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Scoping review on Physical Health Conditions in Mincéirs - Irish Travellers

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Complete List of Authors:	Kennedy, Fiona; Trinity College Dublin, School of Medicine Ward, Amy; Independent Public and Patient Expert Mockler, David; Trinity College Dublin, John Stearne Library Villani, Jacopo; Health Service Executive Broderick, Julie; Trinity College Dublin, School of Medicine
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Title page

Title: Scoping review on Physical Health Conditions in Mincéirs - Irish Travellers

Author and co-author names:

Kennedy F[1], Ward A[2], Mockler D[3], Villani J[4], Broderick J[1],

[1]School of Medicine, Trinity College Dublin, Ireland.

[2]Independant Public and Patient Expert, Belfast, UK.

[3]John Stern Library, Trinity College Dublin, Ireland.

[4]Health Service Executive, Dublin, Ireland.

Corresponding author details:

Name: Dr. Julie Broderick,

Address: Trinity Centre for Health Sciences, St. James's Hospital, Dublin D08W9RT, Ireland

E-mail: broderju@tcd.ie

Telephone: +353 1 8962110

Fax number: no fax

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Abstract

Objective: The objective of this scoping review was to collate physical health conditions in Mincéirs - Irish Travellers

Design: Scoping review

Search Strategy: MEDLINE/PubMed, EMBASE, PEDro, AMED, CINAHL, PsycINFO, SCOPUS as well as reports and grey literature were searched for primary data reporting physical health of Irish Travellers.

Results: From 198 citations generated from the database search, 9 unique studies (18 reports) were included in this scoping review, including n=7,342 participants. Driven by the data, physical health conditions were categorised into cardiovascular diseases, respiratory diseases, injuries, genetic disorders and gut/bowel conditions. This review showed that the metabolic syndrome, asthma, bronchitis, tuberculosis and intentional injuries were 2-3 times more prevalent in Irish Travellers compared to the background population. Genetic conditions were also described in a proportion of Travellers.

Conclusions; Overall Irish Travellers experience a disproportionate burden of physical health conditions compared to background populations. Health care providers need to be aware of the unique physical health burden experienced by many Irish Travellers and devise improved targeted health care strategies for this vulnerable and marginalised group.

Strengths and limitations of this study

- The methods for this scoping review were informed by the scoping review guidance from the Joanna Briggs Institute and it was reported according to the Preferred Reporting Items for Systematic Review and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist.
- Screening and data extraction processes were performed in duplicate.

- Stakeholder involvement was integral to this review, as a member of the Travelling community was one of the co-authors of this work.
- This was the first time all studies, reports and grey literature were comprehensively reviewed and collated to provide a broad picture of the physical health of Irish Travellers.
- As is the convention in scoping reviews, quality assessment was not undertaken – results must be interpreted in light of this.

Introduction

Irish Travellers or 'Mincéirs', as known in their language of Shelta [1 2], are a traditionally nomadic minority group primarily based on the island of Ireland[3]. They also reside in the UK with smaller populations in Europe and the USA. The number of Travellers recorded in the Irish Census of 2016 was reported to be 30,987 accounting for 0.7% of the general population[4]. In the 2011 Census for England and Wales, 58,000 people identified as Gypsy or Traveller (Irish origin) which may be an underestimation of the actual number[5].

The term 'Travellers' refers to people who have a tradition based on a mobile lifestyle and includes English and Welsh Gypsies, Irish Travellers and Scottish Travellers[6]. Each group has a separate ethnic identity and shares common aspects of cultural identity[7]. In this work, we included 'Irish Travellers' only. As 'Irish Travellers' are often known as 'Travellers', this term is used hereafter, recognising that the authors are referring to Travellers of Irish descent.

Travellers have been recognised formally as a distinct indigenous ethnic group in Ireland since 2017, which should have marked a positive step towards an inclusive society[8]. Yet, Travellers are 22 times more likely to experience discrimination than the general population[9] and they remain a severely marginalised group [10 11]. Consequently, Travellers face poor health and experience a higher burden of mortality and morbidity than the general population[11].

Traveller life expectancy has been reported to be 66 years, 11.5-15.1 years less than that of the general population[11]. The infant mortality rate is 3.6 times higher than the general population[11] and ten percent of Travellers do not reach their 2nd birthday [12]. The

disproportionate mortality may be due to poor health as well as other factors such as inadequate housing, education and literacy levels[13]. Mental health disorders are prevalent, with reported suicide rates six-seven fold higher than the general population[11]. Physical health appears to be poorer[11] but the scale and range of physical health conditions experienced by Travellers is not well known. The aim of this review was to summarise available data and categorise the physical health of Travellers. Due to the exploratory nature and lack of delineation of this area identified by an initial test review, a scoping review methodology was chosen.

The objectives of this review were;

(i) To explore the extent, breadth and nature of the literature with regards to the physical health of Travellers.

(ii) To categorise the evidence about physical health in Travellers.

(iii) To compare the physical health of Travellers to the background population where possible.

Methodology

The protocol of for this review was published on Open Science Framework (https://osf.io/v6etg/). This review followed the Joanna Briggs Institute's (JBI) methodology for scoping reviews[14] and was also informed by the original framework of Arksey[15], and enhancements proposed by Levac[16]. It was checked against the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist[17].

The inclusion criteria was based on the Patient, Concept, Context (PPC) mnemonic[18]. The population was Travellers. The concept referred to physical health. It was originally envisaged that this review would encompass 'health' in a more holistic way including mental and physical health. Given the large scope of a review including both dimensions of health, a

pragmatic decision was taken to consider physical health only in this review and refine the search strategy appropriately[19 20].

A comprehensive search strategy was developed collaboratively with a skilled research librarian (DM). The following electronic databases were searched: MEDLINE/PubMed, EMBASE, PEDro, AMED, CINAHL, PsycINFO, SCOPUS (see extended data). The search strategy was generated from a combination of free text search terms, text words, Medical Subject Headings (MeSH) terms and keywords with Boolean operators. The full search details are outlined in Supplementary Box 1. Authors of abstracts included in this review were contacted to ascertain if full text versions were available. Reference lists of included studies were examined for relevant studies. Grey literature was searched using the CADTH Grey Matters tool and the following websites were checked; Lenus, ProQuest E-Thesis Portal and RIAN. A search of Google Scholar and WorldCat search engines was also performed.

Only English language sources were searched with no date restriction. Quantitative studies, which examined physical health of Travellers (>18 years) were included. Only baseline data of intervention studies were extracted.

Duplications were removed and studies were imported into Covidence™ for title and abstract screening which took place independently by two reviewers (JB/FK). Both authors then conducted a full-text evaluation. If necessary, discrepancies were resolved by consensus by including a third author.

Two reviewers (JB and FK) independently extracted data from the first ten studies using a bespoke data extraction instrument [14 20] and minor changes were then made. The following data was extracted [author, title, year of publication, aims/objectives, research design, living arrangements, number and location of participants, inclusion/exclusion criteria, data collection method, age, biological sex, details of physical disease in Traveller and physical background population if available]. Data were summarized and presented to show the breadth and depth of the field[20] and categorized meaningfully into subcategories of physical health.

Patient and Public Involvement

Stakeholder involvement was integral to this review. The research question was generated from the principal author who has as interest in the physical health characteristics of marginalised groups and was refined by engaging informally with a member of the Travelling community (AW) about this research topic who identified the poor physical health of many members of her community. AW was then personally invited to join the review team. Her involvement began after the initial database search and continued throughout the data synthesis and write-up phases. A number of online meetings took place during which AW shared her perspectives on early results and drafts of the review as they emerged.

Results

Studies identified

The original search was performed on 09.03.21 (re-run 02.11.21). After removal of duplicates, 197 studies were identified. After excluding irrelevant studies, a total of 9 studies and 18 reports were deemed eligible for inclusion. The PRISMA flow chart summarises the search strategy (Figure 1).

Figure 1: PRISMA flow diagram ABOUT HERE

Study characteristics are shown in Supplementary Table 1. Over seven thousand participants (n=7342) were included with more than half (n=4,141) from the AITHS[11]. One study took part in the UK[21] and the remaining studies were based in Ireland, North and South. Living arrangements of participants were reported in three studies. In one study, a quarter (n=515) lived in a caravan, a trailer or a chalet[22] and in another, participants' accommodation included encampments, halting sites and social housing[23]. All (Traveller) participants in Mac Gabhann's study (n=296) resided in prisons in England and Wales[21].

Participants' characteristics are shown in Supplementary Table 2. The UK based study included mostly male participants (93.6% male)[21]while one study was female only[24].The age profile of participants was predominantly young, with the majority in their second, third and fourth decade.

Using a data-driven approach, physical diseases were categorised into the following conditions; cardiovascular disease (CVD), respiratory, genetic, injuries and gut/bowel conditions. Tables 1-4 summarise the physical health variables associated with these physical conditions.

Table 1: Cardiovascular diseases

Physical Health Variable	**Authors**	**Result**
High tri-glyceride levels	Tan et al 2009	High triglyceride level 23% (n=49%), males 89% (n=8), females 40% (n=15)
HDL/LDL	Tan et al 2009	Low HDL level, 62% (n=29), males 78%, females 58% (n=22)
Impaired Fasting Glucose	Tan et al 2009	Total: 19% (n=9), Males: 22% (n=2), females 18% (n=7)
Diabetes Mellitus	Slattery et al, 2011	5.9% Traveller sample (background population 4.3%)
	Tan et al 2009	8.5% Traveller sample (background population 4.3%)
Pre-diabetes	Slattery et al, 2011	9.3% (background population 6.2%)
	Tan et al 2009	11.6% Traveller sample (background population 6.3%)
Systolic BP ≥ 130mmHg	Tan et al 2009	Total 43% (n=20), Males: 22% (n=2), Females 47% (n=18)
Diastolic BP ≥ 85 mmHg	Tan et al 2009	Total 38% (n=18), Males: 44% (n=4), Females 37% (n=14)
Metabolic Syndrome	Slattery et al 2011	39.3% Traveller sample (background population 21%)
	Tan et al 2009	53.2% Traveller sample (background population 21.0%)

Self-reported CVD	McGorrian et al, 2010/2012	-Self-reported CVD was 5.6% (5.8% in men and 5.5% in women), compared to 16.1% in the general Irish population. -The prevalence of CVD increased with age and the Travellers who reported CVD were older (mean age 54.06 ±14.48 V 34.99 ±13.85). -No significant difference in the prevalence of reported CVD, hypercholesterolaemia and hypertension between the comparator groups was found. -However, diabetes, smoking, consumption of salt and fried food and physical inactivity is more frequent in Travellers. -Significant positive association was found between CVD and age, high cholesterol, hypertension, diabetes and current/former V never smoking, drinking alcohol and increasing discrimination. -Significant negative association was found between CVD and self-rated health, consumption of fried food and trust of others.
	Kelleher et al, 2012	-Self-reported BP, cholesterol, diabetes screening by GP (48%, n=1996)

Table 2: Respiratory diseases

Disease and variable measured	Authors	Result
TB: incidence rate	O'Toole et al, 2015	- Higher incidence rate and younger age in Irish travellers than white Irish-born and general population:

		- CIR of TB in the Traveller population was <5/100000 population per annum from 2002-2009. This increased after 2010 and CIR >10/100000 population per annum 2011-2013.
		- From 2002-2013, the CIR of TB decreased in the general population (10.5/100000 in 2002 to 8.3/100000 in 2013).
		- CIR for TB in Travellers was about 3-fold higher than that of white born Irish population in 2011 and 2012.
		- In 2013, the CIR in Travellers increased to 40.6/100000 following an outbreak.
		- 5-year cumulative CIR 2009-2013:
		  o Travellers: 81.4/100000
		  o General pop: 45.5/100000
		  o White Irish-born: 27.3/100000
		- When AITHS population data was used to calculate CIR rather than the CSO Census data, the CIR was lower. Regardless of the method of data collection of CIR, the rate was still higher in Irish travellers than the general population/white Irish born.
		- Average incidence by age was higher for the Traveller population, majority in 0-34 age group, compared to the general population where the majority was in the 25-65 age group and in the white Irish-born population where the majority was in the 55 to > 65 age group.

COPD: number of smokers, presence of respiratory symptoms, diagnosis of asthma & spirometry	Nolan et al, 2017	- 41% were current smokers, 6/14 non-smokers regularly exposed to passive smoke - 86% of smokers reported respiratory symptoms including cough, wheeze and shortness of breath - 10/35 had GP diagnosis of asthma - 23% (7/30) had obstructive pattern

Table 3: Injuries

Details of non-fatal injuries	Authors	Result
Injury **(prevalence of injury and intentional/unintentional)**	Abdalla et al, 2013	- Travellers had a higher incidence of intentional injuries, SIR = 224 for intentional injuries (male = 181, female = 268) - Travellers had a lower incidence of unintentional injury than the general population: SIR = 44 (male = 42, female = 46). - Travellers over 65 years were twice as likely to report an injury than the general population. o Overall injury SIR for Travellers aged 15-64 years = 59 & 65 years +=208 o Intentional injury SIR for Travellers >65 years = 517 o Unintentional injury SIR for Travellers >65years= 137. Overall injury SIR for Travellers >65years = 208.
Injury **(Question from Dimension 4 Lifestyle and health behaviour of the health status interview)**	Kelleher et al 2012	'Free of injuries in the last 2 years vs. one or more injury': 88.7% (n=1800)

SIR: standardised incidence ratio (ratio of the observed number of Traveller non-fatal injuries to that expected if Travellers experienced the age-specific retrospective incidence of non-fatal injury of the general population)

Table 4: Genetic diseases, other conditions and self-rated health

Details of Genetic disease		Author	Result
Phenotype	Medical history, clinical observation & physical examination	Cullinane, Lynch and Marnane, 2020	Case of leukoencephalopathy described. Patient presented with short stature, pes planus, hypotonia, history of osteogenic sarcoma Participants' medical history: Epilepsy, multiple cerebral cysts (removed by craniotomy/cyst excisions over the course of 15 years from age 5), left ventriculo-peritoneal shunt inserted and later removed, multiple vascular malformations of the capillary-cavernous type with associated haematomas, surrounding gliosis, hemosiderin deposition, Rosenthal fibres and areas of white matter calcification.
	Blood & urine testing	Flynn et al (1989)	Type II hyperprolinaemia (n=13, including 7 adults) Mild hyperprolinaemia (n=50, proportion of adults unclear) Seizures from hyperprolinaemia: 4 adults suffered grand mal seizures, 1 of whom had a severe mental handicap, 1 suffered from petit mal seizures.
Genotype	Whole exome sequencing	Cullinane, Lynch and Marnane, 2020	Identified a homozygous variant of the SNORD118 gene. The sister of this case, with milder symptoms was homozygous for the same variant.
Other conditions			
Chronic inflammatory bowel disease		McCormick et al,	No recorded traveller with idiopathic inflammatory bowel disease
Self-rated Health: 'Chronic health condition diagnosed by GP' Physical Health not good ≥ 1 day in last month Daily activity or work limited due to a long-term illness, health problem or disability		Kelleher et al, 2012 (Dimension 6 in Health Status Interview)	41.5% (n = 2022) 59.3% (n=1843) 17.2% (2012)
Doctor-diagnosed illnesses within 12 months		AITHS	Health Status (Travellers ROI, n=1624) back condition (30.4%), asthma (12.5%), chronic bronchitis (12%), cancer (1%), arthritis (13.8%), diabetes (6.1%), angina (4.3%), heart attack (2.3%), stroke (1.1%)

Three studies reported cardiovascular diseases (Table 1). Tan et al, (2009)[25] reported the following CVD risk factors among study participants (n=47); high triglyceride levels (23%), low HDL cholesterol levels (62%), impaired fasting glucose levels (19%) and hypertension (systolic BP ⩾ 130mmHg 43% and diastolic BP ⩾ 85mmHg 38%)[25]. The prevalence of diabetes, pre-diabetes and the metabolic syndrome evaluated in a series of pilot studies was higher than the general population[26].

Two studies explored respiratory conditions (Table 2)[27 28]. One study reported a five-year tuberculosis (TB) cumulative crude incidence rate (CIR) of 81.4/100000 in Travellers compared to 45.5/100000 and 27.3/100000 in the general population and white Irish-born population, respectively[27]. Nolan et al (2017)reported that 41% of Travellers were smokers and 86% of these smokers reported respiratory symptoms including cough, wheeze and shortness of breath while 23% had an obstructive respiratory disease pattern[28].

Abdalla et al (2020) evaluated injuries[29] (Table 3). They demonstrated that the prevalence of unintentional non-fatal injury in Travellers < 65 years was lower (SIR=40), while the prevalence of intentional injury was higher (SIR=213) than the general population. Travellers > 65 years had higher injury rates for both unintentional (SIR=137) and intentional injury (SIR=517).

Two studies (Table 4) examined genetic disorders both inherited in an autosomal recessive manner. One was a case report of a 32 year-old female who inherited a rare leukoencephalopathy and severe central nervous system (CNS) impairment was reported[31]. Flynn et al (1989) also reported CNS dysfunction in Travellers due to the presence of Type II hyperprolinemia [30].

One study examined effects of lifestyle changes on the microbiome and its associated risks for chronic disease[23]. Results demonstrated that Travellers retained a microbiota similar to that of non-industrialised populations due to halting site dwelling, number of siblings and animal ownership. Another study evaluating the prevalence of inflammatory bowel disease found no records of idiopathic bowel disease in the Traveller population[31].

Discussion

This review appears to be the first time data relating to physical health of Travellers has been synthesised. Pooling this evidence highlights the disproportionately high burden of physical health conditions experienced by Travellers compared to the general population.

Over 7,000 Travellers were included in this review with the largest source of data from the AITHS (n=4,141). One study took place in England and Wales, while the rest of studies were based in Ireland. Living conditions were not specified in the majority of studies. This is important to note as living conditions are a key driver of health[32] which is rated higher by Travellers when living conditions are better [22 23].

There was a higher representation of females (61%) within this review. This may be explained by findings from the AITHS highlighting that female Travellers were more likely to engage in research studies[11]. The majority of participants were in their second to fourth decades, which concurs with CSO (2016) data[4] demonstrating that Travellers are a young population**.** The paucity of older participants means that the effects of ageing and extent of geriatric syndromes in this population are not fully known.

This review showed high rates of CVD risk factors and established CVD disease yet lower self-reported CVD of approximately 5%. This compared to a self-reported CVD rate of 16.1% for the general population. This likely underestimation of CVD among Travellers may be due to a reluctance to divulge information and/or a lack of disease awareness, fewer attendances for preventive services as well as late presentation and higher case-fatality rates of CVD[11] . The incidence of metabolic disease was over twice as high among Travellers (53.2%) compared to the background population (21%)[26]. Evidently, improved targeted primary and secondary care strategies for Travellers are required.

Respiratory conditions (bronchitis and asthma) were rated as the second most common physical health condition, with a prevalence of 24.5% among Travellers in the ROI and 35.1% in Northern Ireland[11]. This is considerably higher than the comparison ROI background population of 3% with chronic bronchitis[33]. This concurs with Nolan's findings where 28.5% of Travellers had a GP diagnosis of asthma and 23% had abnormal spirometry results[28]. Rates of TB were three-fold higher in Travellers than the white Irish-born population[27] and

proposed risk factors were cited as higher house occupancy, smoking and the presence of diabetes or pre-diabetes.

Travellers suffer a greater burden of injuries and a higher risk of dying from injuries than the general population[29]. Notably, a higher rate of intentional injuries was reported and a lower rate of unintentional injuries compared to the general population. The high rate of intentional injuries likely links to mental health crises among Travellers with a suicide rate six times the general population[11]. The true intentional-injury rates may be in fact higher as Travellers may not present themselves to care settings for minor injuries, and may be more inclined to self-treat or present late for care[11]. Conversely, there may actually be a lower unintentional-injury rate due to lower participation in sport and recreational activities in young Travellers. Travellers over 65 years, however, were twice as likely to be injured, highlighting their vulnerability. The AITHS (2010) cited the home as the most likely location for an injury, which may be due to poor living environments. This is in accordance with a recent report, which highlighted grossly inadequate living conditions among Travellers[34].

This review highlighted two genetic conditions, representing an important factor affecting physical health in Travellers as autosomal recessive conditions are commonly reported [35]. Of note, some studies examining inherited disorders (n=5) were excluded from this review as they did not meet the age-related eligibility criteria. Given that genetic conditions are prevalent in Travellers, consideration of 'grown up' genetic conditions should be an area of emerging focus.

Positive physical health factors linked to the gut, were discussed in two studies[23 31]. McCormick et al (2001) noted the absence of consultant-diagnosed inflammatory bowel disease possibly due to exposure to enteric bacteria and infection in early life[31]. Keohane et al (2020) suggested the 'non-industrialised microbiome' of Travellers may be due to living conditions and animal ownership[23]. How the gut microbiome changes with modernisation should be evaluated in future studies.

A strength of this review is the synthesis of physical health data of Travellers based in England and Wales, ROI and Northern Ireland. A further strength was the active stakeholder involvement by the inclusion of a member of the Travelling community as an integral and valued member of the review team. This ensured the real world relevance of this research

and is likely to increase chances of implementation of research findings into real life settings[36].

There were a number of limitations. As is the general convention in scoping reviews a formal quality assessment of included studies[14 15]was not conducted therefore, the robustness of evidence[15]could not be judged. We acknowledge that definitive recommendations not be possible and the review must be interpreted in light of this[14 15]. We therefore see this work as a useful accessible summary of the evidence base regarding physical health in Travellers [14 37 38]. As previously stated, the initial intention was to perform a review encompassing physical and mental health, however, a pragmatic decision was taken to include physical health data only which we acknowledge is somewhat unidimensional as physical and mental health are inter-related and multi-morbidity can straddle both.

Recommendations and Gaps

The extent of physical health conditions may be underestimated due to Travellers not presenting or presenting late for care as well as a mistrust of healthcare professionals[11]. Ethnic identifiers would enable physical health data to be more accurately tracked but this would need to be conducted sensitively. Future studies including Travellers should include data on living arrangements. Non-communicable diseases such as cancer and arthritis in Travellers did not feature within this review.

While the AITHS [11], the most comprehensive report of Traveller health is over 10 years old, bridging the implementation gap is strongly recommended rather than further reports[39]. Healthcare service design needs to be culturally appropriate, although, how cultural competence can best be applied to Travellers is not well known[40]. Further work is needed to empower Travellers to self-manage their health without 'talking at them'. Functional and health literacy levels need to be optimised while also reducing the stigma associated with accessing healthcare [11].

Conclusion

This scoping review highlights marked inequalities in the burden of physical health conditions experienced by Mincéirí. Better targeted healthcare is necessary to meet the needs of this marginalised group.

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Author's contribution

FK**;** independent data screening, data extraction, data synthesis, drafting of manuscript**,** AW**;** contribution to the development of the design, drafting of manuscript, JV; drafting of manuscript**,** DM; generation and refinement of search strategy, JB; conception of original idea and deigning the study, refinement of search strategy, independent data screening, data extraction, data synthesis, drafting of manuscript. All authors provided important intellectual contribution and guidance throughout the development of the manuscript. All authors contributed, edited and approved the final version of this manuscript.

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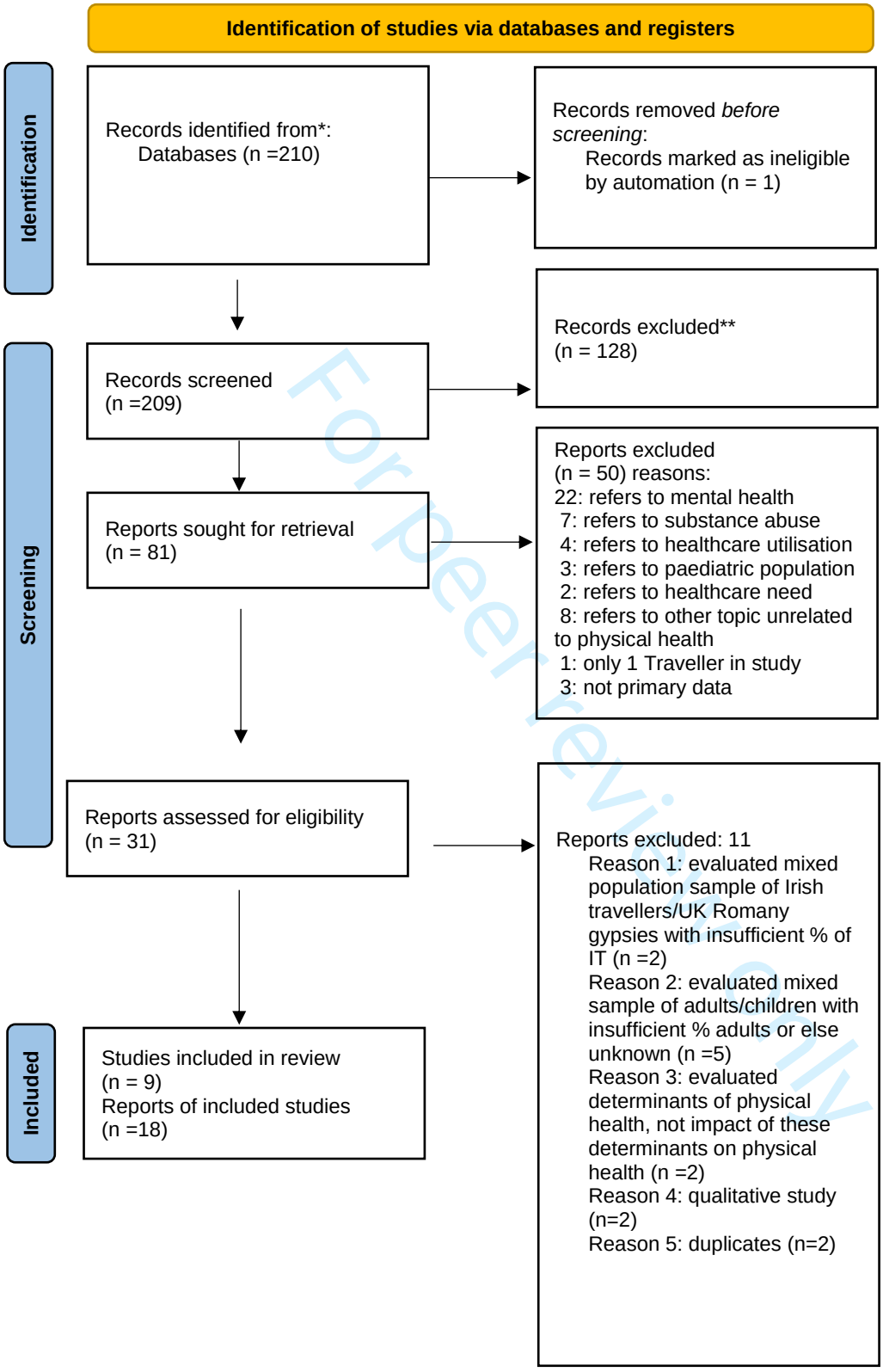
Figure Legend

Figure 1 PRISMA flow diagram



Supplementary Box 1: Full search details

EMBASE

'health'/exp OR 'health status'/exp OR 'mental health'/exp OR 'mental disease'/exp OR 'physical disease'/exp
((Mental* OR psychological*) NEAR/2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR 'well being' OR stress* OR distress OR disease*)):ti,ab
(depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*):ti,ab
((physical*) NEAR/3 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)):ti,ab
((cardiac OR cardiovascular OR heart) NEAR/3 (health OR disorder* or disease*)):ti,ab
('health study' OR 'health studies'):ti,ab
#1 OR #2 OR #3 OR #4 OR #5 OR #6
((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) NEAR/3 (traveller* OR gypsy OR gypsies)):ti,ab
#7 AND #8

Medline (OVID)

exp Health/ OR exp Health Status/ OR exp Mental Disorders/ OR exp Chronic Disease/ OR exp Health Behavior/
((Mental* OR psychological*) adj2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR well being OR stress* OR distress OR disease*)).ti,ab.
(depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*).ti,ab.
((physical*) adj3 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)).ti,ab.
((cardiac OR cardiovascular OR heart) adj3 (health OR disorder* or disease*)).ti,ab.
(health study OR health studies).ti,ab.
or/1-6
((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) adj3 (traveller* OR gypsy OR gypsies)).ti,ab.
7 AND 8

Web of Science

TS =((((Mental* OR psychological*) NEAR/2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR "well being" OR stress* OR distress OR disease*)) OR (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*) OR ((physical*) NEAR/3 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)) OR ((cardiac OR cardiovascular OR heart) NEAR/3 (health OR disorder* or disease*)) OR ("health study" OR "health studies")) AND ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) NEAR/3 (traveller* OR gypsy OR gypsies)))

GoogleScholar

"Irish travellers|traveller" "mental health|fitness|status|distress" "physical fitness|health|status|illness"

CINAHL

(MH "Mental Health") OR (MH "Mental Health Services+") OR (MH "Health Status+") OR (MH "Physical Fitness+") OR (MH "Psychological Well-Being")
TI ((Mental* OR psychological*) N2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR "well being" OR stress* OR distress OR disease*)) OR AB

((Mental* OR psychological*) N2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR "well being" OR stress* OR distress OR disease*))
TI (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*) OR AB (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*)
TI ((physical*) N2 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)) OR AB ((physical*) N2 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness))
TI ((cardiac OR cardiovascular OR heart) N3 (health OR disorder* or disease*)) OR AB ((cardiac OR cardiovascular OR heart) N3 (health OR disorder* or disease*))
TI ("health study" OR "health studies") OR AB ("health study" OR "health studies")
S1 OR S2 OR S3 OR S4 OR S5 OR S6
TI ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) N3 (traveller* OR gypsy OR gypsies)) OR AB ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) N3 (traveller* OR gypsy OR gypsies))
S7 AND S8

SCOPUS

TITLE-ABS-KEY ((((Mental* OR psychological*) W/2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR "well being" OR stress* OR distress OR disease*)) OR (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*) OR ((physical*) W/3 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)) OR ((cardiac OR cardiovascular OR heart) W/3 (health OR disorder* or disease*)) OR ("health study" OR "health studies")) AND ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) W/3 (traveller* OR gypsy OR gypsies)))

PsycINFO

DE "Mental Health" OR DE "Health" OR DE "Health Literacy" OR DE "Health Status" OR DE "Physical Health" OR DE "Health Attitudes" OR DE "Health Behavior" OR DE "Health Risk Behavior" OR DE "Mental Disorders" OR DE "Chronic Mental Illness"
TI ((Mental* OR psychological*) N2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR "well being" OR stress* OR distress OR disease*)) OR AB ((Mental* OR psychological*) N2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR "well being" OR stress* OR distress OR disease*))
TI (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*) OR AB (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*)
TI ((physical*) N2 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)) OR AB ((physical*) N2 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness))
TI ((cardiac OR cardiovascular OR heart) N3 (health OR disorder* or disease*)) OR AB ((cardiac OR cardiovascular OR heart) N3 (health OR disorder* or disease*))
TI ("health study" OR "health studies") OR AB ("health study" OR "health studies")
S1 OR S2 OR S3 OR S4 OR S5 OR S6
TI ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) N3 (traveller* OR gypsy OR gypsies)) OR AB ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) N3 (traveller* OR gypsy OR gypsies))
S7 AND S8

Supplementary Table 1: Study Characteristics

No	Author(s) and Title	Study Aims & Objectives	Research Design	Living Arrangements	Location of participants	Inclusion/Exclusion Criteria	Data Collection Method
1	**The All Ireland Traveller Health Study (AITHS)**	-To record the number of Travellers on the island of Ireland -To record fertility rate and deaths in one year -To follow a birth cohort for 1 year -To document health status and determine factors affecting the health status of Travellers and their access to health services -To document attitudes/perceptions of Travellers to health services	Census and quantitative study	Documented in some studies/reports	Island of Ireland North and South	Travellers from island of Ireland	Survey-census section, health status section, health status for children, health services utilisation for adults.

1.a	Abdalla et al, 2020. **'Disparities in fatal and non-fatal injuries between Irish travellers and the Irish general population are similar to those of other indigenous minorities: a cross-sectional population-based comparative study'**	To assess disparities in fatal and non-fatal injury between travellers and the general population in Ireland	Comparative study based on cross-sectional population-based data.	Not stated	ROI	Inclusion: -Irish Travellers who participated in the AITHS -Aged 15 years or older.	*Traveller data*: -from the AITHS -from the General Register Office -CSO -PHNs working with traveller families. *General population data*: -from the CSO 2008 report 2006 census and the Survey of Lifestyle, Attitude and Nutrition (SLAN) 2002.
1.b	(i) Kelleher et al, 2012 **Sociodemographic, environmental, lifestyle and psychosocial factors predict self-rated health in Irish Travellers, a minority nomadic population** (ii) Whelan et al, 2010. **Socio-demographic, health status, psycho-social and lifestyle predictors of self-rated health in the All-Ireland Traveller Health Study (abstract)**	Aim: to assess the predictive ability of socio-demographic, environmental, lifestyle and psychosocial factors to self-rated health.	Census survey of Traveller families in Ireland, North and South (AITHS)	75% (n=1547) live in house/apartment 25% (n=515) live in caravan/trailer/ chalet	ROI/Northern Ireland	Inclusion: Self-identified Travellers in the Republic and Northern Ireland	Health Status survey: subjective questions around lifestyle, culture, social experiences/supports, health behaviour and self-reported health status.

1.c	(i)Mc Gorrian et al, 2010 **Adverse cardiovascular risk profile in a disadvantaged minority community consistent with the thrifty phenotype hypothesis. Findings from the All-Ireland Traveller Health Study (Abstract)** (ii) McGorrian et al, 2012 **Cardiovascular disease and risk factors in an indigenous minority population. The All-Ireland Traveller Health Study.**	Aim: To examine CVD epidemiology and CVD risk factors in Irish Travellers and associations with social disadvantage.	Observational study	Not stated	A random sample (20%) of participants in the AITHS	Inclusion: All self-identified Traveller families on the island of Ireland were invited to participate.	AITHS: health survey via an oral-visual data collection instrument
2 **2.a**	(i)Slattery et al, 2011 **The point prevalence of diabetes, pre-diabetes and metabolic syndrome in Irish travellers** **Abstracts** (ii) Slattery et al, 2011	Aim for all: to evaluate CVD risk factors and the point prevalence of diabetes, pre-diabetes and metabolic syndrome in the Irish Traveller population.	Observational pilot study- abstract only	N/S	Travellers living along 'western seaboard' recruited from Galway and Western Traveller movements	Inclusion: Travellers (>18 years)	The following outcomes were evaluated; glucose levels, lipid profiles, oral glucose tolerance tests, blood pressure, weight, height and waist circumference.

2.b	**The prevalence of diabetes, pre-diabetes and metabolic syndrome in Irish Travellers and the impact of lifestyle modification (abstract)** (iii) Slattery, Brennan, Canny, Sweeney, Ward, O' Shea and Dunne **Cardiovascular health in the Irish Traveller community** (iv) Slattery et al, 2011						
2.c	**The prevalence of diabetes, Pre-diabetes and the Metabolic Syndrome in Irish Travellers** Tan et al, 2009						
2.d	**Traveller Health: Prevalence of Diabetes, Pre-Diabetes and the Metabolic Syndrome (abstract)**						

3	Cullinane et al, 2020. **'Phenotypic Variability in Leukoencehalopathy with Brain Calcifications and Cysts: Case reports of siblings from an Irish Traveller Family with a Homozygous SNORD118 Mutation'**	To describe a case report of an Irish traveller with a leukoencephalopathy and an inherited mutation in the SNORD118 gene.	Case report	Not stated	Not stated	Inclusion: 32 year old female Irish Traveller with leukoencephalopathy.	Clinical examination, family history, medical history including birth history, medications, histopathology investigations, genetic studies.
4	Flynn et al, 1989 **Type II Hyperprolinaemia in a pedigree of Irish travellers (nomads)**	Aim: not stated but to investigate Type II hyperprolinaemia in Irish Travellers	Descriptive study	Not stated	Not stated	Inclusion: not clearly stated but family of the 'proband' and close relatives	Testing of urine by two-dimensional paper chromatography, those showing prolinuria had blood samples taken in plain tubes and their serum or plasma proline concentrations were determined on a Locarte amino acid analyser. In many cases no urine was collected but a blood sample was.
5	McCormick et al, 2001 **Chronic inflammatory bowel disease and the 'over-clean' environment: Rarity in the Irish 'Traveller' community.**	Aim: to estimate the prevalence of inflammatory bowel disease in the traveller population.	Survey	N/A	Study was conducted in 11/26 counties in Ireland where 25/30 gastroenterologists were based	Inclusion: all gastroenterologists or surgeons working in the public health service in Ireland for at least three years at time of study, identified from the Irish Society of Gastroenterology.	Collected the number of members of the travelling community ever seen with inflammatory bowel disease and type of disease seen (Crohn's and Ulcerative colitis).

6	Keohane et al, 2020. **Microbiome and health implications for ethnic minorities after enforced lifestyle changes.**	Aim: to investigate whether recent lifestyle changes are associated with differences in the microbiome and risk factors for chronic disease.	Cross-sectional study.	Within 30km radius of Cork city at one of five locations. Varied from permanent encampment, h alting sites or social housing. NB 87% of participants were nomadic in childhood but their living conditions had since changed.	Cork	Inclusion: None of the participants had taken antibiotics within 1 month and none were taking laxatives, corticosteroids, anti-inflammatories or anticoagulants	- Fecal microbiota of Irish Travellers were collected and compared with that of the settled background population in the same geographic locality and with that from individuals in other industrialised and non-industrialised countries. -Dietary habits were assessed via questionnaire -Body composition was assessed by DXA. -Well-being was assessed by the WHO-5 Well-Being Index -Personal, medical and family history was recorded
7	O'Toole et al, 2015. **Tuberculosis incidence in the Irish Traveller population in Ireland from 2002 to 2013**	To examine data regarding TB notifications in Ireland from 2002 to 2013.	Descriptive epidemiologic al study	N/S	N/S	Inclusion: -all cases of TB reported by the National TB Surveillance System and CID, -cases reported in the Census of 2002, 2006 and 2011 and	Data were collected from National TB Surveillance System and Computerised Infections Disease Reporting system by the Health Surveillance Centre. Crude incidence rates (CIR) were calculated from the CSO and the AITHS data.

						-cases reported by the AITHS.	5 year cumulative CIR values were calculated for 2009-2013. Average incidence rates for 2002-2013 were calculated for each age group using CSO data.
8	Nolan et al, 2017 **Respiratory Health in an Irish Traveller Community**	Aim: to assess respiratory health in Irish Travellers	Observational study	N/S	Travellers residing in West Dublin	Inclusion: Irish Travellers > 18 years	Subjective and objective data collected: BMI, smoking history, respiratory symptoms, GP diagnosis of asthma and spirometry measures were taken
9	Mac Gabhann, 2011 **Voices Unheard. A study of Irish travellers in Prison.**	Aim: to explore issues faced by Irish Travellers in prison	Mixed methods study	England/Wales	Prisons in England/Wales	Inclusion- -Irish travellers in prison -prison staff in prisons in England and Wales. Exclusion -Young Offenders Institution	1.Survey of Irish Travellers across the prison estate and a response form for prison staff involving prison officials and 2.A series of focus groups and semi-structured interviews with Irish travellers in seven prisons.

Supplementary Table 2: Details of Study Participants

No	Author	Number of Participants	Age (Mean + SD)	Biological Sex
1	AITHS	4,141 adults interviewed	5-14 years: 26% 15-24 years: 21% 25-39 years: 21% 40-64 years: 13% 65 years+: 3%	Males: 1,817, Females: 2,324
1a	Abdalla et al, 2013	Non-fatal injury data in Travellers: n = 1663 Travellers	Aged 15 years +	Males = 702 (42%), Females = 961 (58%)
1b	Whelan et al, 2010 (abstract) Kelleher et al 2012	n= 2065	<30 years: 48% (n=945) 30-44: 28.6% (n=563) 45-64: 18.4% (n=362) >65: 5.1% (n=100)	Males: 43.5% (n=898), Females: 56.5% (n=1166)
1c	(i) McGorrian et al, 2010 (abstract) (ii)McGorrian et al, 2012	2023 Age, sex and CVD data was available on 1878 of the total sample of 2023 Comparator population: 10,364	18-29: 41.8% (n=784) 30-34: 31.6% (n=594) 45-59: 18% (n=338) 60-74: 7.5% (n=140) >75: 1.2% (n=22)	Traveller population: Males: 32% (n=601), Females: 68% (n=1277)

2a-e	5 reports: Tan et al, 2009, Slattery et al 2010, 2011	354 travellers were screened in the largest study *(Tan et al, n=47; Slattery 2010, n=187; Slattery 2011, n=285; Slattery 2011, n=353)*	Mean age 37 ± 11 (SD)	Males: 127; Females: 227
3	Cullinane, Lynch and Marnane, 2020	1	32 years	Female
4	Flynn et al 2020	*Whole sample: 312 Urine from 280, blood from 147. Adult sample with Type II hyperprolinaemia: 7	*Not stated for whole sample, but among 7 adults with Type II hyperprolinaemia the mean age was 27.9 years	*Not stated for whole sample, but among 7 adults with Type II hyperprolinaemia, 4 females and 3 males.
5	McCormick and Manning, 2001	25	N/S	N/S
6	Keohane et al, 2020	118	39 (+/-13 years sd)	Males =53(44.9%), Females = 65 (55.1%)
7	O' Toole et al, 2015	2060	Travellers: majority of cases were in 0-34 yrs age group (mean of 26 years, median of 24 years) General population: majority of cases were in the 25 to > 65 years age group	N/S

			(mean of 43 years, median of 38 years) Irish-born: majority of cases in 55 to >65 years age group (mean of 49 years, median of 49 years)	
8	Nolan et al, 2017	35	Mean age 44 years (18-69)	Males: 16; Females: 19
9	Mac Gabhann, C, 2011	453 (0.6% of prison population). Of this, 296 survey forms were completed. 57 travellers participated in the focus groups/interviews	Age range of IT prisoners: 20-30: 39.5% 30-40: 29.5% 40-50: 17.1% 15-20:8.5% 50-60:4.3% 60-70:1.1%	Male = 93.6%, female = 6.4% 1 female prison was visited out of 7 in total.

N/S: not stated

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	Page 1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Page 1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Page 3
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Page 4
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Not applicable
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Page 4
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	Page 4
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supplementary file 1/Extended data
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Page 4
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Page 4
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page 4
Critical appraisal of individual	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe	Not applicable

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
sources of evidence§		the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Page 5
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Fig. 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Tables
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not applicable
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Tables and page 5-6
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Pages 5-6
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Page 7
Limitations	20	Discuss the limitations of the scoping review process.	Page 9
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Page 10
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Page 10

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

BMJ Open

Scoping review on Physical Health Conditions in Mincéirs - Irish Travellers

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Primary Subject Heading:	Public health
Secondary Subject Heading:	Cardiovascular medicine, Respiratory medicine
Keywords:	PUBLIC HEALTH, PRIMARY CARE, Coronary heart disease < CARDIOLOGY

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Title page

Title: Scoping review on Physical Health Conditions in Mincéirs - Irish Travellers

Author and co-author names:

Kennedy F[1], Ward A[2], Mockler D[3], Villani J[4], Broderick J[1],

[1]School of Medicine, Trinity College Dublin, Ireland.

[2]Independant Public and Patient Expert, Belfast, UK.

[3]John Stern Library, Trinity College Dublin, Ireland.

[4]Health Service Executive, Dublin, Ireland.

Corresponding author details:

Name: Dr. Julie Broderick,

Address: Trinity Centre for Health Sciences, St. James's Hospital, Dublin D08W9RT, Ireland

E-mail: broderju@tcd.ie

Telephone: +353 1 8962110

Fax number: no fax

Keywords: Irish travellers, physical health, Ethnic minority, inequality

Word count: 2547

Abstract

Objective: The objective of this scoping review was to collate physical health conditions in Mincéirs - Irish Travellers

Design: Scoping review

Search Strategy and charting method: MEDLINE/PubMed, EMBASE, PEDro, AMED, CINAHL, PsycINFO, SCOPUS as well as reports and grey literature were searched for primary data reporting physical health conditions of Irish Travellers up to 04.04.23. Data was extracted, described and organised meaningfully into tables according to reported physical health conditions.

Eligibility criteria: The population was Travellers. The concept referred to physical health conditions. The context was Irish Travellers based in any location or setting. Exclusion criteria was data/research other than primary data relating to physical health conditions of Irish Travellers.

Results: From 198 citations generated from the database search, 11 unique studies (20 reports) were included in this scoping review, including n=7,397 participants. Driven by the data, physical health conditions were categorised into cardiovascular diseases, respiratory diseases, injuries/musculoskeletal/arthritic disorders, genetic disorders and gut/bowel conditions. This review showed that the metabolic syndrome, asthma, bronchitis, tuberculosis and intentional injuries were 2-3 times more prevalent in Irish Travellers compared to the background population. Genetic conditions were also described in a proportion of Travellers.

Conclusions; Overall Irish Travellers experience a disproportionate burden of physical health conditions compared to background populations. Health care providers need to be aware of the unique physical health burden experienced by many Irish Travellers. Multifaceted strategies are needed to improve the health profile of this vulnerable and marginalised group.

Strengths and limitations of this study

- The methods for this scoping review were informed by the scoping review guidance from the Joanna Briggs Institute and it was reported according to the Preferred Reporting Items for Systematic Review and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist.
- Screening and data extraction processes were performed in duplicate.
- Stakeholder involvement was integral to this review, as a member of the Travelling community was one of the co-authors of this work.
- This was the first time all studies, reports and grey literature were comprehensively reviewed and collated to provide a broad picture of physical health conditions of Irish Travellers.
- As is the convention in scoping reviews, quality assessment was not undertaken – results must be interpreted in light of this.

Introduction

Irish Travellers or 'Mincéirs', as known in their language of Shelta [1 2], are a traditionally nomadic minority group primarily based on the island of Ireland[3]. They also reside in the UK with smaller populations in Europe and the USA. The term 'Travellers' is used as a generic term to refer to people who have a historical and cultural tradition based on a mobile lifestyle and includes English and Welsh Gypsies, Irish Travellers and Scottish Travellers. Each of these groups has a separate ethnic identity that is particularly evident from their different languages but they share many aspects of a common cultural identity as traditional Travellers or Romani people[3 4]. In this review we specifically included 'Irish Travellers' only. As Irish Travellers in Ireland are known as 'Travellers' rather than 'Irish Travellers, the term 'Travellers' is used hereafter, recognising that the authors are referring to Travellers of Irish descent.

The number of Travellers recorded in the Irish Census of 2016 was reported to be 30,987 accounting for 0.7% of the general population[5]. In the 2011 Census for England and Wales,

58,000 people identified as Gypsy or Traveller (Irish origin) which may be an underestimation of the actual number[4].

Travellers have been recognised formally as a distinct indigenous ethnic group in Ireland since 2017, which should have marked a positive step towards an inclusive society[6]. Yet, Travellers are 22 times more likely to experience discrimination than the general population[7] and they remain a severely marginalised group[8 9]. Consequently, Travellers face poor health and experience a higher burden of mortality and morbidity than the general population[9].

Traveller life expectancy has been reported to be 66 years, 11.5-15.1 years less than that of the general population[9]. The infant mortality rate is 3.6 times higher than the general population[9] and ten percent of Travellers do not reach their 2nd birthday[10]. The disproportionate mortality may be due to poor health as well as other factors such as inadequate housing, education and literacy levels[9]. Mental health disorders are prevalent, with reported suicide rates six-seven fold higher than the general population[9]. Physical health appears to be poorer[9] but the scale and range of physical health conditions experienced by Travellers is not well known. The aim of this review was to summarise available data and categorise physical health conditions in Travellers. Due to the exploratory nature and lack of delineation of this area identified by an initial test review, a scoping review methodology was chosen.

The objectives of this review were;

(i) To explore the extent, breadth and nature of the literature with regards to physical health conditions experienced by Travellers.

(ii) To categorise the evidence about physical health in Travellers.

(iii) To compare physical health conditions of Travellers to the background population where possible.

Methodology

The protocol for this review was published on Open Science Framework (https://osf.io/v6etg/). This review followed the Joanna Briggs Institute's (JBI) methodology for scoping reviews[11] and was also informed by the original framework of Arksey[12], and enhancements proposed by Levac[13]. It was checked against the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist[14]. The six stage framework developed by Arksey and O' Malley (2005)[12] was used to structure this review.

Stage one refers to identifying the research question. The primary research question was; what is known about the physical health of Travellers. The secondary research question was; how does the physical health of Travellers compare to the background population, where this information was available.

Stage two refers to identifying relevant studies. A comprehensive search strategy was developed collaboratively with a skilled research librarian (DM). The following electronic databases were searched: MEDLINE/PubMed, EMBASE, PEDro, AMED, CINAHL, PsycINFO, SCOPUS (see extended data). The search strategy was generated from a combination of free text search terms, text words, Medical Subject Headings (MeSH) terms and keywords with Boolean operators. The full search details are outlined in Supplementary Box 1. Authors of abstracts included in this review were contacted to ascertain if full text versions were available. Reference lists of included studies were examined for relevant studies. Grey literature was searched using the CADTH Grey Matters tool and the following websites were checked; Lenus, ProQuest E-Thesis Portal and RIAN. For each of these sources the terms 'Travellers' and 'Health' were searched. For each, the website was 'hand searched' for potentially relevant documents. The first ten pages of each search's hits were reviewed for potentially relevant material. A targeted search of Google Scholar and WorldCat search engines was also performed.

Stage three refers to study selection. This was based on the Population, Concept, Context (PPC) mnemonic[11]. The population was Travellers. The concept referred to physical health conditions. There is no single definition of physical health conditions. We took this to mean any condition, including a disease or event (eg injury) that impacts the physical health

system. The context was quite broad and included Irish Travellers based in any location or setting. It was originally envisaged that this review would encompass 'health' in a more holistic way including mental and physical health conditions. Given the large scope of a review including both dimensions of health, a pragmatic decision was taken to consider physical health conditions only in this review and refine the search strategy appropriately[15] [13] . This included primary data documenting prevalence of physical health conditions and as well as perceptions of Travellers regarding physical health conditions experienced. Only English language sources were searched as it was expected the literature would be concentrated mainly in Ireland and the UK/other English-speaking jurisdictions. No date restriction was applied to generate a purposefully broad scope of the available literature. To meet the objective of the scoping review questions in this study, both quantitative and qualitative study designs were included, although it was expected data would be primarily quantitative in nature. Studies, regardless of study design, which examined physical health conditions of Travellers (>18 years) as a primary or secondary outcome measure were included. If intervention studies were included, only baseline data was extracted. Exclusion criteria were data which did not related to physical health conditions of Irish Travellers.

Duplications were removed and studies were imported into Covidence™ for title and abstract screening which took place independently by two reviewers (JB/FK). Both authors then conducted a full-text evaluation. If necessary, discrepancies were resolved by consensus by including a third author.

Stage four refers to charting the data. Relevant data pertaining to physical health conditions of Travellers was retrieved. Two reviewers (J.B. and F.K.) independently extracted data using a bespoke data extraction instrument[11]. The data extraction process took place from October 2021 – March 2022. The data extraction instrument was designed by review authors (JB and FK) based on the JBI template source of evidence details, characteristics, and results. Two review authors (JB and FK) independently extracted data from the first ten studies using the initially developed data extraction form and met to ascertain its suitability. Minor changes to the data extraction tool were made at this stage. The data extraction instrument collected the following data relating to included studies (author, title, year of publication, study aims/objectives, research design, living arrangements, location of participants, inclusion/exclusion criteria, data collection method, number of participants,

age (mean and standard deviation), biological sex, details of physical health condition reported and physical health conditions in the background comparison population. Any differences were resolved by consensus discussion. A third author (D.M.) was available if disparities emerged between reviewers.

Stage five refers to collating, summarizing and reporting of results. Data were reported for each selected study within each category as agreed on in the previous stage. Findings were mapped to summarize the range of evidence to present the breadth and depth of the field[13]. Tables were also presented to outline the research findings as defined in Stage four. As per scoping review methodological enhancements proposed by Levac[13], results were presented numerically and in a data driven approach were categorized meaningfully into subcategories of physical health conditions. Where available, data were compared to the background population. Implications for policy, practice and research were identified. Entries were independently checked by two authors (JB and FK).

Patient and Public Involvement

Stage six refers to patient and public involvement. Stakeholder/public involvement was integral to this review. The initial research question was generated from the principal author who has an interest broadly in the physical health of marginalised groups. In the planning phase, the research question evolved and was refined by engaging informally with the research team and a member of the Travelling community (AW) about this topic. In conversation, AW identified the poor physical health and prevalence of physical health conditions among many Travellers which consolidated the purpose of conducting this review. AW was then personally invited to join the review team. Her involvement began after the initial database search and continued throughout the data synthesis and write-up phases. A number of online meetings took place during which AW shared her perspectives verbally and in written form on early results, drafts and conclusions of the review as they emerged.

Results

Studies identified

The original search was performed on 09.03.21 (re-run 02.11.21 and 04.04.23). After removal of duplicates, 197 studies were identified. After excluding irrelevant studies, a total of 11 studies and 18 reports were deemed eligible for inclusion. Quantitative studies predominated (n=8), with two qualitative studies and one mixed methods study. Three were reports generated from the grey literature search while the remaining were generated from the systematic database search. The PRISMA flow chart summarises the search strategy (Figure 1).

Figure 1: PRISMA flow diagram ABOUT HERE

Study characteristics are shown in Supplementary Table 1. Over seven thousand participants (n=7397) were included with more than half (n=4,141) from the AITHS[9]. One study took part in the UK[16] and the remaining studies were based in Ireland, North and South. Living arrangements of participants were reported in three studies. In one study, a quarter (n=515) lived in a caravan, a trailer or a chalet[17] and in another, participants' accommodation included encampments, halting sites and social housing[18]. All (Traveller) participants in Mac Gabhann's study (n=296) resided in prisons in England and Wales[16].

Participants' characteristics are shown in Supplementary Table 2. The majority of studies included males and females with overall 61% of participants female. The UK based study included mostly male participants (93.6% male)[16] while one study was female only[19].The age profile of participants was predominantly young, with the majority in their second, third and fourth decade.

Using a data-driven approach, physical health conditions were categorised were categorized in the following way; cardiovascular disease (CVD), respiratory, genetic, injuries/musculoskeletal/arthritic disorders and gut/bowel conditions. Tables 1-4 summarise physical health conditions from included primary studies.

Table 1: Cardiovascular diseases

Physical Health Variable	**Authors**	**Result**
High tri-glyceride levels	Tan et al 2009[17]	High triglyceride level 23% (n=49%), males 89% (n=8), females 40% (n=15)
HDL/LDL	Tan et al 2009[17]	Low HDL level, 62% (n=29), males 78%, females 58% (n=22)
Impaired Fasting Glucose	Tan et al 2009[17]	Total: 19% (n=9), Males: 22% (n=2), females 18% (n=7)
Angina	AITHS, 2012[9]	4.3% Travellers, ROI (background population 2%) 2.1% Travellers, Northern Ireland
Diabetes Mellitus	AITHS, 2012[9]	6.1% Travellers, ROI (background population 3%) 6.1% Travellers, Northern Ireland
	Slattery et al, 2011[20]	5.9% Traveller sample (background population 4.3%)
	Tan et al 2009[17]	8.5% Traveller sample (background population 4.3%)
Pre-diabetes	Slattery et al, 2011[21]	9.3% (background population 6.2%)
	Tan et al 2009[17]	11.6% Traveller sample (background population 6.3%)
'Heart Attack'	AITHS 2012[9]	2.3% Travellers, ROI (background population <1%)

		2.1% Travellers, Northern Ireland
Systolic BP ≥ 130mmHg	Tan et al 2009[17]	Total 43% (n=20), Males: 22% (n=2), Females 47% (n=18)
Diastolic BP ≥ 85 mmHg	Tan et al 2009[17]	Total 38% (n=18), Males: 44% (n=4), Females 37% (n=14)
Metabolic Syndrome	Slattery et al 2011[20]	39.3% Traveller sample (background population 21%)
	Tan et al 2009[17]	53.2% Traveller sample (background population 21.0%)
Self-reported CVD	McGorrian et al, 2010/2012[22 23]	-Self-reported CVD was 5.6% (5.8% in men and 5.5% in women), compared to 16.1% in the general Irish population. -The prevalence of CVD increased with age and the Travellers who reported CVD were older (mean age 54.06 ±14.48 V 34.99 ±13.85). -No significant difference in the prevalence of reported CVD, hypercholesterolaemia and hypertension between the comparator groups was found. -However, diabetes, smoking, consumption of salt and fried food and physical inactivity is more frequent in Travellers. -Significant positive association was found between CVD and age, high cholesterol, hypertension, diabetes and current/former V never smoking, drinking alcohol and increasing discrimination. -Significant negative association was found between CVD and self-rated health, consumption of fried food and trust of others.
	Kelleher et al, 2012[24]	-Self-reported BP, cholesterol, diabetes screening by GP (48%, n=1996)

ROI: Republic of Ireland

Table 2: Respiratory diseases

Disease and variable measured	Authors	Result
TB: incidence rate	O'Toole et al, 2015[25]	- Higher incidence rate and younger age in Irish travellers than white Irish-born and general population: - CIR of TB in the Traveller population was <5/100000 population per annum from 2002-2009. This increased after 2010 and CIR >10/100000 population per annum 2011-2013. - From 2002-2013, the CIR of TB decreased in the general population (10.5/100000 in 2002 to 8.3/100000 in 2013). - CIR for TB in Travellers was about 3-fold higher than that of white born Irish population in 2011 and 2012. - In 2013, the CIR in Travellers increased to 40.6/100000 following an outbreak. - 5-year cumulative CIR 2009-2013: o Travellers: 81.4/100000 o General pop: 45.5/100000 o White Irish-born: 27.3/100000 - When AITHS population data was used to calculate CIR rather than the CSO Census data, the CIR was lower. Regardless of the method of data collection of CIR, the rate was still higher in Irish travellers than the general population/white Irish born. - Average incidence by age was higher for the Traveller population, majority in 0-34 age group, compared to the general population where the majority was in the 25-65 age group and in the white Irish-born population where the majority was in the 55 to > 65 age group.
COPD: number of smokers, presence of respiratory symptoms, diagnosis of asthma & spirometry	Nolan et al, 2017[26]	- 41% were current smokers, 6/14 non-smokers regularly exposed to passive smoke - 86% of smokers reported respiratory symptoms including cough, wheeze and shortness of breath - 10/35 had GP diagnosis of asthma - 23% (7/30) had obstructive pattern

Chronic bronchitis	AITHS, 2012[9]	- 12% Travellers ROI, 9.4% Travellers Northern Ireland, (background population 3%)
Asthma	AITHS, 2012[9]	- 12.5% Travellers ROI, 25.7% Travellers Northern Ireland, (background population 6%)

Table 3: Injuries/Musculoskeletal/Arthritic disorders

Details of non-fatal injuries	Authors	Result
'Back condition'	AITHS, 2012[9]	- 30.4% Travellers, ROI (background population 16%) - 25.2% Travellers, Northern Ireland
Arthritis	AITHS, 2012[9]	- 13.8% Travellers, ROI (background population 11%) - 13.2% Travellers, Northern Ireland
Injury **(prevalence of injury and intentional/unintentional)**	Abdalla et al, 2013[27]	- Travellers had a higher incidence of intentional injuries, SIR = 224 for intentional injuries (male = 181, female = 268) - Travellers had a lower incidence of unintentional injury than the general population: SIR = 44 (male = 42, female = 46). - Travellers over 65 years were twice as likely to report an injury than the general population.

		○ Overall injury SIR for Travellers aged 15-64 years = 59 & 65 years +=208 ○ Intentional injury SIR for Travellers >65 years = 517 ○ Unintentional injury SIR for Travellers >65years= 137. Overall injury SIR for Travellers >65years = 208.
Injury **(Question from Dimension 4 Lifestyle and health behaviour of the health status interview)**	Kelleher et al 2012[24]	'Free of injuries in the last 2 years vs. one or more injury': 88.7% (n=1800)

SIR: standardised incidence ratio (ratio of the observed number of Traveller non-fatal injuries to that expected if Travellers experienced the age-specific retrospective incidence of non-fatal injury of the general population)

Table 4: Genetic diseases, other conditions and self-rated health

Details of Genetic disease		Author	Result
Phenotype	Medical history, clinical observation & physical examination	Cullinane, Lynch and Marnane, 2020[28]	Case of leukoencephalopathy described. Patient presented with short stature, pes planus, hypotonia, history of osteogenic sarcoma Participants' medical history: Epilepsy, multiple cerebral cysts (removed by craniotomy/cyst excisions over the course of 15 years from age 5), left ventriculo-peritoneal shunt inserted and later removed, multiple vascular malformations of the capillary-cavernous type with associated haematomas, surrounding gliosis, hemosiderin deposition, Rosenthal fibres and areas of white matter calcification.
	Blood & urine testing	Flynn et al 1989[29]	Type II hyperprolinaemia (n=13, including 7 adults) Mild hyperprolinaemia (n=50, proportion of adults unclear) Seizures from hyperprolinaemia: 4 adults suffered grand mal seizures, 1 of whom had a severe mental handicap, 1 suffered from petit mal seizures.
Genotype	Whole exome sequencing	Cullinane, Lynch and Marnane, 2020[28]	Identified a homozygous variant of the SNORD118 gene. The sister of this case, with milder symptoms was homozygous for the same variant.
Other conditions			
Chronic inflammatory bowel disease		McCormick et al, 2001[30]	No recorded traveller with idiopathic inflammatory bowel disease
Cancer		AITHS, 2012[9]	1% Travellers, ROI (background population 1%) 0.3% Travellers, Northern Ireland
Physical Health problems		Mac Gabhann [16]	Out of sample n=281 Travellers in a UK prison, the following physical health conditions were reported. asthma (n=12), 'back' problems (n=10), epilepsy (n=9) and arthritis (n=7)

Self-rated Health:		
'Chronic health condition diagnosed by GP'	Kelleher et al, 2012[24]	41.5% (n = 2022)
Physical Health not good ≥ 1 day in last month	(Dimension 6 in Health Status Interview)	59.3% (n=1843)
Daily activity or work limited due to a long-term illness, health problem or disability		17.2% (2012)

*Doctor diagnosed illness in previous 12 months

Three studies reported cardiovascular diseases (Table 1). Tan et al, (2009)[17] reported the following CVD risk factors among study participants (n=47); high triglyceride levels (23%), low HDL cholesterol levels (62%), impaired fasting glucose levels (19%) and hypertension (systolic BP ⩾ 130mmHg 43% and diastolic BP ⩾ 85mmHg 38%). The prevalence of diabetes, pre-diabetes and the metabolic syndrome evaluated in a series of pilot studies was higher than the general population[20]. The incidence of metabolic disease was over twice as high among Travellers (53.2%) compared to the background population (21%)[20]. Self-report CVD was approximately 5%, compared to a self-reported CVD rate of 16.1% in the general population[9].

Two studies explored respiratory conditions (Table 2)[25 26]. One study reported a five-year tuberculosis (TB) cumulative crude incidence rate (CIR) of 81.4/100000 in Travellers compared to 45.5/100000 and 27.3/100000 in the general population and white Irish-born population, respectively[25]. Rates of TB were therefore three-fold higher in Travellers than the white Irish-born population[25]. Nolan et al (2017) reported that 41% of Travellers were smokers and 86% of these smokers reported respiratory symptoms including cough, wheeze and shortness of breath while 23% had an obstructive respiratory disease pattern[26]. Respiratory conditions (bronchitis and asthma) were rated as the second most common physical health condition, with a prevalence of 24.5% among Travellers in the ROI and 35.1%

in Northern Ireland[9]. This is considerably higher than available comparison ROI background population of 3% with chronic bronchitis[31].

Abdalla et al (2020) evaluated injuries[27] (Table 3). They demonstrated that the prevalence of unintentional non-fatal injury in Travellers < 65 years was lower (SIR=40), while the prevalence of intentional injury was higher (SIR=213) than the general population. Travellers > 65 years had higher injury rates for both unintentional (SIR=137) and intentional injuries (SIR=517). Common physical health problems reported by a population of 281 Travellers in prison in the U.K. were asthma (n=12), 'back' problems (n=10), epilepsy (n=9) and arthritis (n=7)[16].

Two studies (Table 4) examined genetic disorders both inherited in an autosomal recessive manner. One was a case report of a 32 year-old female who inherited a rare leukoencephalopathy and severe central nervous system (CNS) impairment was reported[28]. Flynn et al (1989) also reported CNS dysfunction in Travellers due to the presence of Type II hyperprolinemia[29].

One study examined effects of lifestyle changes on the microbiome and its associated risks for chronic disease[18]. Results demonstrated that Travellers retained a microbiota similar to that of non-industrialised populations due to halting site dwelling, number of siblings and animal ownership. Another study evaluating the prevalence of inflammatory bowel disease found no records of idiopathic bowel disease in the Traveller population.

Most Travellers described their health as very good (59%) or good (28%)[9]. Comparable figures among the general population are similar at 62% and 29%, respectively[31]. Twelve percent of Travellers described their health as fair, bad or very bad[9]. The corresponding figure for non-Travellers was 9%[31]. Breaking this down for 34-54 year age group, 31% of Travellers[9] categorised their health as 'very good' compared to 57% among non-Travellers[31]. In this age group, 29% of Travellers[9] had health categorised as 'fair', 'bad' or 'very bad' while the comparable figure in non-Travellers was 8%[31].

Three studies conducted qualitative or mixed methods research. In the Mac Gabhann (2011) which explored experiences of Travellers in prison in the UK[16], prison staff completed 296 surveys, while 57 Travellers (of Irish origin), predominantly male (93.6%) participated in

focus groups and semi-structured interviews. Almost a quarter (24.6%) of prisoners reported physical health problems and Travellers reflected negatively on the use of healthcare prison facilities to manage their health condition.

> *'I'll never go back to them, they've done nothing for me'.*

Murphy (2016)[32] explored the experiences of homelessness for Travellers through qualitative interviews of 14 Travellers in one county in the Republic of Ireland. They vividly described the negative impact of homelessness had on their physical health.

> *'I never had blood pressure in my life. Now, the last year and a half, ever since the time we had to leave (the rented house), I'm taking blood pressure tablets.'*

Collateral relevant to family members was also reported.

> *'My mother is on a breathing machine because she has a sleeping disorder so in the, in the night time if she would knock it off, she goes into her, what's it a coma. And with the sleeping disorder it cut's your oxygen from your throat to your brain, so that leads to a heart attack or a stroke'.*

Murphy described health problems that participants directly attributed to their homeless state or living conditions (on a site with no toilet) such as chronic kidney infections. Limited access to electricity was a problem identified as well as a lack of refrigeration to store fsleeping rough as he had nowhere else to keep it.

Hodgins et al (2006)[19] explored, through focus groups, perceptions of illness causation and health inequalities in 41 Traveller women in two regions in Ireland. Themes of poor living conditions, discrimination, stress, anxiety, depression and violence described their perceptions of the cause of their poor health. Traveller women attributed other health conditions such as heart disease to the stresses of their life and considered risk factors such as smoking as less important factors and often beneficial to health status.

> *'People have a lot of worry, a lot of stresses and can develop heart disease and heart attacks…'.*

The interaction of poor accommodation and health was also noted.

''An awful lot of it comes from bad accommodation and discrimination. I keep sayin' those two words an' I know well it's those that are causing' the most problems. causin' heart problems and depression''

Discussion

This scoping review appears to be the first-time that data relating to physical health conditions of Travellers has been synthesised. Pooling the evidence together underlines two key findings. Firstly, the disproportionately high burden of physical health conditions such as the metabolic syndrome, asthma, bronchitis, TB and intentional injuries which were 2-3 times higher in Travellers compared to the background Irish population. Secondly, the unique health considerations such as rare genetic diseases experienced by a proportion of Travellers and the possibility of health benefits associated with their distinct gut microbiome linked to the traditional Traveller way of life.

Over 7,000 Travellers were included in this review with the largest source of data from the AITHS (n=4,141)[9]. One study took place in England and Wales, while the rest of studies were based in Ireland. Living conditions were not specified in the majority of studies. This is important to note as living conditions are a key driver of health[33] which is rated higher by Travellers when living conditions are better[18 24].

There was a higher representation of females (61%) within this review. This may be explained by findings from the AITHS highlighting that female Travellers were more likely to engage in research studies[9]. The majority of participants were in their second to fourth decades, which concurs with CSO (2016) data[5] demonstrating that Travellers are a young population**.** The paucity of older participants means that the effects of ageing and extent of geriatric syndromes in this population are not fully known.

This review showed high rates of the metabolic syndrome, CVD risk factors and established CVD disease compared to the background population, yet lower self-reported CVD of approximately 5.6%[23], which was less than self-reported CVD rate of 16.1% for the general population[31]. This likely underestimation of CVD among Travellers may be due to a reluctance to divulge information and/or a lack of disease awareness, fewer attendances for preventive services as well as late presentation and higher case-fatality rates of CVD[9].

Evidently, improved targeted primary and secondary care strategies for Travellers are required.

Respiratory conditions (bronchitis and asthma) were rated as the second most common physical health condition, with a prevalence of 24.5% among Travellers in the ROI and 35.1% in Northern Ireland[9] which is markedly higher than the comparison ROI background population of 3% with chronic bronchitis[31]. This concurs with Nolan's findings where 28.5% of Travellers had a GP diagnosis of asthma and 23% had abnormal spirometry results[26]. Rates of TB were three-fold higher in Travellers than the white Irish-born population[25]. Proposed risk factors were cited as higher house occupancy, smoking and the presence of diabetes or pre-diabetes.

Travellers suffer a greater burden of injuries and a higher risk of dying from injuries than the general population[27]. Notably, a higher rate of intentional injuries was reported, and a lower rate of unintentional injuries compared to the general population. The high rate of intentional injuries likely links to mental health crises among Travellers with a suicide rate six times the general population[9]. The true intentional-injury rates may be in fact higher as Travellers may not present themselves to care settings for minor injuries, and may be more inclined to self-treat or present late for care[9]. Conversely, there may actually be a lower unintentional-injury rate due to lower participation in sport and recreational activities in young Travellers. Travellers over 65 years, however, were twice as likely to be injured, highlighting their vulnerability. The AITHS (2010) cited the home as the most likely location for an injury, which may be due to poor living environments[9]. This is in accordance with a recent report, which highlighted grossly inadequate living conditions among Travellers[34].

This review highlighted genetic conditions such as Type II hyperprolinaemia[29] and leukoencephalopathy[28]. These represent an important factor affecting physical health in Travellers as autosomal recessive conditions are commonly reported[35]. Of note, some studies (n=5) examining inherited disorders such as congenital atrichia, a rare autosomal recessive disorder were excluded from this review as they did not meet the age eligibility criteria. Given that genetic conditions are prevalent in Travellers, consideration of 'grown up' genetic conditions should be an area of emerging focus.

Positive physical health factors linked to the gut, were discussed in two studies[18 30]. McCormick et al (2001) noted the absence of consultant-diagnosed inflammatory bowel disease possibly due to exposure to enteric bacteria and infection in early life[30]. Keohane et al (2020) suggested the 'non-industrialised microbiome' of Travellers may be due to living conditions and animal ownership[18]. How the gut microbiome changes with modernisation should be evaluated in future studies.

When comparing Travellers to non-Travellers (35–54 age group), Travellers are approximately three times as likely to have poor health or some type of difficulty or disability with the health gap rapidly increasing with age, which mirrors the pattern in other ethnic minority groups.[36] A UK based study found that compared to white British people and 17 different ethnic minority groups, Gypsy and Irish Travellers (with the exception of younger and older age groups) had markedly high levels of multiple long-term conditions[37]. Another study found inequalities in health-related quality of life were widest for Gypsy or Irish Travellers, Pakistani and Bangladeshi women[38].

In a similar way to Travellers experiencing a high burden of physical health conditions compared to the background population, poorer health is experienced by the Roma population compared to non-Roma across Europe[39]. For instance, a high prevalence of tuberculosis has been detected in the Roma population[40]. Other diseases have been described in Roma, such as hepatitis A[41] and hepatitis C virus (HCV) and HIV[42]. An outbreak of Hepatitis A in Travellers was described in the literature[43] but was not included in the current review due to the high proportion of participants under 18 years. A high prevalence of measles was documented in Roma[44], a number of papers also described measles outbreaks in Irish Travellers[45] but similarly were also excluded from the present review due to the proportion of children in these papers.

A strength of this review is the synthesis of data relating to physical health conditions of Travellers based in England and Wales, ROI and Northern Ireland. A further strength was the active stakeholder involvement by the inclusion of a member of the Travelling community as an integral and valued member of the review team. This ensured the real-world relevance of this research and is likely to increase chances of implementation of research findings into real life settings[46].

There were a number of limitations. As is the general convention in scoping reviews a formal quality assessment of included studies[11 12] was not conducted therefore, the robustness of evidence[12] could not be judged. We acknowledge that definitive recommendations are not possible and the review must be interpreted in light of this[11 12]. We therefore see this work as a useful accessible summary of the evidence base regarding physical health conditions in Travellers[11 47]. As previously stated, the initial intention was to perform a review encompassing physical and mental health conditions, however, a pragmatic decision was taken to include physical health conditions only which we acknowledge is somewhat unidimensional as physical and mental health conditions are inter-related and multi-morbidity can straddle both.

The AITHS which is over 10 years old remains the most comprehensive report of Traveller health and is quoted widely in subsequent reports. It highlighted four priority areas for intervention: mother and child services; men's health; cause-specific issues for respiratory and cardio-vascular disease; and a new model of primary care delivery. The importance of using a 'social determinants' approach linking inequalities in healthcare, accommodation, and other factors such as racism and discrimination to poor health was also advocated[9]. With a stark 39% of Travellers estimated to be homeless, this negatively affects overall health and well-bring and compounds health inequalities[48]. The long awaited recently published National Traveller Health Action Plan (2022)[49], relevant to the Republic of Ireland, contained 45 key actions around resourcing, identifying, reinstating, and expanding Primary Health Care for Traveller Projects and engaging with public health. It also echoed a social determinants approach with targeted and mainstream strategies to overcome inequalities. This was also advocated in the National Traveller and Roma Inclusion Strategy 2017-2021 (NTRIS)[50]. Another important approach of the National Traveller Health Action Plan is a 'whole-of-government approach' with integrated cross sectoral working. All of these approaches if implemented should impact the burden of physical health conditions in Travellers but there is a sense of policy conflict[51], policy fatigue and policy failure in the absence of tangible action on recommendations.

More is known about physical health conditions in Irish-based Travellers and policies described are relevant to this setting. Less is known specifically about the physical health conditions of UK based Irish Travellers. Some research collectively pooled data from gypsies

and Irish Travellers as well as other Traveller groups. Although all these groups experience discrimination, poor living conditions and health inequalities, how these groups vary in relation to physical health conditions is not well known.

Ethnic identifiers would enable physical health conditions to be more accurately tracked but this would need to be conducted sensitively. This is line with a key recommendation of the National Traveller Health Action Plan (2022-2027)[49], which recommends systematic ethnic equality monitoring, including the introduction of ethnic identifiers on health data sets. Due to the inter-relationship between living conditions and health, living conditions need to be radically improved and studies including Travellers should include data on living arrangements.

It should also be considered that the extent of physical health conditions may be underestimated due to Travellers not presenting or presenting late for care as well as a mistrust of healthcare professionals[9]. The co-development of trust-building mechanisms and improved cooperation between Travellers and healthcare professionals has been recognized as important strategies to improve Travellers' access and engagement with mainstream health services[52]. Non-communicable diseases such as cancer and arthritis in Travellers featured minimally within this review. The health of older Travellers was not specifically explored, which may be partly due to the mortality gap. Further work is needed on how best to build confidence and empower Travellers to self-manage their health without 'talking at them'. Functional literacy and health literacy levels need to be optimised while also reducing the stigma associated with accessing healthcare[9]. Supporting Traveller groups to co-design culturally appropriate health literacy resources has been identified as crucial to improve understanding of pathways to access services and signs and symptoms of different health conditions[52]. Health care staff can be discriminatory in their attitudes[53] which also needs attention. At a broader level, healthcare service design needs to be culturally appropriate. A recent study exploring Travellers' views about how existing healthcare provision could be more responsive to their needs found that employing members of the community within the health service, embedding an ethos of cultural safety and humility and delivering Traveller Cultural Awareness Training to healthcare staff would improve the cultural appropriateness of mainstream health services[52].

Ultimately, ethnic inequalities in health, relevant to Travellers and other ethnic minority groups are closely linked to racism and discrimination as well as the social determinants of health such as housing, education, employment and income which are strongly associated with poor health[54]. These underlying factors therefore need to be tackled to impact health.

Conclusion

This scoping review highlights marked inequalities in the burden of physical health conditions experienced by Mincéirí. Many common physical health conditions were 2-3 times more prevalent in Travellers compared to the background population. Multifaceted and tangible action is required including better targeted approaches and accommodations within mainstream healthcare, underpinned by a social determinants approach, to bridge the gap in physical health conditions experienced by this marginalised group.

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Author's contribution

FK**;** independent data screening, data extraction, data synthesis, drafting of manuscript**,** AW**;** contribution to the development of the design, drafting of manuscript, JV; drafting of manuscript**,** DM; generation and refinement of search strategy, JB; conception of original idea and deigning the study, refinement of search strategy, independent data screening, data extraction, data synthesis, drafting of manuscript. All authors provided important

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Figure Legend

Figure 1 PRISMA flow diagram

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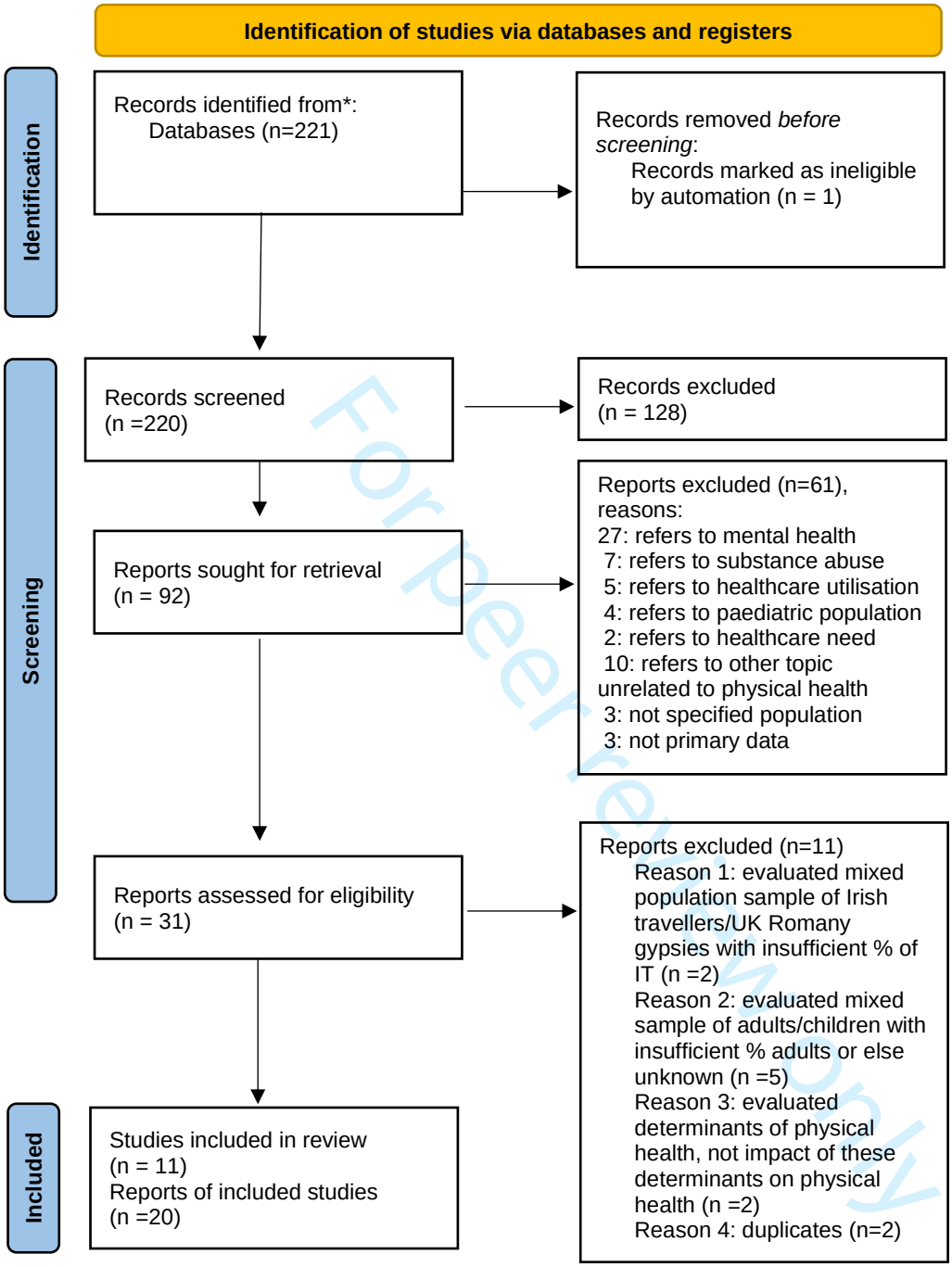
PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only



Supplementary Box 1: Full search details

EMBASE

'health'/exp OR 'health status'/exp OR 'mental health'/exp OR 'mental disease'/exp OR 'physical disease'/exp
((Mental* OR psychological*) NEAR/2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR 'well being' OR stress* OR distress OR disease*)):ti,ab
(depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*):ti,ab
((physical*) NEAR/3 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)):ti,ab
((cardiac OR cardiovascular OR heart) NEAR/3 (health OR disorder* or disease*)):ti,ab
('health study' OR 'health studies'):ti,ab
#1 OR #2 OR #3 OR #4 OR #5 OR #6
((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) NEAR/3 (traveller* OR gypsy OR gypsies)):ti,ab
#7 AND #8

Medline (OVID)

exp Health/ OR exp Health Status/ OR exp Mental Disorders/ OR exp Chronic Disease/ OR exp Health Behavior/
((Mental* OR psychological*) adj2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR well being OR stress* OR distress OR disease*)).ti,ab.
(depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*).ti,ab.
((physical*) adj3 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)).ti,ab.
((cardiac OR cardiovascular OR heart) adj3 (health OR disorder* or disease*)).ti,ab.
(health study OR health studies).ti,ab.
or/1-6
((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) adj3 (traveller* OR gypsy OR gypsies)).ti,ab.
7 AND 8

Web of Science

TS =((((Mental* OR psychological*) NEAR/2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR "well being" OR stress* OR distress OR disease*)) OR (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*) OR ((physical*) NEAR/3 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)) OR ((cardiac OR cardiovascular OR heart) NEAR/3 (health OR disorder* or disease*)) OR ("health study" OR "health studies")) AND ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) NEAR/3 (traveller* OR gypsy OR gypsies)))

GoogleScholar

"Irish travellers|traveller" "mental health|fitness|status|distress" "physical fitness|health|status|illness"

CINAHL

(MH "Mental Health") OR (MH "Mental Health Services+") OR (MH "Health Status+") OR (MH "Physical Fitness+") OR (MH "Psychological Well-Being")
TI ((Mental* OR psychological*) N2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR "well being" OR stress* OR distress OR disease*)) OR AB

((Mental* OR psychological*) N2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR “well being” OR stress* OR distress OR disease*))
TI (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*) OR AB (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*)
TI ((physical*) N2 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)) OR AB ((physical*) N2 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness))
TI ((cardiac OR cardiovascular OR heart) N3 (health OR disorder* or disease*)) OR AB ((cardiac OR cardiovascular OR heart) N3 (health OR disorder* or disease*))
TI (“health study” OR “health studies”) OR AB (“health study” OR “health studies”)
S1 OR S2 OR S3 OR S4 OR S5 OR S6
TI ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) N3 (traveller* OR gypsy OR gypsies)) OR AB ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) N3 (traveller* OR gypsy OR gypsies))
S7 AND S8

SCOPUS

TITLE-ABS-KEY ((((Mental* OR psychological*) W/2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR “well being” OR stress* OR distress OR disease*)) OR (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*) OR ((physical*) W/3 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)) OR ((cardiac OR cardiovascular OR heart) W/3 (health OR disorder* or disease*)) OR (“health study” OR “health studies”)) AND ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) W/3 (traveller* OR gypsy OR gypsies)))

PsycINFO

DE "Mental Health" OR DE "Health" OR DE "Health Literacy" OR DE "Health Status" OR DE "Physical Health" OR DE "Health Attitudes" OR DE "Health Behavior" OR DE "Health Risk Behavior" OR DE "Mental Disorders" OR DE "Chronic Mental Illness"
TI ((Mental* OR psychological*) N2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR “well being” OR stress* OR distress OR disease*)) OR AB ((Mental* OR psychological*) N2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR “well being” OR stress* OR distress OR disease*))
TI (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*) OR AB (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*)
TI ((physical*) N2 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)) OR AB ((physical*) N2 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness))
TI ((cardiac OR cardiovascular OR heart) N3 (health OR disorder* or disease*)) OR AB ((cardiac OR cardiovascular OR heart) N3 (health OR disorder* or disease*))
TI (“health study” OR “health studies”) OR AB (“health study” OR “health studies”)
S1 OR S2 OR S3 OR S4 OR S5 OR S6
TI ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) N3 (traveller* OR gypsy OR gypsies)) OR AB ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) N3 (traveller* OR gypsy OR gypsies))
S7 AND S8

Supplementary Table 1: Study Characteristics

No	Author(s) and Title	Study Aims & Objectives	Research Design	Living Arrangements	Location of participants	Inclusion/Exclusion Criteria	Data Collection Method
1	**The All Ireland Traveller Health Study (AITHS)**	-To record the number of Travellers on the island of Ireland -To record fertility rate and deaths in one year -To follow a birth cohort for 1 year -To document health status and determine factors affecting the health status of Travellers and their access to health services -To document attitudes/perceptions of Travellers to health services	Census and quantitative study	Documented in some studies/reports	Island of Ireland North and South	Travellers from island of Ireland	Survey-census section, health status section, health status for children, health services utilisation for adults.

1.a	Abdalla et al, 2020. **'Disparities in fatal and non-fatal injuries between Irish travellers and the Irish general population are similar to those of other indigenous minorities: a cross-sectional population-based comparative study'**	To assess disparities in fatal and non-fatal injury between travellers and the general population in Ireland	Comparative study based on cross-sectional population-based data.	Not stated	ROI	Inclusion: -Irish Travellers who participated in the AITHS -Aged 15 years or older.	*Traveller data*: -from the AITHS -from the General Register Office -CSO -PHNs working with traveller families. *General population data*: - from the CSO 2008 report 2006 census and the Survey of Lifestyle, Attitude and Nutrition (SLAN) 2002.
1.b	(i) Kelleher et al, 2012 **Sociodemographic, environmental, lifestyle and psychosocial factors predict self-rated health in Irish Travellers, a minority nomadic population** (ii) Whelan et al, 2010. **Socio-demographic, health status, psycho-social and lifestyle predictors of self-rated health in the All-Ireland Traveller Health Study (abstract)**	Aim: to assess the predictive ability of socio-demographic, environmental, lifestyle and psychosocial factors to self-rated health.	Census survey of Traveller families in Ireland, North and South (AITHS)	75% (n=1547) live in house/apartment 25% (n=515) live in caravan/trailer/ chalet	ROI/Northern Ireland	Inclusion: Self-identified Travellers in the Republic and Northern Ireland	Health Status survey: subjective questions around lifestyle, culture, social experiences/supports, health behaviour and self-reported health status.

1.c	(i)Mc Gorrian et al, 2010 **Adverse cardiovascular risk profile in a disadvantaged minority community consistent with the thrifty phenotype hypothesis. Findings from the All-Ireland Traveller Health Study (Abstract)** (ii) McGorrian et al, 2012 **Cardiovascular disease and risk factors in an indigenous minority population. The All-Ireland Traveller Health Study.**	Aim: To examine CVD epidemiology and CVD risk factors in Irish Travellers and associations with social disadvantage.	Observational study	Not stated	A random sample (20%) of participants in the AITHS	Inclusion: All self-identified Traveller families on the island of Ireland were invited to participate.	AITHS: health survey via an oral-visual data collection instrument
2	Cullinane et al, 2020. **'Phenotypic Variability in Leukoencehalopathy with Brain Calcifications and Cysts: Case reports of siblings from an Irish Traveller Family with a Homozygous SNORD118 Mutation'**	To describe a case report of an Irish traveller with a leukoencephalopathy and an inherited mutation in the SNORD118 gene.	Case report	Not stated	Not stated	Inclusion: 32 year old female Irish Traveller with leukoencephalopathy.	Clinical examination, family history, medical history including birth history, medications, histopathology investigations, genetic studies.

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3	Flynn et al, 1989 **Type II Hyperprolinaemia in a pedigree of Irish travellers (nomads)**	Aim: not stated but to investigate Type II hyperprolinaemia in Irish Travellers	Descriptive study	Not stated	Not stated	Inclusion: not clearly stated but family of the 'proband' and close relatives	Testing of urine by two-dimensional paper chromatography, those showing prolinuria had blood samples taken in plain tubes and their serum or plasma proline concentrations were determined on a Locarte amino acid analyser. In many cases no urine was collected but a blood sample was.
4	**Hodgins et al, 2006** **''… it's all the same no matter how much fruit or vegetables or fresh air we get''. Traveller women's perceptions of illness causation and health inequalities**	Aim: to explore health, ill-health and health inequalities in Traveller women	Qualitative study	Not stated	Not stated	Inclusion: not explicitly stated but appears to be Traveller women accessing pre-existing community projects or adult education initiatives	-response to a vignette in focus groups
5	Keohane et al, 2020. **Microbiome and health implications for ethnic minorities after enforced lifestyle changes.**	Aim: to investigate whether recent lifestyle changes are associated with differences in the microbiome and risk factors for chronic disease.	Cross-sectional study.	Within 30km radius of Cork city at one of five locations. Varied from permanent encampment, halting sites or social housing.	Cork	Inclusion: None of the participants had taken antibiotics within 1 month and none were taking laxatives, corticosteroids, anti-inflammatories or anticoagulants	- Fecal microbiota of Irish Travellers were collected and compared with that of the settled background population in the same geographic locality and with that from individuals in other industrialised and non-industrialised countries.

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				NB 87% of participants were nomadic in childhood but their living conditions had since changed.			-Dietary habits were assessed via questionnaire -Body composition was assessed by DXA. -Well-being was assessed by the WHO-5 Well-Being Index -Personal, medical and family history was recorded
~~2~~ ~~2.a~~ ~~2.b~~	~~(i)Slattery et al, 2011~~ ~~**The point prevalence of diabetes, pre-diabetes and metabolic syndrome in Irish travellers**~~ ~~**Abstracts**~~ ~~(ii) Slattery et al, 2011~~ ~~**The prevalence of diabetes, pre-diabetes and metabolic syndrome in Irish Travellers and the impact of lifestyle modification (abstract)**~~ ~~(iii) Slattery, Brennan, Canny, Sweeney, Ward, O' Shea and Dunne~~	~~Aim for all: to evaluate CVD risk factors and the point prevalence of diabetes, pre-diabetes and metabolic syndrome in the Irish Traveller population.~~	~~Observational pilot study~~ ~~abstract only~~	~~N/S~~	~~Travellers living along 'western seaboard' recruited from Galway and Western Traveller movements~~	~~Inclusion: Travellers (>18 years)~~	~~The following outcomes were evaluated; glucose levels, lipid profiles, oral glucose tolerance tests, blood pressure, weight, height and waist circumference.~~

2.c 2.d	Cardiovascular health in the Irish Traveller community (iv) Slattery et al, 2011 The prevalence of diabetes, Pre-diabetes and the Metabolic Syndrome in Irish Travellers Tan et al, 2009 Traveller Health: Prevalence of Diabetes, Pre-Diabetes and the Metabolic Syndrome (abstract)						
3	Cullinane et al, 2020. 'Phenotypic Variability in Leukoencephalopathy with Brain Calcifications and Cysts: Case reports of siblings from an Irish Traveller Family with a	To describe a case report of an Irish traveller with a leukoencephalopathy and an inherited mutation in the SNORD118 gene.	Case report	Not stated	Not stated	Inclusion: 32 year old female Irish Traveller with leukoencephalopathy.	Clinical examination, family history, medical history including birth history, medications, histopathology investigations, genetic studies.

	Homozygous SNORD118 Mutation[2]						
4	Flynn et al, 1989 Type II Hyperprolinaemia in a pedigree of Irish travellers (nomads)	Aim: not stated but to investigate Type II hyperprolinaemia in Irish Travellers	Descriptive study	Not stated	Not stated	Inclusion: not clearly stated but family of the 'proband' and close relatives	Testing of urine by two-dimensional paper chromatography, those showing prolinuria had blood samples taken in plain tubes and their serum or plasma proline concentrations were determined on a Locarte amino acid analyser. In many cases no urine was collected but a blood sample was.
5	McCormick et al, 2001 Chronic inflammatory bowel disease and the 'over-clean' environment: Rarity in the Irish 'Traveller' community.	Aim: to estimate the prevalence of inflammatory bowel disease in the traveller population.	Survey	N/A	Study was conducted in 11/26 counties in Ireland where 25/30 gastroenterologists were based	Inclusion: all gastroenterologists or surgeons working in the public health service in Ireland for at least three years at time of study, identified from the Irish Society of Gastroenterology.	Collected the number of members of the travelling community ever seen with inflammatory bowel disease and type of disease seen (Crohn's and Ulcerative colitis).

6	Keohane et al, 2020. **Microbiome and health implications for ethnic minorities after enforced lifestyle changes.**	Aim: to investigate whether recent lifestyle changes are associated with differences in the microbiome and risk factors for chronic disease.	Cross-sectional study.	Within 30km radius of Cork city at one of five locations. Varied from permanent encampment, halting sites or social housing. NB 87% of participants were nomadic in childhood but their living conditions had since changed.	Cork	Inclusion: None of the participants had taken antibiotics within 1 month and none were taking laxatives, corticosteroids, anti-inflammatories or anticoagulants	- Fecal microbiota of Irish Travellers were collected and compared - with that of the settled background population in the same geographic locality and with that from individuals in other industrialised and non-industrialised countries. - Dietary habits were assessed via questionnaire - Body composition was assessed by DXA. - Well-being was assessed by the WHO-5 Well-Being Index - Personal, medical and family history was recorded

6	Mac Gabhann, 2011 **Voices Unheard. A study of Irish travellers in Prison.**	Aim: to explore issues faced by Irish Travellers in prison	Mixed methods study	England/Wales	Prisons in England/Wales	Inclusion- -Irish travellers in prison -prison staff in prisons in England and Wales. Exclusion -Young Offenders Institution	1.Survey of Irish Travellers across the prison estate and a response form for prison staff involving prison officials and 2.A series of focus groups and semi-structured interviews with Irish travellers in seven prisons.
7	McCormick et al, 2001 **Chronic inflammatory bowel disease and the 'over-clean' environment: Rarity in the Irish 'Traveller' community.**	Aim: to estimate the prevalence of inflammatory bowel disease in the traveller population.	Survey	N/A	Study was conducted in 11/26 counties in Ireland where 25/30 gastroenterologists were based	Inclusion: all gastroenterologists or surgeons working in the public health service in Ireland for at least three years at time of study, identified from the Irish Society of Gastroenterology.	Collected the number of members of the travelling community ever seen with inflammatory bowel disease and type of disease seen (Crohn's and Ulcerative colitis).

7	O'Toole et al, 2015. **Tuberculosis incidence in the Irish Traveller population in Ireland from 2002 to 2013**	To examine data regarding TB notifications in Ireland from 2002 to 2013.	Descriptive epidemiological study	N/S	N/S	Inclusion: -all cases of TB reported by the National TB Surveillance System and CID, -cases reported in the Census of 2002, 2006 and 2011 and -cases reported by the AITHS.	Data were collected from National TB Surveillance System and Computerised Infections Disease Reporting system by the Health Surveillance Centre. Crude incidence rates (CIR) were calculated from the CSO and the AITHS data. 5 year cumulative CIR values were calculated for 2009-2013. Average incidence rates for 2002-2013 were calculated for each age group using CSO data.
8	**Murphy 2016** **Travelling through homelessness: A study of Traveller Homelessness in County Offaly**	Aim: To explore the experience of homelessness for Travellers in Co. Offaly and to describe how Travellers are accounted for within the definitions of homelessness used at a County level	Qualitative interview-based study	Current living conditions of participants varied but all had experienced homelessness in the previous year	Travellers residing in Co. Offaly	Inclusion: Member of the Travelling Community, living in Country Offaly, or have been living in County Offaly before a movement to emergency/temporary accommodation outside of the country, have experienced homelessness within the previous 12 months, be aged over 18 years	'Life history interviews' were conducted with participants.

98	Nolan et al, 2017 **Respiratory Health in an Irish Traveller Community**	Aim: to assess respiratory health in Irish Travellers	Observational study	N/S	Travellers residing in West Dublin	Inclusion: Irish Travellers > 18 years	Subjective and objective data collected: BMI, smoking history, respiratory symptoms, GP diagnosis of asthma and spirometry measures were taken
9	Mac Gabhann, 2011 **Voices Unheard. A study of Irish travellers in Prison.**	Aim: to explore issues faced by Irish Travellers in prison	Mixed methods study	England/Wales	Prisons in England/Wales	Inclusion Irish travellers in prison prison staff in prisons in England and Wales. Exclusion Young Offenders Institution	1.Survey of Irish Travellers across the prison estate and a response form for prison staff involving prison officials and 2.A series of focus groups and semi-structured interviews with Irish travellers in seven prisons.
10	O'Toole et al, 2015. **Tuberculosis incidence in the Irish Traveller population in Ireland from 2002 to 2013**	To examine data regarding TB notifications in Ireland from 2002 to 2013.	Descriptive epidemiological study	N/S	N/S	Inclusion: -all cases of TB reported by the National TB Surveillance System and CID, -cases reported in the Census of 2002, 2006 and 2011 and	Data were collected from National TB Surveillance System and Computerised Infections Disease Reporting system by the Health Surveillance Centre. Crude incidence rates (CIR) were calculated from the CSO and the AITHS data.

						-cases reported by the AITHS.	5 year cumulative CIR values were calculated for 2009-2013. Average incidence rates for 2002-2013 were calculated for each age group using CSO data.
11 11.a 11.b	(i)Slattery et al, 2011 **The point prevalence of diabetes, pre-diabetes and metabolic syndrome in Irish travellers** **Abstracts** (ii) Slattery et al, 2011 **The prevalence of diabetes, pre-diabetes and metabolic syndrome in Irish Travellers and the impact of lifestyle modification (abstract)** (iii) Slattery, Brennan, Canny, Sweeney, Ward, O' Shea and Dunne **Cardiovascular health in the Irish Traveller community**	Aim for all: to evaluate CVD risk factors and the point prevalence of diabetes, pre-diabetes and metabolic syndrome in the Irish Traveller population.	Observational pilot study- abstract only	N/S	Travellers living along 'western seaboard' recruited from Galway and Western Traveller movements	Inclusion: Travellers (>18 years)	The following outcomes were evaluated; glucose levels, lipid profiles, oral glucose tolerance tests, blood pressure, weight, height and waist circumference.

11.c 11.d	(iv) Slattery et al, 2011 **The prevalence of diabetes, Pre-diabetes and the Metabolic Syndrome in Irish Travellers** Tan et al, 2009 **Traveller Health: Prevalence of Diabetes, Pre-Diabetes and the Metabolic Syndrome (abstract)**						

Supplementary Table 2: Details of Study Participants

No	Author	Number of Participants	Age (Mean + SD)	Biological Sex
1	AITHS	4,141 adults interviewed	5-14 years: 26% 15-24 years: 21% 25-39 years: 21% 40-64 years: 13% 65 years+: 3%	Males: 1,817, Females: 2,324
1a	Abdalla et al, 2013	Non-fatal injury data in Travellers: n = 1663 Travellers	Aged 15 years +	Males = 702 (42%), Females = 961 (58%)
1b	Whelan et al, 2010 (abstract) Kelleher et al 2012	n= 2065	<30 years: 48% (n=945) 30-44: 28.6% (n=563) 45-64: 18.4% (n=362) >65: 5.1% (n=100)	Males: 43.5% (n=898), Females: 56.5% (n=1166)
1c	(i) McGorrian et al, 2010 (abstract) (ii)McGorrian et al, 2012	2023 Age, sex and CVD data was available on 1878 of the total sample of 2023 Comparator population: 10,364	18-29: 41.8% (n=784) 30-34: 31.6% (n=594) 45-59: 18% (n=338) 60-74: 7.5% (n=140) >75: 1.2% (n=22)	Traveller population: Males: 32% (n=601), Females: 68% (n=1277)

2	Cullinane, Lynch and Marnane, 2020	1	32 years	Female
3	Flynn et al 2020	*Whole sample: 312 Urine from 280, blood from 147. Adult sample with Type II hyperprolinaemia: 7	*Not stated for whole sample, but among 7 adults with Type II hyperprolinaemia the mean age was 27.9 years	*Not stated for whole sample, but among 7 adults with Type II hyperprolinaemia, 4 females and 3 males.
4	Hodgkins et al, 2006	41	Age range: 15-19 years: 15% 20-29 years: 51% 30-39 years: 20% >40 years: 14%	All female
5	Keohane et al, 2020	118	39 (+/-13 years sd)	Males =53(44.9%), Females = 65 (55.1%)
6	Mac Gabhann, C, 2011	453 (0.6% of prison population). Of this, 296 survey forms were completed. 57 travellers participated in the focus groups/interviews	Age range of IT prisoners: 20-30: 39.5% 30-40: 29.5% 40-50: 17.1% 15-20:8.5% 50-60:4.3% 60-70:1.1%	Male = 93.6%, female = 6.4% 1 female prison was visited out of 7 in total.

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7	McCormick and Manning, 2001	25	N/S	N/S
8	Murphy, 2016	14	N/S	N/S
9	Nolan et al, 2017	35	Mean age 44 years (18-69)	Males: 16; Females: 19
~~2a-e~~	~~5 reports:~~ ~~Tan et al, 2009, Slattery et al 2010, 2011~~	~~354 travellers were screened in the largest study~~ ~~*(Tan et al, n=47; Slattery 2010, n=187; Slattery 2011, n=285; Slattery 2011, n=353)*~~	~~Mean age 37 ± 11 (SD)~~	~~Males: 127; Females: 227~~
~~3~~	~~Cullinane, Lynch and Marnane, 2020~~	~~1~~	~~32 years~~	~~Female~~
~~4~~	~~Flynn et al 2020~~	~~*Whole sample: 312~~ ~~Urine from 280, blood from 147.~~ ~~Adult sample with Type II hyperprolinaemia: 7~~	~~*Not stated for whole sample, but among 7 adults with Type II hyperprolinaemia the mean age was 27.9 years~~	~~*Not stated for whole sample, but among 7 adults with Type II hyperprolinaemia, 4 females and 3 males.~~
10~~5~~	McCormick and Manning, 2001	25	N/S	N/S
~~6~~	~~Keohane et al, 2020~~	~~118~~	~~39 (+/- 13 years sd)~~	~~Males =53(44.9%), Females = 65 (55.1%)~~

11~~7~~	O' Toole et al, 2015	2060	Travellers: majority of cases were in 0-34 yrs age group (mean of 26 years, median of 24 years) General population: majority of cases were in the 25 to > 65 years age group (mean of 43 years, median of 38 years) Irish-born: majority of cases in 55 to >65 years age group (mean of 49 years, median of 49 years)	N/S
~~8~~	~~Nolan et al, 2017~~	~~35~~	~~Mean age 44 years (18-69)~~	~~Males: 16; Females: 19~~
~~9~~	~~Mac Gabhann, C, 2011~~	~~453 (0.6% of prison population). Of this, 296 survey forms were completed.~~ ~~57 travellers participated in the focus groups/interviews~~	~~Age range of IT prisoners:~~ ~~20-30: 39.5%~~ ~~30-40: 29.5%~~ ~~40-50: 17.1%~~ ~~15-20:8.5%~~ ~~50-60:4.3%~~ ~~60-70:1.1%~~	~~Male = 93.6%, female = 6.4%~~ ~~1 female prison was visited out of 7 in total.~~

12	Slattery et al. 2011 5 reports: Tan et al, 2009, Slattery et al 2010, 2011	354 travellers were screened in the largest study *(Tan et al, n=47; Slattery 2010, n=187; Slattery 2011, n=285; Slattery 2011, n=353)*	Mean age 37 ± 11 (SD)	Males: 127; Females: 227

N/S: not stated

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	Page 1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Page 1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Page 3
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Page 4
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Not applicable
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Page 4
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	Page 4
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supplementary file 1/Extended data
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Page 4
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Page 4
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page 4
Critical appraisal of individual	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe	Not applicable

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
sources of evidence§		the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Page 5
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Fig. 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Tables
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not applicable
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Tables and page 5-6
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Pages 5-6
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Page 7
Limitations	20	Discuss the limitations of the scoping review process.	Page 9
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Page 10
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Page 10

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

BMJ Open

Scoping review on Physical Health Conditions in Mincéirs - Irish Travellers

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Secondary Subject Heading:	Cardiovascular medicine, Respiratory medicine
Keywords:	PUBLIC HEALTH, PRIMARY CARE, Coronary heart disease < CARDIOLOGY

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Title page

Title: Scoping review on Physical Health Conditions in Mincéirs - Irish Travellers

Author and co-author names:

Kennedy F[1], Ward A[2], Mockler D[3], Villani J[4], Broderick J[1],

[1]School of Medicine, Trinity College Dublin, Ireland.

[2]Independant Public and Patient Expert, Belfast, UK.

[3]John Stern Library, Trinity College Dublin, Ireland.

[4]Health Service Executive, Dublin, Ireland.

Corresponding author details:

Name: Dr. Julie Broderick,

Address: Trinity Centre for Health Sciences, St. James's Hospital, Dublin D08W9RT, Ireland

E-mail: broderju@tcd.ie

Telephone: +353 1 8962110

Fax number: no fax

Keywords: Irish travellers, physical health, Ethnic minority, inequality

Word count: 2547

Abstract

Objective: The objective of this scoping review was to collate physical health conditions in Mincéirs - Irish Travellers

Design: Scoping review

Search Strategy and charting method: MEDLINE/PubMed, EMBASE, PEDro, AMED, CINAHL, PsycINFO, SCOPUS as well as reports and grey literature were searched for primary data reporting physical health conditions of Irish Travellers up to 04.04.23. Data was extracted, described and organised meaningfully into tables according to reported physical health conditions.

Eligibility criteria: The population was Travellers. The concept referred to physical health conditions. The context was Irish Travellers based in any location or setting. Exclusion criteria was data/research other than primary data relating to physical health conditions of Irish Travellers.

Results: From 198 citations generated from the database search, 11 unique studies (20 reports) were included in this scoping review, including n=7,397 participants. Driven by the data, physical health conditions were categorised into cardiovascular diseases, respiratory diseases, injuries/musculoskeletal/arthritic disorders, genetic disorders and gut/bowel conditions. This review showed that the metabolic syndrome, asthma, bronchitis, tuberculosis and intentional injuries were 2-3 times more prevalent in Irish Travellers compared to the background population. Genetic conditions were also described in a proportion of Travellers.

Conclusions; Overall Irish Travellers experience a disproportionate burden of physical health conditions compared to background populations. Health care providers need to be aware of the unique physical health burden experienced by many Irish Travellers. Multifaceted strategies are needed to improve the health profile of this vulnerable and marginalised group.

Strengths and limitations of this study

- The methods for this scoping review were informed by the scoping review guidance from the Joanna Briggs Institute and it was reported according to the Preferred Reporting Items for Systematic Review and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist.
- Screening and data extraction processes were performed in duplicate.
- Stakeholder involvement was integral to this review, as a member of the Travelling community was one of the co-authors of this work.
- This was the first time all studies, reports and grey literature were comprehensively reviewed and collated to provide a broad picture of physical health conditions of Irish Travellers.
- As is the convention in scoping reviews, quality assessment was not undertaken – results must be interpreted in light of this.

Introduction

Irish Travellers or 'Mincéirs', as known in their language of Shelta (1, 2), are a traditionally nomadic minority group primarily based on the island of Ireland (3). They also reside in the UK with smaller populations in Europe and the USA. The term 'Travellers' is used as a generic term to refer to people who have a historical and cultural tradition based on a mobile lifestyle and includes English and Welsh Gypsies, Irish Travellers and Scottish Travellers. Each of these groups has a separate ethnic identity that is particularly evident from their different languages but they share many aspects of a common cultural identity as traditional Travellers or Romani people (3, 4). In this review we specifically included 'Irish Travellers' only. As Irish Travellers in Ireland are known as 'Travellers' rather than 'Irish Travellers, the term 'Travellers' is used hereafter, recognising that the authors are referring to Travellers of Irish descent.

The number of Travellers recorded in the Irish Census of 2016 was reported to be 30,987 accounting for 0.7% of the general population (5). In the 2011 Census for England and

Wales, 58,000 people identified as Gypsy or Traveller (Irish origin) which may be an underestimation of the actual number (4).

Travellers have been recognised formally as a distinct indigenous ethnic group in Ireland since 2017, which should have marked a positive step towards an inclusive society (6). Yet, Travellers are 22 times more likely to experience discrimination than the general population (7) and they remain a severely marginalised group (8, 9). Consequently, Travellers face poor health and experience a higher burden of mortality and morbidity than the general population (8).

Traveller life expectancy has been reported to be 66 years, 11.5-15.1 years less than that of the general population (8). The infant mortality rate is 3.6 times higher than the general population (8) and ten percent of Travellers do not reach their 2nd birthday (10). The disproportionate mortality may be due to poor health as well as other factors such as inadequate housing, education and literacy levels (8). Mental health disorders are prevalent, with reported suicide rates six-seven fold higher than the general population (8). Physical health appears to be poorer (8) but the scale and range of physical health conditions experienced by Travellers is not well known. The aim of this review was to summarise available data and categorise physical health conditions in Travellers. Due to the exploratory nature and lack of delineation of this area identified by an initial test review, a scoping review methodology was chosen.

The objectives of this review were;

(i) To explore the extent, breadth and nature of the literature with regards to physical health conditions experienced by Travellers.

(ii) To categorise the evidence about physical health in Travellers.

(iii) To compare physical health conditions of Travellers to the background population where possible.

Methodology

The protocol for this review was published on Open Science Framework (https://osf.io/v6etg/). This review followed the Joanna Briggs Institute's (JBI) methodology for scoping reviews (11) and was also informed by the original framework of Arksey(12), and enhancements proposed by Levac (13). It was checked against the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist (14). The six stage framework developed by Arksey and O' Malley (2005) (12) was used to structure this review.

Stage one refers to identifying the research question. The primary research question was; what is known about the physical health of Travellers. The secondary research question was; how does the physical health of Travellers compare to the background population, where this information was available.

Stage two refers to identifying relevant studies. A comprehensive search strategy was developed collaboratively with a skilled research librarian (DM). The following electronic databases were searched: MEDLINE/PubMed, EMBASE, PEDro, AMED, CINAHL, PsycINFO, SCOPUS (see extended data). The original search was performed on 09.03.21 (re-run 02.11.21 and 04.04.23). The search strategy was generated from a combination of free text search terms, text words, Medical Subject Headings (MeSH) terms and keywords with Boolean operators. The full search details are outlined in Supplementary Box 1. Authors of abstracts included in this review were contacted to ascertain if full text versions were available. Reference lists of included studies were examined for relevant studies. Grey literature was searched using the CADTH Grey Matters tool and the following websites were checked; Lenus, ProQuest E-Thesis Portal and RIAN. For each of these sources the terms 'Travellers' and 'Health' were searched. For each, the website was 'hand searched' for potentially relevant documents. The first ten pages of each search's hits were reviewed for potentially relevant material. A targeted search of Google Scholar and WorldCat search engines was also performed.

Stage three refers to study selection. This was based on the Population, Concept, Context (PPC) mnemonic (11). The population was Travellers. The concept referred to physical health conditions. There is no single definition of physical health conditions. We took this to

mean any condition, including a disease or event (e.g. injury) that impacts the physical health system. The context was quite broad and included Irish Travellers based in any location or setting. It was originally envisaged that this review would encompass 'health' in a more holistic way including mental and physical health conditions. Given the large scope of a review including both dimensions of health, a pragmatic decision was taken to consider physical health conditions only in this review and refine the search strategy appropriately (12, 13, 15) . This included primary data documenting prevalence of physical health conditions and as well as perceptions of Travellers regarding physical health conditions experienced. Only English language sources were searched as it was expected the literature would be concentrated mainly in Ireland and the UK/other English-speaking jurisdictions. No date restriction was applied to generate a purposefully broad scope of the available literature. Both quantitative and qualitative study designs were included, although it was expected data would be primarily quantitative in nature. Studies which examined physical health conditions of Travellers (>18 years) as a primary or secondary outcome measure were included. If intervention studies were included, only baseline data was extracted. Exclusion criteria were data which did not related to physical health conditions of Irish Travellers.

Duplications were removed and studies were imported into Covidence™ for title and abstract screening which took place independently by two reviewers (JB/FK). Both authors then conducted a full-text evaluation. If necessary, discrepancies were resolved by consensus by including a third author.

Stage four refers to charting the data. Relevant data pertaining to physical health conditions of Travellers was retrieved. Two reviewers (J.B. and F.K.) independently extracted data using a bespoke data extraction instrument (11). The data extraction process took place from October 2021 – March 2022. The data extraction instrument was designed by review authors (JB and FK) based on the JBI template source of evidence details, characteristics, and results. Two review authors (JB and FK) independently extracted data from the first ten studies using the initially developed data extraction form and met to ascertain its suitability. Minor changes to the data extraction tool were made at this stage. The data extraction instrument collected the following data relating to included studies (author, title, year of publication, study aims/objectives, research design, living arrangements, location of

participants, inclusion/exclusion criteria, data collection method, number of participants, age (mean and standard deviation), biological sex, details of physical health condition reported and physical health conditions in the background comparison population. Any differences were resolved by consensus discussion. A third author (D.M.) was available if disparities emerged between reviewers.

Stage five refers to collating, summarizing and reporting of results. Data were reported for each selected study within each category as agreed on in the previous stage. Findings were mapped to summarize the range of evidence to present the breadth and depth of the field (13). Tables were also presented to outline the research findings as defined in Stage four. As per scoping review methodological enhancements proposed by Levac (13), results were presented numerically and in a data driven approach were categorized meaningfully into subcategories of physical health conditions. Using a data-driven approach, physical health conditions were categorized in the following way; cardiovascular disease (CVD), respiratory, genetic, injuries/musculoskeletal/arthritic disorders and gut/bowel conditions. Where available, data were compared to the background population. Implications for policy, practice and research were identified. Entries were independently checked by two authors (JB and FK).

Patient and Public Involvement

Stage six refers to patient and public involvement. Stakeholder/public involvement was integral to this review. The initial research question was generated from the principal author who has an interest broadly in the physical health of marginalised groups. In the planning phase, the research question evolved and was refined by engaging informally with the research team and a member of the Travelling community (AW) about this topic. In conversation, AW identified the poor physical health and prevalence of physical health conditions among many Travellers which consolidated the purpose of conducting this review. AW was then personally invited to join the review team. Her involvement began after the initial database search and continued throughout the data synthesis and write-up phases. A number of online meetings took place during which AW shared her perspectives verbally and in written form on early results, drafts and conclusions of the review as they emerged.

Results

Studies identified

After removal of duplicates, 197 studies were identified. After excluding irrelevant studies, a total of 11 studies and 18 reports were deemed eligible for inclusion. Quantitative studies predominated (n=8), with two qualitative studies (16, 17) and one mixed methods study (18). Three were reports generated from the grey literature search (9,17,18) while the remaining were generated from the systematic database search. The PRISMA flow chart summarises the search strategy (Figure 1).

Figure 1: PRISMA flow diagram ABOUT HERE

Study characteristics are shown in Supplementary Table 1. Over seven thousand participants (n=7397) were included with more than half (n=4,141) from the AITHS (8). One study took part in the UK(18) and the remaining studies were based in Ireland, North and South. Living arrangements of participants were reported in three studies[9] (18, 19). In one study, a quarter (n=515) lived in a caravan, a trailer or a chalet(19) and in another, participants' accommodation included encampments, halting sites and social housing (20). All (Traveller) participants in Mac Gabhann's study (n=296) resided in prisons in England and Wales(18).

Participants' characteristics are shown in Supplementary Table 2. The majority of studies included males and females with overall 61% of participants female. The UK based study included mostly male participants (93.6% male) (18) while one study was female only (21).The age profile of participants was predominantly young, with the majority in their second, third and fourth decade. Tables 1-4 summarise physical health conditions from included primary studies.

Table 1: Cardiovascular diseases

Physical Health Variable	**Authors**	**Result**
Tri-glyceride levels	Tan et al 2009(22)	High triglyceride level 23% (n=49%), males 89% (n=8), females 40% (n=15)
HDL cholesterol	Tan et al 2009(22)	Low HDL level, 62% (n=29), males 78%, females 58% (n=22)
Impaired Fasting Glucose	Tan et al 2009(22)	Total: 19% (n=9), Males: 22% (n=2), females 18% (n=7)
Angina	All-Ireland Traveller Health Study, 2012(8)	4.3% Travellers, Republic of Ireland (background population 2%) 2.1% Travellers, Northern Ireland
Diabetes Mellitus	All-Ireland Traveller Health Study, 2012(8)	6.1% Travellers, Republic of Ireland (background population 3%) 6.1% Travellers, Northern Ireland
	Slattery et al, 2011(23)	5.9% Traveller sample (background population 4.3%)
	Tan et al 2009(22)	8.5% Traveller sample (background population 4.3%)
Pre-diabetes	Slattery et al, 2011(24)	9.3% (background population 6.2%)
	Tan et al 2009(22)	11.6% Traveller sample (background population 6.3%)

'Heart Attack'	All-Ireland Traveller Health Study 2012(8)	2.3% Travellers, Republic of Ireland (background population <1%) 2.1% Travellers, Northern Ireland
Systolic Blood Pressure ≥ 130mmHg	Tan et al 2009(22)	Total 43% (n=20), Males: 22% (n=2), Females 47% (n=18)
Diastolic Blood Presssure ≥ 85 mmHg	Tan et al 2009(22)	Total 38% (n=18), Males: 44% (n=4), Females 37% (n=14)
Metabolic Syndrome	Slattery et al 2011(23)	39.3% Traveller sample (background population 21%)
	Tan et al 2009(22)	53.2% Traveller sample (background population 21.0%)
Self-reported CVD	McGorrian et al, 2010/2012(25, 26)	-Self-reported CVD was 5.6% (5.8% in men and 5.5% in women), compared to 16.1% in the general Irish population. -The prevalence of CVD increased with age and the Travellers who reported CVD were older (mean age 54.06 ±14.48 V 34.99 ±13.85). -No significant difference in the prevalence of reported CVD, hypercholesterolaemia and hypertension between the comparator groups was found. -However, diabetes, smoking, consumption of salt and fried food and physical inactivity is more frequent in Travellers. -Significant positive association was found between CVD and age, high cholesterol, hypertension, diabetes and current/former versus never smoking, drinking alcohol and increasing discrimination. -Significant negative association was found between CVD and self-rated health, consumption of fried food and trust of others.

	Kelleher et al, 2012(19)	-Self-reported blood pressure, cholesterol, diabetes screening by GP (48%, n=1996)

CVD; cardiovascular disease, GP; General Practitioner, HDL; high density lipoproteins, LDL; low density lipo-proteins, ROI: Republic of Ireland

Table 2: Respiratory diseases

Disease and variable measured	Authors	Result
TB: incidence rate	O'Toole et al, 2015(27)	- Higher incidence rate and younger age in Irish travellers than white Irish-born and general population: - CIR of TB in the Traveller population was <5/100000 population per annum from 2002-2009. This increased after 2010 and CIR >10/100000 population per annum 2011-2013. - From 2002-2013, the CIR of TB decreased in the general population (10.5/100000 in 2002 to 8.3/100000 in 2013). - CIR for TB in Travellers was about 3-fold higher than that of white born Irish population in 2011 and 2012. - In 2013, the CIR in Travellers increased to 40.6/100000 following an outbreak. - 5-year cumulative CIR 2009-2013: o Travellers: 81.4/100000 o General pop: 45.5/100000 o White Irish-born: 27.3/100000 - When All-Ireland Traveller Health Study population data was used to calculate CIR rather than the Central Statistics Office Census data, the CIR was lower. Regardless of the method of data collection of CIR, the rate was still higher in Irish travellers than the general population/white Irish born. - Average incidence by age was higher for the Traveller population, majority in 0-34 age group, compared to the general population where the majority was in the 25-65 age group and in the white Irish-born population where the majority was in the 55 to > 65 age group.

Chronic Obstructive Pulmonary Disease: number of smokers, presence of respiratory symptoms, diagnosis of asthma & spirometry	Nolan et al, 2017(28)	- 41% were current smokers, 6/14 non-smokers regularly exposed to passive smoke - 86% of smokers reported respiratory symptoms including cough, wheeze and shortness of breath - 10/35 had GP diagnosis of asthma - 23% (7/30) had obstructive pattern
Chronic bronchitis	All-Ireland Traveller Health Study , 2012(8)	- 12% Travellers Republic of Ireland, 9.4% Travellers Northern Ireland, (background population 3%)
Asthma	All-Ireland Traveller Health Study , 2012(8)	- 12.5% Travellers Republic of Ireland, 25.7% Travellers Northern Ireland, (background population 6%)

CIR; cumulative incidence ratio, GP: General Practitioner, TB; tuberculosis

Table 3: Injuries/Musculoskeletal/Arthritic disorders

Details of non-fatal injuries	Authors	Result
'Back condition'	All Ireland Traveller Health Study, 2012(8)	- 30.4% Travellers, Republic of Ireland (background population 16%) - 25.2% Travellers, Northern Ireland
Arthritis	All Ireland Traveller Health Study, 2012(8)	- 13.8% Travellers, Republic of Ireland (background population 11%) - 13.2% Travellers, Northern Ireland
Injury **(prevalence of injury and intentional/unintentional)**	Abdalla et al, 2013(29)	- Travellers had a higher incidence of intentional injuries, SIR = 224 for intentional injuries (male = 181, female = 268) - Travellers had a lower incidence of unintentional injury than the general population: SIR = 44 (male = 42, female = 46). - Travellers over 65 years were twice as likely to report an injury than the general population. o Overall injury SIR for Travellers aged 15-64 years = 59 & 65 years +=208 o Intentional injury SIR for Travellers >65 years = 517 o Unintentional injury SIR for Travellers >65years= 137. Overall injury SIR for Travellers >65years = 208.
Injury	Kelleher et al 2012(19)	'Free of injuries in the last 2 years vs. one or more injury': 88.7% (n=1800)

(Question from Dimension 4 Lifestyle and health behaviour of the health status interview)		

SIR: standardised incidence ratio

Table 4: Genetic diseases, other conditions and self-rated health

Details of Genetic disease		Author	Result
Phenotype	Medical history, clinical observation & physical examination	Cullinane, Lynch and Marnane, 2020(30)	Case of leukoencephalopathy described. Patient presented with short stature, pes planus, hypotonia, history of osteogenic sarcoma Participants' medical history: Epilepsy, multiple cerebral cysts (removed by craniotomy/cyst excisions over the course of 15 years from age 5), left ventriculo-peritoneal shunt inserted and later removed, multiple vascular malformations of the capillary-cavernous type with associated haematomas, surrounding gliosis, hemosiderin deposition, Rosenthal fibres and areas of white matter calcification.
	Blood & urine testing	Flynn et al 1989(31)	Type II hyperprolinaemia (n=13, including 7 adults) Mild hyperprolinaemia (n=50, proportion of adults unclear) Seizures from hyperprolinaemia: 4 adults suffered grand mal seizures, 1 of whom had a severe mental handicap, 1 suffered from petit mal seizures.
Genotype	Whole exome sequencing	Cullinane, Lynch and Marnane, 2020(30)	Identified a homozygous variant of the SNORD118 gene. The sister of this case, with milder symptoms was homozygous for the same variant.
Other conditions			
Chronic inflammatory bowel disease		McCormick et al, 2001(32)	No recorded traveller with idiopathic inflammatory bowel disease
Cancer		All-Ireland Traveller Health study, 2012(8)	1% Travellers, Republic of Ireland (background population 1%) 0.3% Travellers, Northern Ireland
Physical Health problems		Mac Gabhann(18)	Out of sample n=281 Travellers in a UK prison, the following physical health conditions were reported. asthma (n=12), 'back' problems (n=10), epilepsy (n=9) and arthritis (n=7)

Self-rated Health:		
'Chronic health condition diagnosed by GP'	Kelleher et al, 2012(19)	41.5% (n = 2022)
Physical Health not good ≥ 1 day in last month	(Dimension 6 in Health Status Interview)	59.3% (n=1843)
Daily activity or work limited due to a long-term illness, health problem or disability		17.2% (2012)

**Doctor diagnosed illness in previous 12 months, GP; general practitioner, UK; United Kingdom*

Three studies reported cardiovascular diseases (Table 1). Tan et al, (2009) (22) reported the following cardiovascular disease (CVD) risk factors among study participants (n=47); high triglyceride levels (23%), low HDL cholesterol levels (62%), impaired fasting glucose levels (19%) and hypertension (systolic BP ⩾ 130mmHg 43% and diastolic BP ⩾ 85mmHg 38%). The prevalence of diabetes, pre-diabetes and the metabolic syndrome evaluated in a series of pilot studies was higher than the general population(23). The incidence of metabolic disease was over twice as high among Travellers (53.2%) compared to the background population (21%)(23). Self-report CVD was approximately 5%, compared to a self-reported CVD rate of 16.1% in the general population (8).

Two studies explored respiratory conditions (Table 2) (27, 28). One study reported a five-year tuberculosis (TB) cumulative crude incidence rate (CIR) of 81.4/100000 in Travellers compared to 45.5/100000 and 27.3/100000 in the general population and white Irish-born population, respectively (27). Rates of TB were therefore three-fold higher in Travellers than the white Irish-born population (27). Nolan et al (2017) reported that 41% of Travellers were smokers and 86% of these smokers reported respiratory symptoms including cough, wheeze and shortness of breath while 23% had an obstructive respiratory disease pattern (28). Respiratory conditions (bronchitis and asthma) were rated as the second most common physical health condition, with a prevalence of 24.5% among Travellers in the Republic of

Ireland and 35.1% in Northern Ireland (8). This is considerably higher than available comparison Republic of Ireland background population of 3% with chronic bronchitis (33).

Abdalla et al (2020) evaluated injuries (29) (Table 3). They demonstrated that the prevalence of unintentional non-fatal injury in Travellers < 65 years was lower [Standardised incidence ratio (SIR)=40], while the prevalence of intentional injury was higher (SIR=213) than the general population. Travellers > 65 years had higher injury rates for both unintentional (SIR=137) and intentional injuries (SIR=517). Common physical health problems reported by a population of 281 Travellers in prison in the U.K. were asthma (n=12), 'back' problems (n=10), epilepsy (n=9) and arthritis (n=7) (18).

Two studies (Table 4) examined genetic disorders both inherited in an autosomal recessive manner. One was a case report of a 32 year-old female who inherited a rare leukoencephalopathy and severe central nervous system (CNS) impairment was reported(30). Flynn et al (1989) also reported CNS dysfunction in Travellers due to the presence of Type II hyperprolinemia (31).

One study examined effects of lifestyle changes on the microbiome and its associated risks for chronic disease (20). Results demonstrated that Travellers retained a microbiota similar to that of non-industrialised populations due to halting site dwelling, number of siblings and animal ownership. Another study evaluating the prevalence of inflammatory bowel disease found no records of idiopathic bowel disease in the Traveller population.

Most Travellers described their health as very good (59%) or good (28%)(8). Comparable figures among the general population are similar at 62% and 29%, respectively (33). Twelve percent of Travellers described their health as fair, bad or very bad(8). The corresponding figure for non-Travellers was 9%(33). Breaking this down for 34-54 year age group, 31% of Travellers(8) categorised their health as 'very good' compared to 57% among non-Travellers(33). In this age group, 29% of Travellers(8) had health categorised as 'fair', 'bad' or 'very bad' while the comparable figure in non-Travellers was 8% (33).

Three studies conducted qualitative or mixed methods research. In the Mac Gabhann (2011) which explored experiences of Travellers in prison in the UK (18), prison staff completed 296 surveys, while 57 Travellers (of Irish origin), predominantly male (93.6%) participated in

focus groups and semi-structured interviews. Almost a quarter (24.6%) of prisoners reported physical health problems and Travellers reflected negatively on the use of healthcare prison facilities to manage their health condition.

> *'I'll never go back to them, they've done nothing for me'.*

Murphy (2016) (17) explored the experiences of homelessness for Travellers through qualitative interviews of 14 Travellers in one county in the Republic of Ireland. They vividly described the negative impact of homelessness had on their physical health.

> *'I never had blood pressure in my life. Now, the last year and a half, ever since the time we had to leave (the rented house), I'm taking blood pressure tablets.'*

Collateral relevant to family members was also reported.

> *'My mother is on a breathing machine because she has a sleeping disorder so in the, in the night time if she would knock it off, she goes into her, what's it a coma. And with the sleeping disorder it cut's your oxygen from your throat to your brain, so that leads to a heart attack or a stroke'.*

Murphy (2016) also described health problems that participants directly attributed to their homeless state or living conditions (on a site with no toilet) such as chronic kidney infections. Limited access to electricity was a problem identified as well as a lack of refrigeration to store fsleeping rough as he had nowhere else to keep it (17).

Hodgins et al (2006) explored, through focus groups, perceptions of illness causation and health inequalities in 41 Traveller women in two regions in Ireland (16). Themes of poor living conditions, discrimination, stress, anxiety, depression and violence described their perceptions of the cause of their poor health. Traveller women attributed other health conditions such as heart disease to the stresses of their life and considered risk factors such as smoking as less important factors and often beneficial to health status.

> *'People have a lot of worry, a lot of stresses and can develop heart disease and heart attacks…'.*

The interaction of poor accommodation and health was also noted.

''An awful lot of it comes from bad accommodation and discrimination. I keep sayin' those two words an' I know well it's those that are causing' the most problems. causin' heart problems and depression''

Discussion

This scoping review appears to be the first-time that data relating to physical health conditions of Travellers has been synthesised. Pooling the evidence together underlines two key findings. Firstly, the disproportionately high burden of physical health conditions such as the metabolic syndrome, asthma, bronchitis, TB and intentional injuries which were 2-3 times higher in Travellers compared to the background Irish population. Secondly, the unique health considerations such as rare genetic diseases experienced by a proportion of Travellers and the possibility of health benefits associated with their distinct gut microbiome linked to the traditional Traveller way of life.

Over 7,000 Travellers were included in this review with the largest source of data from the All-Ireland Traveller Health Study (8). One study took place in England and Wales, while the rest of studies were based in Ireland. Living conditions were not specified in the majority of studies. This is important to note as living conditions are a key driver of health (34) which is rated higher by Travellers when living conditions are better (20).

There was a higher representation of females (61%) within this review. This may be explained by findings from the All-Ireland Traveller Health Study highlighting that female Travellers were more likely to engage in research studies (8). The majority of participants were in their second to fourth decades, which concurs with Central Statistics Office (2016) data (5) demonstrating that Travellers are a young population**.** The paucity of older participants means that the effects of ageing and extent of geriatric syndromes in this population are not fully known.

This review showed high rates of the metabolic syndrome, CVD risk factors and established CVD disease compared to the background population, yet lower self-reported CVD of approximately 5.6% (26), versus 16.1% for the general population (33). This likely underestimation of CVD among Travellers may be due to a reluctance to divulge information and/or a lack of disease awareness, fewer attendances for preventive services as well as late

presentation and higher case-fatality rates of CVD(8). Evidently, improved targeted primary and secondary care strategies for Travellers are required.

Respiratory conditions (bronchitis and asthma) were rated as the second most common physical health condition, with a prevalence of 24.5% among Travellers in the Republic of Ireland and 35.1% in Northern Ireland (8). This is markedly higher than the comparison background population of 3% with chronic bronchitis (33) in the Republic of Ireland. Rates of TB were three-fold higher in Travellers than the white Irish-born population (27). Proposed risk factors were cited as higher house occupancy, smoking and the presence of diabetes or pre-diabetes.

Travellers suffer a greater burden of injuries and a higher risk of dying from injuries than the general population (29). Notably, a higher rate of intentional injuries was reported, and a lower rate of unintentional injuries compared to the general population. The high rate of intentional injuries likely links to mental health crises among Travellers with a suicide rate six times the general population (8). The true intentional-injury rates may be in fact higher as Travellers may not present themselves to care settings for minor injuries, and may be more inclined to self-treat or present late for care (8). Conversely, there may actually be a lower unintentional-injury rate due to lower participation in sport and recreational activities in young Travellers. Travellers over 65 years, however, were twice as likely to be injured, highlighting their vulnerability. The All-Ireland Traveller Health Study (AITHS) (2010) cited the home as the most likely location for an injury, which may be due to poor living environments (8). This is in accordance with a recent report, which highlighted grossly inadequate living conditions among Travellers (35).

This review highlighted genetic conditions such as Type II hyperprolinaemia (31) and leukoencephalopathy (30). These represent an important factor affecting physical health in Travellers as autosomal recessive conditions are commonly reported (36). Of note, some studies (n=5) examining inherited disorders such as congenital atrichia, a rare autosomal recessive disorder were excluded from this review as they did not meet the age eligibility criteria. Given that genetic conditions are prevalent in Travellers, consideration of 'grown up' genetic conditions should be an area of emerging focus.

Positive physical health factors linked to the gut, were discussed in two studies (20, 32). McCormick et al (2001) noted the absence of consultant-diagnosed inflammatory bowel disease possibly due to exposure to enteric bacteria and infection in early life(32). Keohane et al (2020) suggested the 'non-industrialised microbiome' of Travellers may be due to living conditions and animal ownership (20). How the gut microbiome changes with modernisation should be evaluated in future studies.

When comparing Travellers to non-Travellers (35–54 age group), Travellers are approximately three times as likely to have poor health or some type of difficulty or disability with the health gap rapidly increasing with age, which mirrors the pattern in other ethnic minority groups (37). A UK based study found that compared to white British people and 17 different ethnic minority groups, Gypsy and Irish Travellers (with the exception of younger and older age groups) had markedly high levels of multiple long-term conditions (38). Another study found inequalities in health-related quality of life were widest for Gypsy or Irish Travellers, Pakistani and Bangladeshi women (39).

In a similar way to Travellers experiencing a high burden of physical health conditions compared to the background population, poorer health is experienced by the Roma population compared to non-Roma across Europe (40). For instance, a high prevalence of TB has been detected in the Roma population (41). Other diseases have been described in Roma, such as hepatitis A(42) and hepatitis C virus (HCV) and HIV (43). An outbreak of Hepatitis A in Travellers was described in the literature (44) but was not included in the current review due to the high proportion of participants under 18 years. A high prevalence of measles was documented in Roma (45), a number of papers also described measles outbreaks in Irish Travellers (46) but similarly were also excluded from the present review due to the proportion of children in these papers.

A strength of this review is the synthesis of data relating to physical health conditions of Travellers based in England and Wales, Republic of Ireland and Northern Ireland. A further strength was the active stakeholder involvement by the inclusion of a member of the Travelling community as an integral and valued member of the review team. This ensured the real-world relevance of this research and is likely to increase chances of implementation of research findings into real life settings (47).

There were a number of limitations. As is the general convention in scoping reviews a formal quality assessment of included studies (11, 12) was not conducted therefore, the robustness of evidence (12) could not be judged. We acknowledge that definitive recommendations are not possible and the review must be interpreted in light of this (11, 12). We therefore see this work as a useful accessible summary of the evidence base regarding physical health conditions in Travellers (11, 48). As previously stated, the initial intention was to perform a review encompassing physical and mental health conditions, however, a pragmatic decision was taken to include physical health conditions only which we acknowledge is somewhat unidimensional as physical and mental health conditions are inter-related and multi-morbidity can straddle both.

The All-Ireland Traveller Health Study (AITHS) which is over 10 years old remains the most comprehensive report of Traveller health and is quoted widely in subsequent reports. It highlighted four priority areas for intervention: mother and child services; men's health; cause-specific issues for respiratory and cardio-vascular disease; and a new model of primary care delivery. The importance of using a 'social determinants' approach linking inequalities in healthcare, accommodation, and other factors such as racism and discrimination to poor health was also advocated(8). With a stark 39% of Travellers estimated to be homeless, this negatively affects overall health and well-bring and compounds health inequalities (49). The long awaited recently published National Traveller Health Action Plan (2022) (50), relevant to the Republic of Ireland, contained 45 key actions around resourcing, identifying, reinstating, and expanding Primary Health Care for Traveller Projects and engaging with public health. It also echoed a social determinants approach with targeted and mainstream strategies to overcome inequalities. This was also advocated in the National Traveller and Roma Inclusion Strategy 2017-2021 (NTRIS) (51). Another important approach of the National Traveller Health Action Plan is a 'whole-of-government approach' with integrated cross sectoral working. All of these approaches if implemented should impact the burden of physical health conditions in Travellers but there is a sense of policy conflict (52), policy fatigue and policy failure in the absence of tangible action on previous recommendations.

More is known about physical health conditions in Irish-based Travellers and policies described are relevant to this setting. Less is known specifically about the physical health

conditions of UK based Irish Travellers. Some research collectively pooled data from gypsies and Irish Travellers as well as other Traveller groups. Although all these groups experience discrimination, poor living conditions and health inequalities, how these groups vary in relation to physical health conditions is not well known.

Ethnic identifiers would enable physical health conditions to be more accurately tracked but this would need to be conducted sensitively. This is line with a key recommendation of the National Traveller Health Action Plan (2022-2027) (50), which recommends systematic ethnic equality monitoring, including the introduction of ethnic identifiers on health data sets. Due to the inter-relationship between living conditions and health, living conditions need to be radically improved and studies including Travellers should include data on living arrangements.

It should also be considered that the extent of physical health conditions may be underestimated due to Travellers not presenting or presenting late for care as well as a mistrust of healthcare professionals (8). The co-development of trust-building mechanisms and improved cooperation between Travellers and healthcare professionals has been recognized as important strategies to improve Travellers' access and engagement with mainstream health services (53). Non-communicable diseases such as cancer and arthritis in Travellers featured minimally within this review. The health of older Travellers was not specifically explored, which may be partly due to the mortality gap. Further work is needed on how best to build confidence and empower Travellers to self-manage their health without 'talking at them'. Functional literacy and health literacy levels need to be optimised while also reducing the stigma associated with accessing healthcare (8). Supporting Traveller groups to co-design culturally appropriate health literacy resources has been identified as crucial to improve understanding of pathways to access services and signs and symptoms of different health conditions (53). Health care staff can be discriminatory in their attitudes (54) which also needs attention. At a broader level, healthcare service design needs to be culturally appropriate. A recent study exploring Travellers' views about how existing healthcare provision could be more responsive to their needs found that employing members of the community within the health service, embedding an ethos of cultural safety and humility and delivering Traveller Cultural Awareness Training to healthcare staff would improve the cultural appropriateness of mainstream health services (53).

Ultimately, inequalities in health, relevant to Travellers and other ethnic minority groups are closely linked to racism and discrimination as well as the social determinants of health such as housing, education, employment and income which are strongly associated with poor health (55). These underlying factors therefore need to be tackled to impact health.

Conclusion

This scoping review highlights marked inequalities in the burden of physical health conditions experienced by Mincéirí. Many common physical health conditions were 2-3 times more prevalent in Travellers compared to the background population. Multifaceted and tangible action is required including better targeted approaches and accommodations within mainstream healthcare, underpinned by a social determinants approach, to bridge the gap in physical health conditions experienced by this marginalised group.

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Author's contribution

FK**;** independent data screening, data extraction, data synthesis, drafting of manuscript**,** AW**;** contribution to the development of the design, drafting of manuscript, JV; drafting of manuscript**,** DM; generation and refinement of search strategy, JB; conception of original idea and deigning the study, refinement of search strategy, independent data screening, data extraction, data synthesis, drafting of manuscript. All authors provided important

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Figure Legend

Figure 1 PRISMA flow diagram

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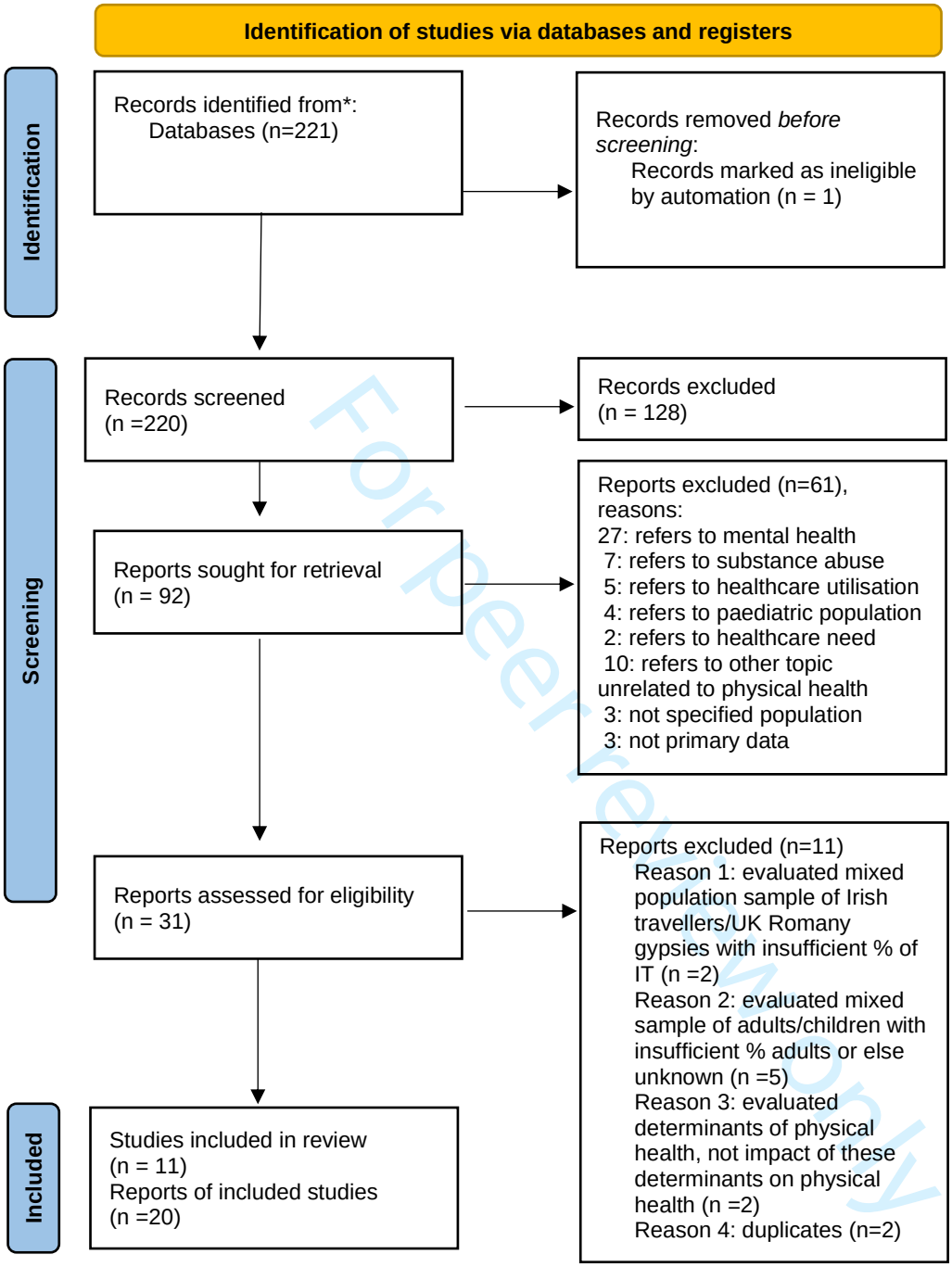
PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only



Supplementary Box 1: Full search details

EMBASE

'health'/exp OR 'health status'/exp OR 'mental health'/exp OR 'mental disease'/exp OR 'physical disease'/exp
((Mental* OR psychological*) NEAR/2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR 'well being' OR stress* OR distress OR disease*)):ti,ab
(depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*):ti,ab
((physical*) NEAR/3 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)):ti,ab
((cardiac OR cardiovascular OR heart) NEAR/3 (health OR disorder* or disease*)):ti,ab
('health study' OR 'health studies'):ti,ab
#1 OR #2 OR #3 OR #4 OR #5 OR #6
((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) NEAR/3 (traveller* OR gypsy OR gypsies)):ti,ab
#7 AND #8

Medline (OVID)

exp Health/ OR exp Health Status/ OR exp Mental Disorders/ OR exp Chronic Disease/ OR exp Health Behavior/
((Mental* OR psychological*) adj2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR well being OR stress* OR distress OR disease*)).ti,ab.
(depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*).ti,ab.
((physical*) adj3 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)).ti,ab.
((cardiac OR cardiovascular OR heart) adj3 (health OR disorder* or disease*)).ti,ab.
(health study OR health studies).ti,ab.
or/1-6
((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) adj3 (traveller* OR gypsy OR gypsies)).ti,ab.
7 AND 8

Web of Science

TS =((((Mental* OR psychological*) NEAR/2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR "well being" OR stress* OR distress OR disease*)) OR (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*) OR ((physical*) NEAR/3 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)) OR ((cardiac OR cardiovascular OR heart) NEAR/3 (health OR disorder* or disease*)) OR ("health study" OR "health studies")) AND ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) NEAR/3 (traveller* OR gypsy OR gypsies)))

GoogleScholar

"Irish travellers|traveller" "mental health|fitness|status|distress" "physical fitness|health|status|illness"

CINAHL

(MH "Mental Health") OR (MH "Mental Health Services+") OR (MH "Health Status+") OR (MH "Physical Fitness+") OR (MH "Psychological Well-Being")
TI ((Mental* OR psychological*) N2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR "well being" OR stress* OR distress OR disease*)) OR AB

((Mental* OR psychological*) N2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR “well being” OR stress* OR distress OR disease*))
TI (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*) OR AB (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*)
TI ((physical*) N2 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)) OR AB ((physical*) N2 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness))
TI ((cardiac OR cardiovascular OR heart) N3 (health OR disorder* or disease*)) OR AB ((cardiac OR cardiovascular OR heart) N3 (health OR disorder* or disease*))
TI (“health study” OR “health studies”) OR AB (“health study” OR “health studies”)
S1 OR S2 OR S3 OR S4 OR S5 OR S6
TI ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) N3 (traveller* OR gypsy OR gypsies)) OR AB ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) N3 (traveller* OR gypsy OR gypsies))
S7 AND S8

SCOPUS

TITLE-ABS-KEY ((((Mental* OR psychological*) W/2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR “well being” OR stress* OR distress OR disease*)) OR (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*) OR ((physical*) W/3 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)) OR ((cardiac OR cardiovascular OR heart) W/3 (health OR disorder* or disease*)) OR (“health study” OR “health studies”)) AND ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) W/3 (traveller* OR gypsy OR gypsies)))

PsycINFO

DE "Mental Health" OR DE "Health" OR DE "Health Literacy" OR DE "Health Status" OR DE "Physical Health" OR DE "Health Attitudes" OR DE "Health Behavior" OR DE "Health Risk Behavior" OR DE "Mental Disorders" OR DE "Chronic Mental Illness"
TI ((Mental* OR psychological*) N2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR “well being” OR stress* OR distress OR disease*)) OR AB ((Mental* OR psychological*) N2 (condition OR factor* OR health OR fit OR fitness OR help OR state* OR status OR well-being OR “well being” OR stress* OR distress OR disease*))
TI (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*) OR AB (depression OR depressed OR addiction* OR anxiety OR anxious OR delirium OR psychosis OR schizophreni*)
TI ((physical*) N2 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness)) OR AB ((physical*) N2 (health* OR fit OR fitness OR well-being OR wellbeing OR status OR ill OR illness))
TI ((cardiac OR cardiovascular OR heart) N3 (health OR disorder* or disease*)) OR AB ((cardiac OR cardiovascular OR heart) N3 (health OR disorder* or disease*))
TI (“health study” OR “health studies”) OR AB (“health study” OR “health studies”)
S1 OR S2 OR S3 OR S4 OR S5 OR S6
TI ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) N3 (traveller* OR gypsy OR gypsies)) OR AB ((Irish OR Ireland OR Dublin OR limerick OR Waterford OR Galway OR Dublin OR cork) N3 (traveller* OR gypsy OR gypsies))
S7 AND S8

Supplementary Table 1: Study Characteristics

No	Author(s) and Title	Study Aims & Objectives	Research Design	Living Arrangements	Location of participants	Inclusion/Exclusion Criteria	Data Collection Method
1	**The All Ireland Traveller Health Study (AITHS)**	-To record the number of Travellers on the island of Ireland -To record fertility rate and deaths in one year -To follow a birth cohort for 1 year -To document health status and determine factors affecting the health status of Travellers and their access to health services -To document attitudes/perceptions of Travellers to health services	Census and quantitative study	Documented in some studies/reports	Island of Ireland North and South	Travellers from island of Ireland	Survey-census section, health status section, health status for children, health services utilisation for adults.

1.a	Abdalla et al, 2020. **'Disparities in fatal and non-fatal injuries between Irish travellers and the Irish general population are similar to those of other indigenous minorities: a cross-sectional population-based comparative study'**	To assess disparities in fatal and non-fatal injury between travellers and the general population in Ireland	Comparative study based on cross-sectional population-based data.	Not stated	ROI	Inclusion: -Irish Travellers who participated in the AITHS -Aged 15 years or older.	*Traveller data*: -from the AITHS -from the General Register Office -CSO -PHNs working with traveller families. *General population data*: -from the CSO 2008 report 2006 census and the Survey of Lifestyle, Attitude and Nutrition (SLAN) 2002.
1.b	(i) Kelleher et al, 2012 **Sociodemographic, environmental, lifestyle and psychosocial factors predict self-rated health in Irish Travellers, a minority nomadic population** (ii) Whelan et al, 2010. **Socio-demographic, health status, psycho-social and lifestyle predictors of self-rated health in the All-Ireland Traveller Health Study (abstract)**	Aim: to assess the predictive ability of socio-demographic, environmental, lifestyle and psychosocial factors to self-rated health.	Census survey of Traveller families in Ireland, North and South (AITHS)	75% (n=1547) live in house/apartment 25% (n=515) live in caravan/trailer/ chalet	ROI/Northern Ireland	Inclusion: Self-identified Travellers in the Republic and Northern Ireland	Health Status survey: subjective questions around lifestyle, culture, social experiences/supports, health behaviour and self-reported health status.

1.c	(i)Mc Gorrian et al, 2010 **Adverse cardiovascular risk profile in a disadvantaged minority community consistent with the thrifty phenotype hypothesis. Findings from the All-Ireland Traveller Health Study (Abstract)** (ii) McGorrian et al, 2012 **Cardiovascular disease and risk factors in an indigenous minority population. The All-Ireland Traveller Health Study.**	Aim: To examine CVD epidemiology and CVD risk factors in Irish Travellers and associations with social disadvantage.	Observational study	Not stated	A random sample (20%) of participants in the AITHS	Inclusion: All self-identified Traveller families on the island of Ireland were invited to participate.	AITHS: health survey via an oral-visual data collection instrument
2	Cullinane et al, 2020. **'Phenotypic Variability in Leukoencehalopathy with Brain Calcifications and Cysts: Case reports of siblings from an Irish Traveller Family with a Homozygous SNORD118 Mutation'**	To describe a case report of an Irish traveller with a leukoencephalopathy and an inherited mutation in the SNORD118 gene.	Case report	Not stated	Not stated	Inclusion: 32 year old female Irish Traveller with leukoencephalopathy.	Clinical examination, family history, medical history including birth history, medications, histopathology investigations, genetic studies.

3	Flynn et al, 1989 **Type II Hyperprolinaemia in a pedigree of Irish travellers (nomads)**	Aim: not stated but to investigate Type II hyperprolinaemia in Irish Travellers	Descriptive study	Not stated	Not stated	Inclusion: not clearly stated but family of the 'proband' and close relatives	Testing of urine by two-dimensional paper chromatography, those showing prolinuria had blood samples taken in plain tubes and their serum or plasma proline concentrations were determined on a Locarte amino acid analyser. In many cases no urine was collected but a blood sample was.
4	**Hodgins et al, 2006** **''… it's all the same no matter how much fruit or vegetables or fresh air we get''. Traveller women's perceptions of illness causation and health inequalities**	Aim: to explore health, ill-health and health inequalities in Traveller women	Qualitative study	Not stated	Not stated	Inclusion: not explicitly stated but appears to be Traveller women accessing pre-existing community projects or adult education initiatives	-response to a vignette in focus groups
5	Keohane et al, 2020. **Microbiome and health implications for ethnic minorities after enforced lifestyle changes.**	Aim: to investigate whether recent lifestyle changes are associated with differences in the microbiome and risk factors for chronic disease.	Cross-sectional study.	Within 30km radius of Cork city at one of five locations. Varied from permanent encampment, halting sites or social housing.	Cork	Inclusion: None of the participants had taken antibiotics within 1 month and none were taking laxatives, corticosteroids, anti-inflammatories or anticoagulants	- Fecal microbiota of Irish Travellers were collected and compared with that of the settled background population in the same geographic locality and with that from individuals in other industrialised and non-industrialised countries.

				NB 87% of participants were nomadic in childhood but their living conditions had since changed.			-Dietary habits were assessed via questionnaire -Body composition was assessed by DXA. -Well-being was assessed by the WHO-5 Well-Being Index -Personal, medical and family history was recorded
6	Mac Gabhann, 2011 **Voices Unheard. A study of Irish travellers in Prison.**	Aim: to explore issues faced by Irish Travellers in prison	Mixed methods study	England/Wales	Prisons in England/Wales	Inclusion- -Irish travellers in prison -prison staff in prisons in England and Wales. Exclusion -Young Offenders Institution	1.Survey of Irish Travellers across the prison estate and a response form for prison staff involving prison officials and 2.A series of focus groups and semi-structured interviews with Irish travellers in seven prisons.

7	McCormick et al, 2001 **Chronic inflammatory bowel disease and the 'over-clean' environment: Rarity in the Irish 'Traveller' community.**	Aim: to estimate the prevalence of inflammatory bowel disease in the traveller population.	Survey	N/A	Study was conducted in 11/26 counties in Ireland where 25/30 gastroenterologists were based	Inclusion: all gastroenterologists or surgeons working in the public health service in Ireland for at least three years at time of study, identified from the Irish Society of Gastroenterology.	Collected the number of members of the travelling community ever seen with inflammatory bowel disease and type of disease seen (Crohn's and Ulcerative colitis).
8	**Murphy 2016** **Travelling through homelessness: A study of Traveller Homelessness in County Offaly**	Aim: To explore the experience of homelessness for Travellers in Co. Offaly and to describe how Travellers are accounted for within the definitions of homelessness used at a County level	Qualitative interview-based study	Current living conditions of participants varied but all had experienced homelessness in the previous year	Travellers residing in Co. Offaly	Inclusion: Member of the Travelling Community, living in Country Offaly, or have been living in County Offaly before a movement to emergency/temporary accommodation outside of the country, have experienced homelessness within the previous 12 months, be aged over 18 years	'Life history interviews' were conducted with participants.
9	Nolan et al, 2017 **Respiratory Health in an Irish Traveller Community**	Aim: to assess respiratory health in Irish Travellers	Observational study	N/S	Travellers residing in West Dublin	Inclusion: Irish Travellers > 18 years	Subjective and objective data collected: BMI, smoking history, respiratory symptoms, GP diagnosis of asthma and spirometry measures were taken

10	O'Toole et al, 2015. **Tuberculosis incidence in the Irish Traveller population in Ireland from 2002 to 2013**	To examine data regarding TB notifications in Ireland from 2002 to 2013.	Descriptive epidemiological study	N/S	N/S	Inclusion: -all cases of TB reported by the National TB Surveillance System and CID, -cases reported in the Census of 2002, 2006 and 2011 and -cases reported by the AITHS.	Data were collected from National TB Surveillance System and Computerised Infections Disease Reporting system by the Health Surveillance Centre. Crude incidence rates (CIR) were calculated from the CSO and the AITHS data. 5 year cumulative CIR values were calculated for 2009-2013. Average incidence rates for 2002-2013 were calculated for each age group using CSO data.
11 **11. a** **11. b**	(i)Slattery et al, 2011 **The point prevalence of diabetes, pre-diabetes and metabolic syndrome in Irish travellers** **Abstracts** (ii) Slattery et al, 2011 **The prevalence of diabetes, pre-diabetes and metabolic syndrome in Irish Travellers**	Aim for all: to evaluate CVD risk factors and the point prevalence of diabetes, pre-diabetes and metabolic syndrome in the Irish Traveller population.	Observational pilot study- abstract only	N/S	Travellers living along 'western seaboard' recruited from Galway and Western Traveller movements	Inclusion: Travellers (>18 years)	The following outcomes were evaluated; glucose levels, lipid profiles, oral glucose tolerance tests, blood pressure, weight, height and waist circumference.

	and the impact of lifestyle modification (abstract) (iii) Slattery, Brennan, Canny, Sweeney, Ward, O' Shea and Dunne **Cardiovascular health in the Irish Traveller community** (iv) Slattery et al, 2011						
11.c	**The prevalence of diabetes, Pre-diabetes and the Metabolic Syndrome in Irish Travellers** Tan et al, 2009						
11. d	**Traveller Health: Prevalence of Diabetes, Pre-Diabetes and the Metabolic Syndrome (abstract)**						

Supplementary Table 2: Details of Study Participants

No	Author	Number of Participants	Age (Mean + SD)	Biological Sex
1	AITHS	4,141 adults interviewed	5-14 years: 26% 15-24 years: 21% 25-39 years: 21% 40-64 years: 13% 65 years+: 3%	Males: 1,817, Females: 2,324
1a	Abdalla et al, 2013	Non-fatal injury data in Travellers: n = 1663 Travellers	Aged 15 years +	Males = 702 (42%), Females = 961 (58%)
1b	Whelan et al, 2010 (abstract) Kelleher et al 2012	n= 2065	<30 years: 48% (n=945) 30-44: 28.6% (n=563) 45-64: 18.4% (n=362) >65: 5.1% (n=100)	Males: 43.5% (n=898), Females: 56.5% (n=1166)
1c	(i) McGorrian et al, 2010 (abstract) (ii)McGorrian et al, 2012	2023 Age, sex and CVD data was available on 1878 of the total sample of 2023 Comparator population: 10,364	18-29: 41.8% (n=784) 30-34: 31.6% (n=594) 45-59: 18% (n=338) 60-74: 7.5% (n=140) >75: 1.2% (n=22)	Traveller population: Males: 32% (n=601), Females: 68% (n=1277)

2	Cullinane, Lynch and Marnane, 2020	1	32 years	Female
3	Flynn et al 2020	*Whole sample: 312 Urine from 280, blood from 147. Adult sample with Type II hyperprolinaemia: 7	*Not stated for whole sample, but among 7 adults with Type II hyperprolinaemia the mean age was 27.9 years	*Not stated for whole sample, but among 7 adults with Type II hyperprolinaemia, 4 females and 3 males.
4	Hodgkins et al, 2006	41	Age range: 15-19 years: 15% 20-29 years: 51% 30-39 years: 20% >40 years: 14%	All female
5	Keohane et al, 2020	118	39 (+/-13 years sd)	Males =53(44.9%), Females = 65 (55.1%)
6	Mac Gabhann, C, 2011	453 (0.6% of prison population). Of this, 296 survey forms were completed. 57 travellers participated in the focus groups/interviews	Age range of IT prisoners: 20-30: 39.5% 30-40: 29.5% 40-50: 17.1% 15-20:8.5% 50-60:4.3% 60-70:1.1%	Male = 93.6%, female = 6.4% 1 female prison was visited out of 7 in total.

7	McCormick and Manning, 2001	25	N/S	N/S
8	Murphy, 2016	14	N/S	N/S
9	Nolan et al, 2017	35	Mean age 44 years (18-69)	Males: 16; Females: 19
10	McCormick and Manning, 2001	25	N/S	N/S
11	O' Toole et al, 2015	2060	Travellers: majority of cases were in 0-34 yrs age group (mean of 26 years, median of 24 years) General population: majority of cases were in the 25 to > 65 years age group (mean of 43 years, median of 38 years) Irish-born: majority of cases in 55 to >65 years age group (mean of 49 years, median of 49 years)	N/S

12	Slattery et al. 2011 5 reports: Tan et al, 2009, Slattery et al 2010, 2011	354 travellers were screened in the largest study *(Tan et al, n=47; Slattery 2010, n=187; Slattery 2011, n=285; Slattery 2011, n=353)*	Mean age 37 ± 11 (SD)	Males: 127; Females: 227

N/S: not stated

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	Page 1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Page 1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Page 3
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Page 4
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Not applicable
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Page 4
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	Page 4
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supplementary file 1/Extended data
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Page 4
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Page 4
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page 4
Critical appraisal of individual	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe	Not applicable

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
sources of evidence§		the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Page 5
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Fig. 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Tables
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not applicable
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Tables and page 5-6
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Pages 5-6
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Page 7
Limitations	20	Discuss the limitations of the scoping review process.	Page 9
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Page 10
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Page 10

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.