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## Sociodemographic and health-related determinants for performing repeated calls within 48 hours to a Medical helpline, -a prospective cohort study.

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12 Sociodemographic and health-related determinants for performing repeated calls within 48 hours to  
13 a Medical helpline, -a prospective cohort study.  
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## ABSTRACT

**Objectives:** Telephone triage to acute medical healthcare services requires for the caller to have the ability to describe symptoms sufficiently, to receive accurate triage outcome. A repeated call might be an indicator of a hampered co-construction in the initial call.

**Aim:** To identify sociodemographic and health-related characteristics for callers performing repeated calls within 48 hours to a medical helpline with triage function, compared to callers performing single calls.

**Setting:** In the Capital Region of Denmark citizens with acute non-life-threatening illness or injury are triaged through a Medical Helpline to acute healthcare services round the clock.

**Participants:** All callers to the medical Helpline between 18 January - 9 February 2017 (n=38,787) were invited to participate in a survey and 12,902 accepted. Exclusion: Temporary civil registration number (n=78), calls not made by patient/close relative (n=699), incomplete answer to survey question (n=19). Single callers (n=11,131) and repeated callers (n=464) were included for analysis.

Data related to caller (age, gender, caller identification) were collected from the Medical Helpline electronic records. Data were enriched with data on callers self-rated health and self-evaluated degree-of-worry, along with register data on income, ethnicity and comorbidities.

**Results:** In the crude logistic regression analysis age, self-rated health, degree-of-worry, ethnicity, income and comorbidities were significantly associated with performing repeated calls.

In the mutually adjusted analysis, odds for performing repeated calls remained significantly decreased for citizens with household income in the middle (OR = 0.71 (95% CI = 0.54-0.92)) and highest (OR = 0.68 (95% CI = 0.48-0.96)) quartile. Immigrants had borderline significantly increased odds (OR = 1.34 (95% CI = 0.96-1.85)).

**Conclusion:** Sociodemographic and health-related characteristics were associated with repeated calls within 48 hours to the Medical Helpline, indicating potentially hampered co-constructions in the initial call. Consequently, telephone triage might unintentionally mediate inequities in access to acute healthcare services.

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## STRENGTH AND LIMITATIONS OF THE STUDY

- The characteristics of citizens making repeated calls to a medical helpline with triage function, have not previously been investigated.
- This study comprises an overview of the frequency of health related and sociodemographic characteristics and its association with citizens performing repeated calls to a medical helpline, compared to citizens performing single calls.
- The individual characteristics influence on the odds of making repeated calls to a medical helpline is calculated in a gender and age adjusted, and in a mutually adjusted, logistic regression analysis.
- The cluster of sociodemographic characteristics influence on making repeated call compared to the health-related characteristics is illustrated.
- In present study 33,3 % of the invited study population accepted to participate in the survey, whereas selection bias might have been introduced.

## MAIN TEXT

### BACKGROUND

In the last decade, out-of-hours (OOH) primary care has been organized in large-scale organizations in several countries (1). Telephone triage is a common feature of the OOH services and serve as a way of determining urgency and healthcare needed (2). In Copenhagen citizens with acute non-life-threatening illness or injury are encouraged to call a one-tier telephone visitation and triage service, organized as the Medical Helpline 1813 (MH1813) (3). Triage outcome can be one of two superior outcomes; 1): face-to-face consultation (home visit, consultation at an hospital-based emergency department or acute care clinic, hospitalisation) or 2): medical telephone advise (advice on self-care, advised to see their usual general practitioner, or medical prescriptions) (4). However, telephone triage is not straight forward, and clinical decision making is compromised by the lack of visual clues (4). The call-handler uses a strategy of “building a picture” of the caller, where non-verbal cues like tone of voice, choice of words and background noises help to determine the urgency of the call (5). In this “picture-building” strategy the call-handlers own preconception and formation of stereotypes are integrated subconsciously (6), as well as the call-handlers professional and personal experience (6). Moreover, when the tasks of the call-handler is to be a gate-keeper and a caregiver at the same time, the clinical decision making might be further complicated (7).

In addition, when a telephone medical helpline serves as the one-tier entry point to a potential face-to-face consultation, it requires for the caller to have the ability to describe symptoms sufficiently and follow the given medical advice adequately (2, 8), -however, callers may vary in their ability to do so (9). Lack of this ability potentially may lead to an increased risk for the caller to receive inaccurate health advise and triage outcome (10). Consequently, the need to perform a repeated call to the medical helpline might be an indicator of a hampered co-construction related to communicative issues in the initial call.

There is a lack of studies investigating if sociodemographic or health-related characteristics are related with repeated calls to a medical helpline with triage function. In the existing literature concerning users of OOH services with face-to-face consultation (e.g. emergency departments), health-related and sociodemographic characteristics such as age, ethnicity and comorbidities have been associated with repeated visits (11-14), and as posing a risk for errors in clinical decision making (11, 15-18).

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4 Identification of sociodemographic and health-related determinants for performing repeated calls  
5 may help to prevent errors in clinical decision making, and thus prevent under- or over triage in  
6 medical helplines.  
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10 **Objectives:** The aim of this paper is to investigate health related and sociodemographic  
11 characteristics in citizens performing repeated calls within 48 hours, compared to citizens  
12 performing single calls. Moreover, we seek to discuss, whether telephone triage unintentionally  
13 may mediate inequity in access to face-to-face OOH medical services.  
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## 21 **METHODS**

### 22 **Design**

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24 A prospective cohort study of citizens who performed repeated calls to the MH1813 within 48  
25 hours from the initial call (n=464) compared to citizens who performed a single call (n=11,131).  
26 Differences between groups were investigated in relation to sociodemographic (income and  
27 ethnicity) and health-related characteristics (age, gender, degree of comorbidities, self-rated health  
28 (SRH) and self-evaluated degree-of-worry (DOW)). Influence of characteristics linked to the initial  
29 call to MH1813 (time of call, caller) was also analysed.  
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### 40 **Setting**

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42 The study was conducted at Emergency Medical Services Copenhagen, The Capital Region of  
43 Denmark, that provides acute and emergency service to a population of 1.7 million citizens. In  
44 Denmark access to public medical health care services is free of charge. The MH1813 is the one-  
45 tier entry point for acute healthcare round the clock, where citizens with acute non-life-threatening  
46 illness or injury, are encouraged to call for preassessment and triage to potential face-to-face  
47 consultation, outside general practitioners office hours (3). Emergency calls for potential life-  
48 threatening symptoms or injury and request for an ambulance are handled through a different  
49 telephone number; 112.  
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56 Approximately one million calls annually are handled by the medical staff at the MH1813, of which  
57 4% of the calls are repeated calls within 48 hours from the initial call (19) . The call-handlers at the  
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MH1813 are nurses (80%) or physicians (20%) and use an electronic decision support tool to determine the urgency of the health problem and health care needed (3).

## Approvals and registration

This study was approved by the Danish Data Protection Agency (2012-58-0004), and Statistics Denmark, and is registered at [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (NCT02979457). The Ethical Committee was consulted but no permission was needed (H-15016323).

## Participants

All citizens calling MH1813 between 18 January - 9 February 2017 were invited to participate in a survey. If the caller agreed to participate, the survey was completed prior to the conversation with the call-handler. During this period 38,787 citizens called, and 12,902 accepted participation (33.26 %). Callers were excluded if they had a temporary civil registration number (e.g. tourists) (n=78), the call was not made by the patient or a close relative to the patient (e.g. primary care nurses) (n=699), or if the caller did not answer all survey question (n=19) - leaving 12,106 calls for analysis as illustrated in Figure 1.

The calls included in the study cohort were divided into call sequences representing: I) single calls, defined as calls that did not have a repeated call within 48 hours (n=11,131), II) initial calls to the repeated call (n=464), III) first repeated call within 48 hours to the initial call (n=464), IV) two or more repeated call within 48 hours from the initial call (n=47), as illustrated in Figure 2.

Data used in this study were divided into two main groups throughout all analyses: single calls (n=11,131) and the initial call to the repeated call (n=464).

## Exposures

Data on citizens gender, age ( $\leq 5$  years, 6 -18 years, 19 -65 years,  $> 65$  years), time of call (workday, weekend) were retrieved from the electronic patient record at the MH1813. Survey



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4 questions; DOW (Low, middle, high) and SRH (1 to 5, 1=excellent, 5=poor) and caller (patient,  
5 close relative to the patient) were collected prior the conversation with the call handler.  
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9 In Denmark, all citizens are assigned a personal identification number at birth or when officially  
10 registered in the Danish Civil Registration system (CRS) (20, 21), which allows for individual  
11 follow-up in connection with all national registries. Data on each caller could be merged with data  
12 on annual household income divided in to four quartiles (very low, low, middle, high) and ethnicity  
13 (Natives, immigrants, descendants from immigrants) from the Statistics Denmark registers (22).  
14 Data on comorbidity within the past 10 years (Charlson-score 0 = no comorbidities, Charlson-score  
15 1 = one comorbidities, Charlson-score 2 = two or more comorbidities) were obtained from the  
16 National Patient Register (23, 24) where morbidity is registered continuously for all patients in  
17 Danish hospitals. The National Patient Register validity is estimated between 66-99% compared to  
18 journal audit (25).  
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## 30 ANALYSIS

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33 Descriptive baseline analysis of sociodemographic and health-related characteristics were  
34 performed using frequency distributions (number and percentage). Logistic regression analyses  
35 were used for calculating crude, age and gender adjusted and mutually (adjusted for age, gender,  
36 ethnicity, income, call time, caller, DOW, SRH Charlson comorbidity score) adjusted Odds Ratios  
37 (ORs) with 95% Confidence Intervals (95% CI) for repeated callers (n=464) versus single callers  
38 (n=11,131).  
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44 The statistical analyses were performed using SAS Enterprise Guide 7.1  
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## 49 RESULTS

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51 A total of 12,595 callers were included in this analysis, of which 4 % (n=464) represented callers  
52 performing repeated calls within 48 hours from the initial call.  
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55 The results of the crude analysis identified an association between repeated calls within 48 hours to  
56 the MH1813, and citizens' sociodemographic and health-related characteristics as well as  
57 characteristics related to the call. However, these associations decreased in the mutually adjusted  
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analysis, indicating that sociodemographic and health-related characteristics have a reinforcing effect on the need to perform a repeated call.

By comparing the results in the mutually adjusted analysis, it is revealed that the sociodemographic variables have a stronger association with the odds of performing a repeated call within 48 hours, compared to the health-related variables. This is illustrated in Figure 3.

### Health-related characteristics association with performing repeated calls:

The crude analysis on the health-related characteristics (age, gender, DOW, SRH, Charlson comorbidity score) found all characteristics, except from gender, significantly associated with the odds of performing repeated calls. The strongest positive association for performing a repeated call was having a Charlson comorbidity score 2 (two or more comorbidity) compared to those with Charlson comorbidity score 0 (no comorbidity) OR = 1.66 (95% CI = 1.26-2.19) (Table 1).

*Table 1 showing crude, adjusted and full model adjusted Odds ratios (ORs) with 95 % confidence intervals (95%CI) for health-related characteristics for repeated calls < 48 hours (n=464) compared to single calls (n=11,131) to the medical helpline.*

	Single callers (n=11.131)	Repeated callers (n=464)	Crude OR (95%CI)	Adjusted OR (95% CI) *	Mutually adjusted OR (95% CI)**
<b>Gender in % (n)</b>					
Male	45.96 (5116)	44.18 (205)	<b>1</b>	<b>1</b>	<b>1</b>
Female	54.04 (6015)	55.82 (259)	<b>1.08</b> (0.89-1.29)	<b>0.96</b> (0.77-1.13)	<b>0.94</b> (0.78-1.14)
<b>Age in % (n)</b>					
Mean	30.37	34.57			
Age ≤ 5 years	23.14 (2576)	22.84 (106)	<b>1</b>	<b>1</b>	<b>1</b>
Age ≥ 6 ≤ 18 years	17.20 (1915)	13.58 (63)	<b>0.79</b> (0.58-1.09)	<b>0.79</b> (0.58-1.09)	<b>0.95</b> (0.67-1.33)
Age ≥ 19 ≤ 65 years	46.91 (5222)	43.75 (202)	<b>0.95</b> (0.74-1.20)	0.94 (0.74-1.19)	<b>0.80</b> (0.59-1.08)
Age > 65 years	12.74 (1428)	19.83 (92)	<b>1.58</b> (1.18-2.10)	<b>1.57</b> (1.17-2.09)	<b>1.24</b> (0.85-1.81)
<b>Degree of worry (DOW) in % (n)</b>					
Low	30.51 (3396)	28.50 (132)	<b>1</b>	<b>1</b>	<b>1</b>
Middle	36.17 (4026)	30.39 (141)	<b>0.90</b> (0.71-1.15)	<b>0.89</b> (0.69-1.13)	<b>0.88</b> (0.69-1.23)
High	33.32 (3709)	41.16 (191)	<b>1.33</b> (1.06-1.66)	<b>1.23</b> (0.98-1.55)	<b>1.13</b> (0.89-1.45)
<b>Self Rated Health (SRH) in % (n)</b>					
1 (very good)	18.84 (2077)	17.10 (79)	<b>1</b>	<b>1</b>	<b>1</b>
2	24.35 (2685)	23.16 (107)	<b>1.05</b> (0.78-1.41)	<b>1.02</b> (0.76-1.37)	<b>1.02</b> (0.75-1.37)
3	22.07 (2433)	19.26 (89)	<b>0.96</b> (0.71-1.31)	<b>0.90</b> (0.66-1.23)	<b>0.87</b> (0.63-1.19)
4	20.03 (2208)	18.61 (86)	<b>1.02</b> (0.75-1.39)	<b>0.93</b> (0.68-1.28)	<b>0.88</b> (0.63-1.21)
5 (very poor)	14.71 (1622)	21.86 (101)	<b>1.64</b> (1.21-2.21)	<b>1.43</b> (1.05-1.96)	<b>1.26</b> (0.91-1.75)
Missing	n=106	n = 2			

Charlsonscore index in % (n)					
0 (None comorbidities)	81.26 (9045)	75.65 (351)	<b>1</b>	<b>1</b>	<b>1</b>
1 (one comorbidities)	9.95 (1108)	10.78 (50)	<b>1.16</b> (0.86-1.57)	<b>1.06</b> (0.77-1.15)	<b>1.02</b> (0.74-1.40)
2 (two or more comorbidities)	8.79 (978)	13.58 (63)	<b>1.66</b> (1.26-2.19)	<b>1.33</b> (0.96-1.84)	<b>1.27</b> (0.91-1.77)

\* Adjusted for age and gender

\*\*Adjusted for for age, gender, ethnicity, income, call time, caller, DOW, SRH Charlsons comorbidity score

In the mutually adjusted logistic regression analysis, the ORs decreased somewhat and none of the health-related characteristics were significantly associated with the odds of performing a repeated call (Table 1).

### Sociodemographic characteristics association with performing repeated calls:

The crude analysis on the sociodemographic characteristics (household income, ethnicity) found immigrant status to increase the odds of performing a repeated call, while having a middle or a high household income decreased the odds of performing a repeated call (Table 2).

*Table 2 showing crude, adjusted and full model adjusted Odds ratios (ORs) with 95 % confidence intervals (95%CI) for sociodemographic characteristics for repeated calls < 48 hours (n=464) compared to single calls (n=11,131) to the medical helpline.*

	Single callers (n=11.131)	Repeated callers (n=464)	Crude OR (95%CI)	Adjusted OR (95% CI) *	Mutually adjusted OR (95% CI)**
<b>Ethnicity % (n)</b>					
Natives	82.24 (9488)	82.24 (380)	<b>1</b>	<b>1</b>	<b>1</b>
Immigrants	7.22 (833)	10.17 (47)	<b>1.41</b> (1.03-1.93)	<b>1.40</b> (1.02-1.93)	<b>1.34</b> (0.96-1.86)
Descendants from immigrants	6.54 (754)	7.57 (35)	<b>1.16</b> (0.81-1.65)	<b>1.27</b> (0.89-1.82)	<b>1.14</b> (0.79-1.65)
<b>Annual household income % (n)</b>					
Very low	28.31 (3151)	33.62 (156)	<b>1</b>	<b>1</b>	<b>1</b>
Low	28.20 (3139)	31.68 (147)	0.95 (0.75-1.19)	0.82 (0.64-1.06)	0.81 (0.63-1.05)
Middle	28.73 (3198)	23.71 (110)	0.69 (0.54-0.89)	1.03 (0.80-1.33)	0.71 (0.54-0.92)
High	14.76 (1643)	10.99 (51)	0.63 (0.46-0.87)	0.65 (0.46-0.91)	0.68 (0.48-0.96)

\* Adjusted for age and gender

\*\*Adjusted for for age, gender, ethnicity, income, call time, caller, DOW, SRH Charlsons comorbidity score

In the mutually adjusted logistic regression analysis, annual income significantly decreased the odds of performing a repeated call for citizens with household income in the middle quartile OR=0.71

(95% CI=0.54-0.92) and highest quartiles OR = 0.68 (95% CI = 0.48-0.96), compared to citizens with household income in the lowest quartile (Table 2).

Immigrants relative to natives had significantly increased odds for performing repeated calls, in the crude analysis, as well as the analyses adjusted for age and gender. In the mutually adjusted analysis, the association was borderline significant OR = 1.34 (95% CI = 0.96-1.85). This Result indicates that being an immigrant is a potential determinant for performing repeated calls to the MH1813 (Table 2).

### Characteristics attached to the call to MH1813 and association with performing repeated calls

The crude analysis on characteristics related to the call, found that callers who were a close relative to the patient were significantly associated with performing a repeated call, while time of call did not have an association with performing a repeated call (Table 3).

*Table 3 showing crude, adjusted and full model adjusted Odds ratios (ORs) with 95 % confidence intervals (95%CI) for characteristics attach to the call for repeated calls < 48 hours (n=464) compared to single calls (n=11,131) to the medical helpline.*

	Single callers (n=11.131)	Repeated callers (n=464)	Crude OR (95%CI)	Adjusted OR (95% CI) *	Mutually adjusted OR (95% CI)**
<b>Call time in % (n)</b>					
Work day	60.88 (6777)	59.27 (275)	<b>1</b>	<b>1</b>	<b>1</b>
Weekend	39.12 (4354)	40.73 (189)	<b>1.07</b> (0.88-1.29)	<b>1.05</b> (0.87-1.27)	<b>1.09</b> (0.89-1.32)
<b>Caller in % (n)</b>					
Patient	40.26 (4481)	45.26 (210)	<b>1</b>	<b>1</b>	<b>1</b>
Close relative	59.74 (6650)	54.74 (254)	<b>0.82</b> (0.67-0.98)	<b>0.79</b> (0.64-1.00)	<b>0.75</b> (0.59-0.94)

\* Adjusted for age and gender

\*\*Adjusted for for age, gender, ethnicity, income, call time, caller, DOW, SRH Charlsons comorbidity score

In the mutually adjusted logistic regression analysis callers who were close relatives had a significantly decreased odds of performing repeated calls, relatively to callers who were patients OR = 0.75 (95% CI = 0.59-0.94) (Table 3).

## DISCUSSION

The main findings are the stronger association between callers' sociodemographic characteristics, (income and ethnicity) than callers' health-related characteristics (age, gender, comorbidity, SRH, DOW) on repeated calls to the one-tier telephone visitation and triage service MH1813, as illustrated in Figure 3. Similar trends have been observed in citizens with repeated visits to OOH services with face-to-face consultations, where sociodemographic factors also influence the approach pattern (26-31). This indicates that the MH1813 reflects similar patterns among citizens with low income and citizens who are immigrants, as seen in the OOH services in general.

The variable household income was the only characteristic among the sociodemographic and health-related variables, that remained significantly associated with performing repeated calls in the mutually adjusted analysis. Results indicate that high household income might prevent from performing a repeated call within 48 hours from the initial call, and thus, low household income may be seen as a determinant for performing repeated calls. This finding can be based on the evidence that low socio-economic status has a relation to the extent of comorbidity (32, 33) which may increase the need for a professional assessment of the severity of symptoms. Moreover, low socioeconomic status is related to an increased use of medical services in general (30, 33). The results from the present study identify income level as a potentially hampered co-construction of the problem in the initial call. This might influence the citizens ability to benefit from a telephone medical helpline with triage function. Hypothetically, the gate keeper telephone triage may unintentionally mediate inequity in access to health care, that goes beyond the inequities in health existing in the background population.

In relation to ethnicity, the frequency distribution showed that 7.2 % of single callers were immigrants. Compared to the total Danish population 10.31% are immigrants (34) – which indicate a tendency for fewer immigrants in the study population than in the background population. Whether this is an expression of fewer immigrants using the MH1813, or whether it expresses fewer immigrants choosing to participate in the survey, cannot be answered by the present material. However, existing literature suggests the latter, because immigrants generally use OOH acute healthcare with face-to-face consultation more frequently than natives (31).

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4 The mutually adjusted analysis revealed that immigrants had insignificantly higher odds of  
5 performing repeated calls compared to native Danes. This result may be explained by immigrants  
6 who have limited language skills and therefore do not have a proficient vocabulary to perform an  
7 adequate symptom description in a telephone consultation (35, 36). We suggest that immigrants  
8 potentially have an increased risk of not receiving relevant health advice or triage outcome. Another  
9 contributing influence could be explained by the findings from a Norwegian study by Hansen et al.  
10 who investigated adherence to advice after telephone counselling by nurse. The authors found a  
11 significant lower level of trust in the nurses and also, feeling of getting relevant answers to  
12 questions, among immigrants compared to natives. (37) .

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21 In the frequency distribution between repeated callers and single callers, gender had no association  
22 with repeated calls to the MH1813. Nevertheless, there were a higher incidence of women, among  
23 single callers (54.04%) as well as among repeated callers (55.82%) than the distribution in the  
24 Danish population (50.25%) (34). This distribution is similar to other studies concerning OOH  
25 services (2, 38, 39). Women in general contact medical helplines more often than men, moreover  
26 women generally report lower SRH than men (40), and higher DOW (41) when contacting a  
27 medical helpline.

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34 The frequency distribution on comorbidity in the study population shows that citizens with the  
35 highest strata of comorbidity more frequently performed repeated calls (13.58%) than single calls  
36 (8.79%). This is in line with the existing literature where people with chronic diseases have a higher  
37 rate of repeated inquiries to emergency departments, compared to people without chronic disease  
38 (42-44). This is allegedly explained by the fact citizens with multiple comorbidities have a higher  
39 proportion of progressive symptoms, which increases the need for repeated inquiries (8) .

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46 The reported self-evaluations of DOW and SRH were obtained in real time in conjunction with the  
47 call to the MH1813, diminishing the risk of recall bias. Both SRH and DOW are simple self-  
48 reported single-item variables that measure subjective qualitative data with a quantitative method  
49 (45). Poor self-evaluated health is a factor prompting people to seek primary care more frequently  
50 (28, 29). In the present study poor SRH (SRH=5) was significantly associated with the need to  
51 perform repeated calls compared to good SRH (SRH=1) in the crude analysis. Likewise, DOW was  
52 significantly associated in the crude analysis. The observed association remained significant in the  
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4 age and gender adjusted analysis, indicating that self evaluated health and self evaluated worry are  
5 potential predictors for repeated calls.  
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9 When a call was performed on behalf of the patient by a close relative, the risk of performing a  
10 repeated call was significantly reduced. We hypothesize that this result could be based on the  
11 number of relatives who are parents of small children, who seek advice and guidance on how to  
12 handle a child's symptoms, and therefore do not have the need to repeat the call to the MH1813.  
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14 The two youngest age categories (0-5 and 6-18 years) represent almost 40% of all calls to the  
15 MH1813, and are overrepresented compared to the Danish population (22.6%) (34). This is in line  
16 with similar studies demonstrating that younger people have a higher consumption of acute  
17 healthcare in general (2, 15, 38, 39).  
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24 Overall, the analysis on both sociodemographic, health-related characteristics had a trend in the age  
25 and gender, and in the mutually adjusted analysis towards a non-significant difference between  
26 groups. This indicates that the investigated variables had a reinforcing effect, and hence did not  
27 independently characterize citizens with a need to perform repeated calls. Thus, the need to perform  
28 repeated calls constitute a complex issue.  
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33 **Limitations:** In the present study 33,3 % of the invited study cohort accepted to participate in the  
34 survey. In a comparative analysis the participants did not differ significantly from non-responders in  
35 relation to age, gender and triage outcome. Nevertheless, selection bias might have been introduced  
36 in relation to other sociodemographic or health related characteristics.  
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41 Data on comorbidity was obtained from the National Patient register (24). Therefore, citizens may  
42 have had one or more morbidities that were unrecognized and thus, the citizen had not received an  
43 in-hospital diagnosis and following registration. This could potentially have led to an information  
44 bias in relation to the calculation of comorbidity scores in the present study. However, since this  
45 potential information bias would have been present in both citizens with single calls and citizens  
46 with repeated calls, it has been considered a non-differential misclassification.  
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51 In this study, both SRH and DOW are measured with a simplified numeric scale. SRH is recognized  
52 as valid predictor of morbidity and mortality (45). However, DOW is a less investigated variable,  
53 why the validity cannot be accounted for as recommended for self-reported measurements (46).  
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4 **Implications for clinicians and policymakers:** This study indicates that telephone OOH services  
5 to some extent are unable to accommodate the help requested from a population with low income or  
6 who are not native, possibly related to a hampered co-construction related to communicative issues  
7 in the initial call. Results highlight the relevance of an awareness to the risk that telephone-based  
8 visitation may mediate inequities in access to health care services. It is important to recognize these  
9 sociodemographic characteristics, in order to prevent under-triage which poses a risk of delay in  
10 examination and treatment.  
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17 This could potentially be accommodated by implementing additional information on callers  
18 sociodemographic and self-evaluated characteristics in the existing electronic decision support tool,  
19 and thereby subsidize identification and clinical decision making in telephone triage.  
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24 The study results are beneficial for other large-scale OOH medical telephone services with triage  
25 function, hence the study results represent generalizability.  
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## 30 **CONCLUSION**

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32 In the present study 4 % of the calls to the MH1813 represented repeated callers. The analysis  
33 identified sociodemographic and health-related characteristics associated with performing repeated  
34 calls to the MH1813. Our findings suggest that income and ethnicity are potential determinants for  
35 performing repeated calls. This indicates that sociodemographic characteristics, constitute a  
36 hampered co-construction of the problem in the initial call, possibly related to communicative  
37 issues. This may unintentionally mediate inequity in access to health care services, for citizens who  
38 are immigrants or who have a low household income.  
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## 49 **FIGURE LEGENDS/CAPTION:**

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51 **Figure 1:** Flowchart of calls included

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53 **Figure 2:** Division of the included calls in four strata

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55 **Figure 3:** Showing Odds Ratios  
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## AUTHORS CONTRIBUTION

**Mitti Blakø (MB)**, Medical Emergency Services, University of Copenhagen

RN, MSc.

**Hejdi Gamst-Jensen (HG)** Medical Emergency Services Copenhagen

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MD. Ph.D.

**Tom Møller (TM)** UCSF, University of Copenhagen

RN, MPH, Associate Professor.

Contributors: MB, HG, ME and TM conceptualized the study. MB and HG participated in data extraction. MB and ME participated in data analysis. MB and TM produced the first draft of the manuscript, while all authors provided overall guidance and final review of all manuscript drafts.

## ACKNOWLEDGEMENT

We acknowledge the support of Jens Morten Haugaard and especially the Medical Emergency Services Copenhagen in acquiring scientific material and overall guidance.

## FUNDING STATEMENT

The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors. This study was carried out in relation to a Master's thesis, with data from an existing study at Medical Helpline 1813, registered at [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (NCT02979457).

## **A COMPETING INTEREST STATEMENT**

None declared.

## **DATA SHARING STATEMENT**

Additional data that are not available online can be obtained by contacting the corresponding author.

## **PROVENANCE AND PEER REVIEW**

Not commissioned; externally peer reviewed

## **PATIENT CONCENT FOR PUBLICATION**

Not required.

## **PATIENT AND PUBLIC INVOLVEMENT**

The development of the research aim, design, recruitment, conduct and outcome measures in this study were not based on patients' involvement. Participants can request information regarding this study.

## **ETHICS APPROVAL**

The study is approved by the Danish data protective agency (2012-58-0004). The Ethical Committee was consulted but no permission was needed (H-15016323).

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60**RESEARCH REPORTING CHECKLIST**

Section/Topic	Item #	Recommendation	Reported on page #
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1,5
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4,5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5,6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	6
		(b) For matched studies, give matching criteria and number of exposed and unexposed	none
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,7
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	6,7
Bias	9	Describe any efforts to address potential sources of bias	3,13
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	none
		(c) Explain how missing data were addressed	none
		(d) If applicable, explain how loss to follow-up was addressed	none

		(e) Describe any sensitivity analyses	none
<b>Results</b>			
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	6
		(b) Give reasons for non-participation at each stage	none
		(c) Consider use of a flow diagram	Figure 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1 Table 2
		(b) Indicate number of participants with missing data for each variable of interest	Table 1
		(c) Summarise follow-up time (eg, average and total amount)	7,8,9,10
Outcome data	15*	Report numbers of outcome events or summary measures over time	Table 1 Table 2 Table 3 7,8,9
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	7,8,9
		(b) Report category boundaries when continuous variables were categorized	6,7
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	none
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	none
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	11,12,13
<b>Limitations</b>			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
<b>Other information</b>			
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	16

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## REFERENCES

1. 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.
2. Huibers L, Moth G, Carlsen AH, Christensen MB, Vedsted P. Telephone triage by GPs in out-of-hours primary care in Denmark: a prospective observational study of efficiency and relevance. *Br J Gen Pract*. 2016;66(650):e667-73.
3. Wadmann SK J. Evaluering af enstrenget og visiteret akutsystem i Region Hovedstaden. Sammenfatning. Det nationale institut for komuners og regioners analyse og forskning. 2015.
4. Leprohon J, Patel VL. Decision-making strategies for telephone triage in emergency medical services. *Med Decis Making*. 1995;15(3):240-53.
5. Purc-Stephenson RJ, Thrasher C. Nurses' experiences with telephone triage and advice: a meta-ethnography. *J Adv Nurs*. 2010;66(3):482-94.
6. Greenberg ME. A comprehensive model of the process of telephone nursing. *J Adv Nurs*. 2009;65(12):2621-9.
7. Holmstrom I, Dall'Alba G. 'Carer and gatekeeper' - conflicting demands in nurses' experiences of telephone advisory services. *Scand J Caring Sci*. 2002;16(2):142-8.
8. Flarup L, Moth G, Christensen MB, Vestergaard M, Olesen F, Vedsted P. Chronic-disease patients and their use of out-of-hours primary health care: a cross-sectional study. *BMC Fam Pract*. 2014;15:114.
9. Gamst-Jensen H, Lippert FK, Egerod I. Under-triage in telephone consultation is related to non-normative symptom description and interpersonal communication: a mixed methods study. *Scand J Trauma Resusc Emerg Med*. 2017;25(1):52.
10. Bunn F, Byrne G, Kendall S. The effects of telephone consultation and triage on healthcare use and patient satisfaction: a systematic review. *Br J Gen Pract*. 2005;55(521):956-61.
11. Verelst S, Pierloot S, Desruelles D, Gillet JB, Bergs J. Short-term unscheduled return visits of adult patients to the emergency department. *J Emerg Med*. 2014;47(2):131-9.
12. Cheng SY, Wang HT, Lee CW, Tsai TC, Hung CW, Wu KH. The characteristics and prognostic predictors of unplanned hospital admission within 72 hours after ED discharge. *Am J Emerg Med*. 2013;31(10):1490-4.
13. Sabbatini AK, Kocher KE, Basu A, Hsia RY. In-Hospital Outcomes and Costs Among Patients Hospitalized During a Return Visit to the Emergency Department. *JAMA*. 2016;315(7):663-71.
14. Martin-Gill C, Reiser RC. Risk factors for 72-hour admission to the ED. *Am J Emerg Med*. 2004;22(6):448-53.
15. Huibers LA, Moth G, Bondevik GT, Kersnik J, Huber CA, Christensen MB, et al. Diagnostic scope in out-of-hours primary care services in eight European countries: an observational study. *BMC Fam Pract*. 2011;12:30.
16. Byrne M, Murphy AW, Plunkett PK, McGee HM, Murray A, Bury G. Frequent attenders to an emergency department: a study of primary health care use, medical profile, and psychosocial characteristics. *Ann Emerg Med*. 2003;41(3):309-18.
17. Di Giuseppe G, Abbate R, Albano L, Marinelli P, Angelillo IF, Collaborative Research G. Characteristics of patients returning to emergency departments in Naples, Italy. *BMC Health Serv Res*. 2008;8:97.
18. McCusker J, Healey E, Bellavance F, Connolly B. Predictors of repeat emergency department visits by elders. *Acad Emerg Med*. 1997;4(6):581-8.
19. helpline Tepratm. 18 January - 9 February 2017

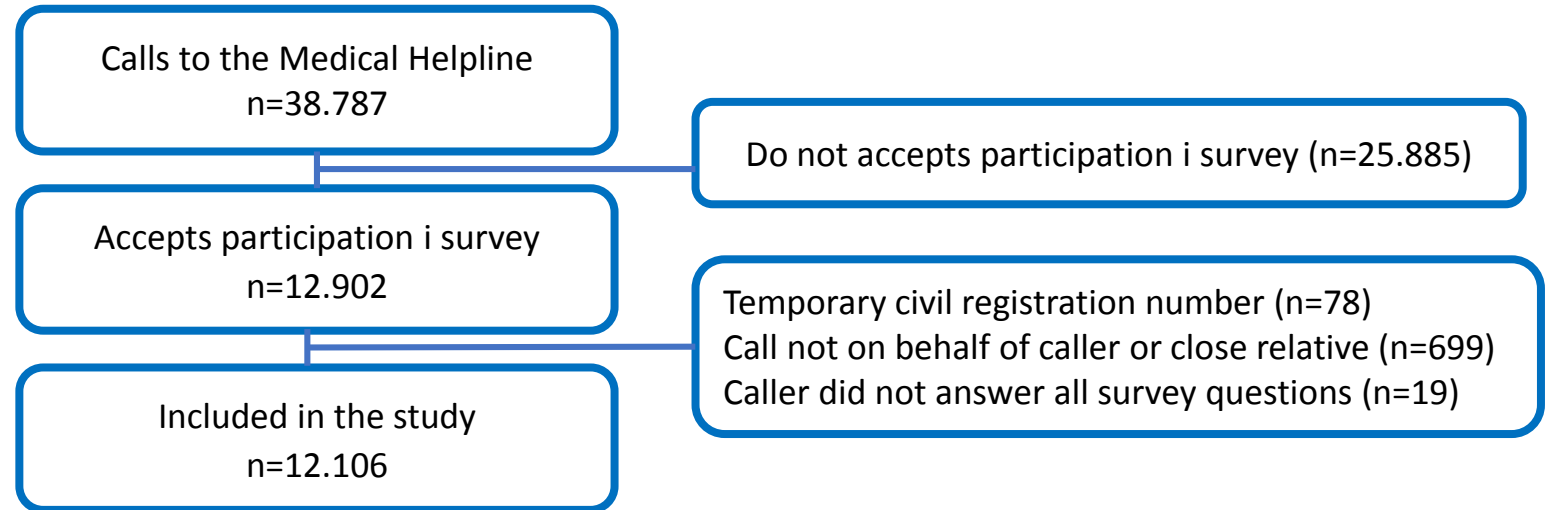
20. Pedersen CB. The Danish Civil Registration System. *Scand J Public Health*. 2011;39(7 Suppl):22-5.
21. Schmidt M, Pedersen L, Sorensen HT. The Danish Civil Registration System as a tool in epidemiology. *Eur J Epidemiol*. 2014;29(8):541-9.
22. Thygesen L. The register-based system of demographic and social statistics in Denmark. *Stat J UN Econ Comm Eur*. 1995;12(1):49-55.
23. Schmidt M, Schmidt SA, Sandegaard JL, Ehrenstein V, Pedersen L, Sorensen HT. The Danish National Patient Registry: a review of content, data quality, and research potential. *Clin Epidemiol*. 2015;7:449-90.
24. Lyng E, Sandegaard JL, Rebolj M. The Danish National Patient Register. *Scand J Public Health*. 2011;39(7 Suppl):30-3.
25. TN N. Datavaliditet og dækningsgrad i Landspatientregisteret. *Ugeskr Læger* 2002;164(01):33-7. 2002.
26. Maheswaran R, Pearson T, Jiwa M. Repeat attenders at National Health Service walk-in centres - a descriptive study using routine data. *Public health*. 2009;123(7):506-10.
27. Sandvik H, Hunskaar S. Frequent attenders at primary care out-of-hours services: a registry-based observational study in Norway. *BMC health services research*. 2018;18(1):492.
28. Vedsted P, Christensen MB. Frequent attenders in general practice care: a literature review with special reference to methodological considerations. *Public Health*. 2005;119(2):118-37.
29. Vedsted P, Fink P, Sorensen HT, Olesen F. Physical, mental and social factors associated with frequent attendance in Danish general practice. A population-based cross-sectional study. *Social science & medicine*. 2004;59(4):813-23.
30. Vedsted P, Olesen F. Social environment and frequent attendance in Danish general practice. *Br J Gen Pract*. 2005;55(516):510-5.
31. Norredam M, Krasnik A, Moller Sorensen T, Keiding N, Joost Michaelsen J, Sonne Nielsen A. Emergency room utilization in Copenhagen: a comparison of immigrant groups and Danish-born residents. *Scand J Public Health*. 2004;32(1):53-9.
32. Marmot M, Wilkinson, R.G. Social determinants of health. Oxford university press. 1999.
33. Marmot MW, R.G. Social determinants of health. Oxford university press. 2003.
34. statistik D. Statistikbanken. Available from : <http://www.statistikbankendk/statbank5a/defaultasp?w=1920> cited 2018 04.07.
35. Wu Z, Penning MJ, Schimmele CM. Immigrant status and unmet health care needs. *Can J Public Health*. 2005;96(5):369-73.
36. Njeru JW, Damodaran S, North F, Jacobson DJ, Wilson PM, St Sauver JL, et al. Telephone triage utilization among patients with limited English proficiency. *BMC Health Serv Res*. 2017;17(1):706.
37. Hansen EH, Hunskaar S. Understanding of and adherence to advice after telephone counselling by nurse: a survey among callers to a primary emergency out-of-hours service in Norway. *Scand J Trauma Resusc Emerg Med*. 2011;19:48.
38. Huibers L, Moth G, Andersen M, van Grunsven P, Giesen P, Christensen MB, et al. Consumption in out-of-hours health care: Danes double Dutch? *Scand J Prim Health Care*. 2014;32(1):44-50.
39. Moth G, Huibers L, Christensen MB, Vedsted P. Out-of-hours primary care: a population-based study of the diagnostic scope of telephone contacts. *Fam Pract*. 2016;33(5):504-9.
40. Christensen A LE, O. Davidsen, M. Juel, K. Sundhed og sygelighed i Danmark 2010 & udviklingen siden 1987 Statens Institut for Folkesundhed, Syddansk Universitet København. 2012.
41. Gamst-Jensen H, Huibers L, Pedersen K, Christensen EF, Ersboll AK, Lippert FK, et al. Self-rated worry in acute care telephone triage: a mixed-methods study. *Br J Gen Pract*. 2018;68(668):e197-e203.

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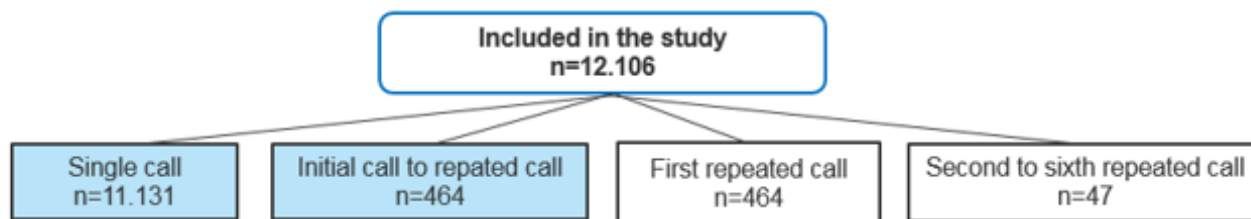
42. Flarup L, Carlsen AH, Moth G, Christensen MB, Vestergaard M, Olesen F, et al. The 30-day prognosis of chronic-disease patients after contact with the out-of-hours service in primary healthcare. *Scand J Prim Health Care*. 2014;32(4):208-16.
43. White D, Kaplan L, Eddy L. Characteristics of patients who return to the emergency department within 72 hours in one community hospital. *Adv Emerg Nurs J*. 2011;33(4):344-53.
44. Sauvin G, Freund Y, Saidi K, Riou B, Hausfater P. Unscheduled return visits to the emergency department: consequences for triage. *Acad Emerg Med*. 2013;20(1):33-9.
45. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav*. 1997;38(1):21-37.
46. McKenna SP. Measuring patient-reported outcomes: moving beyond misplaced common sense to hard science. *BMC Med*. 2011;9:86.

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3 **Figure 1: Flowchart of the calls included**  
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**Figure 2:** Showing division of the included calls in four strata: single calls, initial calls to repeated calls, first repeated calls and second to sixth repeated call within 48 hours.

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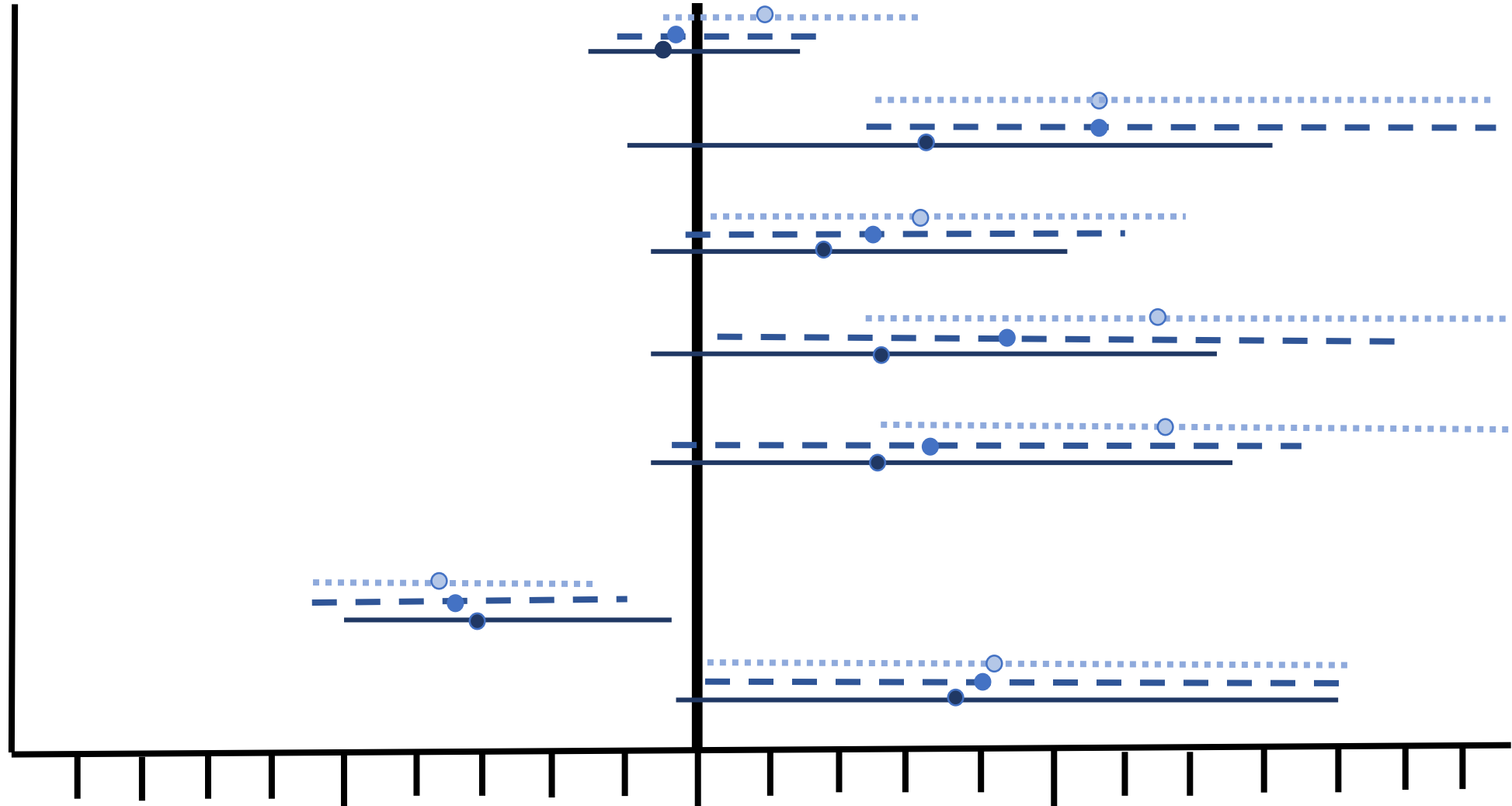
Protective for performing repeated calls

Mediating performing repeated calls

Health-related variables

Sociodemographic variables

- 5 **Female gender**  
Reference group: male
- 9 **Age > 65**  
Reference group: ≤ 5 years
- 13 **High Degree of Worry (DOW)**  
Reference group: low
- 17 **Low Self Rated Health (SRH)**  
Reference group: 1 (very good)
- 22 **Two or more comorbidities**  
Reference group: none
- 28 **High income**  
Reference group: very low
- 32 **Immigrants**  
Reference group: native



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OR's (OR's) and 95 % Confidence interval (CI): Crude ..... Age and gender adjusted - - - - Mutually adjusted ————

**STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies***

Section/Topic	Item #	Recommendation	Reported on page #
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1,5
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4,5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5,66
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	
		(b) For matched studies, give matching criteria and number of exposed and unexposed	none
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,7
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	6,7
Bias	9	Describe any efforts to address potential sources of bias	3,13
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
		(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	None
		(c) Explain how missing data were addressed	None
		(d) If applicable, explain how loss to follow-up was addressed	None
		(e) Describe any sensitivity analyses	none
<b>Results</b>			none

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	6
		(b) Give reasons for non-participation at each stage	None
		(c) Consider use of a flow diagram	Figure 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1 Table 2
		(b) Indicate number of participants with missing data for each variable of interest	Table 1
		(c) Summarise follow-up time (eg, average and total amount)	7,8,9,10
Outcome data	15*	Report numbers of outcome events or summary measures over time	Table 1 Table 2 Table 3 7,8,9
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	7,8,9
		(b) Report category boundaries when continuous variables were categorized	6,7
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	none
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	none
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	11,12,13
<b>Limitations</b>			13
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
<b>Other information</b>			
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	16

\*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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**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](http://www.strobe-statement.org).

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## Sociodemographic and health-related determinants for making repeated calls to a medical helpline: a prospective cohort study

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## **Title page**

### **Title of the article**

Sociodemographic and health-related determinants for making repeated calls to a medical helpline:  
a prospective cohort study

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## 26 27 28 29 30 31 **Abstract**

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33 **Objectives.** To identify sociodemographic and health-related characteristics of callers' making  
34 repeated calls within 48 hours to a medical helpline, compared to those who only call once.

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38 **Setting.** In the Capital Region of Denmark people with acute, non-life-threatening illnesses or  
39 injuries are triaged through a single-tier medical helpline for acute, healthcare services.

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43 **Participants.** People who called the medical helpline between 18 January - 9 February 2017 were  
44 invited to participate in the survey. In the period 38787 calls were handled and 12902 agreed to  
45 participate. Calls were excluded because of temporary civil registration number (n=78), call was not  
46 made by the patient or a close relative (n=699), or survey responses were incomplete (n=19).  
47 Hence, the analysis included 12106 calls, representing 11.131 callers' making single calls and 464  
48 callers' making two or more calls within 48 hours.

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54 Callers' data (age, sex, caller identification) were collected from the medical helpline's electronic  
55 records. Data were enriched using the callers' self-rated health, self-evaluated degree of worry, and  
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registry data on income, ethnicity, and comorbidities. Odds ratio for making repeated calls was calculated in a crude, a sex and age- and in a mutually adjusted analysis.

**Results** The crude logistic regression analysis showed that age, self-rated health, self-evaluated degree of worry, income, ethnicity, and comorbidities were significantly associated with making repeated calls. In the mutually adjusted analysis associations decreased, however, odds ratios remained significantly decreased for callers with a household income in the middle (OR=0.71 (95% CI=0.54 to 0.92)) or highest (OR=0.68 (95% CI=0.48 to 0.96)) quartiles, while immigrants had borderline significantly increased odds ratio (OR=1.34 (95% CI=0.96 to 1.86)) for making repeated calls.

**Conclusions** Findings suggest that income and ethnicity are potential determinants for callers' need to make additional calls within 48 hours to a medical helpline with triage function.

### Strengths and limitations of this study

- The characteristics of callers' who make repeated calls to telephone triage function have not previously been studied.
- This study provided an overview of the frequency of sociodemographic and health-related characteristics and its association with callers' who repeatedly call a medical helpline, compared to those who only call once.
- The sociodemographic and health-related characteristics influence on the odds for making repeated calls to a medical helpline was calculated in a sex and age-adjusted- and in a mutually adjusted logistic regression analysis.
- The sociodemographic characteristics influence on making repeated call compared to the health-related characteristics is illustrated.
- In the present study 33.3% of the invited study population agreed to participate in the survey, possibly introducing selection bias.

## Introduction

In the last decade, out-of-hours (OOH) primary care has taken place in large-scale organisations in various countries,(1) and telephone triage is a common feature of OOH services, serving to determine the level of urgency and healthcare needed.(2) In the Capital Region of Denmark people with acute, non-life-threatening illnesses or injuries are encouraged to call a single-tier telephone preadmission evaluation and triage service called medical helpline 1813 (MH1813).(3) Triage results in one of two possible outcomes: 1) face-to-face consultation (home visit, hospital-based emergency department/acute care clinic, or hospitalisation) or 2) medical telephone advice (self-care, contact general practitioner, or prescriptions).(4) Telephone triage, however, is not straight forward, and a lack of visual cues compromises clinical decision making .(4) The call handler creates a picture of the caller using non-verbal cues, such as tone of voice, diction and background noises to help determine the urgency of the call.(5) When using this strategy call handlers subconsciously incorporate their own preconceptions and stereotypes, (6) not to mention professional and personal experience.(6) An additional complicating factor in the clinical decision making is that the call handler must simultaneously act as a gatekeeper and as a caregiver.(7)

Furthermore, when telephone medical helplines serves as a single-tier entry point for face-to-face consultations, callers must have the ability to describe symptoms sufficiently and follow the given medical advice adequately(2, 8), however; the callers' ability to do so may vary.(9) A lack of ability may increase the risk of receiving inaccurate advice or incorrect triage outcome,(10) potentially increasing the need to make additional calls.

There is a lack of studies on whether sociodemographic and health-related characteristics are related to repeated calls to medical helplines. Existing literature on users of OOH services with face-to-face consultations (eg emergency departments) has shown that sociodemographic and health-related characteristics are associated with repeat visits,(11-14) and that specific characteristics can add to the risk of making errors in clinical decision making.(11, 15-18) Frequent use of OOH services is associated with the presence of comorbidities,(8, 19) while low, self-rated health (SRH) is associated with frequent general practice visits in Denmark.(20) Similarly, immigrants use the emergency room more often than ethnic Danes.(21)

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4 Identification of the sociodemographic and health-related determinants for making repeated calls to  
5 medical helplines may help prevent errors in clinical decision making, preventing over- or under  
6 triage in medical helplines.  
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10 The aim of this paper was to identify the sociodemographic and health-related characteristics of  
11 individuals making repeated calls to a medical helpline within 48-hours, compared to those who  
12 only call once.  
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## 16 17 18 19 20 **Methods**

### 21 22 **Design**

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24 A prospective cohort study was conducted of individuals who repeatedly called MH1813 within 48  
25 hours of their initial call (n=464) compared to those who only called once (n=11131). The  
26 differences between the two groups were examined in relation to sociodemographic (income and  
27 ethnicity) and health-related characteristics (age, sex, degree of comorbidities, SRH and self-  
28 evaluated degree of worry (DOW)). We also analysed the influence of the details on the initial call  
29 (time of call, caller) to MH1813.  
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### 38 39 **Setting**

40 The study was conducted at Emergency Medical Services Copenhagen in the Capital Region of  
41 Denmark, which provides acute and emergency services for 1.7 million people. Access to public  
42 medical healthcare services is free of charge in Denmark. MH1813 is a round-the-clock, single-tier  
43 entry point for acute healthcare for people with acute, non-life-threatening illnesses or injuries and  
44 encourages people to call for preassessment and possible triage to a face-to-face consultation  
45 outside the office hours of general practitioners.(3) A separate three-digit emergency number, 112,  
46 is available for potentially life-threatening symptoms/injuries and to request an ambulance.  
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53 The MH1813 medical staff handle approximately one million calls annually, 4% of which are  
54 repeat calls within 48 hours of the initial call.(22) Call handlers at MH1813 comprise nurses (80%)  
55 and physicians (20%), who use an electronic decision support tool to determine the level of urgency  
56 and healthcare needed.(3)  
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4 The present study is embedded within a wider trial examining DOW as a predictor for the use of  
5 acute healthcare services and is registered at [www.clinicaltrials.gov](http://www.clinicaltrials.gov), file no. NCT02979457.  
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## 10 **Approvals and registration**

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12 This study was approved by the Danish Data Protection Agency (2012-58-0004) and Statistics  
13 Denmark. Approval from the Scientific Ethics Review Committee of the Capital Region of  
14 Denmark was requested but no permission is required (H-15016323). Informed oral consent was  
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## 60 **Participants**

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Initially we divided the calls included in the study cohort into the following four sequences: 1) one-time callers, where the individual only called once within 48 hours (n=11131); 2) initial call plus occurrence of repeated call (n=464); 3) first repeated call within 48 hours of the initial call (n=464); and 4) two or more repeated calls within 48 hours of the initial call (n=47). Figure 2 illustrates the four sequences. For the analysis, however, we divided the study data into two main groups: one-time calls (n=11131) and the initial call to the repeated call (n=464).

## 1000 **Exposure**

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4 patterns in the respective age groups: children, adolescents, adults, and the elderly). Time of call  
5 (workday, weekend) was retrieved from the same electronic patient record.  
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9 Prior to speaking with the call handler, caller responses to three survey questions were collected:  
10 self-evaluated DOW (1=low, 2=middle, 3=high) and SRH (on a scale of 1 to 5, where 1=very good  
11 and 5= very poor) and who the caller was (patient, close relative to the patient, other). A recorded  
12 message presented the survey questions, which callers responded to on a numeric scale using their  
13 phone keypad.  
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18 DOW represents a self-evaluated measure of the caller's level of worry concerning the acuteness of  
19 their health situation. Although this scale has not been validated a previous study showed that  
20 people using OOH services were able to rate their DOW as a measure of the self-evaluated level of  
21 urgency at MH1813.(23, 24)  
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26 SRH reflects an individual's own assessment of their health according to their own definition of  
27 health. SRH is a validated scale that predicts morbidity and mortality,(25) and also prompts people  
28 to seek primary care more frequently.(20, 26)  
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33 All residents of Denmark are assigned a personal identification number at birth or upon officially  
34 registering in the Danish Civil Registration System.(27, 28) This number makes it possible to  
35 conduct individual follow-up in national registries. Call data on each caller was merged with data  
36 on annual household income divided into four quartiles (very low, low, middle, high) and ethnicity  
37 (natives, immigrants, descendants of immigrants) from Statistics Denmark's registries.(29). Data on  
38 comorbidity from the past 10 years (Charlson score: 0=no comorbidities, 1=one comorbidity, 2=two  
39 or more comorbidities) were obtained from the Danish National Patient Registry,(30, 31) where  
40 morbidity is registered continuously for all patients in Danish hospitals. The validity of the Danish  
41 National Patient Registry is estimated at 66-99% compared to a journal audit.(32)  
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## 52 **Analysis**

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55 A descriptive baseline analysis of sociodemographic and health-related characteristics was  
56 performed using frequency distributions (number and percentage). Logistic regression analyses  
57 were used to calculate crude, age and sex adjusted and mutually adjusted (for age, sex, ethnicity,  
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4 income, call time, caller, DOW, SRH, and Charlson comorbidity score) odds ratios (OR) with 95%  
5 confidence intervals (95% CI) for repeat callers (n=464) versus one-time callers (n=11131).  
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9 Due to the limited number of missing values in the data collection (n=106 in SRH), they were  
10 excluded from the analysis because their absence was considered random.  
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13 The statistical analyses were performed using SAS Enterprise Guide 7.1.  
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## 18 **Results**

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20 The analysis included 11595 callers, 4% (n=464) of whom represented callers who made repeated  
21 calls within 48 hours of their initial call.  
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24 The results of the crude analysis identified an association between repeated calls to MH1813 within  
25 48 hours and the callers' sociodemographic and health-related characteristics, as well as the details  
26 related to the call. However, these associations decreased in the mutually adjusted analysis,  
27 indicating that sociodemographic and health-related characteristics have a reinforcing effect on the  
28 need to make an additional call.  
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34 A comparison of the results in the mutually adjusted analysis showed that sociodemographic  
35 variables have a stronger association with the odds of making a repeat call within 48 hours  
36 compared to the health-related variables. Figure 3 illustrates this.  
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40 Findings in the mutually adjusted analysis suggest that income and ethnicity are potential  
41 determinants for individuals need to make repeated calls within 48 hours to a medical helpline with  
42 triage function.  
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## 49 **Association of health-related characteristics with making repeated calls**

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51 The crude analysis on the health-related characteristics (age, sex, DOW, SRH, Charlson  
52 comorbidity score) indicated that all characteristics, except sex, were significantly associated with  
53 the odds of making repeated calls. The strongest positive association for making a repeat call was a  
54 Charlson comorbidity score of 2 compared to a score of 0 (OR=1.66 (95% CI=1.26 to 2.19) (Table  
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Table 1 lists crude, adjusted and full model adjusted odds ratios (OR) with 95% confidence intervals (95% CI) for health-related characteristics for repeated calls <48 hours (n=464) compared to one-time calls (n=11131) to the telephone triage.

	One-time callers (n=11131)	Repeat callers (n=464)	Crude OR (95%CI)	Adjusted OR (95% CI) *	Mutually adjusted OR (95% CI)**
<b>Sex in % (n)</b>					
Male	45.96 (5116)	44.18 (205)	<b>1</b>	<b>1</b>	<b>1</b>
Female	54.04 (6015)	55.82 (259)	<b>1.08</b> (0.89-1.29)	<b>0.96</b> (0.77-1.13)	<b>0.94</b> (0.78-1.14)
<b>Age in % (n)</b>					
Mean	30.37	34.57			
Age ≤5 years	23.14 (2576)	22.84 (106)	<b>1</b>	<b>1</b>	<b>1</b>
Age ≥6 and ≤18 years	17.20 (1915)	13.58 (63)	<b>0.79</b> (0.58-1.09)	<b>0.79</b> (0.58-1.09)	<b>0.95</b> (0.67-1.33)
Age ≥19 and ≤65 years	46.91 (5222)	43.75 (202)	<b>0.95</b> (0.74-1.20)	<b>0.94</b> (0.74-1.19)	<b>0.80</b> (0.59-1.08)
Age >65 years	12.74 (1428)	19.83 (92)	<b>1.58</b> (1.18-2.10)	<b>1.57</b> (1.17-2.09)	<b>1.24</b> (0.85-1.81)
<b>Degree of worry in % (n)</b>					
Low	30.51 (3396)	28.50 (132)	<b>1</b>	<b>1</b>	<b>1</b>
Middle	36.17 (4026)	30.39 (141)	<b>0.90</b> (0.71-1.15)	<b>0.89</b> (0.69-1.13)	<b>0.88</b> (0.69-1.23)
High	33.32 (3709)	41.16 (191)	<b>1.33</b> (1.06-1.66)	<b>1.23</b> (0.98-1.55)	<b>1.13</b> (0.89-1.45)
<b>Self-rated health in % (n)</b>					
1 (very good)	18.84 (2077)	17.10 (79)	<b>1</b>	<b>1</b>	<b>1</b>
2	24.35 (2685)	23.16 (107)	<b>1.05</b> (0.78-1.41)	<b>1.02</b> (0.76-1.37)	<b>1.02</b> (0.75-1.37)
3	22.07 (2433)	19.26 (89)	<b>0.96</b> (0.71-1.31)	<b>0.90</b> (0.66-1.23)	<b>0.87</b> (0.63-1.19)
4	20.03 (2208)	18.61 (86)	<b>1.02</b> (0.75-1.39)	<b>0.93</b> (0.68-1.28)	<b>0.88</b> (0.63-1.21)
5 (very poor)	14.71 (1622)	21.86 (101)	<b>1.64</b> (1.21-2.21)	<b>1.43</b> (1.05-1.96)	<b>1.26</b> (0.91-1.75)
<b>Charlson comorbidity score in % (n)</b>					
0 (None comorbidities)	81.26 (9045)	75.65 (351)	<b>1</b>	<b>1</b>	<b>1</b>
1 (one comorbidities)	9.95 (1108)	10.78 (50)	<b>1.16</b> (0.86-1.57)	<b>1.06</b> (0.77-1.15)	<b>1.02</b> (0.74-1.40)
2 (two or more comorbidities)	8.79 (978)	13.58 (63)	<b>1.66</b> (1.26-2.19)	<b>1.33</b> (0.96-1.84)	<b>1.27</b> (0.91-1.77)

\* Adjusted for age and sex

\*\*Adjusted for age, sex, ethnicity, income, call time, caller, degree of worry, self-rated health, and Charlson comorbidity score

In the mutually adjusted logistic regression analysis the ORs decreased somewhat, and none of the health-related characteristics were significantly associated with the odds of performing a repeated call (Table 1).

### Association of sociodemographic characteristics with making repeated calls

The crude analysis on the sociodemographic characteristics (household income, ethnicity) indicated that immigrant status increased the odds of performing a repeated call, while having a middle or a high household income decreased the odds of performing a repeated call (Table 2).

*Table 2 lists crude, adjusted and full model adjusted odds ratios (OR) with 95% confidence intervals (95% CI) for sociodemographic characteristics for repeated calls <48 hours (n=464) compared to one-time calls (n=11131) to the telephone triage.*

	One-time callers (n=11131)	Repeat callers (n=464)	Crude OR (95%CI)	Adjusted OR (95% CI) *	Mutually adjusted OR (95% CI)**
<b>Ethnicity % (n)</b>					
Natives	82.24 (9488)	82.24 (380)	<b>1</b>	<b>1</b>	<b>1</b>
Immigrants	7.22 (833)	10.17 (47)	<b>1.41</b> (1.03-1.93)	<b>1.40</b> (1.02-1.93)	<b>1.34</b> (0.96-1.86)
Descendants of immigrants	6.54 (754)	7.57 (35)	<b>1.16</b> (0.81-1.65)	<b>1.27</b> (0.89-1.82)	<b>1.14</b> (0.79-1.65)
<b>Annual household income % (n)</b>					
Very low	28.31 (3151)	33.62 (156)	<b>1</b>	<b>1</b>	<b>1</b>
Low	28.20 (3139)	31.68 (147)	<b>0.95</b> (0.75-1.19)	<b>0.82</b> (0.64-1.06)	<b>0.81</b> (0.63-1.05)
Middle	28.73 (3198)	23.71 (110)	<b>0.69</b> (0.54-0.89)	<b>1.03</b> (0.80-1.33)	<b>0.71</b> (0.54-0.92)
High	14.76 (1643)	10.99 (51)	<b>0.63</b> (0.46-0.87)	<b>0.65</b> (0.46-0.91)	<b>0.68</b> (0.48-0.96)

\* Adjusted for age and sex

\*\*Adjusted for age, sex, ethnicity, income, call time, caller, degree of worry, self-rated health, and Charlson comorbidity score

In the mutually adjusted logistic regression analysis, annual income significantly decreased the odds of performing a repeated call for callers' with household income in the middle quartile OR=0.71 (95% CI=0.54 to 0.92) and highest quartiles OR=0.68 (95% CI=0.48 to 0.96), compared to callers' with household income in the lowest quartile (Table 2). This result indicates that low income is a potential determinant for performing repeated calls to the MH1813.

Immigrants relative to natives had significantly increased odds for performing repeated calls, in the crude analysis, as well as the analyses adjusted for age and sex. In the mutually adjusted analysis, the association was borderline significant OR=1.34 (95% CI=0.96 to 1.85). This result indicates that being an immigrant also is a potential determinant for performing repeated calls to the MH1813 (Table 2).

### Characteristics associated with calls to MH1813 and with making repeat calls



The crude analysis on characteristics related to the call, found that callers' who were a close relative to the patient were significantly associated with performing a repeated call, while time of call did not have an association with performing a repeated call (Table 3).

*Table 3 showing crude, adjusted and full model adjusted odds ratios (OR) with 95% confidence intervals (95%CI) for characteristics attach to the call for repeated calls <48 hours (n=464) compared to one-time calls (n=11131) to the telephone triage*

	One-time callers (n=11131)	Repeat callers (n=464)	Crude OR (95%CI)	Adjusted OR (95% CI) *	Mutually adjusted OR (95% CI)**
<b>Call time in % (n)</b>					
Workday	60.88 (6777)	59.27 (275)	<b>1</b>	<b>1</b>	<b>1</b>
Weekend	39.12 (4354)	40.73 (189)	<b>1.07</b> (0.88-1.29)	<b>1.05</b> (0.87-1.27)	<b>1.09</b> (0.89-1.32)
<b>Caller in % (n)</b>					
Patient	40.26 (4481)	45.26 (210)	<b>1</b>	<b>1</b>	<b>1</b>
Close relative	59.74 (6650)	54.74 (254)	<b>0.82</b> (0.67-0.98)	<b>0.79</b> (0.64-1.00)	<b>0.75</b> (0.59-0.94)

\* Adjusted for age and sex

\*\*Adjusted for age, sex, ethnicity, income, call time, caller, DOW, SRH Charlson comorbidity score

In the mutually adjusted logistic regression analysis callers who were close relatives had significantly decreased odds for making repeated calls compared to callers who were patients (OR=0.75 (95% CI=0.59 to 0.94) (Table 3).

## Discussion

The main finding is that the association between callers' sociodemographic characteristics (income and ethnicity) and repeated calls to the MH1813 within 48 hours is stronger than for the callers' health-related characteristics (age, sex, comorbidity, SRH, DOW) (figure 3). Sociodemographic factors have also been shown to be an influence among people with repeated visits to OOH services with face-to-face consultations.(20, 21, 26, 33-35). This indicates that the MH1813 reflects similar patterns among people with low income and people who are immigrants, as seen in the OOH services in general.

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4 Specific clinical factors, such as the call handlers' level of professional experience or language  
5 barriers may also have affected the individual's need to call more than once. Identification of these  
6 factors is beyond the scope of this survey but a relevant issue to explore in future studies.  
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10 The mutually adjusted analysis showed that household income was the only investigated variable  
11 that was significantly associated with making repeated calls. Our results indicate that high  
12 household income may represent a factor that leads to the occurrence of fewer repeated call within  
13 48 hours of the initial call, while low household income may be a determinant for making repeated  
14 calls. This finding is supported by evidence showing that low socio-economic status is related to the  
15 extent of comorbidity,(36, 37) which may increase the need for a professional assessment of the  
16 severity of symptoms. Moreover, low socioeconomic status is related to an increased use of medical  
17 services in general.(35, 37)  
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25 In relation to ethnicity, the frequency distribution showed that 7.2% of one-time callers were  
26 immigrants, which should be seen in light of the fact that immigrants make up 10.31% of the  
27 general population in Denmark.(38) Determining whether fewer immigrants use MH1813, or  
28 whether fewer immigrants declined to participate in the survey, is not possible based on the present  
29 data. The existing literature, however, indicates that immigrants generally use OOH acute  
30 healthcare with face-to-face consultations more frequently than ethnic Danes.(21)  
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37 The mutually adjusted analysis showed that immigrants had insignificantly higher odds of making  
38 repeated calls compared to ethnic Danes. One possible reason for this is that immigrants with  
39 limited language skills may lack the vocabulary to adequately describe their symptoms on the  
40 telephone.(39, 40) According to Hansen et al, who studied adherence to advice given by a nurse on  
41 the telephone, callers' who were immigrants had a significantly lower level of trust in the nurses  
42 and felt that they did not receive relevant answers to questions compared to natives.(41)  
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49 In the frequency distribution between repeated callers' and one-time callers, sex was not associated  
50 with repeated calls. Nevertheless, there were a higher amount of women among one-time callers  
51 (54.04%) and repeat callers (55.82%) compared to the distribution of women in the general Danish  
52 population (50.25%).(38) This distribution is similar to previous studies on OOH services (2, 42,  
53 43). Women generally contact medical helplines more often than men and usually report a lower  
54 SRH than men (44) and a higher DOW.(23)  
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4 The distribution of comorbidity in the study population showed that people with the highest strata  
5 of comorbidity made repeated calls more frequently (13.58%) than one-time calls (8.79%). This is  
6 in line with the existing literature, where people with chronic diseases have a higher rate of repeated  
7 inquiries to emergency departments than those without chronic diseases.(45-47) One possible  
8 explanation is that people with multiple comorbidities have more progressive symptoms, increasing  
9 the need for repeated inquiries.(8)  
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16 The self-reported assessment of DOW and SRH was obtained in real time in conjunction with the  
17 call to MH1813, diminishing the risk of recall bias. SRH and DOW are simple, self-reported single-  
18 item variables that measure subjective, qualitative data using a quantitative method.(48) Poor self-  
19 evaluated health is a factor that prompts people to seek primary care more frequently.(20, 26). In  
20 the present study, the crude analysis showed that very poor SRH (score=5) was significantly  
21 associated with the need to make repeated calls compared to very good SRH (score=1). Likewise,  
22 the crude analysis indicated that high DOW was significantly associated with the need to make  
23 repeated calls compared to low DOW. The observed association remained significant in the age and  
24 sex-adjusted analysis, indicating that SRH and DOW are potential predictors for repeated calls.  
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33 When a close relative made the call on behalf of the patient, the risk of a repeated call occurring  
34 was significantly reduced. We hypothesise that this result is due to the number of relatives who are  
35 parents of small children and request advice and guidance on how to handle a child's symptoms,  
36 reducing the need to call MH1813 again. The two youngest age groups (0-5 and 6-18 years)  
37 represented almost 40% of all the calls in this study, which means they are overrepresented  
38 compared to the general population (22.6%).(38) This is in line with similar studies showing that  
39 younger people generally have a higher consumption of acute healthcare services.(2, 15, 42, 43)  
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46 Overall, the analysis of sociodemographic and health-related characteristics showed that  
47 associations between groups decreased in the adjusted analysis. This suggests that the variables  
48 under study had a reinforcing effect and do not independently characterise people who have a need  
49 to make repeated calls, indicating that identifying the underlying factors for the need to make  
50 repeated calls constitutes a complex issue.  
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### 55 **Limitations**

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57 In the present study 33.3% of the study cohort invited to participate agreed to do the survey. In a  
58 comparative analysis the participants did not differ significantly from non-responders in relation to  
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4 age, sex and triage outcome. Nevertheless, selection bias might have been introduced in relation to  
5 other sociodemographic or health-related characteristics.  
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9 Data on comorbidity were obtained from the Danish National Patient Registry,(31) which is why  
10 people may have had one or more unrecognised morbidities that had not received an in-hospital  
11 diagnosis and subsequent registration in the Danish National Patient Registry. This factor could  
12 potentially have led to an information bias in relation to the calculation of comorbidity scores in the  
13 present study. However, since this potential information bias would have been present in both  
14 people who made one-time calls and people who made repeated calls, it was considered a non-  
15 differential misclassification.  
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23 In this study, SRH and DOW are measured with a simplified numeric scale. SRH is recognised as  
24 valid predictor of morbidity and mortality.(48) DOW, however, is a less studied variable, which is  
25 why the validity cannot be accounted for, as is recommended for self-reported measurements.(49)  
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30 Because one of the aims of this study was to be able to implement results in decision making in  
31 clinical practice, the sociodemographic and health-related characteristics variables were not tested  
32 for interaction. Nevertheless, the existing evidence on the sociodemographic and health-related  
33 characteristics of interest suggest multiple interactions between variables, eg a poor SRH interacts  
34 with age and with comorbidities;(50) a higher DOW interacts with female callers;(23) and  
35 immigrant status interacts with a lower self-perceived health and a higher rate of comorbidities.(51)  
36 Testing for interaction in the statistical analysis could potentially have provided valuable insight  
37 into possible confounders but was considered outside the scope of this study.  
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### 47 **Implications for clinicians and policymakers**

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49 This study indicates that specific sociodemographic characteristics of callers are potential  
50 determinants for the callers' need to make repeated calls to a telephone triage. This implies that the  
51 health service needs of callers with certain sociodemographic characteristics may differ compared  
52 to other sociodemographic groups when calling a telephone medical helpline.  
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57 Our results highlight the relevance of being aware of the risk that telephone-based preadmission  
58 evaluations may unintentionally worsen inequities in access to healthcare services and increase the  
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4 health inequities that exist in the general population. Recognising the sociodemographic  
5 characteristics that play a role is an important aspect of preventing under triage, which poses a risk  
6 of delaying examination and treatment. One way of dealing with this issue is to provide call  
7 handlers with additional information about callers' sociodemographic and self-evaluated  
8 characteristics in the existing electronic decision support tool to supplement identification and  
9 clinical decision-making in telephone triage.  
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15 The results of this study are generalisable and can serve to benefit other large-scale OOH telephone  
16 triage services.  
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## 20 21 22 **Conclusions**

23 In the present study 4% of the calls MH1813 received were from repeat callers. The crude analysis  
24 identified sociodemographic and health-related characteristics associated with making repeated  
25 calls. The mutually adjusted analysis showed that callers with a mid to high household income had  
26 significantly decreased odds for making repeated calls compared to those with very low income.  
27 Also, immigrants had insignificantly higher odds for making repeated calls compared to ethnic  
28 Danes. Other variables under study had a reinforcing effect on the odds of making repeated calls,  
29 which means they did not independently characterise people with a need to make additional calls.  
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37 These findings suggest that income and ethnicity are potential determinants for making repeated  
38 calls, which indicates that OOH telephone triage might benefit from incorporating  
39 sociodemographic characteristics in clinical decision-making tools to prevent over- or under triage.  
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## 47 **Figure legends/caption**

### 48 **Figure 1**

49 Flowchart of calls included

50 Link text : Figure 1: Flowchart of calls

### 51 **Figure 2**

52 Division of the included calls in four strata: One-time callers, initial calls plus occurrence of  
53 repeated call, first repeated call within 48 hours and two or more repeated calls within 48 hours of  
54 the initial call.  
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4 Link text: Division of the included calls  
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9 **Figurer 3**

10 Odds ratios

11 Showing crude, age and gender adjusted, and mutually adjusted Odds Ratio's with 95 %

12 Confidence Interval for health-related and sociodemographic characteristics for repeated calls < 48

13 hours (n=464) compared to single calls (n=11,131) to the medical helpline.

14 Link text : Figure 3: Showing Odds Ratios  
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23 **Authors contribution**

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53 Contributors: MB, HG, ME and TM conceptualised the study. MB and HG participated in data  
54 extraction. MB and ME participated in data analysis. MB and TM produced the first draft of the  
55 manuscript, while HG, ME, HC and TM provided overall guidance and a final review of all  
56 manuscript drafts.  
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## **Competing interest statement**

None declared.

## **Data sharing statement**

This study was carried out as part of a Master's thesis and used data from an existing study on MH1813 ([www.clinicaltrials.gov](http://www.clinicaltrials.gov), NCT02979457).

Data were retrieved from Medical Helpline electronic patient record, Statistics Denmark's registries and Danish National Patient Registry, and are not available online.

## **Provenance and peer review**

Not commissioned, externally peer reviewed.

## **Patient consent for publication**

Not required.

## Patient and public involvement

The development of the research aim, design, recruitment, conduct, and outcome measures in this study were not based on patient involvement. Participants can request further information on this study.

## Ethics approval

The study was approved by the Danish Data Protective Agency (2012-58-0004). Approval from the Scientific Ethics Review Committee of the Capital Region of Denmark was requested but no permission is required (H-15016323).

## References

1. 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.
2. Huibers L, Moth G, Carlsen AH, Christensen MB, Vedsted P. Telephone triage by GPs in out-of-hours primary care in Denmark: a prospective observational study of efficiency and relevance. *Br J Gen Pract*. 2016;66(650):e667-73.
3. Wadmann SK J. Evaluering af enstrengt og visiteret akutsystem i Region Hovedstaden. Sammenfatning. Det nationale institut for komuners og regioners analyse og forskning. 2015.
4. Leprohon J, Patel VL. Decision-making strategies for telephone triage in emergency medical services. *Med Decis Making*. 1995;15(3):240-53.
5. Purc-Stephenson RJ, Thrasher C. Nurses' experiences with telephone triage and advice: a meta-ethnography. *J Adv Nurs*. 2010;66(3):482-94.
6. Greenberg ME. A comprehensive model of the process of telephone nursing. *J Adv Nurs*. 2009;65(12):2621-9.
7. Holmstrom I, Dall'Alba G. 'Carer and gatekeeper' - conflicting demands in nurses' experiences of telephone advisory services. *Scand J Caring Sci*. 2002;16(2):142-8.
8. Flarup L, Moth G, Christensen MB, Vestergaard M, Olesen F, Vedsted P. Chronic-disease patients and their use of out-of-hours primary health care: a cross-sectional study. *BMC Fam Pract*. 2014;15:114.
9. Gamst-Jensen H, Lippert FK, Egerod I. Under-triage in telephone consultation is related to non-normative symptom description and interpersonal communication: a mixed methods study. *Scand J Trauma Resusc Emerg Med*. 2017;25(1):52.
10. Bunn F, Byrne G, Kendall S. The effects of telephone consultation and triage on healthcare use and patient satisfaction: a systematic review. *Br J Gen Pract*. 2005;55(521):956-61.

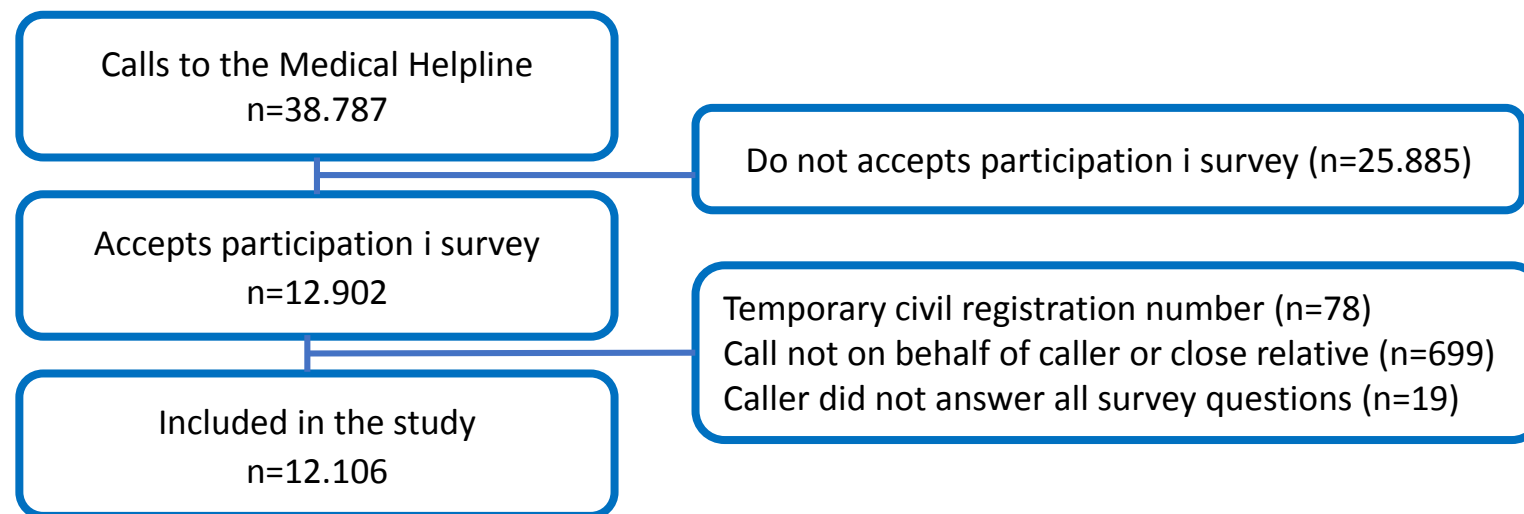


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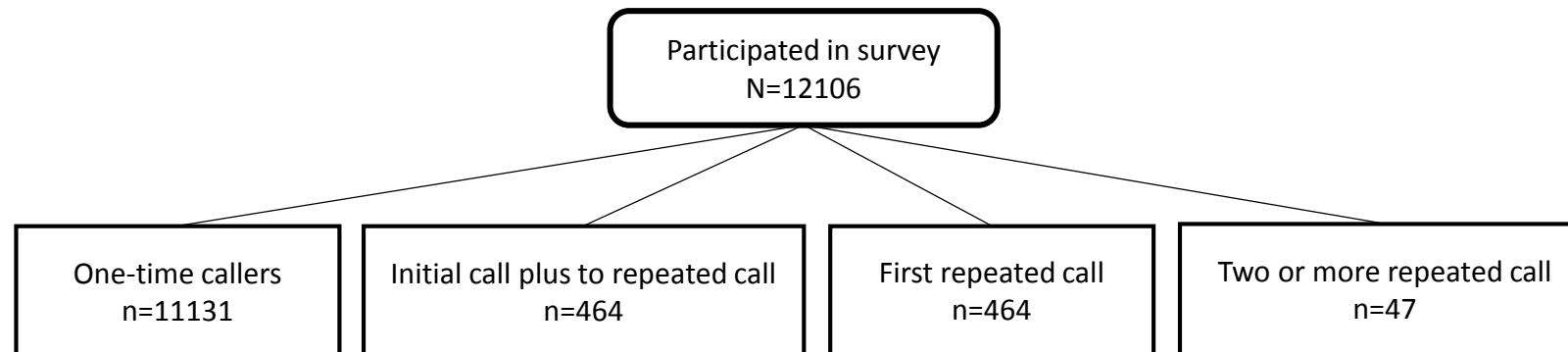
11. Verelst S, Pierloot S, Desruelles D, Gillet JB, Bergs J. Short-term unscheduled return visits of adult patients to the emergency department. *J Emerg Med*. 2014;47(2):131-9.
12. Cheng SY, Wang HT, Lee CW, Tsai TC, Hung CW, Wu KH. The characteristics and prognostic predictors of unplanned hospital admission within 72 hours after ED discharge. *Am J Emerg Med*. 2013;31(10):1490-4.
13. Sabbatini AK, Kocher KE, Basu A, Hsia RY. In-Hospital Outcomes and Costs Among Patients Hospitalized During a Return Visit to the Emergency Department. *JAMA*. 2016;315(7):663-71.
14. Martin-Gill C, Reiser RC. Risk factors for 72-hour admission to the ED. *Am J Emerg Med*. 2004;22(6):448-53.
15. Huibers LA, Moth G, Bondevik GT, Kersnik J, Huber CA, Christensen MB, et al. Diagnostic scope in out-of-hours primary care services in eight European countries: an observational study. *BMC Fam Pract*. 2011;12:30.
16. Byrne M, Murphy AW, Plunkett PK, McGee HM, Murray A, Bury G. Frequent attenders to an emergency department: a study of primary health care use, medical profile, and psychosocial characteristics. *Ann Emerg Med*. 2003;41(3):309-18.
17. Di Giuseppe G, Abbate R, Albano L, Marinelli P, Angelillo IF, Collaborative Research G. Characteristics of patients returning to emergency departments in Naples, Italy. *BMC Health Serv Res*. 2008;8:97.
18. McCusker J, Healey E, Bellavance F, Connolly B. Predictors of repeat emergency department visits by elders. *Acad Emerg Med*. 1997;4(6):581-8.
19. Huber CA, Rosemann T, Zoller M, Eichler K, Senn O. Out-of-hours demand in primary care: frequency, mode of contact and reasons for encounter in Switzerland. *J Eval Clin Pract*. 2011;17(1):174-9.
20. Vedsted P, Fink P, Sorensen HT, Olesen F. Physical, mental and social factors associated with frequent attendance in Danish general practice. A population-based cross-sectional study. *Soc Sci Med*. 2004;59(4):813-23.
21. Norredam M, Krasnik A, Moller Sorensen T, Keiding N, Joost Michaelsen J, Sonne Nielsen A. Emergency room utilization in Copenhagen: a comparison of immigrant groups and Danish-born residents. *Scand J Public Health*. 2004;32(1):53-9.
22. helpline Teprtm. 18 January - 9 February 2017
23. Gamst-Jensen H, Huibers L, Pedersen K, Christensen EF, Ersboll AK, Lippert FK, et al. Self-rated worry in acute care telephone triage: a mixed-methods study. *Br J Gen Pract*. 2018;68(668):e197-e203.
24. Gamst-Jensen H, Frisknecht Christensen E, Lippert F, Folke F, Egerod I, Brabrand M, et al. Impact of caller's degree-of-worry on triage response in out-of-hours telephone consultations: a randomized controlled trial. *Scand J Trauma Resusc Emerg Med*. 2019;27(1):44.
25. Chandola T, Jenkinson C. Validating self-rated health in different ethnic groups. *Ethn Health*. 2000;5(2):151-9.
26. Vedsted P, Christensen MB. Frequent attenders in general practice care: a literature review with special reference to methodological considerations. *Public Health*. 2005;119(2):118-37.
27. Pedersen CB. The Danish Civil Registration System. *Scand J Public Health*. 2011;39(7 Suppl):22-5.
28. Schmidt M, Pedersen L, Sorensen HT. The Danish Civil Registration System as a tool in epidemiology. *Eur J Epidemiol*. 2014;29(8):541-9.
29. Thygesen L. The register-based system of demographic and social statistics in Denmark. *Stat J UN Econ Comm Eur*. 1995;12(1):49-55.
30. Schmidt M, Schmidt SA, Sandegaard JL, Ehrenstein V, Pedersen L, Sorensen HT. The Danish National Patient Registry: a review of content, data quality, and research potential. *Clin Epidemiol*. 2015;7:449-90.
31. Lyng E, Sandegaard JL, Rebolj M. The Danish National Patient Register. *Scand J Public Health*. 2011;39(7 Suppl):30-3.

32. TN N. Datavaliditet og dækningsgrad i Landspatientregisteret. *Ugeskr Læger* 2002;164(01):33-7. 2002.
33. Maheswaran R, Pearson T, Jiwa M. Repeat attenders at National Health Service walk-in centres - a descriptive study using routine data. *Public health*. 2009;123(7):506-10.
34. Sandvik H, Hunskaar S. Frequent attenders at primary care out-of-hours services: a registry-based observational study in Norway. *BMC health services research*. 2018;18(1):492.
35. Vedsted P, Olesen F. Social environment and frequent attendance in Danish general practice. *Br J Gen Pract*. 2005;55(516):510-5.
36. Marmot M, Wilkinson, R.G. Social determinants of health. Oxford university press. 1999.
37. Marmot MW, R.G. Social determinants of health. Oxford university press. 2003.
38. statistik D. Statistikbanken. Available from : .  
<http://wwwstatistikbankendk/statbank5a/defaultasp?w=1920> cited 2018 04.07.
39. Wu Z, Penning MJ, Schimmele CM. Immigrant status and unmet health care needs. *Can J Public Health*. 2005;96(5):369-73.
40. Njeru JW, Damodaran S, North F, Jacobson DJ, Wilson PM, St Sauver JL, et al. Telephone triage utilization among patients with limited English proficiency. *BMC Health Serv Res*. 2017;17(1):706.
41. Hansen EH, Hunskaar S. Understanding of and adherence to advice after telephone counselling by nurse: a survey among callers to a primary emergency out-of-hours service in Norway. *Scand J Trauma Resusc Emerg Med*. 2011;19:48.
42. Huibers L, Moth G, Andersen M, van Grunsven P, Giesen P, Christensen MB, et al. Consumption in out-of-hours health care: Danes double Dutch? *Scand J Prim Health Care*. 2014;32(1):44-50.
43. Moth G, Huibers L, Christensen MB, Vedsted P. Out-of-hours primary care: a population-based study of the diagnostic scope of telephone contacts. *Fam Pract*. 2016;33(5):504-9.
44. Christensen A LE, O. Davidsen, M. Juel, K. Sundhed og sygelighed i Danmark 2010 & udviklingen siden 1987 Statens Institut for Folkesundhed, Syddansk Universitet København. 2012.
45. Flarup L, Carlsen AH, Moth G, Christensen MB, Vestergaard M, Olesen F, et al. The 30-day prognosis of chronic-disease patients after contact with the out-of-hours service in primary healthcare. *Scand J Prim Health Care*. 2014;32(4):208-16.
46. White D, Kaplan L, Eddy L. Characteristics of patients who return to the emergency department within 72 hours in one community hospital. *Adv Emerg Nurs J*. 2011;33(4):344-53.
47. Sauvin G, Freund Y, Saidi K, Riou B, Hausfater P. Unscheduled return visits to the emergency department: consequences for triage. *Acad Emerg Med*. 2013;20(1):33-9.
48. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav*. 1997;38(1):21-37.
49. McKenna SP. Measuring patient-reported outcomes: moving beyond misplaced common sense to hard science. *BMC Med*. 2011;9:86.
50. Jylha M. What is self-rated health and why does it predict mortality? Towards a unified conceptual model. *Soc Sci Med*. 2009;69(3):307-16.
51. Jervelund SS, Malik S, Ahlmark N, Villadsen SF, Nielsen A, Vitus K. Morbidity, Self-Perceived Health and Mortality Among non-Western Immigrants and Their Descendants in Denmark in a Life Phase Perspective. *J Immigr Minor Health*. 2017;19(2):448-76.

**Figure 1:** Flowchart of the calls included



**Figure 2:** Division of the included calls in four strata: One-time callers, initial calls plus occurrence of repeated call, first repeated call within 48 hours and two or more repeated calls within 48 hours of the initial call.



Protective for performing repeated calls

Mediating performing repeated calls

Health-related variables

Sociodemographic variables

Female gender  
Reference group: male

Age > 65  
Reference group: ≤ 5 years

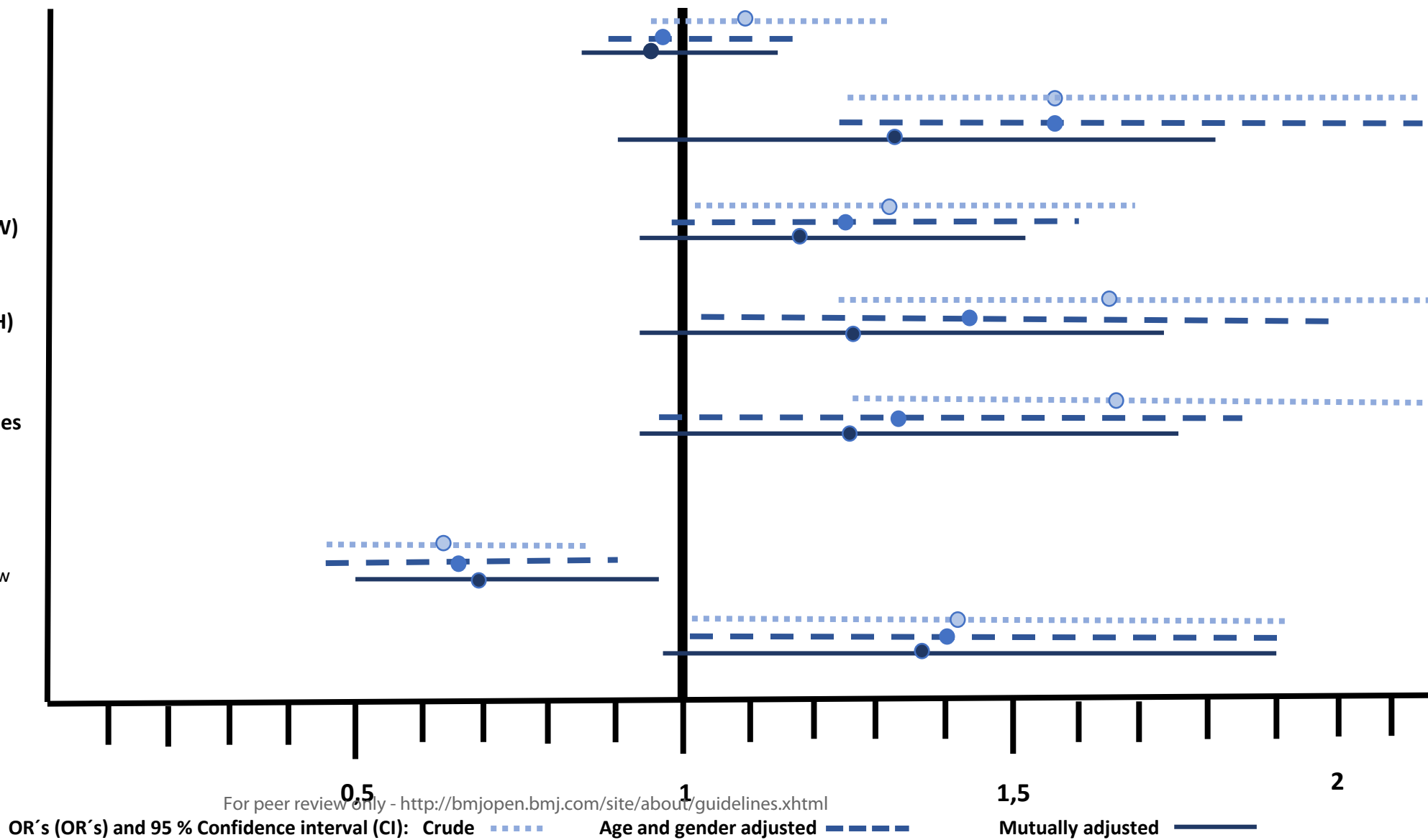
High Degree of Worry (DOW)  
Reference group: low

Low Self Rated Health (SRH)  
Reference group: 1 (very good)

Two or more comorbidities  
Reference group: none

High income  
Reference group: very low

Immigrants  
Reference group: native



**STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies***

Section/Topic	Item #	Recommendation	Reported on page #
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1,5
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4,5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5,66
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	
		(b) For matched studies, give matching criteria and number of exposed and unexposed	none
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,7
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	6,7
Bias	9	Describe any efforts to address potential sources of bias	3,13
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
		(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	None
		(c) Explain how missing data were addressed	None
		(d) If applicable, explain how loss to follow-up was addressed	None
		(e) Describe any sensitivity analyses	none
<b>Results</b>			none

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	6
		(b) Give reasons for non-participation at each stage	None
		(c) Consider use of a flow diagram	Figure 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1 Table 2
		(b) Indicate number of participants with missing data for each variable of interest	Table 1
		(c) Summarise follow-up time (eg, average and total amount)	7,8,9,10
Outcome data	15*	Report numbers of outcome events or summary measures over time	Table 1 Table 2 Table 3 7,8,9
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	7,8,9
		(b) Report category boundaries when continuous variables were categorized	6,7
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	none
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	none
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	11,12,13
<b>Limitations</b>			13
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
<b>Other information</b>			
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	16

\*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.

1  
2 **Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE  
3 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  
4 <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).  
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For peer review only



# BMJ Open

## Sociodemographic and health-related determinants for making repeated calls to a medical helpline: a prospective cohort study

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<b>Primary Subject Heading</b>:	Emergency medicine
Secondary Subject Heading:	Emergency medicine, Health services research
Keywords:	Health & safety < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, ACCIDENT & EMERGENCY MEDICINE

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## **Title page**

### **Title of the article**

Sociodemographic and health-related determinants for making repeated calls to a medical helpline:  
a prospective cohort study

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24  
25 **Word count:** excluding title page, abstract, references, figures and tables. 3505

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31 **Abstract**

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33 **Objectives.** To identify sociodemographic and health-related characteristics of callers' making  
34 repeated calls within 48 hours to a medical helpline, compared to those who only call once.

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38 **Setting.** In the Capital Region of Denmark people with acute, non-life-threatening illnesses or  
39 injuries are triaged through a single-tier medical helpline for acute, healthcare services.

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43 **Participants.** People who called the medical helpline between 18 January - 9 February 2017 were  
44 invited to participate in the survey. In the period 38787 calls were handled and 12902 agreed to  
45 participate. Calls were excluded because of temporary civil registration number (n=78), call was not  
46 made by the patient or a close relative (n=699), or survey responses were incomplete (n=19).  
47 Hence, the analysis included 12106 calls, representing 11.131 callers' making single calls and 464  
48 callers' making two or more calls within 48 hours.

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54 Callers' data (age, sex, caller identification) were collected from the medical helpline's electronic  
55 records. Data were enriched using the callers' self-rated health, self-evaluated degree of worry, and  
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registry data on income, ethnicity, and comorbidities. Odds ratio for making repeated calls was calculated in a crude, a sex and age- and in a mutually adjusted analysis.

**Results** The crude logistic regression analysis showed that age, self-rated health, self-evaluated degree of worry, income, ethnicity, and comorbidities were significantly associated with making repeated calls. In the mutually adjusted analysis associations decreased, however, odds ratios remained significantly decreased for callers with a household income in the middle (OR=0.71 (95% CI=0.54 to 0.92)) or highest (OR=0.68 (95% CI=0.48 to 0.96)) quartiles, while immigrants had borderline significantly increased odds ratio (OR=1.34 (95% CI=0.96 to 1.86)) for making repeated calls.

**Conclusions** Findings suggest that income and ethnicity are potential determinants for callers' need to make additional calls within 48 hours to a medical helpline with triage function.

### Strengths and limitations of this study

- The characteristics of callers' who make repeated calls to telephone triage function have not previously been studied.
- This study provided an overview of the frequency of sociodemographic and health-related characteristics and its association with callers' who repeatedly call a medical helpline, compared to those who only call once.
- The sociodemographic and health-related characteristics influence on the odds for making repeated calls to a medical helpline was calculated in a sex and age-adjusted- and in a mutually adjusted logistic regression analysis.
- The sociodemographic characteristics influence on making repeated call compared to the health-related characteristics is illustrated.
- In the present study 33.3% of the invited study population agreed to participate in the survey, possibly introducing selection bias.

## Introduction

In the last decade, out-of-hours (OOH) primary care has taken place in large-scale organisations in various countries,(1) and telephone triage is a common feature of OOH services, serving to determine the level of urgency and healthcare needed.(2) In the Capital Region of Denmark people with acute, non-life-threatening illnesses or injuries are encouraged to call a single-tier telephone preadmission evaluation and triage service called medical helpline 1813 (MH1813).(3) Triage results in one of two possible outcomes: 1) face-to-face consultation (home visit, hospital-based emergency department/acute care clinic, or hospitalisation) or 2) medical telephone advice (self-care, contact general practitioner, or prescriptions).(4) Telephone triage, however, is not straight forward, and a lack of visual cues compromises clinical decision making .(4) The call handler creates a picture of the caller using non-verbal cues, such as tone of voice, diction and background noises to help determine the urgency of the call.(5) When using this strategy call handlers subconsciously incorporate their own preconceptions and stereotypes, (6) not to mention professional and personal experience.(6) An additional complicating factor in the clinical decision making is that the call handler must simultaneously act as a gatekeeper and as a caregiver.(7)

Furthermore, when telephone medical helplines serves as a single-tier entry point for face-to-face consultations, callers must have the ability to describe symptoms sufficiently and follow the given medical advice adequately(2, 8), however; the callers' ability to do so may vary.(9) A lack of ability may increase the risk of receiving inaccurate advice or incorrect triage outcome,(10) potentially increasing the need to make additional calls.

There is a lack of studies on whether sociodemographic and health-related characteristics are related to repeated calls to medical helplines. Existing literature on users of OOH services with face-to-face consultations (eg emergency departments) has shown that sociodemographic and health-related characteristics are associated with repeat visits,(11-14) and that specific characteristics can add to the risk of making errors in clinical decision making.(11, 15-18) Frequent use of OOH services is associated with the presence of comorbidities,(8, 19) while low, self-rated health (SRH) is associated with frequent general practice visits in Denmark.(20) Similarly, immigrants use the emergency room more often than ethnic Danes.(21)

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4 Identification of the sociodemographic and health-related determinants for making repeated calls to  
5 medical helplines may help prevent errors in clinical decision making, preventing over- or under  
6 triage in medical helplines. In addition, by gaining insight on underlying determinants to perform  
7 repeated calls, policymakers might be provided with knowledge that potentially help prevent the  
8 portion of repeated calls that may be unnecessary and resource demanding.  
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14 The aim of this paper was to identify the sociodemographic and health-related characteristics of  
15 individuals making repeated calls to a medical helpline within 48-hours, compared to those who  
16 only call once.  
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## 23 **Methods**

### 24 **Design**

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26 A prospective cohort study was conducted of individuals who repeatedly called MH1813 within 48  
27 hours of their initial call (n=464) compared to those who only called once (n=11131). The  
28 differences between the two groups were examined in relation to sociodemographic (income and  
29 ethnicity) and health-related characteristics (age, sex, degree of comorbidities, SRH and self-  
30 evaluated degree of worry (DOW)). We also analysed the influence of the details on the initial call  
31 (time of call, caller) to MH1813.  
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### 42 **Setting**

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44 The study was conducted at Emergency Medical Services Copenhagen in the Capital Region of  
45 Denmark, which provides acute and emergency services for 1.7 million people. Access to public  
46 medical healthcare services is free of charge in Denmark. MH1813 is a round-the-clock, single-tier  
47 entry point for acute healthcare for people with acute, non-life-threatening illnesses or injuries and  
48 encourages people to call for preassessment and possible triage to a face-to-face consultation  
49 outside the office hours of general practitioners.(3) A separate three-digit emergency number, 112,  
50 is available for potentially life-threatening symptoms/injuries and to request an ambulance.  
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56 The MH1813 medical staff handle approximately one million calls annually, 4% of which are  
57 repeat calls within 48 hours of the initial call.(22) Call handlers at MH1813 comprise nurses (80%)  
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4 and physicians (20%), who use an electronic decision support tool to determine the level of urgency  
5 and healthcare needed.(3)  
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8 The present study is embedded within a wider trial examining DOW as a predictor for the use of  
9 acute healthcare services and is registered at [www.clinicaltrials.gov](http://www.clinicaltrials.gov), file no. NCT02979457.  
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### 15 **Approvals and registration**

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17 This study was approved by the Danish Data Protection Agency (2012-58-0004) and Statistics  
18 Denmark. Approval from the Scientific Ethics Review Committee of the Capital Region of  
19 Denmark was requested but no permission is required (H-15016323). Informed oral consent was  
20 obtained from all study participants.  
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### 28 **Participants**

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30 Anyone who called MH1813 between 18 January to 9 February 2017 was invited to participate in a  
31 survey. If the caller agreed to participate, the survey was completed prior to speaking with the call  
32 handler. During this period 38787 people called, 12902 of whom agreed to participate in the study  
33 (33.26%). Callers were excluded if they had a temporary civil registration number (eg tourists)  
34 (n=78); the call was not made by the patient or a close relative to the patient (eg primary care  
35 nurses) (n=699); or survey responses were incomplete (n=19), leaving 12106 calls for analysis, as  
36 shown in figure 1.  
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44 Initially we divided the calls included in the study cohort into the following four sequences: 1) one-  
45 time callers, where the individual only called once within 48 hours (n=11131); 2) initial call plus  
46 occurrence of repeated call (n=464); 3) first repeated call within 48 hours of the initial call (n=464);  
47 and 4) two or more repeated calls within 48 hours of the initial call (n=47). Figure 2 illustrates the  
48 four sequences. For the analysis, however, we divided the study data into two main groups: one-  
49 time calls (n=11131) and the initial call to the repeated call (n=464).  
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### 58 **Exposure**

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4 Data on sex (male, female) and age ( $\leq 5$  years, 6-18 years, 19-65 years,  $>65$  years) were retrieved  
5 from MH1813's electronic patient record. This classification of age was selected based on disease  
6 patterns in the respective age groups: children, adolescents, adults, and the elderly). Time of call  
7 (workday, weekend) was retrieved from the same electronic patient record.  
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12 Prior to speaking with the call handler, caller responses to three survey questions were collected:  
13 self-evaluated DOW (1=low, 2=middle, 3=high) and SRH (on a scale of 1 to 5, where 1=very good  
14 and 5= very poor) and who the caller was (patient, close relative to the patient, other). A recorded  
15 message presented the survey questions, which callers responded to on a numeric scale using their  
16 phone keypad.  
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22 DOW represents a self-evaluated measure of the caller's level of worry concerning the acuteness of  
23 their health situation. Although this scale has not been validated a previous study showed that  
24 people using OOH services were able to rate their DOW as a measure of the self-evaluated level of  
25 urgency at MH1813.(23, 24)  
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30 SRH reflects an individual's own assessment of their health according to their own definition of  
31 health. SRH is a validated scale that predicts morbidity and mortality,(25) and also prompts people  
32 to seek primary care more frequently.(20, 26)  
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36 All residents of Denmark are assigned a personal identification number at birth or upon officially  
37 registering in the Danish Civil Registration System.(27, 28) This number makes it possible to  
38 conduct individual follow-up in national registries. Call data on each caller was merged with data  
39 on annual household income divided into four quartiles (very low, low, middle, high) and ethnicity  
40 (natives, immigrants, descendants of immigrants) from Statistics Denmark's registries.(29). Data on  
41 comorbidity from the past 10 years (Charlson score: 0=no comorbidities, 1=one comorbidity, 2=two  
42 or more comorbidities) were obtained from the Danish National Patient Registry,(30, 31) where  
43 morbidity is registered continuously for all patients in Danish hospitals. The validity of the Danish  
44 National Patient Registry is estimated at 66-99% compared to a journal audit.(32)  
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## 56 **Analysis**

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4 A descriptive baseline analysis of sociodemographic and health-related characteristics was  
5 performed using frequency distributions (number and percentage). Logistic regression analyses  
6 were used to calculate crude, age and sex adjusted and mutually adjusted (for age, sex, ethnicity,  
7 income, call time, caller, DOW, SRH, and Charlson comorbidity score) odds ratios (OR) with 95%  
8 confidence intervals (95% CI) for repeat callers (n=464) versus one-time callers (n=11131).  
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14 Due to the limited number of missing values in the data collection (n=106 in SRH), they were  
15 excluded from the analysis because their absence was considered random.  
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18 The statistical analyses were performed using SAS Enterprise Guide 7.1.  
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## 23 **Results**

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25 The analysis included 11595 callers, 4% (n=464) of whom represented callers who made repeated  
26 calls within 48 hours of their initial call.  
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30 The results of the crude analysis identified an association between repeated calls to MH1813 within  
31 48 hours and the callers' sociodemographic and health-related characteristics, as well as the details  
32 related to the call. However, these associations decreased in the mutually adjusted analysis,  
33 indicating that sociodemographic and health-related characteristics have a reinforcing effect on the  
34 need to make an additional call.  
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40 A comparison of the results in the mutually adjusted analysis showed that sociodemographic  
41 variables have a stronger association with the odds of making a repeat call within 48 hours  
42 compared to the health-related variables. Figure 3 illustrates this.  
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46 Findings in the mutually adjusted analysis suggest that income and ethnicity are potential  
47 determinants for individuals need to make repeated calls within 48 hours to a medical helpline with  
48 triage function.  
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## 52 **Association of health-related characteristics with making repeated calls**

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55 The crude analysis on the health-related characteristics (age, sex, DOW, SRH, Charlson  
56 comorbidity score) indicated that all characteristics, except sex, were significantly associated with  
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the odds of making repeated calls. The strongest positive association for making a repeat call was a Charlson comorbidity score of 2 compared to a score of 0 (OR=1.66 (95% CI=1.26 to 2.19) (Table 1).

*Table 1 lists crude, adjusted and full model adjusted odds ratios (OR) with 95% confidence intervals (95% CI) for health-related characteristics for repeated calls <48 hours (n=464) compared to one-time calls (n=11131) to the telephone triage.*

	One-time callers (n=11131)	Repeat callers (n=464)	Crude OR (95% CI)	Adjusted OR (95% CI) *	Mutually adjusted OR (95% CI)**
<b>Sex in % (n)</b>					
Male	45.96 (5116)	44.18 (205)	<b>1</b>	<b>1</b>	<b>1</b>
Female	54.04 (6015)	55.82 (259)	<b>1.08</b> (0.89-1.29)	<b>0.96</b> (0.77-1.13)	<b>0.94</b> (0.78-1.14)
<b>Age in % (n)</b>					
Mean	30.37	34.57			
Age ≤5 years	23.14 (2576)	22.84 (106)	<b>1</b>	<b>1</b>	<b>1</b>
Age ≥6 and ≤18 years	17.20 (1915)	13.58 (63)	<b>0.79</b> (0.58-1.09)	<b>0.79</b> (0.58-1.09)	<b>0.95</b> (0.67-1.33)
Age ≥19 and ≤65 years	46.91 (5222)	43.75 (202)	<b>0.95</b> (0.74-1.20)	<b>0.94</b> (0.74-1.19)	<b>0.80</b> (0.59-1.08)
Age >65 years	12.74 (1428)	19.83 (92)	<b>1.58</b> (1.18-2.10)	<b>1.57</b> (1.17-2.09)	<b>1.24</b> (0.85-1.81)
<b>Degree of worry in % (n)</b>					
Low	30.51 (3396)	28.50 (132)	<b>1</b>	<b>1</b>	<b>1</b>
Middle	36.17 (4026)	30.39 (141)	<b>0.90</b> (0.71-1.15)	<b>0.89</b> (0.69-1.13)	<b>0.88</b> (0.69-1.23)
High	33.32 (3709)	41.16 (191)	<b>1.33</b> (1.06-1.66)	<b>1.23</b> (0.98-1.55)	<b>1.13</b> (0.89-1.45)
<b>Self-rated health in % (n)</b>					
1 (very good)	18.84 (2077)	17.10 (79)	<b>1</b>	<b>1</b>	<b>1</b>
2	24.35 (2685)	23.16 (107)	<b>1.05</b> (0.78-1.41)	<b>1.02</b> (0.76-1.37)	<b>1.02</b> (0.75-1.37)
3	22.07 (2433)	19.26 (89)	<b>0.96</b> (0.71-1.31)	<b>0.90</b> (0.66-1.23)	<b>0.87</b> (0.63-1.19)
4	20.03 (2208)	18.61 (86)	<b>1.02</b> (0.75-1.39)	<b>0.93</b> (0.68-1.28)	<b>0.88</b> (0.63-1.21)
5 (very poor)	14.71 (1622)	21.86 (101)	<b>1.64</b> (1.21-2.21)	<b>1.43</b> (1.05-1.96)	<b>1.26</b> (0.91-1.75)
<b>Charlson comorbidity score in % (n)</b>					
0 (None comorbidities)	81.26 (9045)	75.65 (351)	<b>1</b>	<b>1</b>	<b>1</b>
1 (one comorbidities)	9.95 (1108)	10.78 (50)	<b>1.16</b> (0.86-1.57)	<b>1.06</b> (0.77-1.15)	<b>1.02</b> (0.74-1.40)
2 (two or more comorbidities)	8.79 (978)	13.58 (63)	<b>1.66</b> (1.26-2.19)	<b>1.33</b> (0.96-1.84)	<b>1.27</b> (0.91-1.77)

\* Adjusted for age and sex

\*\*Adjusted for age, sex, ethnicity, income, call time, caller, degree of worry, self-rated health, and Charlson comorbidity score

In the mutually adjusted logistic regression analysis the ORs decreased somewhat, and none of the health-related characteristics were significantly associated with the odds of performing a repeated call (Table 1).

## Association of sociodemographic characteristics with making repeated calls

The crude analysis on the sociodemographic characteristics (household income, ethnicity) indicated that immigrant status increased the odds of performing a repeated call, while having a middle or a high household income decreased the odds of performing a repeated call (Table 2).

Table 2 lists crude, adjusted and full model adjusted odds ratios (OR) with 95% confidence intervals (95% CI) for sociodemographic characteristics for repeated calls <48 hours (n=464) compared to one-time calls (n=11131) to the telephone triage.

	One-time callers (n=11131)	Repeat callers (n=464)	Crude OR (95%CI)	Adjusted OR (95% CI) *	Mutually adjusted OR (95% CI)**
<b>Ethnicity % (n)</b>					
Natives	82.24 (9488)	82.24 (380)	<b>1</b>	<b>1</b>	<b>1</b>
Immigrants	7.22 (833)	10.17 (47)	<b>1.41</b> (1.03-1.93)	<b>1.40</b> (1.02-1.93)	<b>1.34</b> (0.96-1.86)
Descendants of immigrants	6.54 (754)	7.57 (35)	<b>1.16</b> (0.81-1.65)	<b>1.27</b> (0.89-1.82)	<b>1.14</b> (0.79-1.65)
<b>Annual household income % (n)</b>					
Very low	28.31 (3151)	33.62 (156)	<b>1</b>	<b>1</b>	<b>1</b>
Low	28.20 (3139)	31.68 (147)	<b>0.95</b> (0.75-1.19)	<b>0.82</b> (0.64-1.06)	<b>0.81</b> (0.63-1.05)
Middle	28.73 (3198)	23.71 (110)	<b>0.69</b> (0.54-0.89)	<b>1.03</b> (0.80-1.33)	<b>0.71</b> (0.54-0.92)
High	14.76 (1643)	10.99 (51)	<b>0.63</b> (0.46-0.87)	<b>0.65</b> (0.46-0.91)	<b>0.68</b> (0.48-0.96)

\* Adjusted for age and sex

\*\*Adjusted for age, sex, ethnicity, income, call time, caller, degree of worry, self-rated health, and Charlson comorbidity score

In the mutually adjusted logistic regression analysis, annual income significantly decreased the odds of performing a repeated call for callers' with household income in the middle quartile OR=0.71 (95% CI=0.54 to 0.92) and highest quartiles OR=0.68 (95% CI=0.48 to 0.96), compared to callers' with household income in the lowest quartile (Table 2). This result indicates that low income is a potential determinant for performing repeated calls to the MH1813.

Immigrants relative to natives had significantly increased odds for performing repeated calls, in the crude analysis, as well as the analyses adjusted for age and sex. In the mutually adjusted analysis, the association was borderline significant OR=1.34 (95% CI=0.96 to 1.85). This result indicates that being an immigrant also is a potential determinant for performing repeated calls to the MH1813 (Table 2).

## Characteristics associated with calls to MH1813 and with making repeat calls

The crude analysis on characteristics related to the call, found that callers' who were a close relative to the patient were significantly associated with performing a repeated call, while time of call did not have an association with performing a repeated call (Table 3).

*Table 3 showing crude, adjusted and full model adjusted odds ratios (OR) with 95% confidence intervals (95%CI) for characteristics attach to the call for repeated calls <48 hours (n=464) compared to one-time calls (n=11131) to the telephone triage*

	One-time callers (n=11131)	Repeat callers (n=464)	Crude OR (95%CI)	Adjusted OR (95% CI) *	Mutually adjusted OR (95% CI)**
<b>Call time in % (n)</b>					
Workday	60.88 (6777)	59.27 (275)	<b>1</b>	<b>1</b>	<b>1</b>
Weekend	39.12 (4354)	40.73 (189)	<b>1.07</b> (0.88-1.29)	<b>1.05</b> (0.87-1.27)	<b>1.09</b> (0.89-1.32)
<b>Caller in % (n)</b>					
Patient	40.26 (4481)	45.26 (210)	<b>1</b>	<b>1</b>	<b>1</b>
Close relative	59.74 (6650)	54.74 (254)	<b>0.82</b> (0.67-0.98)	<b>0.79</b> (0.64-1.00)	<b>0.75</b> (0.59-0.94)

\* Adjusted for age and sex

\*\*Adjusted for age, sex, ethnicity, income, call time, caller, DOW, SRH Charlson comorbidity score

In the mutually adjusted logistic regression analysis callers who were close relatives had significantly decreased odds for making repeated calls compared to callers who were patients (OR=0.75 (95% CI=0.59 to 0.94) (Table 3).

## Discussion

The main finding is that the association between callers' sociodemographic characteristics (income and ethnicity) and repeated calls to the MH1813 within 48 hours is stronger than for the callers' health-related characteristics (age, sex, comorbidity, SRH, DOW) (figure 3). Sociodemographic factors have also been shown to be an influence among people with repeated visits to OOH services with face-to-face consultations.(20, 21, 26, 33-35). This indicates that the MH1813 reflects similar

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4 patterns among people with low income and people who are immigrants, as seen in the OOH  
5 services in general.  
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9 Specific clinical factors, such as the call handlers' level of professional experience or language  
10 barriers may also have affected the individual's need to call more than once. Identification of these  
11 factors is beyond the scope of this survey but a relevant issue to explore in future studies.  
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15 The mutually adjusted analysis showed that household income was the only investigated variable  
16 that was significantly associated with making repeated calls. Our results indicate that high  
17 household income may represent a factor that leads to the occurrence of fewer repeated call within  
18 48 hours of the initial call, while low household income may be a determinant for making repeated  
19 calls. This finding is supported by evidence showing that low socio-economic status is related to the  
20 extent of comorbidity,(36, 37) which may increase the need for a professional assessment of the  
21 severity of symptoms. Moreover, low socioeconomic status is related to an increased use of medical  
22 services in general.(35, 37)  
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30 In relation to ethnicity, the frequency distribution showed that 7.2% of one-time callers were  
31 immigrants, which should be seen in light of the fact that immigrants make up 10.31% of the  
32 general population in Denmark.(38) Determining whether fewer immigrants use MH1813, or  
33 whether fewer immigrants declined to participate in the survey, is not possible based on the present  
34 data. The existing literature, however, indicates that immigrants generally use OOH acute  
35 healthcare with face-to-face consultations more frequently than ethnic Danes.(21)  
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41 The mutually adjusted analysis showed that immigrants had insignificantly higher odds of making  
42 repeated calls compared to ethnic Danes. One possible reason for this is that immigrants with  
43 limited language skills may lack the vocabulary to adequately describe their symptoms on the  
44 telephone.(39, 40) According to Hansen et al, who studied adherence to advice given by a nurse on  
45 the telephone, callers' who were immigrants had a significantly lower level of trust in the nurses  
46 and felt that they did not receive relevant answers to questions compared to natives.(41)  
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54 In the frequency distribution between repeated callers' and one-time callers, sex was not associated  
55 with repeated calls. Nevertheless, there were a higher amount of women among one-time callers  
56 (54.04%) and repeat callers (55.82%) compared to the distribution of women in the general Danish  
57 population (50.25%).(38) This distribution is similar to previous studies on OOH services (2, 42,  
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4 43). Women generally contact medical helplines more often than men and usually report a lower  
5 SRH than men (44) and a higher DOW.(23)  
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9 The distribution of comorbidity in the study population showed that people with the highest strata  
10 of comorbidity made repeated calls more frequently (13.58%) than one-time calls (8.79%). This is  
11 in line with the existing literature, where people with chronic diseases have a higher rate of repeated  
12 inquiries to emergency departments than those without chronic diseases.(45-47) One possible  
13 explanation is that people with multiple comorbidities have more progressive symptoms, increasing  
14 the need for repeated inquiries.(8)  
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20 The self-reported assessment of DOW and SRH was obtained in real time in conjunction with the  
21 call to MH1813, diminishing the risk of recall bias. SRH and DOW are simple, self-reported single-  
22 item variables that measure subjective, qualitative data using a quantitative method.(48) Poor self-  
23 evaluated health is a factor that prompts people to seek primary care more frequently.(20, 26). In  
24 the present study, the crude analysis showed that very poor SRH (score=5) was significantly  
25 associated with the need to make repeated calls compared to very good SRH (score=1). Likewise,  
26 the crude analysis indicated that high DOW was significantly associated with the need to make  
27 repeated calls compared to low DOW. The observed association remained significant in the age and  
28 sex-adjusted analysis, indicating that SRH and DOW are potential predictors for repeated calls.  
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37 When a close relative made the call on behalf of the patient, the risk of a repeated call occurring  
38 was significantly reduced. We hypothesise that this result is due to the number of relatives who are  
39 parents of small children and request advice and guidance on how to handle a child's symptoms,  
40 reducing the need to call MH1813 again. The two youngest age groups (0-5 and 6-18 years)  
41 represented almost 40% of all the calls in this study, which means they are overrepresented  
42 compared to the general population (22.6%).(38) This is in line with similar studies showing that  
43 younger people generally have a higher consumption of acute healthcare services.(2, 15, 42, 43)  
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50 Overall, the analysis of sociodemographic and health-related characteristics showed that  
51 associations between groups decreased in the adjusted analysis. This suggests that the variables  
52 under study had a reinforcing effect and do not independently characterise people who have a need  
53 to make repeated calls, indicating that identifying the underlying factors for the need to make  
54 repeated calls constitutes a complex issue.  
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## Limitations

In the present study 33.3% of the study cohort invited to participate agreed to do the survey. In a comparative analysis the participants did not differ significantly from non-responders in relation to age, sex and triage outcome. Nevertheless, selection bias might have been introduced in relation to other sociodemographic or health-related characteristics.

Data on comorbidity were obtained from the Danish National Patient Registry,(31) which is why people may have had one or more unrecognised morbidities that had not received an in-hospital diagnosis and subsequent registration in the Danish National Patient Registry. This factor could potentially have led to an information bias in relation to the calculation of comorbidity scores in the present study. However, since this potential information bias would have been present in both people who made one-time calls and people who made repeated calls, it was considered a non-differential misclassification.

In this study, SRH and DOW are measured with a simplified numeric scale. SRH is recognised as valid predictor of morbidity and mortality.(48) DOW, however, is a less studied variable, which is why the validity cannot be accounted for, as is recommended for self-reported measurements.(49)

Because one of the aims of this study was to be able to implement results in decision making in clinical practice, the sociodemographic and health-related characteristics variables were not tested for interaction. Nevertheless, the existing evidence on the sociodemographic and health-related characteristics of interest suggest multiple interactions between variables, e.g. a poor SRH interacts with age and with comorbidities;(50) a higher DOW interacts with female callers;(23) and immigrant status interacts with a lower self-perceived health and a higher rate of comorbidities.(51) Testing for interaction in the statistical analysis could potentially have provided valuable insight into possible confounders but was considered outside the scope of this study.

## Implications for clinicians and policymakers

This study indicates that specific sociodemographic characteristics of callers are potential determinants for the callers' need to make repeated calls to a telephone triage. This implies that the

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4 health service needs of callers with certain sociodemographic characteristics may differ compared  
5 to other sociodemographic groups when calling a telephone medical helpline.  
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9 Recognising the sociodemographic characteristics that play a role is an important aspect of  
10 preventing under triage, which poses a risk of delaying examination and treatment. One way of  
11 dealing with this issue is to provide call handlers with additional information about callers'  
12 sociodemographic and self-evaluated characteristics in the existing electronic decision support tool  
13 to supplement identification and clinical decision-making in telephone triage.  
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18 The aim and design of this study provides knowledge on callers' determinants for performing  
19 repeated calls. However, the study does not provide knowledge on potential determinants related to  
20 the call handler, nor the interaction between caller and call-handler during the initial call, which is  
21 relevant to investigate in future studies.  
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27 The results of this study are generalisable and can serve to benefit other large-scale OOH telephone  
28 triage services.  
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### 33 34 **Conclusions**

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36 In the present study 4% of the calls MH1813 received were from repeat callers. The crude analysis  
37 identified sociodemographic and health-related characteristics associated with making repeated  
38 calls. The mutually adjusted analysis showed that callers with a mid to high household income had  
39 significantly decreased odds for making repeated calls compared to those with very low income.  
40 Also, immigrants had insignificantly higher odds for making repeated calls compared to ethnic  
41 Danes. Other variables under study had a reinforcing effect on the odds of making repeated calls,  
42 which means they did not independently characterise people with a need to make additional calls.  
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49 These findings suggest that income and ethnicity are potential determinants for making repeated  
50 calls, which indicates that OOH telephone triage might benefit from incorporating  
51 sociodemographic characteristics in clinical decision-making tools to prevent over- or under triage.  
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### 58 **Figure legends/caption**

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**Figure 1**

Flowchart of calls included

Link text : Figure 1: Flowchart of calls

**Figure 2**

Division of the included calls in four strata: One-time callers, initial calls plus occurrence of repeated call, first repeated call within 48 hours and two or more repeated calls within 48 hours of the initial call.

Link text: Division of the included calls

**Figure 3**

Odds ratios

Showing crude, age and gender adjusted, and mutually adjusted Odds Ratio's with 95 %

Confidence Interval for health-related and sociodemographic characteristics for repeated calls < 48 hours (n=464) compared to single calls (n=11,131) to the medical helpline.

Link text : Figure 3: Showing Odds Ratios

**Authors contribution**

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RN, MPH, associate professor

Contributors: MB, HG, ME and TM conceptualised the study. MB and HG participated in data extraction. MB and ME participated in data analysis. MB and TM produced the first draft of the manuscript, while HG, ME, HC and TM provided overall guidance and a final review of all manuscript drafts.

### **Acknowledgements**

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### **Funding statement**

There are no funders to report for this submission

### **Competing interest statement**

None declared.

### **Data sharing statement**

This study was carried out as part of a Master's thesis and used data from an existing study on MH1813 ([www.clinicaltrials.gov](http://www.clinicaltrials.gov), NCT02979457).

Data were retrieved from Medical Helplien electronic patient record, Statistics Denmark's registries and Danish National Patient Registry, and are not available online.

### **Provenance and peer review**

Not commissioned, externally peer reviewed.

### **Patient consent for publication**

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## 10 **Patient and public involvement**

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14 The development of the research aim, design, recruitment, conduct, and outcome measures in this  
15 study were not based on patient involvement. Participants can request further information on this  
16 study.  
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## 20 **Ethics approval**

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24 The study was approved by the Danish Data Protective Agency (2012-58-0004). Approval from the  
25 Scientific Ethics Review Committee of the Capital Region of Denmark was requested but no  
26 permission is required (H-15016323).  
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## 37 **References**

- 38  
39 1. Huibers L, Giesen P, Wensing M, Grol R. Out-of-hours care in western countries: assessment  
40 of different organizational models. *BMC Health Serv Res*. 2009;9:105.  
41 2. Huibers L, Moth G, Carlsen AH, Christensen MB, Vedsted P. Telephone triage by GPs in out-  
42 of-hours primary care in Denmark: a prospective observational study of efficiency and relevance. *Br J Gen*  
43 *Pract*. 2016;66(650):e667-73.  
44 3. Wadmann SK J. Evaluering af enstrenget og visiteret akutsystem i Region Hovedstaden.  
45 Sammenfatning. Det nationale institut for kommuners og regioners analyse og forskning. 2015.  
46 4. Leprohon J, Patel VL. Decision-making strategies for telephone triage in emergency medical  
47 services. *Med Decis Making*. 1995;15(3):240-53.  
48 5. Purc-Stephenson RJ, Thrasher C. Nurses' experiences with telephone triage and advice: a  
49 meta-ethnography. *J Adv Nurs*. 2010;66(3):482-94.  
50 6. Greenberg ME. A comprehensive model of the process of telephone nursing. *J Adv Nurs*.  
51 2009;65(12):2621-9.  
52 7. Holmstrom I, Dall'Alba G. 'Carer and gatekeeper' - conflicting demands in nurses' experiences  
53 of telephone advisory services. *Scand J Caring Sci*. 2002;16(2):142-8.  
54 8. Flarup L, Moth G, Christensen MB, Vestergaard M, Olesen F, Vedsted P. Chronic-disease  
55 patients and their use of out-of-hours primary health care: a cross-sectional study. *BMC Fam Pract*.  
56 2014;15:114.  
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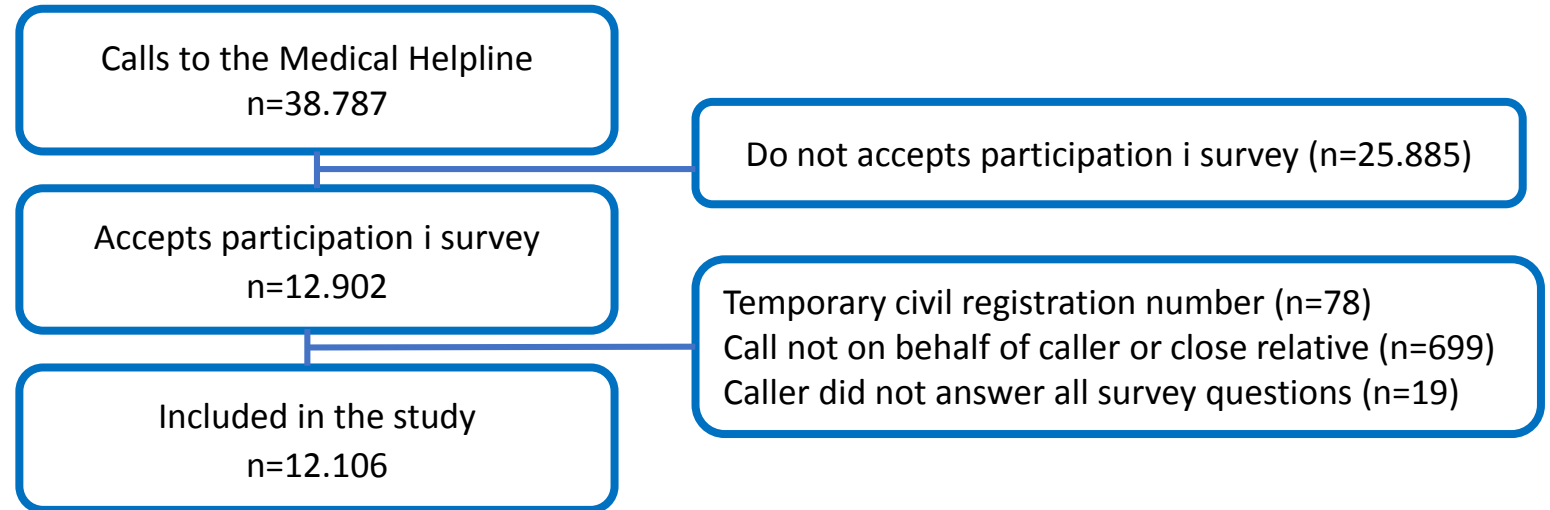
9. Gamst-Jensen H, Lippert FK, Egerod I. Under-triage in telephone consultation is related to non-normative symptom description and interpersonal communication: a mixed methods study. *Scand J Trauma Resusc Emerg Med.* 2017;25(1):52.
10. Bunn F, Byrne G, Kendall S. The effects of telephone consultation and triage on healthcare use and patient satisfaction: a systematic review. *Br J Gen Pract.* 2005;55(521):956-61.
11. Verelst S, Pierloot S, Desruelles D, Gillet JB, Bergs J. Short-term unscheduled return visits of adult patients to the emergency department. *J Emerg Med.* 2014;47(2):131-9.
12. Cheng SY, Wang HT, Lee CW, Tsai TC, Hung CW, Wu KH. The characteristics and prognostic predictors of unplanned hospital admission within 72 hours after ED discharge. *Am J Emerg Med.* 2013;31(10):1490-4.
13. Sabbatini AK, Kocher KE, Basu A, Hsia RY. In-Hospital Outcomes and Costs Among Patients Hospitalized During a Return Visit to the Emergency Department. *JAMA.* 2016;315(7):663-71.
14. Martin-Gill C, Reiser RC. Risk factors for 72-hour admission to the ED. *Am J Emerg Med.* 2004;22(6):448-53.
15. Huibers LA, Moth G, Bondevik GT, Kersnik J, Huber CA, Christensen MB, et al. Diagnostic scope in out-of-hours primary care services in eight European countries: an observational study. *BMC Fam Pract.* 2011;12:30.
16. Byrne M, Murphy AW, Plunkett PK, McGee HM, Murray A, Bury G. Frequent attenders to an emergency department: a study of primary health care use, medical profile, and psychosocial characteristics. *Ann Emerg Med.* 2003;41(3):309-18.
17. Di Giuseppe G, Abbate R, Albano L, Marinelli P, Angelillo IF, Collaborative Research G. Characteristics of patients returning to emergency departments in Naples, Italy. *BMC Health Serv Res.* 2008;8:97.
18. McCusker J, Healey E, Bellavance F, Connolly B. Predictors of repeat emergency department visits by elders. *Acad Emerg Med.* 1997;4(6):581-8.
19. Huber CA, Rosemann T, Zoller M, Eichler K, Senn O. Out-of-hours demand in primary care: frequency, mode of contact and reasons for encounter in Switzerland. *J Eval Clin Pract.* 2011;17(1):174-9.
20. Vedsted P, Fink P, Sorensen HT, Olesen F. Physical, mental and social factors associated with frequent attendance in Danish general practice. A population-based cross-sectional study. *Soc Sci Med.* 2004;59(4):813-23.
21. Norredam M, Krasnik A, Moller Sorensen T, Keiding N, Joost Michaelsen J, Sonne Nielsen A. Emergency room utilization in Copenhagen: a comparison of immigrant groups and Danish-born residents. *Scand J Public Health.* 2004;32(1):53-9.
22. helpline Teparatm. 18 January - 9 February 2017
23. Gamst-Jensen H, Huibers L, Pedersen K, Christensen EF, Ersboll AK, Lippert FK, et al. Self-rated worry in acute care telephone triage: a mixed-methods study. *Br J Gen Pract.* 2018;68(668):e197-e203.
24. Gamst-Jensen H, Frisknecht Christensen E, Lippert F, Folke F, Egerod I, Brabrand M, et al. Impact of caller's degree-of-worry on triage response in out-of-hours telephone consultations: a randomized controlled trial. *Scand J Trauma Resusc Emerg Med.* 2019;27(1):44.
25. Chandola T, Jenkinson C. Validating self-rated health in different ethnic groups. *Ethn Health.* 2000;5(2):151-9.
26. Vedsted P, Christensen MB. Frequent attenders in general practice care: a literature review with special reference to methodological considerations. *Public Health.* 2005;119(2):118-37.
27. Pedersen CB. The Danish Civil Registration System. *Scand J Public Health.* 2011;39(7 Suppl):22-5.
28. Schmidt M, Pedersen L, Sorensen HT. The Danish Civil Registration System as a tool in epidemiology. *Eur J Epidemiol.* 2014;29(8):541-9.
29. Thygesen L. The register-based system of demographic and social statistics in Denmark. *Stat J UN Econ Comm Eur.* 1995;12(1):49-55.

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- 4
- 5 30. Schmidt M, Schmidt SA, Sandegaard JL, Ehrenstein V, Pedersen L, Sorensen HT. The Danish
- 6 National Patient Registry: a review of content, data quality, and research potential. *Clin Epidemiol.*
- 7 2015;7:449-90.
- 8 31. Lynge E, Sandegaard JL, Rebolj M. The Danish National Patient Register. *Scand J Public*
- 9 *Health.* 2011;39(7 Suppl):30-3.
- 10 32. TN N. Datavaliditet og dækningsgrad i Landspatientregisteret. *Ugeskr Læger* 2002;164(01):
- 11 33-7. 2002.
- 12 33. Maheswaran R, Pearson T, Jiwa M. Repeat attenders at National Health Service walk-in
- 13 centres - a descriptive study using routine data. *Public health.* 2009;123(7):506-10.
- 14 34. Sandvik H, Hunskaar S. Frequent attenders at primary care out-of-hours services: a registry-
- 15 based observational study in Norway. *BMC health services research.* 2018;18(1):492.
- 16 35. Vedsted P, Olesen F. Social environment and frequent attendance in Danish general practice.
- 17 *Br J Gen Pract.* 2005;55(516):510-5.
- 18 36. Marmot M, Wilkinson, R.G. Social determinants of health. Oxford university press. 1999.
- 19 37. Marmot MW, R.G. Social determnants of health. Oxford university press. 2003.
- 20 38. statistik D. Statistikbanken. Available from : .
- 21 <http://wwwstatistikbankendk/statbank5a/default.asp?w=1920> cited 2018 04.07.
- 22 39. Wu Z, Penning MJ, Schimmele CM. Immigrant status and unmet health care needs. *Can J*
- 23 *Public Health.* 2005;96(5):369-73.
- 24 40. Njeru JW, Damodaran S, North F, Jacobson DJ, Wilson PM, St Sauver JL, et al. Telephone
- 25 triage utilization among patients with limited English proficiency. *BMC Health Serv Res.* 2017;17(1):706.
- 26 41. Hansen EH, Hunskaar S. Understanding of and adherence to advice after telephone
- 27 counselling by nurse: a survey among callers to a primary emergency out-of-hours service in Norway. *Scand*
- 28 *J Trauma Resusc Emerg Med.* 2011;19:48.
- 29 42. Huibers L, Moth G, Andersen M, van Grunsven P, Giesen P, Christensen MB, et al.
- 30 Consumption in out-of-hours health care: Danes double Dutch? *Scand J Prim Health Care.* 2014;32(1):44-
- 31 50.
- 32 43. Moth G, Huibers L, Christensen MB, Vedsted P. Out-of-hours primary care: a population-
- 33 based study of the diagnostic scope of telephone contacts. *Fam Pract.* 2016;33(5):504-9.
- 34 44. Christensen A LE, O. Davidsen, M. Juel, K. Sundhed og sygelighed i Danmark 2010 &
- 35 udviklingen siden 1987 Statens Institut for Folkesundhed, Syddansk Universitet København. 2012.
- 36 45. Flarup L, Carlsen AH, Moth G, Christensen MB, Vestergaard M, Olesen F, et al. The 30-day
- 37 prognosis of chronic-disease patients after contact with the out-of-hours service in primary healthcare.
- 38 *Scand J Prim Health Care.* 2014;32(4):208-16.
- 39 46. White D, Kaplan L, Eddy L. Characteristics of patients who return to the emergency
- 40 department within 72 hours in one community hospital. *Adv Emerg Nurs J.* 2011;33(4):344-53.
- 41 47. Sauvin G, Freund Y, Saidi K, Riou B, Hausfater P. Unscheduled return visits to the emergency
- 42 department: consequences for triage. *Acad Emerg Med.* 2013;20(1):33-9.
- 43 48. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community
- 44 studies. *J Health Soc Behav.* 1997;38(1):21-37.
- 45 49. McKenna SP. Measuring patient-reported outcomes: moving beyond misplaced common
- 46 sense to hard science. *BMC Med.* 2011;9:86.
- 47 50. Jylha M. What is self-rated health and why does it predict mortality? Towards a unified
- 48 conceptual model. *Soc Sci Med.* 2009;69(3):307-16.
- 49 51. Jervelund SS, Malik S, Ahlmark N, Villadsen SF, Nielsen A, Vitus K. Morbidity, Self-Perceived
- 50 Health and Mortality Among non-Western Immigrants and Their Descendants in Denmark in a Life Phase
- 51 Perspective. *J Immigr Minor Health.* 2017;19(2):448-76.
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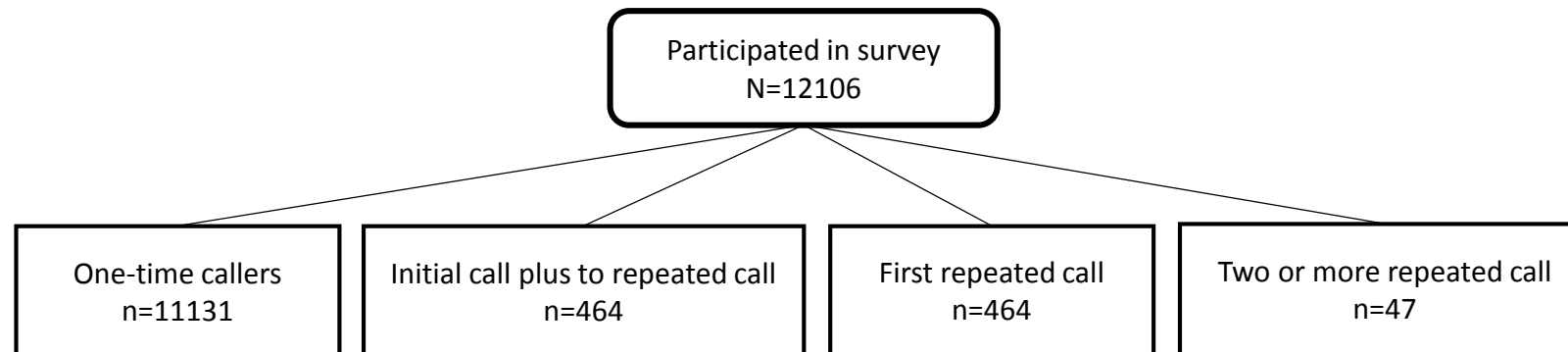
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3 **Figure 1: Flowchart of the calls included**  
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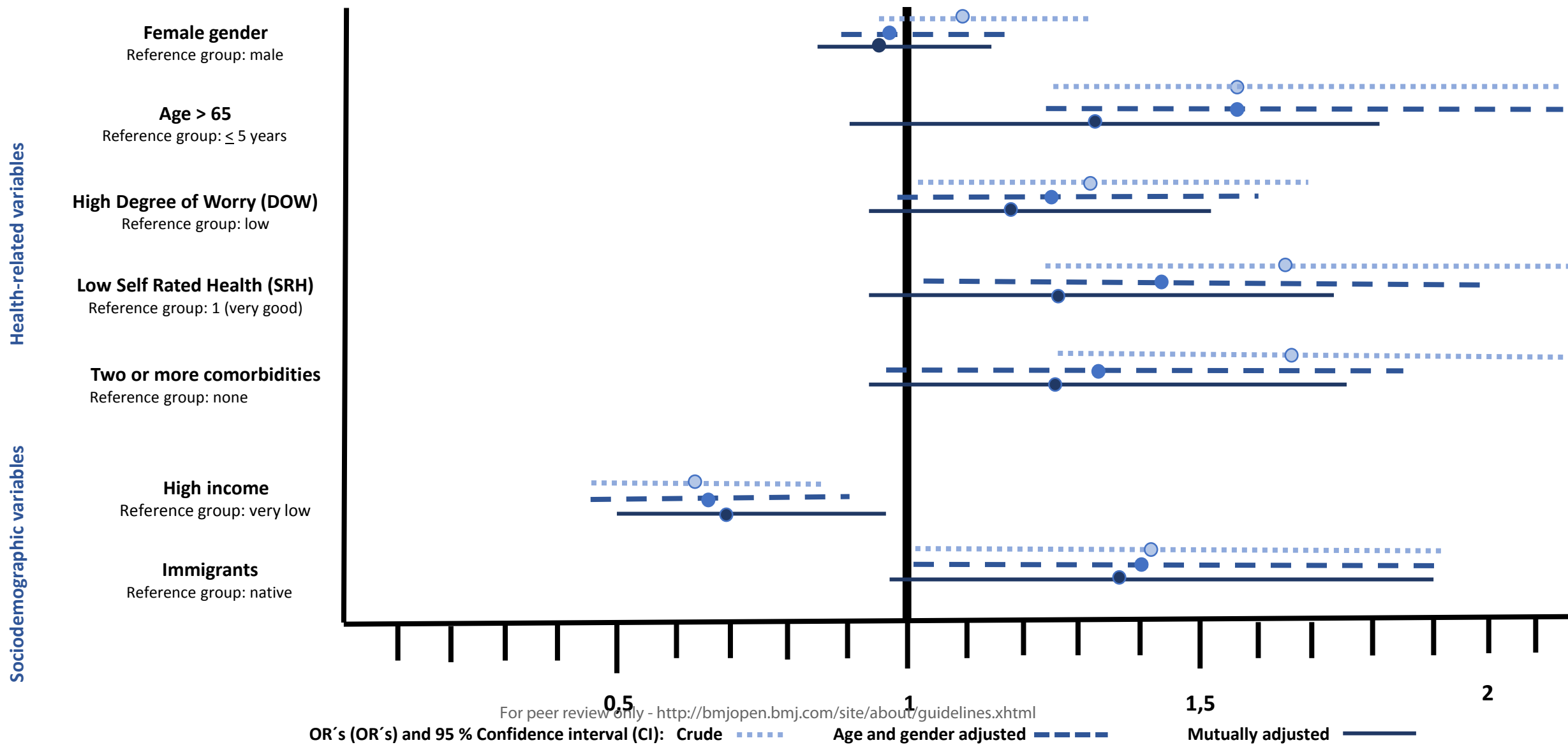
**Figure 2:** Division of the included calls in four strata: One-time callers, initial calls plus occurrence of repeated call, first repeated call within 48 hours and two or more repeated calls within 48 hours of the initial call.





Protective for performing repeated calls

Mediating performing repeated calls



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**STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies***

Section/Topic	Item #	Recommendation	Reported on page #
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1,5
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4,5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5,66
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	
		(b) For matched studies, give matching criteria and number of exposed and unexposed	none
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,7
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	6,7
Bias	9	Describe any efforts to address potential sources of bias	3,13
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
		(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	None
		(c) Explain how missing data were addressed	None
		(d) If applicable, explain how loss to follow-up was addressed	None
		(e) Describe any sensitivity analyses	none
<b>Results</b>			none

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	6
		(b) Give reasons for non-participation at each stage	None
		(c) Consider use of a flow diagram	Figure 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1 Table 2
		(b) Indicate number of participants with missing data for each variable of interest	Table 1
		(c) Summarise follow-up time (eg, average and total amount)	7,8,9,10
Outcome data	15*	Report numbers of outcome events or summary measures over time	Table 1 Table 2 Table 3 7,8,9
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	7,8,9
		(b) Report category boundaries when continuous variables were categorized	6,7
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	none
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	none
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	11,12,13
<b>Limitations</b>			13
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
<b>Other information</b>			
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	16

\*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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**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](http://www.strobe-statement.org).

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