Socioeconomic inequalities in primary-care and specialist physician visits: a systematic review

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Abstract

Background: Utilization of primary-care and specialist physicians seems to be associated differently with socioeconomic status (SES). This review aims to summarize and compare the evidence on socioeconomic inequalities in consulting primary-care or specialist physicians in the general adult population in high-income countries.

Methods: We carried out a systematic search across the most relevant databases (Web of Science, Medline) and included all studies, published since 2004, reporting associations between SES and utilization of primary-care and/or specialist physicians. In total, 57 studies fulfilled the eligibility criteria.

Results: Many studies found socioeconomic inequalities in physician utilization, but inequalities were more pronounced in visiting specialists than primary-care physicians. The results of the studies varied strongly according to the operationalization of utilization, namely whether a physician was visited (probability) or how often a physician was visited (frequency). For probabilities of visiting primary-care physicians predominantly no association with SES was found, but frequencies of visits were higher in the most disadvantaged. The most disadvantaged often had lower probabilities of visiting specialists, but in many studies no link was found between the number of visits and SES.

Conclusion: This systematic review emphasizes that inequalities to the detriment of the most deprived is primarily a problem in the probability of visiting specialist physicians. Healthcare policy should focus first off on effective access to specialist physicians in order to tackle inequalities in healthcare.

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Keywords: Social inequalities, Socioeconomic Status, Primary health care, Access to health care

Background

Health inequalities, precisely inverse associations between socioeconomic status (SES) and morbidity and mortality, are well analysed and described [1]. Further, numerous studies prove evidence for vertical inequalities in utilization of healthcare according to education, income and occupation, which represent SES. In order to shed more light on the role of healthcare in explaining health inequalities, it is crucial to examine socioeconomic inequalities in the utilization of treatment in a more differentiated way. It has been shown that socioeconomic inequalities in healthcare are present in both universal and non-universal health care systems, and existence does not depend on the type and financing of health systems [2–4]. Distinctions were more likely to be found according to the different dimensions of
healthcare for which inequalities are analysed. So far, international evidence on socioeconomic inequalities in treatment was mainly summarized on disease-specific, or country-specific basis and indicate that lower SES is associated with poor diabetes management, lower achievement of glycaemic control targets, and reduced visits of diabetes clinics and ambulatory care facilities for treatment of diabetes [3, 5]. In cancer patients, lower SES is associated with receiving less often (neo) adjuvant therapy for colorectal cancer, [6] and with receiving less often any treatment, surgery and chemotherapy for lung cancer [2]. In coronary heart disease patients SES was often associated with lower access to coronary procedures [4]. Nevertheless, SES was only partly associated with receiving radiotherapy and chemotherapy in colorectal cancer patients, [6] or with access to drug treatment and cardiac rehabilitation in coronary heart disease patients, [4] and not associated with radiotherapy for lung cancer [2]. In contrast, in diabetes patients, it was found that lower SES was associated with more visits to a diabetologist, and more often GP consultations [3]. For Germany it was summarized that higher status groups presented higher utilization in terms of specialist consultations and prevention services [7]. It should be noted, however, that systematic reviews often summarize studies that use different operationalisations of SES and healthcare utilization, and may therefore be difficult to compare.

In order to tackle inequalities in utilization of healthcare, we need to gain a better understanding of healthcare inequalities. More detailed evidence is needed in which domains of healthcare and indicators of utilisation and SES are specified [8]. Despite disease- and country-specific systematic reviews on socioeconomic inequalities, only two reviews summarized the international evidence of inequalities in utilization rates in the general population [8, 9]. However, the first limited their analyses to home health services in developed countries, and found that utilization of home health services in the general population was notably lower for persons with high compared to low SES [8]. The second limited the analyses to healthcare utilization rates in the elderly population and found that the association with SES varied strongly according to the type of healthcare analysed. While elderly patients with low SES were advantaged in home visits, they were disadvantaged in dental and medical appointments, and no association with SES was found for hospitalization rates and emergency use [9].

So far, it is evident that socioeconomic inequalities in utilization rates differ depending on the domain of healthcare analysed. Nevertheless, the evidence on socioeconomic differences in physician utilization in the general adult population has not been summarized so far. Moreover, individual studies suggest that inequalities in physician visits differ depending on whether utilization of primary-care or specialist physicians is analysed [10–12]. Therefore, enhanced knowledge is needed (1) if socioeconomic inequalities in visiting primary-care or specialist physicians do exist; and (2) if divergent results of inequalities in physician visits can be explored depending on methodical diversity, e.g., operationalization of SES or utilization.

Methods

This review aims to summarize the evidence on socioeconomic inequalities in consulting primary-care and specialist physicians in the general adult population in high-income countries. Studies from low- and middle-income countries (defined by The World Bank 2019 [13]) were excluded as the nature of and issues related to healthcare utilization and health-care system differ significantly from health care systems in high-income countries. To perform this review, we searched the electronic databases Medline and Web of Science to identify relevant studies. In addition, we manually searched the reference lists of all included articles for further potentially relevant studies. The search was conducted in January 2019 and limited to articles published in either English or German within the last 15 years. Different combinations of keywords related to (a) primary-care or specialist physicians, (b) inequalities, and (c) SES were used for the search (see additional file 1).

Study selection and eligibility criteria

The identified records were independently screened by two researchers for eligibility criteria in three consecutive steps: titles, abstracts, full texts. SLL conducted the screening at any step, JH conducted the title- and abstract screening, and JR and JM each conducted half of the full text screening. After each step a joint decision was reached through discussions in cases of disagreement. The criteria used to identify articles of interest limited the search results to original quantitative studies. An article was included in the review if it met the following criteria: (a) analysing the general population aged 15 years or older in a high-income country; (b) analysing any SES indicator (income, education, occupation, social class, or any combination of these indicators) based on individual data; (c) analysing utilization of primary-care, or specialist physicians, or both independently from each other (d) presenting quantitative original data on differences in utilization between at least two different SES groups. The following exclusion criteria were applied: (a) specific populations, namely disease- or SES-specific; (b) differences in race, rurality, insurance status, financial barriers, or employment status; (c) utilization of medical interventions, dentists, inpatient treatment, healthcare in general, or of physicians without differentiating between
primary and specialized care; (d) SES or utilization based on area data, or not linked to the individual; (e) conference abstracts and comments.

Data extraction and quality assessment
Data extraction was conducted by SLL, and checked by JR or JM. The following information was extracted from texts, tables, and figures of the included studies: author, year, countries, database, number of participants, participant’s age, physician (primary care or specialist), measurement of utilization, measurement of SES, confounder variables, and the result if an association of SES with physician visits has been found. As the included studies analysed different aspects, it was difficult to compare them in a common scheme that would account for all differences. Consequently, assumptions and simplifications had to be made in order to compare the studies. The results in the tables were abstracted to the most relevant finding analysing if a relationship (and the direction) between SES and utilization of primary-care or specialist physicians was found with the following simplifications:

1. the results comparing the highest SES with the lowest SES (when more than two SES-groups were compared);
2. significant differences at a \( p \leq 0.05 \) or lower (when several \( p \) values were designated);
3. the most recent findings (from studies analysing trends of socioeconomic inequalities);
4. the results from the best fitting final model (if an analysis was conducted using different types of adjustments);
5. the results including the broadest variety of the population (if subgroups, e.g. private and public healthcare, were analysed)

Further, to simplify the description of the extracted information and the comparison:

1. we only report the results from high-income countries and report only the most frequent result (if several analyses have been conducted for more than four countries);
2. we dichotomized adjustment variables to “↑” if adjustments were made for at least gender, age and any general health variable; and “↓” if the required need adjustments were not made, including only adjusting for age, gender, and mental health.

Risk of bias was assessed in accordance with RoBANS, [14] and assessed independently by (1) SLL and (2) either JR or JM. The assessments were subsequently discussed to achieve a consensus regarding the rating of each domain in each included article. In a joint decision it was defined that register and national survey data are defined to present “low risk of bias” for the selection of participants, but “high risk” when only sub-populations were analysed without rationale. Second, confounding variables presenting a “low risk of bias” are age, gender, and a minimum of one need-variable of chronic diseases or self-rated health. Further, register data and standardized questionnaires measuring self-reported values are defined to be a “low risk for bias” for measurement of exposure. Fourth, register and national survey data are defined to present “low risk of bias” for the blinding of outcome measure. Fifths, the risk of bias for incomplete outcome data was defined unclear, when missing values were not mentioned or imputed, but high risk when missing values were evident but not tested, and defined low risk when missing values were mentioned and tested. Lastly, for secondary data analyses and analyses of register, panel or national survey data without a study protocol, selective outcome reporting was rated “low risk of bias” when descriptions in the methods section match with the results section.

Results
We found 1229 unique abstracts published between January 2004 and December 2018. Among these, 57 examined socioeconomic differences in physician visits and met all inclusion criteria. The flowchart of the study selection procedure is presented in Fig. 1. Most studies were based on register-data or secondary data from population surveys (see Table 1). In total, the studies comprised data from 32 high-income countries, of which seven were non-European countries, namely, Australia, Canada, Chile, Hong Kong, Israel, New Zealand, and the USA. Whereas three studies analysed pooled data from several European countries, the majority analysed data from one country (\( n=44 \)), or several countries separately (\( n=10 \)). These 54 studies most often reported data from Spain (\( n=15 \)), Germany (\( n=14 \)), and Belgium (\( n=10 \)).

Overall, 70% (\( n=40 \)) of the studies analysed both primary-care and specialist physician visits, another 25% (\( n=14 \)) of the studies only primary-care physician visits, and 5% (\( n=3 \)) only specialist physician visits (Table 2). The definition of primary- and specialist care differed between the studies and health-care systems. Primary-care implied family physicians, and/or general practitioners, but in some cases after excluding prevention services, child or maternity care, physicians at healthcare centres, or internal medicine physicians. Specialist care was defined as medical outpatient specialists, any specialist except while being hospitalized, or generally physician visits at the hospital without being hospitalized. Utilization of physicians was measured according to probability (having visited a physician or not) in 72% (\( n=41 \)) of the studies, according to frequency (number of
visits) in 37% (n=21) of the studies, or according to conditional frequency (number of visits conditional to having visited a physician at least once) in 30% (n=17) of the studies. 95% (n=54) of the studies adjusted the analysis for need according to at least gender, age, and either self-rated health or chronic conditions. SES was measured by income (58%; n=33) and/or education (54%; n=31) in most of the studies. 4% (n=2) of the studies measured SES by income, education, and occupation; 9% (n=5) of the studies only by occupation; and 7% (n=4) of the studies by an SES-index. The period for which physician utilization was reported by the participants, ranged from two weeks to two years. 68% (n=39) of the studies analysed utilization rates within the last 12 months, 14% (n=8) of the studies within the last four weeks or one month, 11% (n=6) of the studies within the last three months, 5% of the studies within the last two months, each 4% (n=2) of the studies within the last two weeks, and last two years, and 2% (n=1) of the studies within the last six months. Most of the 57 studies have carried out several calculations (for different countries, age groups, utilization or SES measures; see Table 2). Therefore, and through rounding the percentages are more than 100%. The following results are based on a total of 548 different analyses.

Socioeconomic differences in primary-care and specialist physician visits

Overall, 52% of the analyses on utilization of primary-care physicians found no inequalities, and 35% found higher utilization for the lowest SES group (Fig. 2; primary care ‘all’). Contrary, 71% of the analyses on utilization of specialist physicians found higher utilization for the highest SES group, and 28% found no inequalities (Fig. 2; specialist care ‘all’). While taking a closer look at the various measures of utilization (Fig. 2; probability, frequency and conditional frequency), we found that 62% of the analyses on the probabilities of utilizing a primary-care physician found no socioeconomic inequalities, while 55% of the analyses on frequencies, and 54% of the analyses on conditional frequencies of primary-care physician visits found higher utilization in the most deprived. The results on specialist physicians also differed according to the operationalization of utilization in the way that 78% of the analyses on the probability and 75% of the analyses on the frequency of specialist visits found higher utilization for the highest SES-group. Higher utilization for the highest SES-group was found in only 50% of the analyses on the conditional frequency of specialist visits, whereas another 47% of the latter found no inequalities.

Various measures of socioeconomic differences in physician utilization

In a second step, we took a closer look at further variations of measures, in order to examine whether they might cause distinct results. Therefore, we contrasted the study’s results (additional file 2) according to
| Author                          | Year | Countries                                      | database (target population)                                                                                                                                                                                                                                                                                                                                 | number of participants | age of participants |
|--------------------------------|------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------|
| Abasolo, Saez, López-Casasnovas [15] | 2017 | Spain                                         | Spanish National Health Survey 2011/12                                                                                                                                                                                                                                                                                                                | 19,935                 | ≥ 15 years         |
| Agerholm et al. [16]            | 2013 | Sweden                                        | Public Health Survey in Stockholm County 2006, Stockholm County Council’s administrative database 2007, Longitudinal integration database for health insurance and labor market studies                                                                                                                                                                                                                           | 31,848                 | 25 to 84 years     |
| Allin [17]                      | 2008 | Canada                                        | Canadian Community Health Survey 2003                                                                                                                                                                                                                                                                                                                | 104,510                | ≥ 15 years         |
| Asada, Kephart [18]             | 2007 | Canada                                        | Canadian Community Health Survey 2000/1                                                                                                                                                                                                                                                                                                                 | 133,300                | ≥ 20 years         |
| Bago d’Uva, Jones, van Doorslaer [19] | 2009 | Austria, Belgium, Denmark, Finland, Greece, Ireland, Italy, Netherlands, Portugal, Spain  | European Community Household Panel User Database 1994–2001                                                                                                                                                                                                                                                                                              | N.A.                   | ≥ 16 years         |
| Baron-Epel, Garty, Green [20]   | 2007 | Israel                                        | Israel National Health Survey 2003/04                                                                                                                                                                                                                                                                                                                   | 9512                   | ≥ 21 years         |
| Beckman, Anell [21]             | 2013 | Sweden                                        | Skåne Regional Council and Statistics Sweden 2010/11, Statistics Sweden 2009                                                                                                                                                                                                                                                                              | 828,988                | 25 to 84 years     |
| Bergmann, Kalcklösch, Tiemann [22] | 2005 | Germany                                       | Telephone Health Survey 2003                                                                                                                                                                                                                                                                                                                            | 8318                   | ≥ 18 years         |
| Bourke [23]                     | 2009 | Ireland                                       | Living in Ireland survey 2001                                                                                                                                                                                                                                                                                                                          | 6518                   | ≥ 16 years         |
| Bremer, Wübker [24]             | 2013 | Germany                                       | Survey of Health, Aging and Retirement in Europe 2004–2006                                                                                                                                                                                                                                                                                              | 2861                   | ≥ 50 years         |
| Bremer, et al. [25]             | 2018 | pooled data from 16 European countries        | Survey of Health, Aging and Retirement in Europe 2010/11                                                                                                                                                                                                                                                                                                | 56,989                 | ≥ 50 years         |
| Crespo-Cebada, Urbanos-Garrido [26] | 2012 | Spain                                         | Survey of Health, Aging and Retirement in Europe 2006/07                                                                                                                                                                                                                                                                                                 | 1860                   | ≥ 50 years         |
| Devaux, de Looper [27]          | 2012 | Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Hungary, Ireland, New Zealand, Poland, Slovak Republic, Slovenia, Spain, Switzerland, UK | European Health Interview Surveys (2006/07, 2007, 2008 or 2009) other national health interview surveys (2005, 2006/07, 2007, 2007/08, 2008 or 2009)                                                                                                                                                      | N.A.                   | ≥ 15 years         |
| Fjaer, et al. [28]              | 2017 | Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Israel, Lithuania, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, UK | European social survey 2014                                                                                                                                                                                                                                                                                                                              | 31,971                 | 25 to 75 years     |
| Garrido-Cumbra, et al. [29]     | 2010 | Spain                                         | Spanish National Health Survey 2006                                                                                                                                                                                                                                                                                                                   | 29,478                 | ≥ 16 years         |
| Glazier et al. [30]             | 2009 | Canada                                        | Canadian Community Health Survey 2000/01, Physician claim files in 2002/03 and 2003/04                                                                                                                                                                                                                                                                     | 25,558                 | 20 to 79 years     |
| Gonzalez-Alvarez, Barranquero [31] | 2009 | Spain                                         | European Community Household Panel 1994–2001                                                                                                                                                                                                                                                                                                             | 15,076                 | ≥ 16 years         |
| Grasdalen, Monstad [32]         | 2011 | Norway                                        | Survey of Living Conditions 2005, Administrative records 2005                                                                                                                                                                                                                                                                                              | 3002                   | 16 to 69 years     |
| Gruber, Kiesel [33]             | 2010 | Germany                                       | Survey of Health, Ageing and Retirement in Europe 2004                                                                                                                                                                                                                                                                                                  | 2260                   | 50 to 90 years     |
| Habicht, Kunst [34]             | 2005 | Estonia                                       | Survey of Living Conditions 1999                                                                                                                                                                                                                                                                                                                          | 3990                   | 25 to 74 years     |
| Hansen, et al. [35]             | 2012 | Norway                                        | Tromsø Study 2007/08                                                                                                                                                                                                                                                                                                                                     | 12,982                 | 30 to 87 years     |
| Hoebel, et al. [12]             | 2016 | Germany                                       | German Health Interview and Examination Survey for Adults 2008–2011                                                                                                                                                                                                                                                                                     | 6754                   | 18 to 69 years     |
| Author                  | Year | Countries                                                                 | database (target population)                                                                 | number of participants | age of participants |
|------------------------|------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|------------------------|---------------------|
| Hoeck, et al. [36]     | 2011 | Belgium                                                                   | Belgian Health Interview Survey 2001–2004                                                   | 4494                   | ≥ 65 years          |
| Hoeck, et al. [37]     | 2013 | Belgium                                                                   | Belgian Health Interview Survey 2001–2004                                                   | 19,563                 | ≥ 16 years          |
| Korda, et al. [38]     | 2009 | Australia                                                                 | Australian Longitudinal Study of Women's Health 2004                                         | 10,905                 | 53 to 58 years      |
| La Parra-Casado, et al. [39] | 2018 | Spain                                                                     | Spanish National Health Survey 2011/12                                                        | 21,650                 | ≥ 16 years          |
| Lichte [40]            | 2017 | Germany                                                                   | random sample survey of general practitioner attendees 2015/16                              | 519                    | ≥ 18 years          |
| Lostao, et al. [41]    | 2011 | UK, Spain                                                                 | General Household Survey 2004/05; Spanish National Health Survey 2003                         | 36,488                 | ≥ 16 years          |
| Lu, et al. [42]        | 2007 | Hong Kong                                                                | Thematic Household Survey 2002                                                               | 19,522                 | ≥ 16 years          |
| Masseria, Giannoni [43]| 2010 | Italy                                                                     | Multiscopo Survey 1999/2000                                                                  | 109,964                | > 16 years          |
| McDonald, Conde [44]   | 2010 | Canada                                                                    | Canadian Community Health Survey 2002/03                                                     | 39,974                 | 55 to 79 years      |
| Mosquera, et al. [45]  | 2017 | Sweden                                                                   | Health on Equal Terms survey 2014                                                            | 3016                   | 16 to 25 years      |
| Nolan [46]             | 2007 | Ireland                                                                  | Living in Ireland Survey 1995–2001                                                          | 49,237                 | ≥ 16 years          |
| Palència, et al. [47]  | 2013 | Spain                                                                     | Spanish National Health Survey 2006                                                           | 20,478                 | ≥ 16 years          |
| Põlluste, Kalda, Lember [48] | 2009 | Estonia                                                                  | random sample survey of general population 2005                                             | 182                    | 65 to 74 years      |
| Rattay et al. [49]     | 2013 | Germany                                                                   | German Health Interview and Examination Survey for Adults 2008–2011                           | 8152                   | 18 to 79 years      |
| Regidor, et al. [50]   | 2008 | Spain                                                                     | Spanish National Health Survey 2003/04                                                        | 18,837                 | 16 to 74 years      |
| Reibling, Wendt [51]   | 2010 | Austria, Belgium, Denmark, France, Germany, Greece, Italy, Netherlands, Spain, Sweden, Switzerland | Survey of Health, Ageing and Retirement in Europe 2004                                      | 26,808                 | ≥ 50 years          |
| Rogowski et al. [52]   | 2008 | USA                                                                       | random sample survey of Medicare enrollees 2000; administrative data                         | 4600                   | ≥ 65 years          |
| Ryvicker, Gallo, Fahs [53] | 2012 | USA                                                                       | random sample survey of community-dwelling older senior center attendees 2008               | 1870                   | 60 to 99 years      |
| San Sebastian, Mosquera, Gustafsson [54] | 2017 | Sweden                                                                   | Health on equal terms survey 2014; Statistics Sweden                                         | 24,889                 | 19 to 84 years      |
| Schnitzler, et al. [55] | 2011 | Germany                                                                   | Representative sample survey of the population with statutory health insurance 2010         | 5232                   | 18 to 79 years      |
| Schulz [56]            | 2016 | pooled data from 13 European countries                                   | Survey of Health, Aging, and Retirement 2004/05–2006/07                                     | 48,065                 | ≥ 40 years          |
| Stirbu, et al. [11]    | 2011 | Belgium, Estonia, France, Germany, Hungary, Ireland, Latvia, Netherlands, Norway | several national health surveys between 1995 and 2004                                         | 104,503                | ≥ 15 years          |
| Suominen-Taipale, et al. [57] | 2004 | Finland, Norway                                                           | The Health Study of Nord-Trøndelag, HUNT 1995–1997; FINRISK-97 senior survey 1997            | 9202                   | 65 to 74 years      |
| Tavares, Zantomio [58] | 2017 | Italy, Spain, Portugal                                                   | Survey of Health, Aging and Retirement in Europe 2011                                        | 9049                   | ≥ 50 years          |
| Terraneo [10]          | 2015 | pooled data from 12 European countries                                   | Survey of Health, Aging and Retirement in Europe 2007–2009                                   | 16,431                 | ≥ 50 years          |
| Thode et al. [59]      | 2005 | Germany                                                                   | German Health Interview and Examination Survey for Adults 1998                               | 7124                   | 18 to 79 years      |
| Tille, et al. [60]     | 2017 | Germany                                                                   | random sample survey of the general population 2006–2016                                    | 42,925                 | ≥ 18 years          |
differences in time periods for which physician utilization was reported, and SES indicators.

Regarding time periods of utilization, it was found that in shorter time periods of 6 months or less, higher probabilities for primary-care physician visits in the lowest SES-group emerged, whereas studies analysing longer time periods found more often no inequalities. Contrariwise, for specialist visits higher probabilities in the highest SES-group were found less often in short compared to long time periods. Because only a very limited number of studies analysed the frequency or conditional frequency of utilization in a short time period, we renounced the comparison.

Regarding different SES indicators, higher probabilities and frequencies of primary-care physician visits were found for those with low education compared to those with low income, but higher conditional frequencies of primary-care physician visits were found more often for those with low income compared to those with low education. Results for socioeconomic inequalities in specialist physician visits seemed to hardly differ according to SES measurement. As only few studies measured SES by occupation or by an index, we renounced the comparison.

Quality of the studies
The quality of the included studies was fairly high, as the majority of the studies was rated to have a low risk of bias in more than one domain (additional file 3). The risk of bias of confounding variables, measurement of exposure, blinding of outcome measure and selective outcome reporting was rated low in 54 studies, whereas the risk of bias of incomplete outcome data was rated high in 23 studies (additional file 3).

Discussion
Principal findings
In general, socioeconomic inequalities in utilization of physicians were more prevalent among specialists than among primary-care physicians. The probability of utilizing primary care was often not influenced by SES in the general population, but the disadvantaged visited their primary-care physician more frequently. Moreover, the highest-SES groups often had higher probabilities for specialist visits, but studies often found no associations of SES with (conditional) frequencies of specialist visits.

Interpretation
This systematic review confirms that the existence of socioeconomic differences in healthcare utilization heavily depends on the health services analysed [9]. The existing review on socioeconomic inequalities in physician visits in the elderly population, which did not differentiate between primary-care and specialist physicians, found more medical appointments for the highest-SES group [9]. Accordingly, we found that a distinction of medical appointments between primary and specialized care is necessary when analysing socioeconomic inequalities in

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Table 1 Characteristics of the 57 studies included in the systematic review (Continued)

| Author                        | Year | Countries                                      | database (target population)                                      | number of participants | age of participants |
|-------------------------------|------|-----------------------------------------------|------------------------------------------------------------------|------------------------|--------------------|
| van Doorslaer, Koolman, Jones | 2004 | Austria, Belgium, Denmark, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, UK | European community household panel 1996                         | N.A.                   | ≥ 16 years         |
| van Doorslaer, Masseria, Koolman | 2006 | Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Switzerland, UK | European community household panel and other nationally representative surveys 1996–2002 | N.A.                   | ≥ 16 years         |
| van Oorti                     | 2004 | Belgium                                       | panel study of Belgian households 2001                           | 4809                   | > 15 years         |
| Vasquez, Paraje, Estay        | 2013 | Chile                                         | national socio-economic characterization survey 2009             | 246,924                | ≥ 18 years         |
| Vedsted et al.                | 2004 | Denmark                                       | intervention study of general practitioner attendees             | 2526                   | 20 to 64 years     |
| Vedsted, Olesen               | 2005 | Denmark                                       | intervention study of general practitioner attenders             | 2211                   | 20 to 64 years     |
| Vikum, et al.                 | 2013 | Norway                                        | Nord-Trendelag Health Study 2006/08 register data                | 46,860                 | ≥ 20 years         |
| Vikum, Krokstad, Westin       | 2012 | Norway                                        | Nord-Trendelag Health Study 2006/08 register data                | 44,755                 | ≥ 20 years         |
| Author                          | Countries                                      | Age group                | Time          | Physician utilisation | SES measure                | Need-adjusted | Result |
|--------------------------------|------------------------------------------------|--------------------------|---------------|-----------------------|----------------------------|----------------|--------|
| Abasolo, Saez, López-Casasnovas | Spain                                          | ≥ 15 years               | 4 weeks       | frequency             | household income           | ↓              | o      |
| Agerholm et al.                 | Sweden                                         | 25 to 64 years           | 12 months     | frequency             | adjusted household income  | ↑              | o⁴     |
| Allin                          | Canada                                         | ≥ 15 years               | 12 months     | probability           | adjusted household income  | ↑              | +      |
| Asada, Kephart                 | Canada                                         | ≥ 20 years               | 12 months     | probability           | education                  | ↑              | +      |
| Bago d'Uva, Jones, van Doorslaer| Austria, Belgium, Denmark, Finland, Greece, Ireland, Italy, Netherlands, Portugal, Spain | ≥ 16 years               | 12 months     | frequency             | adjusted household income  | ↑              | –⁵     |
| Baron-Epel, Garty, Green       | Israel                                         | ≥ 21 years               | 4 weeks       | probability           | education                  | ↑              | –      |
| Beckman, Anell                | Sweden                                         | 25 to 44 years           | 2 years       | probability           | household income           | ↓              | +      |
| Bergmann, Kalcklösch, Tiemann  | Germany                                        | ≥ 18 years               | 12 months     | frequency             | index                      | ↑              | –      |
| Author                      | Countries                                                                 | Age Group | Time  | Physician utilisation | SES measure                  | Need-adjusted | Result |
|-----------------------------|---------------------------------------------------------------------------|-----------|-------|------------------------|------------------------------|---------------|--------|
| Bourke [23]                 | Ireland                                                                   | ≥ 16 years | 12 months | primary care probability | adjusted household income ↑ | o             |        |
|                             |                                                                           |           |       |                        | conditional frequency       |               |        |
|                             |                                                                           |           |       |                        | specialist probability     |               |        |
|                             |                                                                           |           |       |                        | conditional frequency       |               |        |
| Bremer, Wübker [24]         | Germany                                                                   | ≥ 50 years | 12 months | primary care probability | education ↑ | o             |        |
|                             |                                                                           |           |       |                        | adjusted household income  |               |        |
|                             |                                                                           |           |       |                        | conditional frequency       |               |        |
|                             |                                                                           |           |       |                        | specialist probability     |               |        |
|                             |                                                                           |           |       |                        | education ↑ | o             |        |
|                             |                                                                           |           |       |                        | adjusted household income  |               |        |
|                             |                                                                           |           |       |                        | conditional frequency       |               |        |
| Bremer, et al. [25]         | Pooled Data from 16 European Countries                                   | ≥ 50 years | 12 months | primary care frequency | education ↑ | o             |        |
|                             |                                                                           |           |       |                        | adjusted household income  |               |        |
|                             |                                                                           |           |       |                        | conditional frequency       |               |        |
| Crespo-Cebada, Urbanos-Garrido [26] | Spain                                                                    | ≥ 50 years | 12 months | primary care probability | education ↑ | o             |        |
|                             |                                                                           |           |       |                        | adjusted household income  |               |        |
|                             |                                                                           |           |       |                        | conditional frequency       |               |        |
|                             |                                                                           |           |       |                        | specialist probability     |               |        |
|                             |                                                                           |           |       |                        | education ↑ | o             |        |
|                             |                                                                           |           |       |                        | adjusted household income  |               |        |
| Devaux, de Looper [27]      | Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Hungary, Ireland, New Zealand, Poland, Slovak Republic, Slovenia, Spain, Switzerland, UK | ≥ 15 years | 12 months¹ | primary care probability | adjusted household income ↑ | o/s          |        |
|                             |                                                                           |           |       |                        | specialist probability     |               |        |
|                             |                                                                           |           |       |                        | frequency ±                |               |        |
| Author                  | Countries                                                                 | Age Group | Time | Physician Utilisation | SES Measure                                                                 | Need-Adjusted | Result   |
|------------------------|---------------------------------------------------------------------------|-----------|------|----------------------|-----------------------------------------------------------------------------|---------------|----------|
| Fjaer, et al. [28]     | Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Israel, Lithuania, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, UK | 25 to 75 years | 12 months | primary care probability specialist | education          | ↑          | o<sup>5</sup> |
| Garrido-Cumbrera, et al. [29] | Spain                                                                      | ≥ 16 years | 4 weeks | primary care probability specialist | occupation           | ↑          | –        |
| Glazier et al. [30]    | Canada                                                                    | 20 to 79 years | 2 years | primary care probability specialist | education adjusted household income | o<sup>0</sup> | –        |
|                        |                                                                           |            |       |                      | conditional frequency adjusted household income | o<sup>0</sup> | –        |
|                        |                                                                           |            |       |                      | specialist probability education adjusted household income | +            | o        |
|                        |                                                                           |            |       |                      | conditional frequency adjusted household income | o<sup>0</sup> | –        |
| Gonzalez-Alvarez, Barranquero [31] | Spain                                                                    | ≥ 16 years | 12 months | primary care probability specialist | education adjusted household income frequency | o<sup>0</sup> | –        |
|                        |                                                                           |            |       |                      | conditional frequency adjusted household income | o<sup>0</sup> | –        |
|                        |                                                                           |            |       |                      | specialist probability education adjusted household income frequency | +            | o        |
|                        |                                                                           |            |       |                      | conditional frequency adjusted household income | +            | o        |
| author                  | countries | age group | time | physician | utilisation | SES measure                              | need-adjusted | result |
|------------------------|-----------|-----------|------|-----------|-------------|------------------------------------------|---------------|--------|
| Grasdal, Monstad [32]  | Norway    | 16 to 69 years | 12 months | primary care | probability | adjusted household income               | ↑             | o      |
|                        |           |           |      |           | condition frequency |                      |               |        |
|                        |           |           |      |           | specialist probability | condition frequency |             |        |
| Gruber, Kiesel [33]    | Germany   | 50 to 90 years | 12 months | specialist | probability | education adjusted household income + 6 | ↑             | o      |
|                        |           |           |      |           | frequency | education adjusted household income     |               |        |
| Habicht, Kunst [34]    | Estonia   | 25 to 74 years | 6 months | primary care | probability | education adjusted household income +   | ↑             | o      |
|                        |           |           |      |           | specialist | education adjusted household income     |               |        |
| Hansen, et al. [35]    | Norway    | 30 to 87 years | 12 months | primary care | probability | education adjusted household income     | ↑             | o      |
|                        |           |           |      |           | conditional frequency | household income occupation +             |               |        |
| Hoebel, et al. [12]    | Germany   | 18 to 69 years | 12 months | primary care | probability | education adjusted household income     | ↑             | o      |
|                        |           |           |      |           | condition frequency | specialist probability adjusted household income |               |        |
| Hoeck, et al. [36]     | Belgium   | ≥ 65 years  | 2 months | primary care | probability | education adjusted household income     | ↑             | o      |
|                        |           |           |      |           | specialist | education adjusted household income     |               |        |
| Hoeck, et al. [37]     | Belgium   | ≥ 16 years  | 2 months | primary care | probability | education adjusted household income     | ↑             | o      |
|                        |           |           |      |           | conditional frequency | education adjusted household income     |               |        |
|                        |           |           |      |           | specialist | education adjusted household income     |               |        |
Table 2 Results on relationships between socioeconomic status and utilization of primary-care and specialist physicians (Continued)

| author | countries | age group | time | physician | utilisation | SES measure | need-adjusted | result |
|--------|-----------|-----------|------|-----------|-------------|-------------|---------------|--------|
| Korda, et al. [38] | Australia | 53 to 58 years | 12 months | primary care | probability | education | ↑ | o |
| | | | | | | adjusted household income | o | |
| | | | | | | conditional frequency | o | |
| | | | | | | specialist | probability | o | |
| | | | | | | adjusted household income | o | |
| | | | | | | conditional frequency | o | |
| La Parra-Casado, et al. [39] | Spain | ≥ 16 years | 4 weeks | primary care | probability | occupation | ↑ | o |
| | | | | | | adjustment | o | |
| | | | | | | conditional frequency | o | |
| Lichte [40] | Germany | ≥ 18 years | 3 months | primary care | conditional frequency | education | ↑ | o |
| | | | | | | household income | o | |
| Lostao, et al. [41] | UK | ≥ 16 years | 2 weeks | primary care | probability | occupation | ↑ | o |
| | | | | | | adjustment | o | |
| | | | | | | conditional frequency | o | |
| | | | | | | specialist | probability | o | |
| | | | | | | adjustment | o | |
| Lu, et al. [42] | Hong Kong | ≥ 16 years | 1 month | primary care | probability | income | ↑ | + |
| | | | | | | adjustment | o | |
| | | | | | | conditional frequency | o | |
| | | | | | | specialist | probability | o | |
| | | | | | | adjustment | o | |
| Masseria, Giannoni [43] | Italy | > 16 years | 4 weeks | primary care | probability | education | ↑ | − |
| | | | | | | adjustment | o | |
| | | | | | | conditional frequency | o | |
| | | | | | | specialist | probability | o | |
| | | | | | | adjustment | o | |
| McDonald, Conde [44] | Canada | 55 to 79 years | 12 months | primary care | probability | education | ↑ | + |
| | | | | | | adjustment | o | |
| | | | | | | conditional frequency | o | |
| | | | | | | specialist | probability | o | |
| | | | | | | adjustment | o | |

Korda, et al. [38] Australia 53 to 58 years 12 months primary care probability education ↑ o adjusted household income o
conditional frequency o specialist probability education + adjusted household income o conditional frequency o

La Parra-Casado, et al. [39] Spain ≥ 16 years 4 weeks primary care probability occupation ↑ o adjustment o
conditional frequency o specialist probability occupation + o

Lichte [40] Germany ≥ 18 years 3 months primary care conditional frequency education + o household income o

Lostao, et al. [41] UK ≥ 16 years 2 weeks primary care probability occupation ↑ o adjustment o
conditional frequency o specialist probability occupation o o

Lu, et al. [42] Hong Kong ≥ 16 years 1 month primary care probability income ↑ + adjustment o
conditional frequency o specialist probability income + o

Masseria, Giannoni [43] Italy > 16 years 4 weeks primary care probability education ↑ − adjustment o
conditional frequency o specialist probability education + o

McDonald, Conde [44] Canada 55 to 79 years 12 months primary care probability education ↑ + adjustment o
conditional frequency o specialist probability education o o

Lostao, et al. [41] UK ≥ 16 years 2 weeks primary care probability occupation ↑ o adjustment o
conditional frequency o specialist probability occupation o o

Lu, et al. [42] Hong Kong ≥ 16 years 1 month primary care probability income ↑ + adjustment o
conditional frequency o specialist probability income + o

Masseria, Giannoni [43] Italy > 16 years 4 weeks primary care probability education ↑ − adjustment o
conditional frequency o specialist probability education + o

McDonald, Conde [44] Canada 55 to 79 years 12 months primary care probability education ↑ + adjustment o
conditional frequency o specialist probability education o o
| author            | countries                           | age group        | time       | physician       | utilisation      | SES measure             | need-adjusted | result |
|-------------------|-------------------------------------|------------------|------------|-----------------|------------------|-------------------------|----------------|--------|
| Mosquera, et al.  | Sweden                              | 16 to 25 years   | 3 months   | primary care    | probability      | household income       | +              | o      |
| Nolan             | Ireland                             | ≥ 16 years       | 12 months  | primary care    | frequency        | education               | +              | o      |
| Palència, et al.  | Spain                               | ≥ 16 years       | 4 weeks    | primary care    | probability      | occupation              | +              | o      |
| Põlluste, Kalda,  | Estonia                             | 65 to 74 years   | 12 months  | primary care    | probability      | education               | +              | o      |
| Rattay et al.     | Germany                             | 18 to 79 years   | 12 months  | primary care    | probability      | index                   | ↓              | –      |
| Regidor, et al.   | Spain                               | 16 to 74 years   | 2 weeks    | primary care    | probability      | education               | ↑              | –      |
| Reibling, Wendt   | Austria, Belgium, Denmark, France,  | ≥ 50 years       | 12 months  | specialist      | probability      | education               | ↑              | +      |
|                   | Germany, Greece, Italy, Netherlands,|                  |            |                 |                  |                        |                |        |
|                   | Spain, Sweden, Switzerland          |                  |            |                 |                  |                        |                |        |
| Rogowski et al.   | USA                                 | ≥ 65 years       | 12 months  | primary care    | frequency        | education               | ↑              | o      |
| Ryvicker, Gallo,  | USA                                 | 60 to 99 years   | 12 months  | primary care    | probability      | education               | ↑              | +      |
| F. [53]           | San Sebastian, Mosquera, Gustafsson | 18 to 84 years   | 3 months   | primary care    | probability      | income                  | ↑              | +      |
| Schnitzer, et al. | Germany                             | 18 to 79 years   | 12 months  | specialist      | frequency        | education               | ↑              | +      |
| Schulz [56]       | Pooled                              | ≥ 40 years       | 12         | primary         | frequency        | education               | ↑              | –      |
### Table 2 Results on relationships between socioeconomic status and utilization of primary-care and specialist physicians (Continued)

| Author | Countries | Age Group | Time | Physician Utilisation | SES Measure | Result |
|--------|-----------|-----------|------|------------------------|-------------|--------|
| Stirbu, et al. [11] | Data from 13 European Countries | ≥ 15 years | 12 months | primary care probability | education | ↑ o5 + |
| Suominen-Taipale, et al. [57] | Finland | 65 to 74 years | 12 months | primary care probability | education | ↑ o |
| | Norway | | | | | + |
| Tavares, Zantomio [58] | Italy | ≥ 50 years | 12 months | primary care frequency | education | ↑ – |
| | Spain | | | | | + |
| | Portugal | | | | | + |
| Terraneo [10] | Pooled Data from 12 European Countries | ≥ 50 years | 12 months | primary care probability | education | ↑ o |
| Thode et al. [59] | Germany | 18 to 79 years | 12 months | primary care frequency | index | ↑ – |
| Tille, et al. [60] | Germany | ≥ 18 years | 12 months | primary care frequency | education | ↑ – |
| van Doorslaer, Koolman, Jones [61] | Austria, Belgium, Denmark, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, UK | ≥ 16 years | 12 months | primary care probability | adjusted household income | ↑ o5 – |
physician visits, because the results differed greatly according to the type of doctor and the type of service. We found that not all medical appointments, but mainly specialist were visited with higher probabilities and frequencies by the highest-SES groups. In contrast, most studies indicated that the probability of visiting primary-care physicians was not determined by SES, comparable to the evidence for hospitalization and emergency use, which rather presents access to need- and emergency-oriented healthcare [9]. Lastly, the frequency of primary-care physician visits often was higher in the lowest-SES groups, and is therefore comparable to the evidence on inequalities in utilization of home health services and visits [8, 9].

Consequently, socioeconomic inequalities disadvantaging the deprived are a matter of concern especially in specialist visits. Based on this review, we are not able to infer whether these inequalities are a matter of need, a matter of access barriers to specialist physicians, a matter of different information, or a matter of different
preferences and patient choice. Nevertheless, nearly all studies adjusted for patient’s need according to gender, age, and any physical health condition. Either self-rated health or the number of self-reported chronic conditions was applied as an indicator for the latter. Although this indicates good quality, these indicators remain only approximate to real need of receiving healthcare. Accordingly, we cannot conclude that probability of primary-care physician visits is needs-based even though most studies did not find significant associations with SES. In order to avoid underestimating or disregarding differences, when analysing only probabilities of visits using register-based data, Agerholm et al. concluded that health status should be considered in analyses on socioeconomic differences in healthcare utilization [16]. Nevertheless, self-rated health remains a subjective rating of people’s perception of their health. Although studies found that self-rated health is a good proxy for objective health in the general population, [69] one study found that the evaluation of self-rated health is biased by SES, because the more educated rated their subjective health worse with the same level of objective health, [70] which implies socioeconomic differences might be underestimated.

Given the results that low-SES populations often visit specialist physicians less often, but primary-care physicians more frequently at concurrently equal probabilities compared to high SES populations, an intuitive explanation is that barriers in access to specialists are important in explaining healthcare inequalities. One possible reason for access barriers to specialists might be rurality of low-SES populations [71]. Thus, waiting time and distance might carry more weight in visiting specialists, because those are often distributed regionally more widely than primary-care physicians. Furthermore, the results suggest that different information, preferences, and patient choices are relevant reasons for socioeconomic inequalities in physician visits, because the relationship with primary-care physicians is more trusting and familiar than with specialist. As a consequence, the lower educated might feel less exposed to existing communication problems (language barriers, terminology, information gap) [72] with their longtime, well-known primary-care physicians, and they might prefer visits to them compared to specialist physicians [10]. The perceived role in healthcare varies between SES groups, as those with low SES tend to delegate responsibility to healthcare professionals [73]. Given the trustful and longtime relationship with primary care physicians compared to specialists, and given that primary-care physicians have the task of gatekeeping in some countries, might emphasize the importance of primary-care physicians from the perspective of the low-SES population when delegating responsibility for their healthcare, and might therefore explain the more frequent visits from the most deprived.
This review found that income inequalities advantaging high-SES groups in primary-care physician visits are more pronounced than educational differences. This may be an indication that financial barriers are a relevant additional factor explaining socioeconomic inequalities in utilization of primary-care physicians [74]. The finding that detrimental inequalities were found less often in shorter time periods is consistent with the finding that detrimental inequalities were found less often when utilization was operationalized with frequency versus probability. Accordingly, a higher frequency of physician visits among the most deprived means that they are more likely to have visited a physician at least once in a short period. A possible explanation could be that frequencies are more likely to be influenced by preferences and patient choice, whereas probabilities are more likely to be influenced by access barriers.

Limitations
Although we have screened 1229 references we might have missed relevant publications, especially those not differentiating between primary and specialized healthcare in the abstract, but only in the main text. Second, the selection criteria might bias the results, which are not generalizable to children, disease-specific populations, low- and middle-income-countries, or inequalities induced by other (horizontal) disadvantages. Because very few studies based SES on area data, we excluded them even when area SES was linked to the individual on postal codes. Third, we made various simplifications in order to compare the studies, which influenced the reported results, which must be interpreted carefully. We described the results only by comparing the highest with the lowest SES group, and we did not include effect sizes in our descriptions. The health systems of the countries are very different, e.g., primary and specialized healthcare was defined differently in different studies. Primary health and its connection with specialist care is organised differently between the countries. For these reasons and because some studies analysed the same data basis, frequencies must be interpreted with caution, and comparisons are rather explorative hints than robust results. Finally, data on utilization, SES, and health were often self-rated, and even though instruments are valid, the accuracy is affected by different factors, [75] which limits expressiveness.

Conclusions
In order to tackle socioeconomic inequalities in healthcare to the detriment of the deprived population, utilization of and access to specialist physicians is essential. The fact that predominantly no inequalities in probabilities of visiting primary-care physicians were found is generally a good result. Not visiting a primary-care physician can be interpreted as more fatal in maintaining good health than visiting specialists less frequently. This emphasizes the fact that the general population in high-income countries might have access to physicians largely independent of their SES, but the deprived might experience more barriers in accessing specialized healthcare. We assume that higher frequencies of primary-care physician visits from the low-SES groups with the same level of need might be subject to patient preferences in order to compensate for different levels of health literacy, information and communication, and therefore improve equal opportunities in receiving health maintenance.
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