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Hospital admissions for physical health conditions for people with intellectual disabilities: Systematic Review.
Abstract

Background: People with intellectual disabilities may have inequalities in hospital admissions compared with the general population. We aimed to investigate their admissions for physical health conditions.

Methods: We conducted a systematic review, searching six databases using terms on intellectual disabilities and hospital admission. Papers were selected based on pre-defined inclusion/exclusion criteria, data extracted, tabulated, and synthesised, and quality assessed. PROSPERO registration number: CRD42015020575.

Results: 7/29,613 papers were included. There were more admissions, and a different pattern of admissions (more medical/dental), for people with intellectual disabilities, but most studies did not take account of higher disease prevalence. Three papers considered admissions for ambulatory care-sensitive conditions, two of which accounted for disease prevalence and found higher admission rates for people with intellectual disabilities.

Conclusion: Admissions are common. Asthma and diabetes admission data suggests sub-optimal primary health care for people with intellectual disabilities compared with the general population, but evidence is limited.
Introduction

People with intellectual disabilities have more complex health needs and are thought to be admitted to hospital more frequently than the general population (Morgan & Kerr, 2000; Williams et al, 2005; van Schrojenstein Lantman-de Valk, 2009; Bebbington et al, 2013; Robertson et al, 2014). Their pattern of types of health needs also differs from the general population (Lin et al, 2003; Cooper et al, 2015). People with intellectual disabilities may also encounter barriers when admitted to hospital. This has been found across countries, for example in England (Mencap, 2007; Mencap 2012), Australia (Iacono et al, 2014), and the USA (Krahn et al, 2006). A recent review found problems with delivery of care in hospital including staff knowledge, skills, and attitudes (Iacono et al, 2014). An understanding of the frequency and types of admissions would provide knowledge that could be used to inform where and how to focus support for secondary care staff.

Psychiatric hospitalisations of people with intellectual disabilities, which are known to be more common, with multiple influences, have been extensively researched (Balogh et al, 2005; Charlot et al, 2011; Gustafsson, 1997). However, it is equally important to know about hospitalizations for physical conditions generally. It is unclear whether people with intellectual disabilities are admitted to hospital more frequently than the general population who
have the same physical health conditions (i.e. accounting for the prevalence of conditions). This is important to consider as the population with intellectual disabilities have more physical conditions than the general population, and one would expect that a higher prevalence of a condition would result in more hospital admissions (Balogh et al, 2010; Cooper et al, 2015).

Ambulatory care-sensitive conditions are defined as conditions which, if managed effectively at the primary care level, should not lead to a hospital admission (Billings et al 1993), as appropriate primary health care should delay the progression of the disease or prevent complications (Balogh et al, 2005; Jansen et al, 2004). Examples are diabetes and asthma. Studies with the general population have documented a relationship between high rates of hospitalisations for ambulatory care-sensitive conditions, and poor access to primary care (Caminal et al, 2004; Ansari et al, 2006). However, it is unclear if people with intellectual disabilities are admitted to hospital more frequently than the general population for ambulatory care-sensitive conditions. A number of lists of ambulatory care-sensitive conditions have been constructed by different researchers, some focussing on particular populations or regions. Purdy (2009) conducted a literature search of ambulatory care-sensitive conditions and found that various jurisdictions identified up to 36 different ambulatory care-sensitive conditions. The National Health Service (NHS) in
England commonly uses a subset of 19 of these conditions which are based on those used in the USA to measure access to primary health care (table 1).

Additionally, Balogh et al (2011) has developed a list of eleven ambulatory care-sensitive conditions which are specific to people with intellectual disabilities e.g. constipation.

**Table 1: Ambulatory care-sensitive conditions as identified by Purdy (2009)**

<table>
<thead>
<tr>
<th>1. Influenza and Pneumonia</th>
<th>10. Nutritional Deficiencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Other Vaccine-Preventable Conditions</td>
<td>11. Dehydration and Gastroenteritis</td>
</tr>
<tr>
<td>3. Asthma</td>
<td>12. Pyelonephritis</td>
</tr>
<tr>
<td>4. Congestive Heart Failure</td>
<td>13. Perforated/Bleeding Ulcer</td>
</tr>
<tr>
<td>6. Chronic Obstructive Pulmonary Disease (COPD)</td>
<td>15. Pelvic Inflammatory Disease</td>
</tr>
<tr>
<td>7. Angina</td>
<td>16. Ear, Nose and Throat Infections</td>
</tr>
<tr>
<td>8. Iron Deficiency Anaemia</td>
<td>17. Dental Conditions</td>
</tr>
<tr>
<td>9. Hypertension</td>
<td>18. Convulsions and Epilepsy</td>
</tr>
<tr>
<td></td>
<td>19. Gangrene</td>
</tr>
</tbody>
</table>

Despite their high rates of physical health conditions, people with intellectual disabilities are reported to face a number of organizational, social, and physical barriers to accessing timely and appropriate primary health care services (Krahn et al, 2006; Emerson & Baines, 2010). A higher rate of admissions amongst people with intellectual disabilities compared with the general
population for either the same condition, or for ambulatory care-sensitive conditions might suggest poorer primary health care management.

This systematic review aims to investigate whether physical health care is equitable for people with intellectual disabilities, through focussing on hospital admissions. The research questions were:

1. Are people with intellectual disabilities admitted to hospital more frequently than the general population, and do any differences in admission rate persist when between-group disease prevalence differences are adjusted for?

2. Are people with intellectual disabilities admitted to hospital for the same reasons as the general population?

3. Are people with intellectual disabilities admitted to hospital more frequently for ambulatory care-sensitive conditions than the general population, and do any differences in admission rates persist when between-group disease prevalence differences are adjusted for?

**Methods**

The review was prospectively registered with the International Prospective Register of Systematic Reviews (PROSPERO, registration number: CRD42015020575). The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist was followed.
The literature search was conducted on 2\textsuperscript{nd} February 2015, and updated on 8\textsuperscript{th} February 2016. The specific search strategy included relevant terms for intellectual disabilities (including historical terms), and terms for hospital admission (Appendix).

The following databases were searched: Psych INFO, Science Direct, Medline, Cochrane database, NICE guidelines, and Web of Science Core Collection, dating back to 1\textsuperscript{st} January 1960. Reference lists of included papers were scrutinised, as were citing papers. The initial search was conducted by a single researcher, with a second researcher searching a random selection of the retrieved papers; 5% of titles, and 5% of abstracts. This was done so that the reasons for any discrepancies in paper selection could be identified and resolved through discussion to enable a systematic approach to paper selection across all retrieved articles. Authors were contacted for further information where it was not clear if the study met the inclusion criteria.

Strict inclusion and exclusion criteria were used to select papers:

**Inclusion Criteria**

1. Intellectual disabilities

2. In-patient admissions
3. Reported frequency of, and/or reason for, hospital admissions, compared with the general population

4. English language

Exclusion Criteria

1. Psychiatric admissions only

2. Data for people with intellectual disabilities were not separately reported, or less than 50% of the sample had intellectual disabilities.

3. Case series of less than 20.

We used the NHS England list of 19 conditions to identify those conditions that were ambulatory care sensitive conditions. There was no age restriction. We deliberately excluded psychiatric papers at the outset, as we are aware of confusion in some of the psychiatric literature as to long stay and respite care stay versus acute psychiatric hospitalisations, and rates of psychiatric admissions are highly dependent upon third sector and private sector resourcing in the locality. We focussed on in-patient admissions, so excluded accident and emergency department attendance that did not lead to admission.
Data were extracted from selected papers using pre-prepared data extraction tables, and then summarised. Quantitative tools for assessing the quality of randomised controlled trials are well-described, but there is less consensus for observational studies. We assessed the quality of all the selected studies in a systematic way, ensuring we covered all the domains included in a systematic review of tools to assess quality of observational studies (Sanderson et al, 2007). This included the clarity of the stated aims, methodology (including age/gender standardisation, and whether group differences in disease prevalence rates were considered), design, participant selection, study size, measures used, data collected, analyses employed, results, biases, generalisability, conflicts of interests, and ethical procedures. Additionally, in order to generate a “score” we added up the number of items on the Oxford Critical Appraisal Skills Programme Checklist (CASP UK, 2013) that were addressed in each study. The reliability of the appraisal was checked by the appraisal being conducted and compared by two of the authors.

Results

A total of 29,613 papers were retrieved using the search strategy. The flow chart documents the number of papers included/excluded at each stage after
reading titles, abstracts, and full papers, and the reasons for exclusions (figure 1).

Database Results
N= 29,596

Duplicates excluded N= 3,896

Titles read
N= 25,700

Excluded by title N= 24,217
- No intellectual disability N= 23,091
- Outcome not hospital admission N= 1,126

Abstracts read
N= 1,485

Excluded by abstract N= 1,312
- No intellectual disability N= 404
- Outcome not hospital admission N= 811
- No data N= 92
- Less than 50% have intellectual disability/not separately reported N= 5

Full papers read
N= 173

Excluded N= 166
- Outcome not hospital admission N= 113
- No data N= 6
- Less than 50% have intellectual disability/not separately reported N= 12
- Psychiatric admissions N= 17
- Accident & Emergency department admission N= 7
- No general population comparison N= 11

Included
N= 7
The first and second researchers fully agreed on all the titles and abstracts to be included at these stages, so further discussions were not required. One author was contacted and responded to a request for additional information. Seven papers met all inclusion criteria and were selected for inclusion.

Regarding the first research question, Table 2 presents the four studies which report the frequency of admissions overall (rather than only for ambulatory care sensitive conditions) for individuals with intellectual disabilities compared to a general population comparison group (Asberg, 1989; Morgan, Ahmed & Kerr, 2000; Williams et al, 2005; Derrington et al, 2013). Two studies focussed on adults, and two on children, one of which was specifically about children with Down syndrome. The studies were from Sweden, the UK, Australia, and the USA. Their results indicate that both adults and children with intellectual disabilities are admitted to hospital more frequently than members of the general population. However, none considered whether this difference in admission rate persisted when between-group disease prevalence differences are adjusted for. Evidence from these papers also suggests that, once admitted to hospital, adults and children with intellectual disabilities have a longer length of stay (Asberg et al, 1989; Morgan et al, 2000).

Regarding the second research question, table 3 summarises the three studies that consider an overview on whether people with intellectual disabilities are
admitted for the same reasons as the general population (Morgan et al, 2000; Williams et al, 2005; Ailey et al, 2014). Two studies focussed on adults, and one on children up to age 5. The studies were from the UK, Australia, and the USA. The more methodologically robust of the two adult papers reported that adults are more likely to be admitted for medical and dental reasons, and less likely for surgical reasons (Morgan et al, 2000). The other adult study did not report data in a comparable way, including only the five most common discharge diagnoses, all of which were medical reasons, and mostly more common in the group with intellectual disabilities (Ailey et al, 2014). Children with intellectual disabilities were more likely to be admitted than were the comparison group for numerous medical reasons, but not so for disorders of the oral cavity. None of these three papers standardised admission rates for the prevalence of disorders in the two groups.

Regarding the third research question, three papers reported admissions for ambulatory care-sensitive conditions (table 4). The studies were from Canada and the USA. Admissions for epilepsy or seizures were reported in two papers (Balogh et al, 2010; Ailey et al, 2014), and additionally for asthma and diabetes in one of these (Balogh et al, 2010), whilst the third focussed specifically on diabetes (Balogh et al, 2015). Only the studies by Balogh et al (2010, 2015) took account of the likely different prevalence rates of these conditions
between people with intellectual disabilities and the general population which would cause an anticipated difference in admission rates. Balogh (2010) found that admission rates for people with intellectual disabilities were higher for epilepsy, asthma and diabetes. Rate ratios for diabetes and asthma remained significant even after taking account of the population prevalence of these diseases. Balogh et al (2015) also found a significantly higher rate of admissions amongst people with intellectual disabilities and diabetes, which also remained significant after taking account of diabetes prevalence. A further paper which investigated factors associated with hospitalisations for ambulatory care-sensitive conditions, was initially selected, but excluded as it identified factors associated with hospitalisations and did not address the review questions (Balogh et al, 2013).

A systematic quality review revealed that there were limitations to most of the studies that were selected for inclusion in the review; we report these in the tables 4-6.

During our search, we identified several other papers which also reported on admission rates, but these studies did not meet our inclusion criteria as they did not include a general population comparison group. High levels of admission rates were recorded in all these studies, particularly during the first few years of life. A further study focussed only on admissions via emergency
departments (Venkat et al, 2011), and another reported admissions for people with developmental disabilities, but did not separately report people with intellectual disabilities (Walsh et al, 1997). A further nine studies detailed reasons for admission to hospital, typically medical conditions such as respiratory diseases, but did not contain a general population comparison group (Merrick et al, 2005; Merrick et al, 2006; Morad et al, 2007; Merrick et al, 2010a; Merrick et al, 2010b; Merrick et al, 2010c; Fitzgerald et al, 2013; Sullivan et al, 2008; Lin et al, 2007). Four papers reported respiratory diseases, cardiovascular diseases, and heart disease as reasons for admission for children with Down syndrome, but did not have comparison groups (Fitzgerald et al, 2013; So et al, 2007; Thomas et al, 2011).

Discussion

People with intellectual disabilities experience considerable health inequalities compared with the general population, yet the current contribution of health care and health care services to increasing or reducing these inequalities, remains unclear. We have demonstrated, albeit from a slender body of evidence, that people with intellectual disabilities have a higher rate, and different pattern of hospital admissions compared with the general population,
and found emerging evidence that poorer primary health care might contribute to this.

We found that the quantity and quality of existing research is surprisingly limited. Indeed, the study by Asberg (1989) may not be more widely generalisable, and that of Derrington (2013) was specifically of young Down syndrome children so cannot be synthesised with that on young children with intellectual disabilities by Williams (2004), given the different health profiles with congenital heart disease being common in Down syndrome. There was considerable differences in the ages studied, few studies overall, and none but two of the studies adjusted for the different prevalence rates of conditions experienced by people with intellectual disabilities and the associated anticipated difference in rate and pattern of hospital admissions in this population.

The limitations in the evidence are important findings, as firm conclusions cannot be drawn without robust evidence. In particular, further study of ambulatory care-sensitive conditions seems highly indicated; to better understand the relationships and contributions to the health care of people with intellectual disabilities across health care systems, and its impact on health inequalities. The studies included in the review were undertaken using data from countries with differing health care systems and support systems,
yet, whilst acknowledging the limitations in the evidence-base, they are suggestive of poorer health care for people with intellectual disabilities across these countries. This highlights that the problem of poor health care is not localised to one particular type of service organisation and delivery, and so does not have an easy solution, and needs to be further studied to be better understood.

Some concerns have been raised over the variation in lists of ambulatory care-sensitive conditions used in different studies, methods of categorizing admissions as “avoidable”, and the influence of socioeconomic factors on these types of admissions (Flores, 2005; Steiner, 2007), hence these caveats need acknowledging. However, rates of ambulatory care-sensitive admissions are increasingly used as a measure of the effectiveness of primary health care (Purdy et al, 2009). Indeed, Balogh et al (2011) developed a list of eleven ambulatory care-sensitive conditions which are specific to people with intellectual disabilities e.g. constipation. Future work could further explore ambulatory care-sensitive conditions which are unique to this population.

A further potential limitation is that length of hospital stay may be influenced by the patient requiring a new support package/home, or carers needing respite to deal with complex needs at home.
Our review throws light upon where within hospital settings, a focus on staff awareness of the needs of people with intellectual disabilities might have impact on a greater number of people, that is, in medical and dental settings, rather than surgical ones. It might seem surprising that surgical admissions were found to occur at a lower rate than for the general population. One might speculate that this is due to barriers accessing such procedures, but this cannot be confirmed by our review and would require further investigation, and primary data collection.

We systematically reviewed the quality of each of the included studies, and presented the limitations in tables 2-4. We also evaluated the quality of our own systematic review, using the Assessing the Methodological Quality of Systematic Reviews (AMSTAR) checklist, but recognise that there is an inherent bias in evaluating one’s own work. The strengths of this review include the prospective registration of the review protocol, following best practice guidelines (PRISMA), clear inclusion and exclusion criteria, the comprehensive search strategy, including papers from 1960 to the present, and searching multiple databases, and double rating of paper selection and quality. However, the review is limited by excluding papers which were not available in English. As the review focussed on admissions for physical health conditions, we do not comment on psychiatric admissions for this population.
In conclusion, we can tentatively say that people with intellectual disabilities experience a higher rate and different pattern of hospital admissions compared with the general population, and there is emerging evidence that this might reflect poorer primary health care. The higher volume of admissions of people with intellectual disabilities in medical and dental areas highlights the importance of staff awareness on the need of people with learning disabilities in these areas, and guides as to focussing effort and resources, and prioritising, supporting and training staff working on these types of wards. Further work to better understand patterns of admissions on ambulatory care-sensitive conditions and relationships to health inequalities is indicated.

**Source of Funding**

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References


Critical Appraisal Skills Programme (CASP) 2014. CASP Cohort Study Checklist (http://www.casp-uk.net/checklists) Oxford. CASP


Appendix. Database Search Terms

1. Mental

2. intellectual or learning or developmental or neurodevelopmental

3. handicap or disabilit* or difficult* or impairment or deficien* or incapacit*
or delay or problem or subaverage

4. disorder or condition

5. subnormal

6. feeble minded or imbecile or idiot

7. moron

8. oligophreni*

9. aphreni*

10. defective

11. retard*

12. Down syndrome

13. 1 + 3

14. 2 + 3
15. $2 + 4$

16. $12 + 13 + 14 + 15 + 5 + 6 + 7 + 8 + 9 + 10 + 11$

17. Admission

18. Hospital

19. Inpatient

20. Secondary care

21. $17 + 18 + 19 + 20$

22. $16 + 21$
<table>
<thead>
<tr>
<th>Paper</th>
<th>ID Patient Characteristics</th>
<th>ID Data Source</th>
<th>Comparison Group Characteristics and Data Source</th>
<th>Measures and Analyses</th>
<th>Findings</th>
<th>Critique/Quality</th>
</tr>
</thead>
</table>
| Asberg (1989) | N= 41 27 (65.9%)M 14 (34.1%) F 20-64\(^1\) years 20-44 years= 68.3% 45-64 years= 31.7% ID level: Mild-16, Moderate-13, Severe-12, Profound-0 Uppsala, Sweden Cohort identified 01.07.1982 | Medical records of one physician Retrospective review | N=Unspecified General population data from neighbouring district, not age nor gender matched 20-44 years= 58% 45-64 years= 42% | ID: Retrospective review of medical records for hospital admissions 01.07.1982-30.06.1987 General population: Mean number of admissions to the departments of medicine, surgery, psychiatry, and gynaecology, 1982-1985\(^2\) | Mean number of admissions/person: 20-44y: 0.3 for ID, compared to 0.06 45-64y: 0.3 for ID, compared to 0.09 | 9/14 CASP Score Lost points for recruitment (catchment area of one physician only), accuracy of exposure (N/A), confounding factors (few identified in the paper) and generalisability of results (due to recruitment method) Additionally:  
Small sample  
Data collected by the treating physician  
Medical records may be incomplete  
Comparison group from a different health district  
Comparison group not age/gender matched  
Comparison group data may have been for 4 rather than 5 years  
Differences in disease prevalence rates not accounted for  
Funding source not disclosed |
| Morgan et al (2000) | N= 1,595 5-75+ years ID prevalence per 1000 of 4.1 M, 3.2 F ID level not specified South Glamorgan Health Authority, UK Cohort identified 31.12.1996 | ID register (known to Social Services/ID health service), or ID coded during hospital admission | N=434,000 Gender and age not specified South Glamorgan Health Authority, 1996 | Secondary analysis of routinely collected hospital discharge statistics 991-1996; Record linkage to ID data sources | 560,408 admissions for both ID and general population groups  
• 2,678 for ID  
• 557,730 for general population  
People with ID represents 0.48% of admissions, whereas 0.37% of study population has ID | 10/14 CASP Score Lost points for accuracy of exposure (N/A), confounding factors (not taken into account in design) and follow-up (none) Additionally:  
Administrative dataset of people with ID  
No data on ID severity |

\(^1\) Identified as 20-62 in text, but 20-64 in tables.  
\(^2\) Discrepancy in text whether same 5 year period for both groups, or 5 years for ID and 4 years for the general population.
<table>
<thead>
<tr>
<th>Study Details</th>
<th>Dataset</th>
<th>ID Level</th>
<th>Admissions</th>
<th>Relative Risk</th>
<th>CASP Score</th>
<th>Funding Source</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Williams et al (2004)</strong></td>
<td>Australian Midwives Collection database; a Western Australia ID database (Disabilities Services Commission and Department for Education); Western Australia Hospital Morbidity Dataset</td>
<td>Mild/moderate - 211, Severe - 223, Unspecified - 393, ID &amp; Autism - 191, ID with a biomedical cause - 604</td>
<td>2,788 (79%)</td>
<td>1.6 (95%CI 1.6-1.7), p&lt;0.001</td>
<td>13/14</td>
<td>Independent funding source stated</td>
<td>Comparison group not gender matched, Routinely collected data, Differences in disease prevalence rates not accounted for, Funding source not disclosed</td>
</tr>
<tr>
<td><strong>Derrington (2013)</strong></td>
<td>Born to Massachusetts resident mothers, identified via birth certificates, and birth defects registry</td>
<td>All children without Down syndrome Massachusetts, same hospitals</td>
<td>236 (46.8%)</td>
<td>4.5 (95% CI 4.1-5.0)</td>
<td>Independent funding source stated</td>
<td>Routinely collected data, Too young to specify level of ID, Not all children with ID will have been identified by age 3 years, Differences in disease prevalence rates not accounted for</td>
<td>Routinely collected data, Not standardised for gender, Not all children with ID will have been identified by 5 years, Differences in disease prevalence rates not accounted for</td>
</tr>
</tbody>
</table>
N: number

CASP: Critical Appraisal Skills Programme Checklist (CASP UK, 2013)
<table>
<thead>
<tr>
<th>Paper</th>
<th>ID Patient Characteristics</th>
<th>ID Data Source</th>
<th>Comparison Group Characteristics and Data Source</th>
<th>Measures and Analysis</th>
<th>Findings</th>
<th>Critique/Quality of Study</th>
</tr>
</thead>
</table>
| Morgan et al (2000)    | N= 1,595 5-75+ years ID prevalence per 1000 of 4.1 M, 3.2 F ID level not specified South Glamorgan Health Authority, UK Cohort identified 31.12.1996 | ID register (known to Social services/ID health services) or ID coded during hospital admission | N=434,000 Gender and age not specified South Glamorgan health Authority, 1996          | Secondary analysis of routinely collected hospital discharge statistics 991-1996; Record linkage to ID data sources | (Standardized for age) Admission ratios for ID:  
• Dental: 4.6 (95% CI 3.79-5.47)  
• Medical: 1.8 (95% CI 1.74-1.92)  
• Surgical: 0.6 (95% CI 0.59-0.69) | • 10/14 CASP Score  
Lost points for accuracy of exposure (N/A), confounding factors (not taken into account in design) and follow-up (none)   
Additionally:  
• Administrative dataset of people with ID  
• No data on ID severity  
• Comparison group not gender matched  
• Routinely collected data  
• Differences in disease prevalence not considered  
• Funding source not disclosed |
• Infections: 3.7***, 2.6***, 1.7  
• Respiratory: 2.6*, 2.2**, 1.8  
• Gastrointestinal tract: 2.2***, 1.8***, 1.3  
• Central nervous system: 4.2***, 3.1***, 1.6  
• Congenital abnormalities: 2.1**, 1.7*, 1.4  
• Oral cavity: 1.2, 1.2, 1.1  
• Perinatal period: 1.2**, 1.1, 1.1  
• Injury and Poisoning:1.5***, 1.3***, 1.1  
• Social admissions: 4.4***, 1.3*, 1.2  
• Renal/genital:1.4*, 1.3***, 1.1  
• Neoplasm: 10.3, 1.5, 3.5  
• Other: 2.1***, 1.6**, 1.3  
***p=0.0000, **p<0.05, *p<0.05 compared with the comparison group. | • 13/14 CASP Score  
Lost points for accuracy of exposure (N/A)  
Additionally:  
• Routinely collected data  
• Not standardised for gender  
• Only 0-5 years  
• Not all children with ID will not have been identified by 0-5 years  
• Differences in disease prevalence rates not accounted for  
• Independent funding source stated |
| Ailey, S.H. et al (2014) | N= 39,397 Gender not specified 18+ years ID level not specified USA | Clinical database from alliance of 115 USA academic medical centres and 300 | N=7,847,560 Gender and age not specified Adults without ID from same alliance of | Secondary analysis of discharge diagnosis data from a clinical | 0.5% of people had ID ID was over-represented in discharges for their top 5 most prevalent condition groups:  
• Seizures: 4.1%  
• Respiratory infection: 2.3% | • 11/14 CASP Score  
Lost points for accuracy of exposure (N/A), confounding factors (not taken into account in design), and follow-up (length) |
<table>
<thead>
<tr>
<th>Cohort identified July 2011-June 2013</th>
<th>affiliated hospitals</th>
<th>health care providers database</th>
<th>age standardised admission ratio</th>
<th>Pneumonia: 0.9%</th>
<th>Psychosis: 2.6%</th>
<th>Septicaemia: 1.2%</th>
</tr>
</thead>
</table>

Additionally:
- Routinely collected data
- Comparison group not gender matched
- ID identified from secondary diagnosis on clinical database, so likely to be an undercount
- Presentation of data precludes the extraction of other comparison data
- Differences in disease prevalence rates not accounted for
- Funding source not disclosed

F: female
ID: intellectual disabilities
M: male
N: number
CASP: Critical Appraisal Skills Programme Checklist (CASP UK, 2013)
### Table 4. Hospital admissions for ambulatory care-sensitive conditions

<table>
<thead>
<tr>
<th>Paper</th>
<th>ID Patient Characteristics</th>
<th>ID Data Source</th>
<th>Comparison Group Characteristics and Data Source</th>
<th>Measures and Analysis</th>
<th>Findings</th>
<th>Critique/Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balogh et al (2010)</td>
<td>N= 8,000 Gender not specified All ages All persons with ID living in Manitoba, Canada, 1999-2003</td>
<td>Administrative databases detailing contact residents of Manitoba have with health care, social services and education system</td>
<td>N=1,181,658, Gender not specified Manitoba residents without ID hospitalised between 01.01.1999-31.12.03</td>
<td>Secondary analysis of administrative data from Manitoba health care admissions for ambulatory care sensitive conditions Denominator representing person years, crude and adjusted rate ratios (adjusted for gender and 10 year age group) Asthma and diabetes took account of differences in disease prevalence</td>
<td>5 year adjusted rate ratio adjusted for age and sex was 6.1 (95% CI 5.58, 6.72) p&lt;0.0001 Hospitalization rates adjusted for disease prevalence:  - Asthma: 2.1 (95% CI 1.39, 3.16) p&lt;0.0004  - Diabetes: 3.7 (95% CI 2.63, 5.29) p&lt;0.0001</td>
<td>13/14 CASP Score Lost points for accuracy of exposure (N/A) Additionally:  - Administrative data  - Identification of people with ID within routinely collected data  - Asthma and diabetes adjusted for disease prevalence  - Independent funding source stated</td>
</tr>
<tr>
<td>Ailey et al (2014)</td>
<td>N= 39,397 Gender not specified 18+ years ID level not specified USA Cohort identified July 2011-June 2013</td>
<td>Clinical database from alliance of 115 USA academic medical centres and 300 affiliated hospitals</td>
<td>N= 7,847,560 Gender and age not specified Adults without ID from same alliance of health care providers</td>
<td>Secondary analysis of discharge diagnosis data from a clinical database 07.2011-06.2013 Age standardised admission ratio</td>
<td>Most common discharge diagnoses for ID compared to non-ID:  - Seizures: 3122 (7.9%) compared to 73,230 (0.9%) 73230 (0.9%)  - Pneumonia: 1,098(2.8%) compared to 123,529 (1.6%)</td>
<td>11/14 CASP Score Lost points for accuracy of exposure (N/A), confounding factors (not taken into account in design), and follow-up (length) Additionally:  - Routinely collected data  - Comparison group not age/gender matched  - ID identified from secondary diagnosis on clinical database, so likely to be an undercount  - Presentation of data precludes the extraction of other comparison data  - Differences in disease prevalence rates not accounted for  - Funding source not disclosed</td>
</tr>
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| Balogh et al (2015) | N=28,567 15217 (53.3%) M 13350 (46.7%) F 30-69 years Ontario, Canada Cohort identified April 2005-March 2010 | Institute for Clinical Evaluative Sciences in Ontario, Canada-health databases, registries, & census data Individuals with ID identified using Algorithm from Lin et | N= 2,261,919 1105168 (48.9%) M 1156751 (51.1%) F Random 20% sample of Ontarians without ID in the same health databases | Secondary analysis of diabetes data from Canadian health databases Adjusted odds ratio of ambulatory care sensitive conditions, taking account of diabetes prevalence | Odds of being hospitalized for an ambulatory care sensitive condition related to diabetes within a 5-year period:  - Adjusted odds ratio: 2.6 (95% CI 2.21, 3.12) | 13/14 CASP Score Lost points for accuracy of exposure (N/A) Additionally:  - Administrative data  - Identification of people with ID within routinely collected data  - Unable to identify those with type-
F: female
ID: intellectual disabilities
M: male
N: number

CASP: Critical Appraisal Skills Programme Checklist (CASP UK, 2013)