 20], and comparable excesses have been reported for adults with intellectual disabilities in the Netherlands [22] and England [23]. In each case, however, household characteristics have been treated principally as confounders to be adjusted away rather than as exposures of interest, and physical and intellectual disability have rarely been distinguished within the same population using detailed, address-derived measures of household structure [16, 21]. Many analyses also rely on unlinked health records, which capture disability status incompletely and carry little or no information on residential context. In Scotland, the most detailed population-based evidence to date has been confined to adults with intellectual

disabilities [21]. The joint patterning of disability, household living arrangements and COVID-19 outcomes therefore remains insufficiently characterised. Scotland's administrative data infrastructure offers an opportunity to address this gap through secure linkage across Census, address-based and health datasets.

This cohort profile describes a novel, population-based administrative data resource developed as part of a broader programme investigating social risk factors for COVID-19 in Scotland, established under the COVID-19 Data Intelligence Network and Data Taskforce [24, 25]. The study design and analysis plan were prespecified and published in advance [17]. The cohort allows individual disability status and address-derived residential context to be examined simultaneously across a large majority of the adult population, and the first analytic output from the resource has quantified disability-related differences in COVID-19 infection, hospitalisation and mortality [18]. This profile sets out the rationale, scope and structure of the cohort, summarises its key characteristics, and describes the patterns that motivate the analyses it is designed to support.

The identity-first term “disabled people” is used, consistent with the social model of disability and UK usage [26], while recognising that person-first language is preferred in some other contexts. The term “learning disability” is retained only when referring to the Census variable; elsewhere, “intellectual disability” is used, consistent with international classification and the published protocol [17].

Methods

Data, Study Design and Population

This is a population-based cohort assembled from linked, routinely collected administrative data covering the resident population of Scotland. All data linkage and analysis were undertaken within Scotland's national secure data environment in accordance with established information governance and data protection requirements [27].

Three national data resources underpin the cohort, and their roles are set out here for readers unfamiliar with the Scottish setting. The Community Health Index (CHI) is Scotland's healthcare population register: every person registered with a general practice is assigned a unique, permanent ten-digit CHI number that is used at every subsequent NHS Scotland contact, so that the CHI acts as a spine along which health records can be joined for virtually the whole resident population. The Unique Property Reference Number (UPRN) is the corresponding spine for places: a unique, permanent identifier assigned by Ordnance Survey to every addressable location in Great Britain. Because the CHI register holds a current residential address for each individual, those addresses can be matched to Ordnance Survey AddressBase Premium and resolved to a UPRN, so that people recorded at the same UPRN can be treated as co-resident [28]. Household size then follows from counting co-resident cohort members at each UPRN, and residential setting follows from the Basic Land and Property Unit (BLPU) classification code attached to that UPRN, which records the use and type of the property. The 2011 Scottish

Census, a decennial and near-complete enumeration, supplies self-reported disability status and baseline sociodemographic characteristics. Taken together, these three sources allow disability status, household composition and property type to be assigned to a large majority of the adult population.

Cohort Construction

The cohort was constructed through the sequential linkage of national administrative datasets to identify adults resident in Scotland at the start of the COVID-19 pandemic (1 March 2020) who were enumerated in the 2011 Census. The starting population comprised 4,892,658 individuals recorded in the Community Health Index (CHI) who were alive and resident in Scotland on 1 March 2020 (the study baseline) and who had a residential address recorded in the CHI register that could be linked to a Unique Property Reference Number (UPRN) through Ordnance Survey's AddressBase Premium. This allowed household status on 1 March 2020 to be identified and people resident in non-residential property types to be excluded [28].

From this initial group, we excluded 759,698 individuals aged under 16 years on 1 March 2020. This exclusion supported reliable classification of disability status and meaningful analysis of household living arrangements, and left 4,132,960 adults eligible for linkage. Eligible CHI records were then linked to the 2011 Scottish Census to obtain baseline sociodemographic characteristics and self-reported disability status. Of the age-eligible CHI cohort, 3,719,651 individuals (90.0%) were matched to a Census record; the remaining 413,309 records were unmatched and were excluded.

The final analytic cohort comprised 3,719,651 adults aged 16 years and over who were alive and resident in Scotland on 1 March 2020, linked to a valid residential UPRN and enumerated in the 2011 Scottish Census. The cohort was followed from baseline (1 March 2020) through linkage to national COVID-19 surveillance and health outcome datasets. The full sequence of linkage, exclusions and derivation of the analytic cohort is shown in Figure 1.

Measures

Exposure Measures

Individuals were classified sequentially into three mutually exclusive groups: intellectual disability, physical disability, and a comparison group without reported physical or intellectual disability. Individuals who reported intellectual disability together with physical disability or sensory impairment were assigned to the intellectual disability group under this hierarchy. Intellectual disability was identified from responses to the 2011 Census question on long-term health conditions indicating a learning disability [29], a term that in the UK Census context is synonymous with intellectual disability [30]. Physical disability comprised reported physical disability or sensory impairment, or both (including deafness or partial hearing loss, and blindness or partial sight loss), among individuals who did not report intellectual disability [31]. The comparison group comprised individuals who reported no long-term condition, or only conditions not used to define physical

or intellectual disability. It should therefore be read as a group without reported intellectual or physical disability rather than as a healthy population.

Household living arrangements were derived from address-based linkage at baseline, with individuals sharing the same UPRN treated as residing in the same household or residential setting. Residential setting was classified using the Basic Land and Property Unit (BLPU) property classification code attached to each UPRN and grouped into private dwellings and communal establishments [32]. Private dwellings included houses, flats and maisonettes, sheltered housing and houses in multiple occupation; communal establishments included residential institutions such as care homes, nursing homes, residential schools, halls of residence and hostels. Communal establishments were further stratified by the UPRN-linked resident count into small (fewer than 50 linked residents) and large (50 or more linked residents), consistent with Office for National Statistics (ONS) size thresholds used to distinguish smaller communal environments from large institutional settings [33].

Household size was derived by counting the number of cohort members linked to the same UPRN at baseline [34] and categorised into five groups: 1 resident, 2–4 residents, 5–7 residents, 8–10 residents, and 11 or more residents. These categories were chosen to capture increasing residential density and potential for within-household exposure, while remaining interpretable across both private households and communal residential settings.

Outcome Measures

COVID-19 outcomes were ascertained by linking the final analytic cohort (3,719,651 adults) to several national surveillance and administrative health datasets, each contributing a specific outcome domain. Outcomes were identified over the follow-up period from 1 March 2020 (baseline) to 30 April 2022. For COVID-19 infection and COVID-19 hospitalisation, analyses were restricted to the first recorded event per individual during follow-up. COVID-19 mortality was recorded as a single event per individual, as defined by national death registration records.

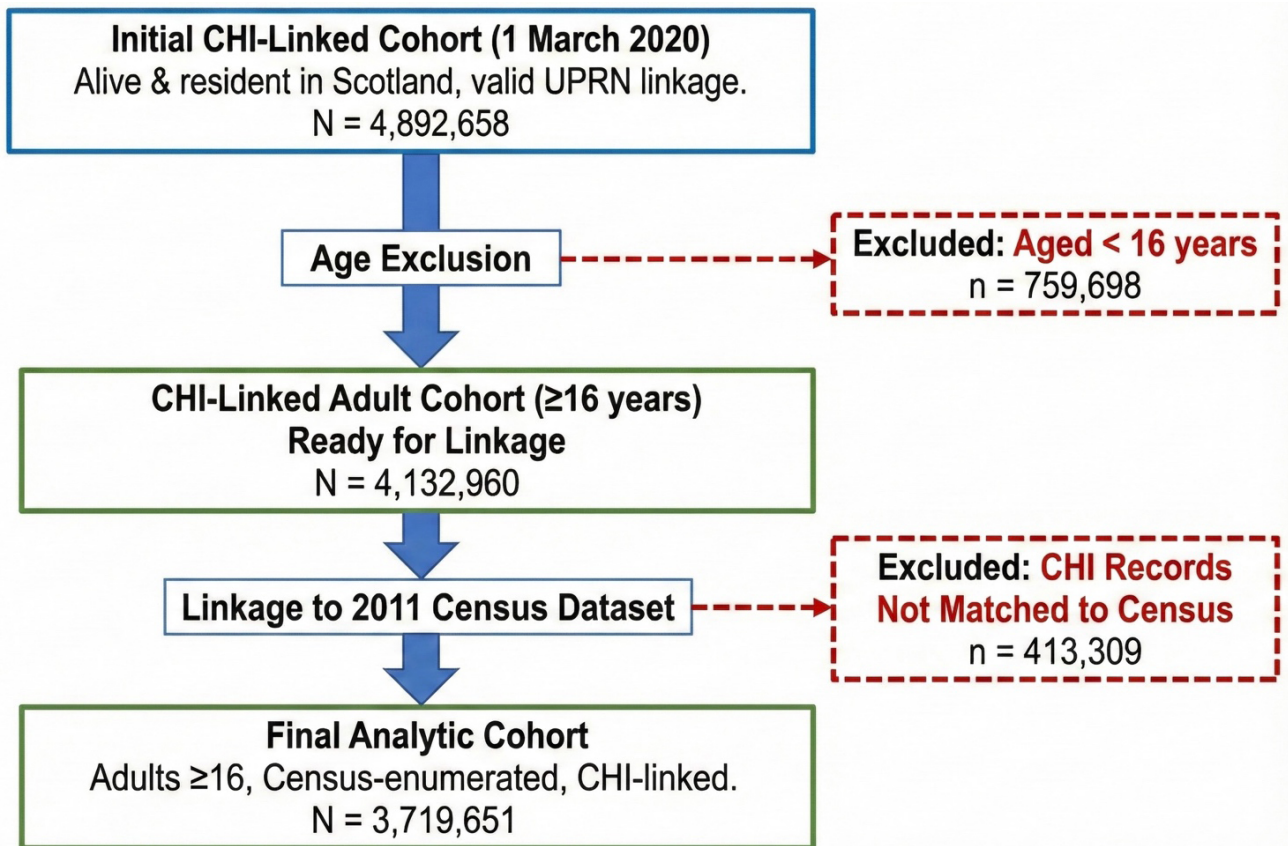
COVID-19 Infection

COVID-19 infection was defined as the first recorded laboratory-confirmed positive SARS-CoV-2 test during follow-up. Positive results were identified from national laboratory surveillance data captured through the COVID-19 testing datasets held within the Public Health Scotland (PHS) COVID-19 Research Database [35]. These sources capture testing undertaken in community, hospital and other national programmes. Individuals with no recorded positive SARS-CoV-2 test during follow-up were assumed not to have had a confirmed infection, reflecting the use of routinely collected surveillance data to identify confirmed infections at population scale.

COVID-19 Hospitalisation

COVID-19 hospitalisation was defined using the Scottish Morbidity Record 01 (SMR01) dataset, which captures all

Figure 1: Derivation of the study cohort



Abbreviations: CHI, Community Health Index (Scotland's register of individuals registered with a general practice); UPRN, Unique Property Reference Number (Ordnance Survey's unique identifier for each addressable location in Great Britain); BLPU, Basic Land and Property Unit (the classification attached to each UPRN describing the use and type of the property); OS, Ordnance Survey; PHS, Public Health Scotland; SMR01, Scottish Morbidity Record 01 (the national record of acute inpatient and day-case hospital admissions); NRS, National Records of Scotland; GP, general practitioner.

acute inpatient and day-case hospital admissions in Scotland [36]. Hospitalisation was identified as the first inpatient admission meeting national surveillance criteria for COVID-19, comprising admissions with COVID-19 recorded as a primary or secondary diagnosis and admissions occurring within 14 days of a laboratory-confirmed positive SARS-CoV-2 test [37]. Only the first qualifying COVID-19-related hospital admission per individual was included.

COVID-19 Mortality

Mortality was ascertained from national death registration records held by National Records of Scotland (NRS). A death was classified as COVID-19-related where the disease was recorded on the death certificate as either the underlying or a contributory cause, or where it occurred within 28 days of a laboratory-confirmed SARS-CoV-2 infection, consistent with national reporting definitions [37].

Sociodemographic and Health Covariates

A wide set of individual-level and household-contextual characteristics was available within the linked data to describe potential sources of social, demographic and health-related heterogeneity. These variables were selected for their

established relevance to disability, household structure and COVID-19 risk, and for their availability within national administrative and Census records (Table 1).

Individual Sociodemographic Characteristics

Age was derived from the CHI register and calculated in years at the cohort index date (1 March 2020). Age was available as an integer measure and is also presented in categories (16–34, 35–49, 50–64 and ≥65 years) that reflect meaningful stages of the life course and support descriptive comparison across disability groups. Sex was obtained from CHI registration records and recorded as male or female, reflecting the structure of routinely collected administrative data. Ethnicity was derived from self-reported responses in the 2011 Scottish Census and categorised as White or Non-White. This grouping preserves statistical power. Educational attainment was obtained from the Census and used as an indicator of individual socioeconomic position and human capital. Highest qualification was categorised as no formal qualifications, lower secondary, upper secondary, post-secondary, degree level or higher, and full-time student status, capturing a broad gradient of educational achievement. Area-level socioeconomic deprivation was measured using the Scottish Index of Multiple Deprivation (SIMD) 2020.

Table 1: Variables and Data Sources in the Linked Cohort

Variable	Coding/category description	Data source
Exposure variables		
Disability status	Intellectual disability; physical disability (including sensory impairment, without intellectual disability); comparison group. Derived sequentially from self-reported long-term conditions at the 2011 Census	2011 Scottish Census
Residential setting	Private dwelling; small communal establishment (<50 linked residents); large communal establishment (≥50 linked residents). Derived from the Basic Land and Property Unit (BLPU) classification code attached to each UPRN, which records the use and type of the property	OS AddressBase Premium (BLPU) + CHI-UPRN linkage
Household size	Number of CHI-registered cohort members linked to the same UPRN at baseline: 1; 2–4; 5–7; 8–10; ≥11 residents	CHI register + OS UPRN
Sociodemographic covariates		
Age (years)	Calculated at index date (1 March 2020); modelled as 16–34; 35–49; 50–64; ≥65	CHI register
Sex	Male, Female	CHI register
Ethnicity	White, Non-White (self-reported at 2011 Census)	2011 Scottish Census
Highest qualification	No formal qualifications; Lower secondary; Upper secondary; Post-secondary; Degree or above; Full-time student (2011 Census)	2011 Scottish Census
Area-level deprivation	Scottish Index of Multiple Deprivation (SIMD) 2020, in quintiles (1 = most deprived; 5 = least deprived), assigned by residential postcode. SIMD is a composite area-based measure ranking small areas of comparable population size by relative deprivation across seven domains: income, employment, education, health, access to services, crime and housing	SIMD 2020
Health-related covariates		
Other long-term (chronic) health conditions	Binary indicator for the presence of one or more self-reported health conditions that had lasted, or were expected to last, at least 12 months, other than those used to define the disability exposure groups. “Long-term” and “chronic” are used interchangeably	2011 Scottish Census
Shielding (individual)	Binary indicator for whether the individual was recorded on Scotland’s national shielding list (the Highest Risk List). Shielding was a UK policy under which people judged clinically extremely vulnerable to severe COVID-19 were advised to take additional protective measures, including minimising contact outside the household. Used here as a marker of recognised clinical vulnerability and of likely behavioural modification of exposure	National shielding list
COVID-19 vaccination status	Total number of vaccine doses received during follow-up: 0; 1; 2; ≥3. Not modelled as a time-varying covariate, and therefore describes cumulative coverage rather than protection at the time an outcome occurred	Public Health Scotland’s National vaccination records / COVID-19 surveillance datasets
Household context covariates		
Multigenerational household	UPRN-linked households with ≥1 person aged ≥65 and ≥1 co-resident ≥20 years younger (ages at baseline)	CHI register + OS UPRN
Household member shielding	Binary indicator for whether at least one other person linked to the same UPRN was recorded on the national shielding list at baseline; captures indirect exposure to shielding behaviour within the household	National shielding list + OS UPRN

Abbreviations: CHI = Community Health Index; OS UPRN = Ordnance Survey Unique Property Reference Number; SIMD = Scottish Index of Multiple Deprivation.

SIMD ranks small geographic areas according to relative deprivation across multiple domains, including income, employment, education, health, access to services, crime, and housing [38]. Individuals were assigned a SIMD quintile on the basis of their residential postcode, with quintile 1 representing the most deprived areas and quintile 5 the least deprived.

Health-Related Characteristics

Long-term illness or health conditions were derived from 2011 Census responses and coded as a binary indicator for the presence of health conditions other than the primary disability exposure. This variable captures broader morbidity burden without conflating it with the study's disability classifications. Clinical vulnerability (shielding status) was identified from national shielding records, which captured individuals advised to take additional protective measures during the pandemic because of underlying clinical risk [39]. This variable reflects heightened medical vulnerability and potential behavioural modification of exposure risk [39]. COVID-19 vaccination status was obtained from national COVID-19 surveillance records and summarised according to the total number of vaccine doses received during the follow-up period (zero, one, two, or three or more doses). Vaccination status provides contextual information on cumulative vaccination coverage during follow-up.

Household-Contextual Characteristics

Multigenerational household status was derived from CHI–UPRN address linkage at the March 2020 baseline and defined as UPRN-linked households containing at least one person aged 65 years or over together with at least one co-resident at least 20 years younger. This measure captures household age structure and potential intergenerational exposure pathways. Household-level shielding exposure was defined as the presence of at least one other UPRN-linked household member recorded on the national shielding list at baseline, reflecting shared exposure to shielding guidance and potential indirect effects of clinical vulnerability within the household environment.

Statistical Analysis

Analyses were descriptive, undertaken to characterise the cohort and to summarise the distribution and incidence of COVID-19 outcomes across disability status and household living arrangements. Cohort characteristics were summarised overall and stratified by disability status (intellectual disability, physical disability, comparison group). Continuous variables were described using means (standard deviations) and medians (interquartile ranges), and categorical variables as counts and percentages. COVID-19 outcomes were summarised as event counts and percentages within strata defined by disability status and residential setting (private dwellings, small communal establishments, large communal establishments) and by disability status and household size (1, 2–4, 5–7, 8–10, 11+ residents). In line with disclosure control requirements for administrative data outputs, small cells (fewer than 10 observations) were suppressed.

For rate calculations, follow-up accrued from 1 March 2020 until the earliest of the first occurrence of the outcome of interest, death, or 30 April 2022. Person-time at risk was calculated separately for each outcome, reflecting outcome-specific censoring at the first event. Crude incidence rates were calculated as the number of events divided by total person-years at risk and expressed per 10,000 person-years. Age- and sex-adjusted incidence rates were estimated by Poisson regression with robust standard errors, using the natural logarithm of person-time at risk (in years) as an offset to account for differing durations of follow-up. Separate models were fitted for infection, hospitalisation, and mortality. Age and sex were included as covariates to account for differences in population structure across strata, and adjusted rates with 95% confidence intervals are reported per 10,000 person-years by disability status, by residential setting, and jointly by disability status and household size.

Adjustment was deliberately confined to age and sex. The purpose of a cohort profile is to describe the composition of a resource and the burden of outcomes within it, rather than to estimate effects. Age and sex are the two characteristics that differ most sharply between disability groups and between residential settings, and that would otherwise dominate any comparison of crude rates. Retaining a minimal adjustment set also keeps the descriptive quantities transparent and avoids conditioning on variables that lie on the pathway between disability, household context and COVID-19. Fuller adjustment for socioeconomic, health-related and vaccination covariates, together with formal tests of effect modification by household living arrangements, was prespecified in the published protocol [17], and the fully adjusted disability analyses are reported in the first analytic paper arising from the resource [18]. The model-based adjusted rates presented here are therefore intended for descriptive comparison only. All analyses were conducted within Scotland's national secure data environment (Safe Haven) using Stata/SE 16 in accordance with approved governance and disclosure control requirements.

Ethical Approval and Data Governance

This study uses linked, routinely collected administrative data and was conducted within Scotland's national secure data environment. Data linkage, storage and analysis were undertaken in the Scottish National Safe Haven in accordance with national information governance and confidentiality requirements, including compliance with the UK GDPR and the Data Protection Act 2018. Data were pseudonymised before researcher access, and linkage was performed by the electronic Data Research and Innovation Service (eDRIS), the Public Health Scotland service that manages the Scottish National Safe Haven. All outputs were subject to statistical disclosure control before release. Ethical approval was granted by the University of Glasgow College of Social Sciences Research Ethics Committee (ref: 400200099). Permissions for data linkage and research use were obtained from the Public Benefit and Privacy Panel for Health and Social Care and the Scottish Government and National Records of Scotland Data Access Panel (previously known as the Scottish Government Statistics Public Benefit and Privacy Panel) (ref: 2021-0119).

Results

Cohort Characteristics by Disability Status

Table 2 summarises the sociodemographic, household and health characteristics of the 3,719,651 adults in the analytic cohort, stratified by disability status. Adults with intellectual disability were younger than those with physical disability (mean age 43.2 vs 68.1 years) and a greater proportion were aged 16–34 years (38.2% vs 4.6%); the comparison group had an intermediate age profile (mean age 48.5 years). Sex distribution differed modestly across groups, with males comprising 57.8% of the intellectual disability group compared with approximately half of those with physical disability (49.8%) and the comparison group (47.6%). Individuals with intellectual disability were more likely to live in the most deprived areas (31.2%) than those with physical disability (24.2%) or the comparison group (18.0%). The cohort was predominantly white across all groups (97.0%–98.8%), with a slightly higher proportion of non-white ethnicity in the comparison group (3.0%) than in the disability groups.

Educational attainment differed substantially between groups: no formal qualifications were reported for 66.2% of individuals with intellectual disability and 45.4% of those with physical disability, compared with 17.5% in the comparison group, while degree level qualifications or higher were most common in the comparison group (24.2%). Multigenerational households were more frequent among those with intellectual disability (24.0%) and physical disability (18.3%) than in the comparison group (10.4%). Shielding status was more common in the physical disability group (7.3%) than in the intellectual disability group (2.0%) or the comparison group (2.3%). Other chronic conditions were also recorded more frequently among individuals with intellectual disability (60.6%) and physical disability (45.3%) than in the comparison group (19.4%). COVID-19 vaccination coverage was high overall, with most cohort members receiving two doses (85.9%); three or more doses were more common among those with physical disability (4.2%) than in the intellectual disability group (2.3%) or the comparison group (2.0%).

Household context also varied by disability status. Residence in communal establishments was more common among individuals with intellectual disability than among those with physical disability or in the comparison group, largely because a higher proportion lived in small communal establishments (4.2%, compared with 1.7% and 0.4%, respectively). The proportion living in large communal establishments was 2.5% in both disability groups and 0.4% in the comparison group. Single-person households were more frequent in the physical disability group (34.7%) than in the intellectual disability group (31.0%) and comparison group (19.2%), while households of 2–4 residents were the most common arrangement across all groups, particularly in the comparison group (68.8%).

Overall COVID-19 Outcomes and Incidence

Over follow-up from 1 March 2020 to 30 April 2022, the cohort accrued 5,172,690 person-years for SARS-CoV-2 infection, 7,181,732 person-years for COVID-19 hospitalisation, and 7,914,901 person-years for COVID-19 mortality. In total,

306,343 individuals had a laboratory-confirmed SARS-CoV-2 infection (8.2% of the cohort), 22,945 were hospitalised with COVID-19 (0.6%), and 12,893 died from COVID-19-related causes (0.3%). The corresponding crude incidence rates were 592 infections, 32 hospitalisations, and 16 deaths per 10,000 person-years.

COVID-19 Outcomes by Disability Status and Residential Setting

Table 3 presents the descriptive distribution of COVID-19 infection, hospitalisation and mortality across disability groups, stratified by residential setting.

Recorded infection was highest among individuals with intellectual disability and increased from 24.7% in private dwellings to 31.6% in small communal establishments and 37.3% in large communal establishments. A similar gradient was observed among individuals with physical disability, with corresponding proportions of 9.6%, 13.2% and 16.6%. Infection was lower overall in the comparison group, increasing from 8.0% in private dwellings to 8.5% in small communal establishments and 9.9% in large communal establishments.

Hospitalisation proportions were also higher in communal establishments than in private dwellings across all disability groups. Among individuals with intellectual disability, hospitalisation increased from 1.2% in private dwellings to 1.7% in small communal establishments and 2.8% in large communal establishments. The corresponding proportions among individuals with physical disability were 1.4%, 2.1% and 3.4%, while those in the comparison group were 0.5%, 1.8% and 2.3%.

Mortality differences across residential settings were particularly pronounced. Among individuals with intellectual disability, mortality increased from 0.5% in private dwellings to 1.5% in small communal establishments and 6.0% in large communal establishments. In the physical disability group, the corresponding proportions were 1.0%, 8.9% and 12.2%. Mortality in the comparison group increased from 0.2% in private dwellings to 5.2% in small communal establishments and 8.4% in large communal establishments.

Within communal establishments, crude mortality proportions were higher in the comparison group (5.2% in small and 8.4% in large establishments) than among adults with intellectual disability (1.5% and 6.0%). This ordering probably reflects differences in the age and resident composition of communal settings across disability groups rather than a lower underlying risk among adults with intellectual disability. The gradient across residential settings was also substantially steeper for mortality than for infection.

Age- and Sex-Adjusted Incidence Rates by Disability Status and Residential Setting

Table 4 presents age- and sex-adjusted incidence rates separately by disability status and residential setting. Rates were highest among adults with intellectual disability, at 1,486 infections, 86 hospitalisations, and 56 deaths per 10,000 person-years. Adults with physical disability had intermediate rates of 932 infections, 58 hospitalisations, and 33 deaths per 10,000 person-years, while the comparison group had

Table 2: Cohort Characteristics Stratified by Disability Status

Characteristic	Intellectual disability (n = 17,354)	Physical disability (n = 377,706)	Comparison group (n = 3,324,591)	Total (N = 3,719,651)
Age (years)				
Mean (SD)	43.2 (17.4)	68.1 (16.2)	48.5 (18.6)	50.4 (19.3)
Median (IQR)	42 (28–57)	71 (59–80)	49 (33–62)	51 (34–65)
Age category, n (%)				
16–34	6,629 (38.2)	17,167 (4.6)	914,236 (27.5)	938,032 (25.2)
35–49	4,066 (23.4)	30,185 (8.0)	771,517 (23.2)	805,768 (21.7)
50–64	4,456 (25.7)	88,318 (23.4)	912,627 (27.5)	1,005,401 (27.0)
≥65	2,203 (12.7)	242,036 (64.0)	726,211 (21.8)	970,450 (26.1)
Sex, n (%)				
Male	10,033 (57.8)	188,206 (49.8)	1,583,033 (47.6)	1,781,272 (47.9)
Female	7,321 (42.2)	189,500 (50.2)	1,741,558 (52.4)	1,938,379 (52.1)
Area-level deprivation (SIMD), n (%)				
Most deprived	5,406 (31.2)	91,333 (24.2)	597,326 (18.0)	694,065 (18.7)
Quintile 2	4,411 (25.4)	86,441 (22.9)	648,828 (19.5)	739,680 (19.9)
Quintile 3	3,505 (20.2)	77,089 (20.4)	673,116 (20.3)	753,710 (20.3)
Quintile 4	2,391 (13.8)	67,079 (17.8)	705,838 (21.1)	775,308 (20.8)
Least deprived	1,629 (9.4)	55,483 (14.7)	696,703 (21.0)	753,815 (20.3)
Missing	12 (0.1)	281 (0.1)	2,780 (0.1)	3,073 (0.1)
Ethnicity, n (%)				
White	16,961 (97.7)	373,331 (98.8)	3,225,034 (97.0)	3,615,326 (97.2)
Non-White	393 (2.3)	4,375 (1.2)	99,557 (3.0)	104,325 (2.8)
Highest qualification, n (%)				
No formal qualifications	11,487 (66.2)	171,284 (45.4)	582,687 (17.5)	765,458 (20.6)
Lower secondary	1,990 (11.5)	70,856 (18.8)	739,103 (22.2)	811,949 (21.8)
Upper secondary	283 (1.6)	33,099 (8.8)	455,058 (13.7)	488,440 (13.1)
Post-secondary	285 (1.6)	26,125 (6.9)	319,180 (9.6)	345,590 (9.3)
Degree or above	339 (2.0)	69,495 (18.4)	805,997 (24.2)	875,831 (23.6)
Full-time student	2,970 (17.1)	6,847 (1.8)	422,566 (12.7)	432,383 (11.6)
Household and health characteristics, n (%)				
Multigenerational household	4,162 (24.0)	69,203 (18.3)	346,228 (10.4)	419,593 (11.3)
Shielding (individual)	340 (2.0)	27,670 (7.3)	75,099 (2.3)	103,109 (2.8)
Other household member shielding	1,096 (6.3)	23,936 (6.3)	92,734 (2.8)	117,766 (3.2)
Other chronic conditions	10,524 (60.6)	171,075 (45.3)	643,817 (19.4)	825,416 (22.2)
COVID-19 vaccination status, n (%)				
Zero dose	1,319 (7.6)	36,374 (9.6)	314,810 (9.5)	352,503 (9.5)
One dose	467 (2.7)	8,455 (2.2)	80,306 (2.4)	89,228 (2.4)
Two doses	15,173 (87.4)	316,901 (83.9)	2,862,363 (86.1)	3,194,437 (85.9)
Three or more doses	395 (2.3)	15,976 (4.2)	67,112 (2.0)	83,483 (2.2)
Residential setting, n (%)				
Private dwellings	16,190 (93.3)	361,765 (95.8)	3,297,043 (99.2)	3,674,998 (98.8)
Small communal	727 (4.2)	6,548 (1.7)	12,413 (0.4)	19,688 (0.5)
Large communal	437 (2.5)	9,393 (2.5)	15,135 (0.4)	24,965 (0.7)
Household size, n (%)				
1 person	5,382 (31.0)	131,018 (34.7)	639,736 (19.2)	776,136 (20.9)
2–4 persons	9,081 (52.3)	215,191 (57.0)	2,288,214 (68.8)	2,512,486 (67.6)
5–7 persons	1,490 (8.6)	14,466 (3.8)	345,456 (10.4)	361,412 (9.7)
8–10 persons	237 (1.4)	1,090 (0.3)	23,637 (0.7)	24,964 (0.7)
11+ persons	1,164 (6.7)	15,941 (4.2)	27,548 (0.8)	44,653 (1.2)

Table 3: Descriptive Distribution of COVID-19 Infection, Hospitalisation, and Mortality by Disability Status and Residential Setting

Disability status	Residential setting	N	COVID-19 infection, n (%)	COVID-19 hospitalisation, n (%)	COVID-19 mortality, n (%)
Intellectual disability					
	Private dwelling	16,190	3,995 (24.7)	189 (1.2)	73 (0.5)
	Small communal	727	230 (31.6)	12 (1.7)	11 (1.5)
	Large communal	437	163 (37.3)	12 (2.8)	26 (6.0)
Physical disability					
	Private dwelling	361,765	34,567 (9.6)	5,036 (1.4)	3,771 (1.0)
	Small communal	6,548	864 (13.2)	140 (2.1)	581 (8.9)
	Large communal	9,393	1,561 (16.6)	318 (3.4)	1,147 (12.2)
Comparison group					
	Private dwelling	3,297,043	262,414 (8.0)	16,665 (0.5)	5,366 (0.2)
	Small communal	12,413	1,055 (8.5)	225 (1.8)	645 (5.2)
	Large communal	15,135	1,494 (9.9)	348 (2.3)	1,273 (8.4)

Values are n (%). Percentages are calculated as the number of events divided by the total number of individuals within each disability–residential setting subgroup. Residential setting was classified using Basic Land and Property Unit (BLPU) property classification codes attached to each UPRN (private dwellings vs communal establishments). Communal establishments were further split into small (<50 linked residents) and large ($\geq$ 50 linked residents) using the UPRN-linked resident count at baseline.

Table 4: Age- and Sex-adjusted Incidence Rates of COVID-19 Outcomes by Disability Status and by Residential Setting

	N	COVID-19 infection	COVID-19 hospitalisation	COVID-19 mortality
By disability status				
Intellectual disability	17,354	1,486 (1,443–1,528)	86 (75–98)	56 (46–67)
Physical disability	377,706	932 (922–942)	58 (56–59)	33 (32–34)
Comparison group	3,324,591	570 (568–572)	29 (29–30)	12 (12–13)
By residential setting				
Private dwellings	3,674,998	596 (593–598)	33 (32–33)	12 (12–13)
Small communal establishments	19,688	1,403 (1,342–1,464)	75 (67–82)	199 (188–211)
Large communal establishments	24,965	2,160 (2,081–2,240)	101 (93–109)	303 (291–316)

Values are age- and sex-adjusted incidence rates per 10,000 person-years with 95% confidence intervals, estimated using Poisson regression with a log(person-time) offset and robust standard errors. N is the number of individuals in each stratum at baseline. Disability status and residential setting are presented as separate marginal summaries of the same cohort; the table does not show their joint distribution. Rates are presented for descriptive comparison and do not represent causal effect estimates.

the lowest rates, at 570 infections, 29 hospitalisations, and 12 deaths per 10,000 person-years. Adjusted mortality was approximately 4.7 times higher among adults with intellectual disability and 2.8 times higher among adults with physical disability than in the comparison group. The corresponding infection rate ratios were 2.6 and 1.6.

Rates also rose markedly across residential settings. Adjusted infection rates rose from 596 per 10,000 person-years in private dwellings to 1,403 in small communal establishments and 2,160 in large communal establishments. The corresponding hospitalisation rates were 33, 75, and 101 per 10,000 person-years. The steepest gradient was observed for mortality, with rates of 12 per 10,000 person-years in private dwellings, 199 in small communal establishments, and 303 in large communal establishments. Mortality rates were therefore approximately 17 times higher in small, and 25 times higher in large, communal establishments than in private dwellings. The corresponding contrasts were smaller for infection, at 2.4-fold and 3.6-fold, and hospitalisation, at 2.3-fold and 3.1-fold.

COVID-19 Outcomes by Disability Status and Household Size

Table 5 presents event counts, proportions, and age- and sex-adjusted incidence rates of COVID-19 infection, hospitalisation, and mortality by disability status and household size.

Infection proportions among individuals with intellectual disability were similar in households of 1 resident (24.6%) and 2–4 residents (24.2%), but were higher in larger households, reaching 27.0% in households of 5–7 residents, 29.1% in households of 8–10 residents, and 33.8% in households with 11 or more residents. Among individuals with physical disability, infection proportions increased from 8.2% in single-resident households to 10.1% in households of 2–4 residents and 13.2% in households of 5–7 residents. The proportion was 11.7% in households of 8–10 residents and reached 15.2% in households with 11 or more residents. In the comparison group, infection was lowest in single-resident households (5.8%), increased to 8.2% in households of 2–4 residents, and peaked in households

Table 5: COVID-19 Outcomes by Disability Status and Household Size: Number at Risk, Events, and Age- and Sex-Adjusted Incidence Rates

Disability status	Household size (residents)	N	COVID-19 infection		COVID-19 hospitalisation		COVID-19 mortality	
			n	Rate (95% CI)	n (%)	Rate (95% CI)	n (%)	Rate (95% CI)
Intellectual disability								
	1	5,382	1,324 (24.6)	1,586 (1,503–1,670)	68 (1.3)	57 (44–71)	26 (0.5)	21 (13–29)
	2–4	9,081	2,200 (24.2)	1,558 (1,495–1,621)	101 (1.1)	74 (59–89)	38 (0.4)	28 (19–37)
	5–7	1,490	402 (27.0)	1,779 (1,612–1,945)	Suppressed	88 (42–134)	Suppressed	35 (4–65)
	8–10	237	69 (29.1)	2,293 (1,766–2,820)	Suppressed	112 (13–211)	Suppressed	56 (0–121)
	11+	1,164	393 (33.8)	4,274 (3,855–4,692)	24 (2.1)	78 (46–110)	37 (3.2)	89 (59–118)
Physical disability								
	1	131,018	10,755 (8.2)	575 (565–586)	2,040 (1.6)	95 (91–99)	1,797 (1.4)	64 (61–67)
	2–4	215,191	21,774 (10.1)	691 (682–700)	2,796 (1.3)	80 (77–83)	1,892 (0.9)	44 (42–46)
	5–7	14,466	1,910 (13.2)	855 (819–893)	184 (1.3)	110 (94–127)	69 (0.5)	46 (35–57)
	8–10	1,090	128 (11.7)	887 (750–1,050)	16 (1.5)	116 (59–173)	13 (1.2)	96 (44–148)
	11+	15,941	2,425 (15.2)	2,483 (2,376–2,598)	458 (2.9)	151 (137–165)	1,728 (10.8)	635 (603–667)
Comparison group								
	1	639,736	37,276 (5.8)	455 (450–459)	3,991 (0.6)	28 (27–29)	2,156 (0.3)	11 (10–11)
	2–4	2,288,214	186,859 (8.2)	600 (597–603)	10,957 (0.5)	25 (25–26)	2,995 (0.1)	6 (6–7)
	5–7	345,456	35,842 (10.4)	686 (679–693)	1,581 (0.5)	34 (33–36)	182 (0.1)	8 (7–9)
	8–10	23,637	2,437 (10.3)	648 (623–673)	136 (0.6)	43 (34–50)	33 (0.1)	19 (12–25)
	11+	27,548	2,549 (9.3)	1,189 (1,142–1,236)	573 (2.1)	84 (77–91)	1,918 (7.0)	218 (207–228)

N is the number of individuals in each disability–household size subgroup at baseline. The n (%) columns give the number of events, with the percentage calculated as the number of events divided by N. The rate columns give the age- and sex-adjusted incidence rate per 10,000 person-years with 95% confidence intervals, estimated using Poisson regression with a log(person-time) offset and robust standard errors. Event counts were suppressed in accordance with statistical disclosure control requirements, including complementary suppression where necessary to prevent the derivation of small cells; model-based adjusted rates for these strata are reported. Households of 11 or more linked residents consist substantially of communal establishments and should not be interpreted as large private households alone. Rates are presented for descriptive comparison and do not represent causal effect estimates.

of 5–7 residents (10.4%) and 8–10 residents (10.3%), before declining slightly to 9.3% in households with 11 or more residents.

Hospitalisation proportions were generally higher in larger households among individuals with physical disability and those in the comparison group. In the physical disability group, hospitalisation increased from 1.6% in single-resident households to 2.9% in households with 11 or more residents. In the comparison group, hospitalisation remained between 0.5% and 0.6% across households of 1 to 10 residents before rising to 2.1% in households with 11 or more residents. Among individuals with intellectual disability, hospitalisation was 1.3% in single-resident households and 1.1% in households of 2–4 residents. Counts were suppressed for households of 5–7 and 8–10 residents, while 2.1% was observed in households with 11 or more residents.

Mortality differences were most pronounced in households with 11 or more residents. Among individuals with intellectual disability, mortality was 0.5% in single-resident households and 0.4% in households of 2–4 residents. Counts were suppressed for households of 5–7 and 8–10 residents, while mortality reached 3.2% in households with 11 or more residents. In the physical disability group, mortality increased from 1.4% in single-resident households to 10.8% in households with 11 or more residents. In the comparison group, mortality

ranged from 0.1% to 0.3% in households containing 1 to 10 residents and increased to 7.0% in households with 11 or more residents.

After adjustment for age and sex, infection rates generally increased with household size across disability groups. The steepest gradient was observed among individuals with intellectual disability, rising from 1,586 per 10,000 person-years in single-resident households to 4,274 per 10,000 person-years in households with 11 or more residents. In the physical disability group, infection rates increased from 575 to 2,483 per 10,000 person-years across the same household size categories, while rates in the comparison group increased from 455 to 1,189 per 10,000 person-years.

Adjusted hospitalisation rates were generally highest in larger households, particularly those with 11 or more residents. In the physical disability group, rates increased from 95 per 10,000 person-years in single-resident households to 151 per 10,000 person-years in households with 11 or more residents. The corresponding increase in the comparison group was from 28 to 84 per 10,000 person-years. Among individuals with intellectual disability, adjusted hospitalisation rates varied across household sizes, reaching their highest level in households of 8–10 residents at 112 per 10,000 person-years, compared with 78 per 10,000 person-years in households with 11 or more residents; the estimate for households of 8–10

residents is imprecise (95% CI 13 to 211), reflecting the small number of individuals in this stratum.

The strongest adjusted mortality gradients were observed in the physical disability and comparison groups. Among individuals with physical disability, mortality increased from 64 per 10,000 person-years in single-resident households to 635 per 10,000 person-years in households with 11 or more residents. In the comparison group, the corresponding increase was from 11 to 218 per 10,000 person-years. Among individuals with intellectual disability, mortality rates increased from 21 to 89 per 10,000 person-years, with wider confidence intervals in larger household categories reflecting smaller subgroup sizes.

Discussion

This cohort profile describes a population-based, Census-linked administrative data resource for Scotland that combines individual disability status with address-derived household context at 1 March 2020 to enable detailed description of health risks across residential settings. Outcomes are ascertained from national surveillance, hospital admission and death registration records, providing a consistent framework for large-scale monitoring across Scotland. Cohort composition varied markedly by disability status across age, deprivation, education and household structure, underlining the importance of situating disability within its wider social and residential context. Age- and sex-adjusted rates of all three outcomes were higher among adults with intellectual and physical disability than in the comparison group, higher in communal establishments than in private dwellings, and generally higher in larger households. These patterns are consistent with established evidence that household crowding, congregate living environments and shared residential facilities amplify both exposure to infection and the severity of COVID-19 [40, 41].

Previous studies have generally been limited either by incomplete ascertainment of disability in routine health records or by a lack of household detail. By linking Census-derived disability with UPRN-based household identifiers and BLPU-based property classifications, this cohort enables Scotland-wide quantification of COVID-19 inequalities across both disability type and empirically defined residential settings, including communal establishments stratified by size. Existing Scottish COVID-19 administrative platforms (for example, EAVE II) are designed primarily around near real-time health surveillance, clinical risk prediction, and vaccine effectiveness using national healthcare records, but do not, by design, provide Census-based disability measures alongside address-derived household structure for a large majority of the adult population [42]. In contrast, the present cohort is explicitly structured to study social and residential drivers of COVID-19 outcomes by integrating (i) self-reported disability from the 2011 Scottish Census with (ii) CHI–UPRN linkage to identify co-residence and household size, and (iii) BLPU-based classification of private versus communal residential settings.

Three descriptive patterns in these data merit particular emphasis. First, the disability gradient is present at every stage of the disease pathway, not only at its severe end: adults with intellectual disability had the highest adjusted

rates of infection as well as of hospitalisation and death. This is consistent with mechanisms operating on exposure, such as close-contact support from co-residents or visiting staff, difficulty maintaining distancing, and residence in shared settings, rather than on clinical vulnerability alone. It implies that prevention and early detection, and not only clinical management, are relevant levers for reducing inequality. Second, the gradient by residential setting is markedly steeper for mortality than for infection. Compared with private dwellings, adjusted infection rates were approximately 2.4 and 3.6 times higher, and adjusted mortality rates were approximately 17 and 25 times higher, in small and large communal establishments, respectively. This divergence probably reflects the older and more clinically vulnerable composition of many communal settings, alongside the potential for rapid transmission in shared environments. Third, the very high rates observed in the largest household size category are largely attributable to the communal establishments captured within it, which shows that household size and residential setting are related rather than independent dimensions of residential context.

Read alongside the wider literature, these patterns accord with national analyses from England, the Netherlands and elsewhere reporting excess COVID-19 mortality among disabled people, and particularly among people with intellectual disability [19, 20, 22, 23], and with Scottish work confined to adults with intellectual disabilities [21]. What this resource adds is the capacity to hold disability type and residential context in view simultaneously within the same population. The first analytic output from the cohort has already shown that hazards of infection, hospitalisation and mortality remain elevated for both intellectual and physical disability after extensive adjustment for demographic, socioeconomic, health-related and vaccination factors, with consistently stronger associations for intellectual disability [18]; the descriptive patterns reported here indicate where in the residential distribution that excess risk is concentrated, and have been summarised for non-specialist and policy audiences in an accompanying data insight [43]. Directly comparable published estimates that stratify jointly by disability type and empirically derived residential setting remain scarce, and these comparisons should therefore be regarded as contextual rather than as formal replication.

Strengths and Limitations

The cohort comprises 3,719,651 adults resident in Scotland at baseline, supporting precise descriptive estimates and detailed stratification by disability status and household context. Linkage of the 2011 Scottish Census to the CHI provides rich baseline sociodemographic information alongside Census-based disability classification, avoiding reliance on incomplete diagnostic coding alone. Address-based linkage to Ordnance Survey AddressBase Premium allows residential setting and household size to be measured objectively for the whole cohort rather than inferred from self-report. COVID-19 outcomes were ascertained from national systems with clear provenance: laboratory surveillance through COVID-19 test data, hospital admissions through SMR01, and death registrations held by National Records of Scotland. This allowed consistent outcome definitions across the study period. All linkage and analysis

were undertaken within the Scottish National Safe Haven under statistical disclosure control, supporting secure and reproducible use of the resource.

Several limitations warrant consideration. Disability status and key sociodemographic characteristics (including ethnicity, education, and long-term conditions) were derived from the 2011 Census and may not fully reflect changes in health, disability status, or socioeconomic circumstances by 2020, introducing potential misclassification. The Census measure also does not capture disability severity or support needs, nor the aetiology of intellectual disability. Both are likely to matter: national analyses have reported markedly higher COVID-19 mortality among people with more severe intellectual disability and among people with Down syndrome specifically, and have shown risk to vary with the presence of associated conditions such as epilepsy and respiratory impairment [20, 22, 23]. We were therefore unable to examine heterogeneity within disability groups by severity or aetiology, and our estimates should be read as averages across heterogeneous populations.

Household context was assigned using residential address at baseline and may not capture residential mobility, temporary residence, changes in caregiving arrangements, or transitions into and out of communal settings during follow-up. Ascertainment of SARS-CoV-2 infection depended on recorded positive tests; individuals without a recorded positive test were treated as not having confirmed infection, which may underestimate infection, particularly asymptomatic cases and periods when testing availability was limited. Definitions of COVID-19 hospitalisation and the time windows around positive tests may also vary in sensitivity over time, owing to changes in testing access and coding practice across pandemic phases. COVID-19 vaccination status was summarised as the cumulative number of doses received across the whole follow-up period and was not modelled as a time-varying covariate; it therefore describes vaccination coverage within the cohort rather than protection at the time each outcome occurred, and it is not aligned in time with the outcomes it might otherwise be thought to explain. It is included here as a descriptive characteristic of the resource only. The household size categories are also not fully independent of residential setting, since the largest category is dominated by communal establishments; the two dimensions should therefore be interpreted together rather than as separate exposures. Finally, this profile reports crude and age- and sex-adjusted rates rather than fully adjusted estimates, and differences should be read as descriptive comparisons of incidence across groups. Statistical analyses were prespecified in the published protocol [17], and the fully adjusted disability analyses are reported separately [18].

Conclusion

The cohort described here brings together Census-based disability status, address-derived household context and nationally ascertained COVID-19 outcomes for 3.72 million adults, representing 90.0% of age-eligible Community Health Index records available for Census linkage in Scotland. Its descriptive findings are themselves substantive. Age- and sex-adjusted rates of COVID-19 infection, hospitalisation and mortality were consistently higher among adults with

intellectual and physical disability than in the comparison group, with the largest relative excess among adults with intellectual disability. Rates also rose markedly across residential settings, and the steepest gradient was observed for mortality: the adjusted mortality rate in large communal establishments was approximately 25 times that in private dwellings. Disability and residential context therefore identify important concentrations of risk, and both should inform pandemic preparedness, risk stratification, and the design of infection prevention measures and support in communal settings.

The resource's value extends well beyond the pandemic that occasioned it. Because it joins a near-complete Census-based measure of disability to objectively derived household composition and property type for a large majority of the adult population, it can support investigation of a wide range of questions in which residential context is plausibly implicated: inequalities in healthcare utilisation, access and unmet need; outcomes of other communicable diseases, including seasonal respiratory infection; long-term conditions, multimorbidity and mortality; and the wider social determinants of health among disabled people. Within the COVID-19 field, the resource has already supported fully adjusted analyses of disability-related differences [18]. Further priorities include formal testing of effect modification by household living arrangements and examination of how risks varied across pandemic phases and policy periods, as prespecified in the protocol [17]. The resource can be extended as further follow-up accrues and additional administrative linkages become available, including longitudinal address data that would support investigation of transitions into and out of communal and supported living. In due course, linkage to more recent Census data could also address the principal measurement limitation identified here. Its broader contribution is to show that disability and residential context can be measured jointly, reproducibly and at national scale, and that doing so is necessary for inclusive public health planning.

Data Access

The linked administrative data used in this study are not publicly available. Access is restricted by ethical approvals, information governance requirements and legal controls that protect privacy and confidentiality. Researchers can request access through Scotland's approved administrative data access processes, subject to permissions from the relevant data controllers and approvals for use within a secure research environment. Access requests should be directed to Public Health Scotland's eDRIS and the Scottish National Safe Haven application process.

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Author Contributions

All authors contributed to the study conception and design. YAA led the development of the protocol, conducted the statistical analysis, and wrote the first draft of the manuscript. YAA, NB, AH, CD, and SP contributed to the data governance framework and the development of the cohort concept. The analytic strategy and interpretation plan were developed by YAA, NB, AH, and SP. All authors critically revised the manuscript for important intellectual content and approved the final version.

Competing Interests

The authors declare no competing interests.

Patient and Public Involvement

Patients and the public were not directly involved in the design, conduct, reporting, or dissemination plans of this cohort profile.

Patient Consent for Publication

Not applicable.

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AI Disclosure Statement

Grammarly, an AI-assisted writing tool, was used for language editing, including grammar, spelling, clarity, and stylistic improvements. It was not used to generate scientific content, conduct analyses, interpret findings, or formulate conclusions. The authors reviewed and take full responsibility for the final content of the manuscript.

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