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Does risk and urgency of requested out-of-hours general practitioners care differ for people with ID compared to the general population? A cross-sectional routine data-based study

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Title: Does risk and urgency of requested out-of-hours general practitioners care differ for people with ID compared to the general population? A cross-sectional routine data-based study

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Structured Abstract

Objectives To investigate whether people with intellectual disabilities (ID) were more likely than people from the general population to request out-of-hours GP care and whether these requests had a similar level of urgency.

Design Cross-sectional routine data-based study.

Setting Two GP cooperatives providing out-of-hours primary care in an area in The Netherlands.

Population 432,582 persons living in the out-of-hours service areas, of which 1,448 could be identified as having an ID.

Main outcome measures GP cooperative records of all contacts in 2014 for people with and without ID were used to calculate the relative risk of requesting care and the associated level of urgency.

Results Of the people with ID (448/1,448), 30.9% requested out-of-hours GP care, whereas for the general population this was 18.4% (79,206/431,134), resulting in a relative risk of 1.7 (95% CI 1.6 to 1.8). We found a different distribution of urgency level for people with and without ID. Generally, requests for people with ID were rated as less urgent.

Conclusion People with ID were more likely to request out-of-hours GP care than the general population. The distribution of the urgency level of requests differed between the two groups. The high percentage of demands relating to people with ID requesting counseling and advice suggests that some out-of-hours GP care may be avoidable. However, out-of-hours primary care might not be sensitive enough to the needs of people with ID, resulting in underestimation of the urgency of requests relating to people with ID.

Keywords: After-hours care, primary healthcare, general practice, triage, intellectual disabilities, health equity

Article Summary: Strengths and limitations of this study

- This is the first study to date to compare out-of-hours primary care use and the urgency of requests of people with ID with the general population
- All care provider services in the out-of-hours service area cooperated to enable identification of people with ID in the administration system, meaning that the study population was limited to their residents.

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- Awareness of underestimation of the urgency of requests of people with ID in out-of-hours general care is timely and internationally relevant

For peer review only

INTRODUCTION

Many challenges persist in the provision of primary care for people with intellectual disabilities (ID) during daytime as well as out-of-hours.^{1,2} As a result, equity in healthcare access as defined in the United Nations' Convention on the Rights of People with Disabilities is at stake.³⁻⁵ The confidential inquiry into the premature deaths of people with ID in the UK reported an elevated mortality and indicated that a better quality of healthcare for people with ID could reduce excess mortality.⁶ This reinforced the need for routinely available data to provide evidence on, and monitoring of, health inequities of people with ID.^{7,8} In primary care, lots of data is generated routinely.⁹ Most studies on primary care for people with ID focused on daytime care, indicating that people with ID have higher healthcare demands^{4,10} and different health needs than the general population.¹¹ The demand of people with ID for out-of-hours GP care, however, is unknown.

Out-of-hours primary care is provided outside physicians' regular practice schedule and can lower costs by reducing avoidable and expensive emergency department visits.¹² In Western countries, out-of-hours primary care is organised in several forms and is increasingly provided in large-scale GP-based organisational models with integrated care.^{13,14} The Dutch model of GP cooperatives is an example of a regional large-scale out-of-hours organisation where GPs are supported by additional personnel like nurses and chauffeurs.¹⁵ Out-of-hours GP care is typically targeted at health issues that cannot wait until the next working day, thus having an urgent and ad-hoc character.¹³ Furthermore, it is the gatekeeper to out-of-hours hospital care, which in addition is internationally of growing research interest with high found overall admission rates and associated costs.¹⁶⁻²⁰ GP cooperative care for people with ID is an untapped area and forms an important link in their health and safety. One might expect the out-of-hours GP care for people with ID to be similar to that for people in the general population: care in response to requests characterized by an urgent character.

This study compares out-of-hours GP care for people with ID with out-of-hours GP care for the general population, based on routine data. The objective of this study is to investigate whether people with ID are as likely as people from the general population to request out-of-hours general practitioner care and whether the requests are similar with respect to their level of urgency.

METHODS

Design and setting

This population-based cross-sectional study used routine data for the full year of 2014 of two out-of-hours GP cooperatives, serving 432,582 persons living in the service areas of Nijmegen and Boxmeer in The Netherlands. The Dutch model of GP cooperatives is in place since the year 2000, and evaluation of these cooperatives show they are accessible, efficient, safe, well-organised, and of high quality.¹³ Depending on their residential status and the local out-of-hours care arrangements, people with ID in The Netherlands either receive out-of-hours primary care from GP cooperatives or from care provider services, the latter involves different actors such as specialised ID physicians, nurse gatekeepers and GPs.²¹ In the area under study, out-of-hours primary care for all persons with or without ID is exclusively and routinely provided by the GP cooperatives. All care provider services for people with ID in the out-of-hours service areas of the GP cooperatives of Nijmegen en Boxmeer participated. In this area, 1,448 people with ID were identified based on addresses available from the care provider services for both community-based and residential care for people with ID.

Measurements

The administration system with the routine data of the GP cooperatives was queried for all contacts on weekdays between 17:00 PM and 8:00 AM and during weekends and holidays. The administration system contained all individuals who made one or more request(s) for out-of-hours primary care. The degree of urgency of every request made was rated on a 5-point scale (Table 1) by telephone nurses conform the validated classification method: National Triage System of the Dutch College of General Practitioners.²²

Table 1: Urgency levels of the National Triage System of the Dutch College of General Practitioners²²

1 - Life threatening	Immediate action required, the vital functions are threatened or delaying treatment will cause serious and irreparable damage to the patient's health.
2 - Acute	Vital functions are not (yet) in danger, but there is a fair chance that the patient's condition will soon deteriorate or delaying treatment will cause serious and irreparable damage to the patient's health. Take action as soon as possible.
3 - Urgent	Do not postpone too long. Treat within a few hours because of medical- or humane reasons.
4 - Routine	There is no pressure resulting from medical- or other grounds. Time and place of treatment should be discussed with the patient.
5 - Counseling and advice	A physical examination can wait till the next day.

Statistical methods

The number of people for whom requests for out-of-hours GP care were made, was used to estimate the relative risk (RR) with 95% CI.²³ The 95% CIs for proportions per urgency level were calculated using the Score method with continuity correction while this is more informative than a point estimate.²⁴ Contacts for which the level of urgency was missing (n=9) were excluded.

RESULTS

About a third (30.9%) of the people with ID (448/1,448) requested out-of-hours GP care, compared to 18.4% (79,206/431,134) in the general population (RR 1.7; 95% CI 1.6 to 1.8), making people with ID more likely to request out-of-hours GP care compared to the general population.

Requests relating to people with ID were rated as less urgent than requests relating to the general population. The different distribution of urgency level reflected requests from people with ID about other than life threatening issues, with more than 60% of these categorized as counseling and advice (Table 2).

Table 2: Comparison of out-of-hour GP care requests by people with ID and the general population

	Requests relating to 1,448 people with ID		Requests relating to 79,206 of 431,134 from the remaining general population	
	n	% (CI)	n	% (CI)
Overall requests	1,318		125,439	
Urgency				
Life-threatening	27	2.0 (1.4–3.0)	3,332	2.7 (2.6–2.7)
Acute	120	9.1 (7.6–10.8)	16,090	12.8 (12.6–13.0)
Urgent	286	21.7 (19.5–24.0)	42,729	34.1 (33.8–34.3)
Routine	90	6.8 (5.6–8.4)	19,432	15.5 (15.3–15.7)
Counseling and advice	795	60.3 (57.6–63.0)	43,856	35.0 (34.7–35.2)

DISCUSSION

People with ID were more likely to request out-of-hours GP care compared to the general population. This aligns with the higher health requirements of people with ID in daytime GP care.^{4,10} Requests of people with ID were more often classified at the lowest level of urgency, requesting counseling and advice.

For this first study on out-of-hours primary care requests of people with ID, all care provider services in the out-of-hours service area provided address data to enable the identification of people with ID in the routine data system. Consequently, children and adults with ID who live in other housing arrangements, e.g. with relatives or with outreach disability support, have been falsely categorized as members of the general population. On the basis of an estimated prevalence of 0.6-0.7%,^{16,25} only 1,448 of the expected 2,595-3,028 persons with ID were identified in this study. Because of the size of the general population, this misclassification may have had a minor impact on the direction of overestimation of the out-of-hours care for the general population compared to people with ID. Results are generalisable to people with ID living at care provider services for people with ID.

A structural limitation in health and healthcare services research is the absence of registration of ID in databases and the absence of national baseline information on the health of people with ID.²⁶ Equality and equity of access to healthcare,^{3,5} means that there ought to be adequate information about the health of, and healthcare for, people with and without ID. Research using routine data and administration databases is generally less demanding, has fewer ethical constraints, and is less costly and time-consuming than most other types of research. Routine data research has the potential to both provide insight and drive quality improvement.²⁷ Currently, routine data research does not

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3 benefit people with ID to its full potential. In addition, meaningful collaboration with people with ID
4 in conducting routine date research, could further improve its quality, though methods to do so are
5 yet to be specified.²⁸ This study confirms, in yet another national context, the importance of
6 questions about knowledge on, and awareness of, care being offered to people with ID, as raised by
7 Lennox et al, Heslop et al, and McCallion and McCarron.^{1,6,8}
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11 The high percentage of counseling and advice requests suggests that some out-of-hours GP care may
12 be avoidable. People with ID and their carers may request out-of-hours GP care more frequently
13 because they feel uncertain when facing health problems.⁹ These feelings may be related to barriers
14 in accurate health information exchange where carers` competencies may not match GPs`
15 expectancies and GP practices not being fit to consultation and communication needs of people with
16 ID.^{29,30} More insight into the nature of these requests will help to develop adequate interventions to
17 address avoidable care and to effectively manage needs of people with ID at GP cooperatives.
18 Additionally, addressing challenges in the interface between in-hours and out-of-hours may reduce
19 avoidable requests, by providing better information on self-care, accessing out-of-hours services and
20 when to access in-hours care.^{9,21}
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29 The National Triage System has been developed with the general population in mind. Further
30 consideration needs to be given to the possibility of the Triage System not being sensitive enough to
31 the needs of people with ID, which could result in an underestimation of the real urgency of their
32 requests. Underestimation of the level of urgency, whereby predictors of early morbidity could be
33 missed, may potentially lead to avoidable and premature deaths.⁶ Tailoring the triage system to
34 health presentation specifics of people with ID could improve healthcare and contribute to reducing
35 health inequity, particularly because Dutch GP cooperatives are known to adhere well to national
36 guidelines.³¹
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42 Differences in care requests and healthcare needs of people with and without ID are present in out-
43 of-hours GP care. This stresses the need for directing interventions towards improvement of health
44 information exchange, and more attention for the interface between in-hours and out-of-hours care.
45 In addition, the applicability of generic triage systems to persons with ID needs to be reconsidered.
46 Further steps have to be made regarding safety of primary care, to get insight into why out-of-hours
47 care is requested and to help understand factors related to the large numbers of out-of-hours
48 primary care requests made concerning people with ID.
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4 cooperative of Nijmegen and Boxmeer for data provision.
5
6

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8 MH and SV acquired the database and extracted the data. MH and HT were responsible for the data
9 analysis. MH and HT drafted the first version of the paper. All authors contributed to data
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12

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21 **Competing interest** SV reports being employed by the GP Cooperative Nijmegen and Boxmeer; no
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23
24

25 **Ethics approval** The regional ethics committee concluded that this research based on non-person
26 identifiable registry data did not require approval from a regional/national ethics committee
27 (2014/054).
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30 **Data sharing statement** Direct access to the data is not permitted without the expressed permission
31 of the approving human research ethics committee and data provider. Researchers interested in the
32 data should contact the author SV with their expression of interest.
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REFERENCES

1. Lennox N, Van Driel ML, van Dooren K. Supporting primary healthcare professionals to care for people with intellectual disability: a research agenda. *J Appl Res Intellect Disabil* 2015; **28**(1): 33–42.
2. Perry J, Felce D, Kerr M, et al. Contact with primary care: the experience of people with intellectual disabilities. *J Appl Res Intellect Disabil* 2014; **27**(3): 200–11.
3. United Nations. *Convention on the Rights of Persons with Disabilities*. <http://www.un.org/disabilities/convention/conventionfull.shtml>, 2006 (accessed 27 January 2016).
4. Krahn GL, Hammond L, Turner A. A cascade of disparities: Health and health care access for people with intellectual disabilities. *Ment Retard Dev Disabil Res Rev* 2006; **12**(1): 70–82.
5. Northway R. *Equality and Equity of Access to Healthcare for People with Intellectual Disabilities*. <http://www.intellectualdisability.info/changing-values/articles/equality-and-equity-of-access-to-healthcare-for-people-with-intellectual-disabilities>, 2011 (accessed 23 January 2017).
6. Heslop P, Blair PS, Fleming P, et al. The confidential inquiry into premature deaths of people with intellectual disabilities in the UK: a population-based study. *Lancet* 2014; **383**(9920): 889–95.
7. Linehan C, Naaldenberg J, van Schroyen Lantman de Valk H, Tobi H. Editorial: Health inequity: from evidence to action. *J Appl Res Intellect Disabil* 2015; **28**(1): 1–2.
8. McCallion P, McCarron M. Deaths of people with intellectual disabilities in the UK. *Lancet* 2014; **383**(9920): 853–55.
9. Kinnersley P, Egbunike JN, Kelly M, et al. The need to improve the interface between in-hours and out-of-hours GP care, and between out-of-hours care and self-care. *Fam Pract* 2010; **27**(6): 664–72.
10. Straetmans JM, van Schroyen Lantman-de Valk HM, Schellevis FG, Dinant GJ. Health problems of people with intellectual disabilities: the impact for general practice. *Br J Gen Pract* 2007; **57**(534): 64–6.
11. Cooper SA, Melville C, Morrison J. People with intellectual disabilities. *BMJ* 2004; **329**(7463): 414–15.
12. Margolius D, Bodenheimer T. Redesigning after-hours primary care. *Ann Intern Med* 2011; **155**(2): 131–32.
13. Giesen P, Smits M, Huibers L, et al. Quality of after-hours primary care in the Netherlands: A narrative review. *Ann Intern Med* 2011; **155**(2): 108–13.
14. Huibers L, Giesen P, Wensing M, Grol R. Out-of-hours care in western countries: Assessment of different organizational models. *BMC Health Serv Res* 2009; **9**: 105. doi: 10.1186/472-6963-9-105.
15. Grol R, Giesen P, van Uden C. After-hours care in the United Kingdom, Denmark, and the Netherlands: new models. *Health Aff (Millwood)* 2006; **25**(6): 1733–37.
16. Reppermund S, Srasuebkul P, Heintze T, et al. Cohort profile: a data linkage cohort to examine health service profiles of people with intellectual disability in New South Wales, Australia. *BMJ Open* 2017; **7**(4): e015627.
17. Bebbington A, Glasson E, Bourke J, et al. Hospitalisation rates for children with intellectual disability or autism born in Western Australia 1983-1999: a population-based cohort study. *BMJ Open* 2013; **3**(2).
18. Iacono T, Bigby C, Unsworth C, et al. A systematic review of hospital experiences of people with intellectual disability. *BMC Health Serv Res* 2014; **14**.
19. Dunn K, Hughes-McCormack L, Cooper SA. Hospital admissions for physical health conditions for people with intellectual disabilities: Systematic review. *J Appl Res Intellect Disabil* 2017.
20. Balogh R, Brownell M, Ouellette-Kuntz H, Colantonio A. Hospitalisation rates for ambulatory care sensitive conditions for persons with and without an intellectual disability—a population perspective. *J Intellect Disabil Res* 2010; **54**(9): pp.

- 1
2
3 21. Heutmekers M, Naaldenberg J, Frankena TK, et al. After-hours primary care for people with
4 intellectual disabilities in The Netherlands-Current arrangements and challenges. *Res Dev Disabil*
5 2016; **59**: 1-7.
6 22. van Ierland Y, van Veen M, Huibers L, et al. Validity of telephone and physical triage in
7 emergency care: the Netherlands Triage System. *Fam Pract* 2011; **28**(3): 334-41.
8 23. Armitage P, Berry G, Matthews JNS. *Statistical Methods in Medical Research*. 4th ed.
9 Blackwell, Oxford, 2009.
10 24. Tobi H, van den Berg PB, de Jong-van den Berg LT. Small proportions: what to report for
11 confidence intervals? *Pharmacoepidemiol Drug Saf* 2005; **14**(4): 239-47.
12 25. van Schroyen Lantman-de Valk HM, Walsh PN. Managing health problems in people with
13 intellectual disabilities. *BMJ* 2008; **337**: a2507.
14 26. Veenstra MY, Walsh PN, van Schroyen Lantman-de Valk HM, et al. Sampling and ethical
15 issues in a multicenter study on health of people with intellectual disabilities. *J Clin Epidemiol* 2010;
16 **63**(10): 1091-100.
17 27. Powell AE, Davies HTO, Thomson RG. Using routine comparative data to assess the quality of
18 health care: understanding and avoiding common pitfalls. *Qual Saf Health Care* 2003; **12**(2): 122-28.
19 28. Frankena TK, Naaldenberg J, Cardol M, et al. Exploring academics' views on designs,
20 methods, characteristics and outcomes of inclusive health research with people with intellectual
21 disabilities: a modified Delphi study. *BMJ Open* 2016; **6**(8): e011861.
22 29. Mastebroek M, Naaldenberg J, van den Driessen Mareeuw FA, et al. Experiences of patients
23 with intellectual disabilities and carers in GP health information exchanges: a qualitative study. *Fam*
24 *Pract* 2016; **33**(5): 543-50.
25 30. Mastebroek M, Naaldenberg J, van den Driessen Mareeuw FA, et al. Health information
26 exchange for patients with intellectual disabilities: a general practice perspective. *Br J Gen Pract*
27 2016; **66**(651): e720-8.
28 31. Willekens M, Giesen P, Plat E, et al. Quality of after-hours primary care in The Netherlands:
29 adherence to national guidelines. *BMJ Qual Saf* 2011; **20**(3): 223-27.
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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses

Continued on next page

Results

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

Discussion

Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based
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*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Does risk and urgency of requested out-of-hours general practitioners care differ for people with intellectual disabilities in residential settings compared to the general population in the Netherlands? A cross-sectional routine data-based study

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3 **Title:** Does risk and urgency of requested out-of-hours general practitioners care differ for people
4 with intellectual disabilities in residential settings compared to the general population in the
5 Netherlands? A cross-sectional routine data-based study
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Structured Abstract

Objectives To investigate whether people with intellectual disabilities (ID) in residential setting were more likely than people from the general population to request out-of-hours GP care and whether these requests had a similar level of urgency.

Design Cross-sectional routine data-based study.

Setting Two GP cooperatives providing out-of-hours primary care in an area in The Netherlands.

Population 432,582 persons living in the out-of-hours service areas, of which 1,448 could be identified as having an ID.

Main outcome measures GP cooperative records of all contacts in 2014 for people with and without ID were used to calculate the relative risk of requesting care and the associated level of urgency.

Results Of the people with ID (448/1,448), 30.9% requested out-of-hours GP care, whereas for the general population this was 18.4% (79,206/431,134), resulting in a relative risk of 1.7 (95% CI 1.6 to 1.8). We found a different distribution of urgency level for people with and without ID. Generally, requests for people with ID were rated as less urgent.

Conclusion People with ID in residential setting were more likely to request out-of-hours GP care than the general population. The distribution of the urgency level of requests differed between the two groups. The high percentage of demands relating to people with ID requesting counseling and advice suggests that some out-of-hours GP care may be avoidable. However, more insight is needed into the nature of out-of-hours primary care requests of people with ID to direct structural and reasonable adjustments towards the improvement of health information exchange in, and around-the-clock access to primary care for people with ID.

Keywords: After-hours care, primary healthcare, general practice, triage, intellectual disabilities, health equity

Article Summary: Strengths and limitations of this study

- This is the first study to date to compare out-of-hours primary care use and the urgency of requests of people with ID with the general population

- All care provider services in the out-of-hours service area cooperated to enable identification of people with ID in the administration system, meaning that the study population was limited to their residents.
- Awareness of underestimation of the urgency of requests of people with ID in out-of-hours general care is timely and internationally relevant

For peer review only

INTRODUCTION

Many challenges persist in the provision of primary care for people with intellectual disabilities (ID) during daytime as well as out-of-hours.^{1,2} As a result, equity in healthcare access as defined in the United Nations' Convention on the Rights of People with Disabilities is at stake.³⁻⁵ The confidential inquiry into the premature deaths of people with ID in the UK reported an elevated mortality and indicated that a better quality of healthcare for people with ID could reduce excess mortality.⁶ This reinforced the need for routinely available data to provide evidence on, and monitoring of, health inequities of people with ID.^{7,8} In primary care, lots of data is generated routinely.⁹ Most studies on primary care for people with ID focused on daytime care, indicating that people with ID have higher healthcare demands^{4,10} and different health needs than the general population.¹¹ The demand of people with ID for out-of-hours GP care, however, is unknown.

Out-of-hours primary care is provided outside physicians' regular practice schedule and can lower costs by reducing avoidable and expensive emergency department visits.¹² In Western countries, out-of-hours primary care is organised in several forms and is increasingly provided in large-scale GP-based organisational models with integrated care.^{13,14} The Dutch model of GP cooperatives is an example of a regional large-scale out-of-hours organisation where GPs are supported by additional personnel like nurses and chauffeurs.¹⁵ Out-of-hours GP care is typically targeted at health issues that cannot wait until the next working day, thus having an urgent and ad-hoc character.¹³ Furthermore, out-of-hours primary care is the gatekeeper to out-of-hours hospital care, which in addition is internationally of growing research interest with high found overall hospitalization rates and associated costs.¹⁶⁻²⁰ GP cooperative care for people with ID in residential setting is an untapped area and forms an important link in their health and safety. One might expect the out-of-hours GP care for people with ID to be similar to that for people in the general population: care in response to requests characterized by an urgent character.

This study aims to compare out-of-hours GP care for people with ID in residential setting with out-of-hours GP care for the general population, based on routine data. The objective of this study is to investigate whether people with ID in residential setting are as likely as people from the general population to request out-of-hours general practitioner care and whether the requests are similar with respect to their level of urgency.

METHODS

Design and Setting

This population-based cross-sectional study used routine data for the full year of 2014 of two out-of-hours GP cooperatives, serving 432,582 persons living in the service areas of Nijmegen and Boxmeer in The Netherlands. The Dutch model of GP cooperatives is in place since the year 2000, and evaluation of these cooperatives show they are accessible, efficient, safe, well-organised, and of high quality.¹³ Depending on their residential status and the local out-of-hours care arrangements, people with ID in The Netherlands either receive out-of-hours primary care from GP cooperatives or from care provider services, the latter involves different actors such as specialised ID physicians, nurse gatekeepers and GPs.²¹ In the area under study, out-of-hours primary care for all persons with or without ID is exclusively and routinely provided by the GP cooperatives.

Study population

In total, 1,448 people with ID were identified based on addresses available for both residential and community living arrangements derived from all care provider services for people with ID in the out-of-hours service areas of the GP cooperatives of Nijmegen en Boxmeer, The Netherlands. The study population lived at community housing or residential campuses of long-term care provision, where they receive continuous or visiting 24-hour support.

Measurements

The administration system with the routine data of the GP cooperatives was queried for all contacts on weekdays between 17:00 PM and 8:00 AM and during weekends and holidays. The administration system contained all individuals who made one or more request(s) for out-of-hours primary care. The degree of urgency of every request was rated on a 5-point scale (Table 1) by telephone nurses conform the validated classification method: National Triage System of the Dutch College of General Practitioners.²²

Table 1: Urgency levels of the National Triage System of the Dutch College of General Practitioners²²

1 - Life threatening	Immediate action required, the vital functions are threatened or delaying treatment will cause serious and irreparable damage to the patient's health.
2 - Acute	Vital functions are not (yet) in danger, but there is a fair chance that the patient's condition will soon deteriorate or delaying treatment will cause serious and irreparable damage to the patient's health. Take action as soon as possible.
3 - Urgent	Do not postpone too long. Treat within a few hours because of medical- or humane reasons.
4 - Routine	There is no pressure resulting from medical- or other grounds. Time and place of treatment should be discussed with the patient.
5 - Counseling and advice	A physical examination can wait till the next day.

Statistical methods

The number of people for whom requests for out-of-hours GP care were made, was used to estimate the relative risk (RR) with 95% CI.²³ The 95% CIs for proportions per urgency level were calculated using the Score method with continuity correction while this is more informative than a point estimate.²⁴ Contacts for which the level of urgency was missing (n=9) were excluded.

RESULTS

About a third (30.9%) of the people with ID (448/1,448) requested out-of-hours GP care, compared to 18.4% (79,206/431,134) in the general population (RR 1.7; 95% CI 1.6 to 1.8), making people with ID more likely to request out-of-hours GP care compared to the general population. The sex and age distribution of people with ID and the general population who requested out-of-hours GP care differed with more males in the ID group and less minors and elderly (Table 2).

Table 2: Sex and age distribution of people with ID and the general population who requested out-of-hour GP care

	People with ID (n=448)		People from the remaining general population (n=79,206)	
	n	%	n	%
Sex				
Female	204	45.5	42,099	53.2
Male	244	54.5	37,107	46.8
Age category				
0–19	70	15.6	22,989	29.0
20–39	171	38.2	19,331	24.4
40–59	119	26.6	17,766	22.4
60–79	80	17.9	13,404	16.9
≥80	8	1.8	5,716	7.2

Requests relating to people with ID were rated as less urgent than requests relating to the general population. The different distribution of urgency level entailed more than 60% of requests made by people with ID categorized as counseling and advice, and did not reflect on life threatening requests (Table 3).

Table 3: Level of urgency of out-of-hour GP care demands for people with ID and the general population

	Demands related to 448 out of 1,448 people with ID		Demands related to 79,206 out of 431,134 from the remaining general population	
	n	% (CI)	n	% (CI)
Overall demands	1,318		125,439	
Urgency				
Life-threatening	27	2.0 (1.4-3.0)	3,332	2.7 (2.6-2.7)
Acute	120	9.1 (7.6-10.8)	16,090	12.8 (12.6-13.0)
Urgent	286	21.7 (19.5-24.0)	42,729	34.1 (33.8-34.3)
Routine	90	6.8 (5.6-8.4)	19,432	15.5 (15.3-15.7)
Counseling and advice	795	60.3 (57.6-63.0)	43,856	35.0 (34.7-35.2)

DISCUSSION

People with ID in residential setting were more likely to request out-of-hours GP care compared to the general population. This aligns with the higher health requirements of people with ID in daytime GP care.^{4,10} Requests of people with ID in residential setting were more often classified at the lowest level of urgency, requesting counseling and advice.

For this first study on out-of-hours primary care requests of people with ID living in residential setting, all care provider services in the out-of-hours service area provided address data to enable the identification in the routine data system. Consequently, children and adults with ID who live in other housing arrangements, e.g. with relatives or with outreach disability support, have been falsely categorized as members of the general population which would be expected to have influenced the pattern of requested care. Literature on ID study populations demonstrate prevalence of 0.6-0.7%.^{16,25} In this study a prevalence of 0.3% (1,448/432,582) was found. This misclassification may have had a minor impact in the direction of overestimation of the out-of-hours care for the general population compared to the ID group. Results are generalisable to people with ID living at care provider services for people with ID.

A structural limitation in health and healthcare services research is the absence of registration of ID in databases and the absence of national baseline information on the health of people with ID.²⁶ Equality and equity of access to healthcare,^{3,5} means that there ought to be adequate information about the health of, and healthcare for, people with and without ID. Research using routine data and administration databases is generally less demanding, has fewer ethical constraints, and is less costly and time-consuming than most other types of research. Routine data research has the potential to both provide insight and drive quality improvement.²⁷ Currently, routine data research does not benefit people with ID to its full potential. In addition, meaningful collaboration with people with ID in conducting routine data research, could further improve its quality, though methods to do so are yet to be specified.²⁸ This study confirms, in yet another national context, the importance of questions about knowledge on, and awareness of, care being offered to people with ID, as raised by Lennox et al, Heslop et al, and McCallion and McCarron.^{1,6,8}

People with ID were more likely than those without to request out-of-hours primary care, which suggests that they utilise healthcare services differently. Accessibility of daytime primary care, that commonly is utilised in less urgent situations, could play a role in this. The National Triage System is developed based on the general population. It's (lack of) sensitivity to the specific health needs, different presentations and predictors of early morbidity in people with ID needs to be reviewed in

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3 this as it could potentially influence healthcare access. Addressing challenges in the interface
4 between daytime and out-of-hours, may improve access to around-the-clock primary care by
5 providing better information on self-care and when to seek help.⁹
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9 The high percentage of counseling and advice requests suggests that some out-of-hours GP care may
10 be avoidable. While the ID group has been selected from residential care provider services, their
11 carers were most likely the ones making the requests. People with ID and their carers may more
12 frequently request out-of-hours GP care because they feel uncertain when facing health problems.⁹
13 These uncertainties may be adding to difficulties in the exchange of health information between
14 carers and GPs and GP practices not being fit to the consultation and communication needs of
15 people with ID.^{29,30} Good practice depends on the knowledge, and flexibility of individual carers and
16 healthcare professionals, which has been shown to lead to reasonable adjustments being initiated
17 random throughout organisations.³¹ More insight into the nature of out-of-hours primary care
18 requests will help to appoint reasonable adjustments that are structural to address avoidable care,
19 make out-of-hours primary care better accessible and effectively manage needs of people with ID at
20 GP cooperatives.
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29 Differences in care requests and healthcare needs of people with ID in residential setting and the
30 general population are present in out-of-hours GP care. This stresses the need for directing
31 interventions towards improvement of health information exchange, and more attention for the
32 interface between in-hours and out-of-hours care. In addition, challenges in around-the-clock access
33 to primary care for persons with ID in residential setting need to be addressed. Further steps have to
34 be made regarding safety of primary care, to get insight into why out-of-hours care is requested and
35 to help understand factors related to the large numbers of out-of-hours primary care requests made
36 concerning people with ID.
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8 MH and SV acquired the database and extracted the data. MH and HT were responsible for the data
9 analysis. MH and HT drafted the first version of the paper. All authors contributed to data
10 interpretation and the writing of the report, and approved the final version for publication.
11
12

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16

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18 publish, or preparation of the manuscript.
19
20

21 **Competing interest** SV reports being employed by the GP Cooperative Nijmegen and Boxmeer; no
22 other relationships or activities that could appear to have influenced the submitted work.
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25 **Ethics approval** The regional ethics committee concluded that this research based on non-person
26 identifiable registry data did not require approval from a regional/national ethics committee
27 (2014/054).
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30 **Data sharing statement** Direct access to the data is not permitted without the expressed permission
31 of the approving human research ethics committee and data provider. Researchers interested in the
32 data should contact the author SV with their expression of interest.
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REFERENCES

1. Lennox N, Van Driel ML, van Dooren K. Supporting primary healthcare professionals to care for people with intellectual disability: a research agenda. *J Appl Res Intellect Disabil* 2015; **28**(1): 33–42.
2. Perry J, Felce D, Kerr M, et al. Contact with primary care: the experience of people with intellectual disabilities. *J Appl Res Intellect Disabil* 2014; **27**(3): 200–11.
3. United Nations. *Convention on the Rights of Persons with Disabilities*. <http://www.un.org/disabilities/convention/conventionfull.shtml>, 2006 (accessed 27 January 2016).
4. Krahn GL, Hammond L, Turner A. A cascade of disparities: health and health care access for people with intellectual disabilities. *Ment Retard Dev Disabil Res Rev* 2006; **12**(1): 70–82.
5. Northway R. *Equality and Equity of Access to Healthcare for People with Intellectual Disabilities*. <http://www.intellectualdisability.info/changing-values/articles/equality-and-equity-of-access-to-healthcare-for-people-with-intellectual-disabilities>, 2011 (accessed 23 January 2017).
6. Heslop P, Blair PS, Fleming P, et al. The Confidential Inquiry into premature deaths of people with intellectual disabilities in the UK: a population-based study. *Lancet* 2014; **383**(9920): 889–95.
7. Linehan C, Naaldenberg J, van Schroyen Lantman de Valk H, Tobi H. Editorial: Health inequity: from evidence to action. *J Appl Res Intellect Disabil* 2015; **28**(1): 1–2.
8. McCallion P, McCarron M. Deaths of people with intellectual disabilities in the UK. *Lancet* 2014; **383**(9920): 853–55.
9. Kinnersley P, Egbunike JN, Kelly M, et al. The need to improve the interface between in-hours and out-of-hours GP care, and between out-of-hours care and self-care. *Fam Pract* 2010; **27**(6): 664–72.
10. Straetmans JM, van Schroyen Lantman-de Valk HM, Schellevis FG, Dinant GJ. Health problems of people with intellectual disabilities: the impact for general practice. *Br J Gen Pract* 2007; **57**(534): 64–6.
11. Cooper SA, Melville C, Morrison J. People with intellectual disabilities. *BMJ* 2004; **329**(7463): 414–15.
12. Margolius D, Bodenheimer T. Redesigning after-hours primary care. *Ann Intern Med* 2011; **155**(2): 131–32.
13. Giesen P, Smits M, Huibers L, et al. Quality of after-hours primary care in the Netherlands: a narrative review. *Ann Intern Med* 2011; **155**(2): 108–13.
14. Huibers L, Giesen P, Wensing M, Grol R. Out-of-hours care in western countries: Assessment of different organizational models. *BMC Health Serv Res* 2009; **9**: 105. doi: 10.1186/472-6963-9-105.
15. Grol R, Giesen P, van Uden C. After-hours care in the United Kingdom, Denmark, and the Netherlands: new models. *Health Aff (Millwood)* 2006; **25**(6): 1733–37.
16. Reppermund S, Srasuebkul P, Heintze T, et al. Cohort profile: a data linkage cohort to examine health service profiles of people with intellectual disability in New South Wales, Australia. *BMJ Open* 2017; **7**(4): e015627.
17. Bebbington A, Glasson E, Bourke J, et al. Hospitalisation rates for children with intellectual disability or autism born in Western Australia 1983-1999: a population-based cohort study. *BMJ Open* 2013; **3**(2).
18. Iacono T, Bigby C, Unsworth C, et al. A systematic review of hospital experiences of people with intellectual disability. *BMC Health Serv Res* 2014; **14**.
19. Dunn K, Hughes-McCormack L, Cooper SA. Hospital admissions for physical health conditions for people with intellectual disabilities: Systematic review. *J Appl Res Intellect Disabil* 2017; **00**: 1–10.
20. Balogh R, Brownell M, Ouellette-Kuntz H, Colantonio A. Hospitalisation rates for ambulatory care sensitive conditions for persons with and without an intellectual disability – a population perspective. *J Intellect Disabil Res* 2010; **54**(9): 820–32.

21. Heutmekers M, Naaldenberg J, Frankena TK, et al. After-hours primary care for people with intellectual disabilities in The Netherlands – current arrangements and challenges. *Res Dev Disabil* 2016; **59**: 1–7.
22. van Ierland Y, van Veen M, Huibers L, et al. Validity of telephone and physical triage in emergency care: the Netherlands Triage System. *Fam Pract* 2011; **28**(3): 334-41.
23. Armitage P, Berry G, Matthews JNS. *Statistical Methods in Medical Research*. 4th ed. Blackwell, Oxford, 2009.
24. Tobi H, van den Berg PB, de Jong-van den Berg LT. Small proportions: what to report for confidence intervals? *Pharmacoepidemiol Drug Saf* 2005; **14**(4): 239–47.
25. Wullink M, van Schroyen Lantman-de Valk HM, Dinant GJ, Metsemakers JF. Prevalence of people with intellectual disability in the Netherlands. *J Intellect Disabil Res* 2007; **51**(Pt 7): 511-9.
26. Veenstra MY, Walsh PN, van Schroyen Lantman-de Valk HM, et al. Sampling and ethical issues in a multicenter study on health of people with intellectual disabilities. *J Clin Epidemiol* 2010; **63**(10): 1091–100.
27. Powell AE, Davies HTO, Thomson RG. Using routine comparative data to assess the quality of health care: understanding and avoiding common pitfalls. *Qual Saf Health Care* 2003; **12**(2): 122–28.
28. Frankena TK, Naaldenberg J, Cardol M, et al. Exploring academics' views on designs, methods, characteristics and outcomes of inclusive health research with people with intellectual disabilities: a modified Delphi study. *BMJ Open* 2016; **6**(8): e011861.
29. Mastebroek M, Naaldenberg J, van den Driessen Mareeuw FA, et al. Experiences of patients with intellectual disabilities and carers in GP health information exchanges: a qualitative study. *Fam Pract* 2016; **33**(5): 543–50.
30. Mastebroek M, Naaldenberg J, van den Driessen Mareeuw FA, et al. Health information exchange for patients with intellectual disabilities: a general practice perspective. *Br J Gen Pract* 2016; **66**(651): e720-8.
31. Tuffrey-Wijne I, Goulding L, Giatras N, et al. The barriers to and enablers of providing reasonably adjusted health services to people with intellectual disabilities in acute hospitals: evidence from a mixed-methods study. *BMJ Open* 2014; **4**(4): e004606.

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title (pag. 1) or the abstract (pag. 2). (b) Provide in the abstract an informative and balanced summary of what was done and what was found (pag. 2).
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported (pag. 4).
Objectives	3	State specific objectives, including any prespecified hypotheses (pag. 4, last paragraph).
Methods		
Study design	4	Present key elements of study design early in the paper (pag. 5, fifth sentence).
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection (pag. 5 'Design and Setting' and 'Study population').
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants (pag. 5 'Design and Setting' and 'Study population'). (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable. Not applicable to observational study.
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group (pag. 5 'Measurements' and Table 1).
Bias	9	Describe any efforts to address potential sources of bias (pag. 5 'Study population').
Study size	10	Explain how the study size was arrived at (pag. 5 'Design and Setting' and 'Study population').
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why (pag. 6 'Statistical methods').
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (pag. 6 'Statistical methods'). (b) Describe any methods used to examine subgroups and interactions (pag. 6 'Statistical methods'). (c) Explain how missing data were addressed (pag. 6 'Statistical methods'). (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was

addressed

Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy. **Not applicable.**

(e) Describe any sensitivity analyses. **Not applicable.**

Results

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (pag. 6 first paragraph of ‘Results’). (b) Give reasons for non-participation at each stage. Not applicable. (c) Consider use of a flow diagram. Not applicable.
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (pag. 7 Table 2). (b) Indicate number of participants with missing data for each variable of interest (pag. 6 ‘Statistical methods’). (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures (pag. 6-7 ‘Results’).
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (pag. 7 Table 3). (b) Report category boundaries when continuous variables were categorized. Not applicable. (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period. Not applicable.
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses. Not applicable.

Discussion

Key results	18	Summarise key results with reference to study objectives (pag. 8 first paragraph of ‘Discussion’).
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias (pag. 8 second and third paragraph of ‘Discussion’).
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence (pag. 8-9 fourth and fifth paragraph of ‘Discussion’).
Generalisability	21	Discuss the generalisability (external validity) of the study results (pag. 8 second paragraph of ‘Discussion’).

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based (pag. 10).
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*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

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2 **Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and
3 published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely
4 available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at
5 <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is
6 available at www.strobe-statement.org.
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