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Burn injuries in primary care in the Netherlands: risk factors and trends

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Abstract

Background: Research to date has mainly focused on burn injuries treated in secondary care. This study aims to provide knowledge on the epidemiology of burn injuries in primary care, to give directions for burn prevention.

Methods: Data were derived from routine electronic health records of general practices and their out-of-hours service organisations in the Netherlands that participated in the Nivel Primary Care Database 20102015. We studied risk factors and trends.

Results: The average burn injury prevalence rate was 4.40 (95% CI 4.274.53) per 1000 personyears in daytime general practice care and 1.47 (95% CI 1.461.49) per 1000 inhabitants in outof-hours care. Children of 04 years old, especially boys, and young adult women had a higher risk. Burn injury risk was higher during the summer months and around New Year's Eve. Living in low socioeconomic and strongly urbanised neighbourhoods was associated with a higher risk of burn injury than living in other neighbourhoods.

Abbreviations: GP, general practitioner; OOH, out-of-hours; ED, emergency department; SES, socioeconomic status; ICPC-1, International Classification of Primary Care - version 1; CBS, Statistics Netherlands; SCP, The Netherlands Institute for Social Research; OR, odds ratio.

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Conclusion: Dutch general practitioners have a large share in burn care and therefore can play a significant role in burn prevention. Prevention may be most effective in the summer and around New Year's Eve, and specific attention seems to be warranted for low socioeconomic groups and strongly urbanised neighbourhoods.

1. Introduction

Burns are very painful and can cause lifelong scarring. Since the great majority of burn injuries are accidental and most are preventable [1], primary prevention is an important instrument to limit the number of burn injuries in the population. In order to develop effective prevention campaigns, identification of target groups and target periods in a year is important.

Like in some other western countries, the general practitioner (GP) in the Netherlands serves as a gatekeeper for hospital and specialised burn care and is usually the first professional to be consulted for health problems that do not require immediate attention. In order to provide accessible care during both day and night, general practitioners are organised in cooperatives for out-of-hours (OOH) primary care services. In the out-of-hours period patients can apply for treatment both at the OOH primary care services or at the emergency department (ED). Both services are located next to each other in hospitals, and share a triage system. Based on the triage, patients are treated at the OOH primary care services or at the ED. Care for minor burns in the Netherlands is provided by general practitioners. Patients in need of specialized care are referred to specialised burn centres, according to the Emergency Management of the Severe Burns (EMSB) criteria for referral (see appendix) [2]. EDs in hospitals (including those with a burn centre) take care of patients in need of immediate medical care.

Until now, research has mainly focused on epidemiology for burns treated in hospitals or specialised burn centres. A recent estimate of the number of severe burns in the Netherlands undergoing hospital admission is 1000 patients each year, 750 of which are admitted to a specialised burn centre [3,4]. A young age (<5 years), being male, having an immigrant status, low income, low level of education and poor living conditions are frequently described risk factors for burn injuries that receive hospital care or care in a specialised burn centre [5-8]. Little is known about the risk factors and the number of less severe burn injuries treated in primary care. Existing knowledge on the epidemiology for burn injuries in general practice is based on a few paediatric studies from the UK [9,10] and a small outdated Dutch cohort study from 1991 [11]. Other publications on burns in primary care describe the diagnosis and treatment of minor burns in high income countries [12-16].

With the GP as first professional to be consulted for health problems and gatekeeper for hospital- and specialised care, more up-to-date research into burns treated in primary care can shed light on the role of general practice in burn care. This study aims to provide this knowledge on the epidemiology of burn injuries in primary care in the Netherlands by studying (1) the prevalence rates of burn injuries and trends over the years, (2) the demographic profile of patients who contact their GP for burns, (3) annual patterns and (4) risk factors for burn injury that receive treatment by the GP. This knowledge will provide directions to prevention policy and campaigns.

2. Methods

2.1. Design and setting

In this cohort study, data on patients that contacted their general practitioner for burn injuries in the Netherlands were studied. Data were derived from health records of general practices in the Netherlands that participated in Nivel Primary Care Database [17]. Nivel Primary Care Database collects data that is routinely recorded in the health care provider's electronic health record system. This includes data on health problems and treatment. Patients in Nivel Primary Care Database are de-identified as described by Kuchinke et al.[18]. Health records of participating general practices for

daytime GP care in 2010-2015 and GP cooperatives for OOH GP care in 2013-2015 (registration onset from 2013) were used in this study. The included general practitioner population reflected a representative sample of the general Dutch population [17]. For the purpose of this study, only coded information from health records was used, no free text.

For 2015, 320 of the 366 participating general practices for daytime GP care met the quality and completeness criteria as described by van der Bij et al. [19] for inclusion in this study. They have a registered population of 1.2 million Dutch citizens, nearly 7.5% of the Dutch population. The 29 included GP cooperatives in 2015 were spread across the Netherlands and covered a population of 11.7 million people, about 70% of the Dutch population. Since registration in general practice is required for all Dutch citizens, the included general practitioner population reflected a representative sample of the Dutch population.

Under Dutch law, informed consent or approval by a medical ethics committee for this study was not required. In line with Dutch law, participating general practitioners are obliged to inform patients about the use of data for research purposes in general and to offer the possibility to opt-out. This study is approved according to the governance rules of Nivel Primary Care Database under number NZR-00315.056 [17].

2.2. Outcome measures

In line with national general practice guidelines, the International Classification of Primary Care - version 1 (ICPC-1) was used for recording symptoms and diagnoses [20]. ICPC-1 code S14 (burn injury) indicates patients with burn injuries (1st, 2nd, 3rd and 4th degree burns).

As patients can consult their GP more than once for the same burn injury, disease episodes were constructed as clustered contacts for the same health problem. Episodes of burns were constructed on the basis of consultation data, via the algorithm described by Nielen et al. [21]. The diagnosis burn injury was categorised as an acute symptom/disease and episodes were created based on a contact-free interval of four weeks, meaning that if a patient did not consult his/her GP again for this burn injury within four weeks of the last consult, the burn injury was considered to be cured and the disease episode was closed. Patients may thus have multiple burn episodes during a year.

The number of ‘person-years’, based on the number of quarters of the year that patients were registered in a general practice, was used as the denominator in calculating the prevalence rates [22]. The numerator for prevalence rates was defined as the number of patients with an ongoing or new episode of burns during the specific year. The denominator for daytime care was defined as the number of person-years of the patients listed in daytime care. The denominator for OOH care was defined as the number of persons in the population of the OOH care service catchment region.

Data from general practices as well as GP cooperatives were pseudonomised by the same algorithm described by Kuchinke et al. [18] what enabled data linkage at patient level in order to identify patients who contacted both daytime and OOH care for the same burn.

2.3. Demographic and socioeconomic factors

Differences in demographic and socioeconomic factors were studied by comparing patients that contacted their GP for burns to a general population without burn injury. The general population for daytime GP care was defined as all patients, without burn injury, listed in the participating general practices. For OOH GP care, the general population was defined as the population in the catchment area. All health records included data on gender and age, and the daytime GP records, in addition, included the patients’ four-digit postal code. This postal code was used to derive estimates of demographic and socioeconomic characteristics by linkage with national census data from Statistics Netherlands [2326] and The Netherlands Institute for Social Research [27]. In these national census data, all neighbourhoods in the Netherlands are allocated to percentile groups of low-income (yearly household purchasing power of less than € 9250; seven categories, from low prevalence to high

prevalence), urbanisation (five categories, from rural: fewer than 500 addresses/km2, to strongly urbanised: 2500 or more addresses/km2), non-western immigrants (seven categories, from low percentage to high percentage) and social economic status (ten categories, from low to high SES (income, education and employment)). Defining a general population for four-digit postal codes analyses in OOH GP care was not possible, since four-digit postal codes were present in the database for patients in need of GP care only. Four-digit postal codes were not available for the complete catchment area population.

2.4. Statistical analyses

The prevalence rates for burns treated in daytime and OOH care was calculated as well as the prevalence rates for males and females and for age groups applicable in burns prevention (0-4, 5-14, 15-29, 30-59, 60-89, ≥90 years of age). Analyses simultaneously pertaining to GP daytime care as well as OOH care, were limited to the patient populations listed in general practices located in areas that were part of a catchment area of an OOH service participating in Nivel Primary Care Database, thus allowing us to make the distinction between patients who contacted their GP for burns only during daytime, only in OOH care and both during daytime and in OOH care. The distribution over time of burn episodes was calculated per month and days of the year, and expressed as percentage of the total number of burn episodes. To prevent outliers, 6-years averages for daytime care (2020-2015) and 3-years averages for OOH care (2013-2015) were used. Odds ratio's (OR) and 95 percent confidence intervals (95% CI) were calculated to assess the associations of age, gender and neighbourhood characteristics (income, urbanisation, non-western immigration status and SES) with GP contact for burn injury in 2015. Data were analysed using Stata [28].

3. Results

3.1. Prevalence of burns and trends over years Table 1 shows the prevalence rates of burns in Dutch general practice. The average annual prevalence of burns in daytime GP care was 4.40 (95% CI 4.27-4.53) per 1000 person-years over the years 2010-2015 and 1.47 (95% CI 1.45-1.49) per 1000 population in OOH care over the years 2013-2015. The prevalence rates of burns in daytime GP care increased with 14.5% from 4.07 per 1000 person-years in 2010 to 4.66 per 1000 person-years in 2015, and in OOH care with 10.7% from 1.40 per 1000 population in 2013 to 1.55 per 1000 population in 2015.

In 2015, the majority (85%) of the patients contacted their GP for burns in daytime, and 29% contacted OOH GP care for burns. Fourteen percent of the patients contacted both daytime and OOH care for the same burns. Over the years 2013-2015, the proportion of patients that contacted both daytime and OOH care for the same burns, increased with 3% (Fig. 1). Extrapolation of prevalence rates to the Dutch population results in an estimated number of 92,000 patients who contacted their GP for burn injury in the Netherlands, in 2015.

3.2. Demographic profile

Table 2 shows that in 2015, 59.8% (daytime care) and 58.0% (OOH care) of all burn episodes occurred in females. The average annual prevalence rate of burns in daytime GP care was 5.12 (95% CI 4.93-5.32) per 1000 female person-years over the years 2010-2015 and 1.70 (95% CI 1.67-1.74) per 1000 females in OOH care over the years 2013-2015. In males, the average annual prevalence of burns in daytime GP care was 3.66 (95% CI 3.49-3.83) per 1000 person-years over the years 2010-2015 and 1.24 (95% CI 1.22-1.27) per 1000 males in OOH care over the years 2013-2015. The prevalence rate of burns in females in daytime care increased from 4.59 to 5.51 per 1000 females between 2010 to 2015, while the prevalence rates for males stayed approximately the same. In OOH GP care, the prevalence of burns in both males and females increased slightly over the years 2013-2015.

[Table 1] [Figure 1]

As shown in Table 3, infants and toddlers are substantially more prone to burn injury treated in general practice than other age groups. This is true both for boys and girls, though young boys more frequently contacted their GP for burns than young girls. After the age of four, the prevalence of burn injury was significantly lower, and children aged 514 years were rarely seen in general practice with burns. Around 15-20 years of age, a second peak in the prevalence of burns was seen, particularly in female patients. In addition, Table 3 shows that the 2010-2015 increase observed in the prevalence of burns during daytime was most remarkable in the 0-4-year-olds, and in those aged 90 and older, prevalence rates increased with 3.71 and 3.20 per 1000, respectively.

3.3. Annual patterns

Episodes of burn injury presented in Dutch general practice are not evenly distributed over the year.

Fig. 2 shows that most burn episodes occurred during the summer months. There is a clear peak in July, during which more than 10% of all annual burn episodes occur (vs. an expected 8.3% if distributed over the months equally). Burns are more likely to occur in December and January as well. This seasonal distribution of burn episodes was the same over the years 2010-2015 and present in both daytime and OOH care data.

[Table 2], [Table 3], [Figure 2]

With regard to specific days, most of the burn episodes started during the days around New Year's Eve. The peak in burn episodes in daytime care is seen on December 31st and the 2nd of January, the days around the public holiday on January 1st. More than 6 times as many burn episodes started on January 2nd compared to an average day. A peak in the number of burn episodes in OOH care was seen on December 31st and the 1st of January. More than 3 times as many burn episodes started on January the 1st compared to an average day. There was also a peak in OOH care during Christmas. Compared to an average day, almost 2.5 times as many patients with a new episode of burns were seen.

3.4. Associations with demographic and socioeconomic factors

Table 4 shows that females and children of 0-4 years of age have higher odds for burn injury treated in daytime care and in OOH care compared to males and other age groups. The odds of burn injury presented to the GP in OOH care were smallest in patients aged 60 years and older.

Patients living in neighbourhoods with relatively many low income households' were 1.21 times more likely to contact their GP for burn injury than patients living in neighbourhoods with higher incomes. Likewise, patients living in neighbourhoods with the lowest SES had a 1.26 times higher odds for burn injury than patients living in neighbourhoods with the highest SES. Level of urbanisation is also associated with the risk of burn injury. Patients living in strongly urbanised neighbourhoods had a 1.28 times higher odds for burn injury than patients living in non-urban neighbourhoods. Finally, patients living in a neighbourhood with the highest percentage of non-western immigrants were 1.47 times more likely to contact their GP for burn injury compared to patients living in neighbourhoods with the lowest percentage of non-western immigrants.

4. Discussion

This paper presents the prevalence and risk factors for burn injuries in Dutch general practice care.

Comparison with international primary care morbidity data is hampered by the limited availability of comparable data. Most studies focus on morbidity data of severe burn injury. And most studies report on incidence rather than prevalence rates. On average, however, burn injury is not a

frequently recurring injury and 12 month prevalence and 12 month incidence rates are probably not very different. Estimates of morbidity rates for burn injury vary largely, related to health care setting and study period. Peck [29] described an incidence rate of non-fatal burn injury in the US of 13.60 per 1000 population in 2008. The annual incidence of severe burn injury was reported in 22 European countries and lies between 2 and 29 per 1000 inhabitants [1]. Burn injury related hospital admission rates in Western Australia reported by Duke [30] were 0.36 per 1000 person-years in 2008. In the Netherlands, an incidence rate of 0.05 per 1000 for burn centre admissions was observed in 2011 [31]. In a more recent review of Smolle et al. [32], several studies on incidence trends are included, but no incidence rates were reported.

The average prevalence rate in daytime GP care reported in our study, is much higher compared to secondary care data, but also in comparison with incidence rates in primary care, reported in a Dutch study 30 years ago [11], with incidences of 1.85 per 1000 compared to a prevalence of 4.48 per 1000 in our study. The incidences by Van Rijn et al. [11] were based on weekly case report forms filled out by general practices, what may have been subject to under-reporting. Prevalence rates in our study, on the other hand, were based on routine electronic health records of general practices.

Our results show a trend towards increasing prevalence rates over the study period, both in daytime care and in OOH care. At the same time, a reverse trend in prevalence of burn injury treatment was seen in the Dutch emergency department registration [4]. An increase in the health insurance deductible over the years 2010-2015 [33], resulting in higher patients costs for hospital care, may have caused a shift from the treatment of burn injury in emergency departments to general practice and OOH service. The increases in patients that contacted their GP for burn injury during daytime and in OOH care are in line with the growing use of OOH services in the Netherlands in recent years [34,35].

Woman accounted for 59% of all burn episodes in general practice, contrary to earlier findings in secondary care, where men were found to be overrepresented [3,4,36]. This suggests that burn injuries in men are more serious than burn injuries in women. This is supported by Dutch hospital data that show that males are more often treated for flame burns and females for contact burns and scalds [4]. Flame burns have been associated with more-extended deeper burns and a higher mortality [1].

[Table 4]

As in other settings, children of 0-4 years old have a higher risk of burn injury compared to other age groups [11,29,31,32,36-38]. Our study thus confirms that young children are a high-risk group. Overrepresentation of boys in this young age group is also in line with previous findings in hospital care and specialized burn care in developed countries [4,32,37-39]. Our finding that women in the age of 15-25 years are overrepresented at the GP for burn injury was unexpected. It is, however, confirmed by a recent Spanish study [40] on injuries in primary care. Zoni et al. [40] observed that burns in women and children occurred mainly in the kitchen and that the age of 15 coincides with the onset of housework. It is known that the age of 15-25 years coincides in the Netherlands with the age of leaving the parental home [41]. Inexperience in cooking is a possible explanation for the higher burns prevalence among young woman in our study. But cannot be confirmed due to the lack of aetiology data.

The 2010-2015 increase observed in the prevalence of burn injury was most remarkable in the 0-4-year-olds, and in individuals aged 90 and older. Increasingly stringent government policies in the Netherlands regarding access to residential care for the elderly may have played a role here [42]. The reason why prevalence rates have increased in 0-4-year-olds is unclear.

Relatively many patients contacted their GP with burn injuries in summer months and around New Year's Eve in the Netherlands. The peak in the number of burn episodes around New Year's Eve,

presumably due to fireworks, is even more remarkable in general practice compared to hospital or specialized burn care [3,4]. This finding suggests that burn injury caused by fireworks has a greater share in the total health care consumption for burns in general practice than in hospitals or specialized burn care in the Netherlands.

Our results show that individuals living in the Netherlands in a low-income neighbourhood with a low socioeconomic status (SES), living in an urban neighbourhood and living in neighbourhoods with a high percentage of non-western immigrants were found to have a higher risk of burn injury than individuals living in other neighbourhoods. This is in line with other studies in hospital or specialized burn care [5-8]. Socioeconomic risk factors are generally highly correlated and can therefore not be considered to be individual causal components [8]. Overall, income, urbanity and migration background are all related to SES [6,23-26]. Low SES is known to be associated to health disadvantages [35,43]. Phelan et al. [44] suggest that the association between low SES and health disadvantages could be explained by limited access to resources that can be used to avoid risks or to minimize the consequences of disease once it occurs. More specific for burn injury, Othman and Kendrick [45] stated that the association of childhood burns with a poor living standard could be explained by limited resources to provide a safer physical environment for young children, more risky cultural practices or differential safety awareness.

4.1. Strengths and limitations

A major strength of this study is that it was based on the large population sample of 1.2 million individuals listed as patients in general practices and 11.7 million people in the catchment area of the OOH services in the Netherlands. An important limitation in this study is that findings may be specific for the Netherlands and that data may not be generalizable to countries with other types of health care systems. We identified several factors that were associated with the risk of burn injury. However, the number of factors that could be included in the analyses was limited, and we were unable to assess causality. Behavioural and environmental factors as well may be associated with the risk for burn injury. This study was also limited by the fact that aetiological information on burn injuries is not recorded as structured data in electronic health records and by the fact that free text data could not be used. Furthermore, socioeconomic factors could only be linked to individuals on the basis of their four digit postcode. Living in an area with relatively many migrants does not mean that an individual is of foreign descent him or herself. Future studies should include more information on behavioural factors, aetiology of the burn injuries, and linkage with environmental factors at the individual level rather than postcode.

4.2. Implications for burn prevention policy

Extrapolation of prevalence rates resulted in an estimated total number of 92,000 patients in the Netherlands who contacted their GP for burn injury in 2015. This means that general practitioners in the Netherlands treat 92 times as many patients with burn injury as hospitals and specialized burn care centres do [3,4]. The Dutch Burns Foundation is the designated authority for developing and coordinating burn prevention programs in the Netherlands. Within these programs, professionals with a broader expertise than burns (e.g. fire brigade or maternity care), serve as partners to reach target groups. Until now, GP's were hardly involved in the prevention of burn injury. General practices should therefore be more involved than currently is the case. They for example can inform patients about risks and alert them. When specific risk factors for burns are recognised in consultations or during home visits, for example poor living conditions in young parents, general practitioners could inform their patient about how to prevent burn injury, or enable preventive resources such as referral to an online burn prevention programme.

Furthermore, prevention campaigns should particularly focus on children of 0-4 years old (especially boys), young adult women and people who live in disadvantaged socioeconomic

neighbourhoods and larger cities. Important target periods in the Netherlands are the summer months and just before New Year's Eve.

Finally, the results (and the methods) of this study can be used to evaluate the effects of future policy measures. For example the effects of a future ban on domestic fireworks in the Netherlands around New Year's Eve.

5. Conclusions

The outcomes of this large electronic health records-based study provide up-to-date knowledge on the epidemiology of burn injury in general practice in the Netherlands. It shows that general practitioners have a large share in burn care. Dutch GPs treat about 92 times as many patients with burn injuries as secondary care does. GPs can therefore play a relevant role in the prevention of burn injury. Children of 0-4 years old (especially boys), young adult women and people who live in weak socioeconomic neighbourhoods and neighbourhoods with a high level of urbanisation are obvious target groups for burn injury prevention. Important target periods in the Netherlands are the summer months and New Year's Eve. The results and methods of this study can be used to assess effectiveness of prevention campaigns and other policy measures, such as a (partial) ban on domestic fireworks around New Year's Eve.

Declaration of interests

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.burns.2021.04.030.

References

[1] Brusselaers N, Monstrey S, Vogelaers D, Hoste E, Blot S. Severe burn injury in Europe: a systematic review of the incidence, etiology, morbidity, and mortality. Crit Care 2010;14:R188.

[2] Australian & New Zealand Burn Association. ANZBA referral criteria. 2012. https://anzba.org.au/care/referral-criteria/.

[3] The Dutch Burn Repository group. Dutch burn repository R3; short report 2018. Beverwijk, Groningen, Rotterdam: Association of Dutch Burn Centres; 2019.

[4] Stam C. Brandwondenrapportage 2017 [Burns report 2017]. Amsterdam: Consumer Safety Institute; 2019.

[5] Alnababtah K, Khan S, Ashford R. Socio-demographic factors and the prevalence of burns in children: an overview of the literature. Paediatr Int Child Health 2016;36(1):45-51.

[6] Edelman LS. Social and economic factors associated with the risk of burn injury. Burns 2007;33:958-65.

[7] Park JO, Shin SD, Kim J, Song KJ, Peck MD. Association between socioeconomic status and burn injury severity. Burns 2008;35:482-90.

[8] Stirbu I, Kunst AE, Bos V, van Beeck EF. Injury mortality among ethnic minority groups in the Netherlands. J Epidemiol Community Health 2006;60:249-55, doi:http://dx.doi.org/10.1136/jech.2005.037325.

[9] Davies K, Johnson EL, Hollén L, Jones HM, Lyttle MD, Maguire S, et al. Incidence of medically attended paediatric burns across the UK. Inj Prev 2020;26(1):24-30, doi:http://dx.doi.org/10.1136/injuryprev-2018-042881.
[10] Shah M, Orton E, Tata LJ, Gomes C, Kendrick D. Risk factors for scald injury in children under 5 years of age: a case-control study using routinely collected data. Burns 2013;39:1474-8.
[11] van Rijn OJL, Grol MEC, Bouter LM, Mulder S, Kester ADM. Incidence of medically treated burns in the Netherlands. Burns 1991;17(5):357-62.
[12] Lloyd ECO, Rodgers BC, Michener M, Williams MS. Outpatient burns:prevention andcare.AmFamPhysician2012;85(1):25-32.
[13] Morgan ED, Bledsoe SC, Barker J. Ambulatory management of burns. Am Fam Physician 2000;62(9):2015-26.
[14] Moss LS. Treatment of the burn patient in primary care. Adv Skin Wound Care 2010;23:517-24.
[15] TranS, JacquesMA,HollandAJA.Assessmentand management of minor burns in children. AJGP 2019;48(9):590-5.
[16] Waitzman AA, Neligan PC. How to manage burns in primary care. Can Fam Physician 1993;39:2394-400.
[17] Nivel. Nivel Primary Care Database. https://www.nivel.nl/en/nivel-primary-care-database [Accessed May 2019].
[18] Kuchinke W, Krauth C, Bergmann R, Karakoyun T, Woollard A, Schluender I, et al. Legal assessment tool (LAT): an interactive tool to address privacy and data protection issues for data sharing. BMC Med Inform Decis Mak 2016;16:81, doi:http://dx.doi.org/10.1186/s12911-016-0325-0.
[19] van der Bij S, Khan N, Ten Veen P, de Bakker DH, Verheij RA. Improving the quality of EHR recording in primary care: a data quality feedback tool. J Am Med Inform Assoc 2017;24(1):81-7, doi:http://dx.doi.org/10.1093/jamia/ocw054.
[20] Lamberts H, Wood M. ICPC. International classification of primary care. Oxford: Oxford University Press; 1987.
[21] Nielen MMJ, Spronk I, Davids R, Korevaar JC, Poos R, Hoeymans N, et al. Estimating morbidity rates based on routine electronic health records in primary care: observational study. JMIR Med Inform 2019;7(3):e11929, doi:http://dx.doi.org/10.2196/11929.
[22] Spronk I, Korevaar JC, Poos R, Davids R, Hilderink H, Schellevis FG, et al. Calculating incidence rates and prevalence proportions: not as simple as it seems. BMC Public Health 2019;19(1):512, doi:http://dx.doi.org/10.1186/s12889-019-6820-3.
[23] Centraal Bureau voor de Statistieka. Inkomen per gemeente en wijk. 2015. [Accessed April 2017] https://www.cbs.nl/nl-nl/maatwerk/2018/03/inkomen-per-gemeente-en-wijk-2015.
[24] Centraal Bureau voor de Statistiekb. Bevolking per 4 cijferige postcode op 1 januari 2015. https://www.cbs.nl/nl-nl/maatwerk/2016/04/bevolking-en-huishoudens-viercijferigepostcode- 1-januari-2015 [Accessed April 2017].
[25] Centraal Bureau voor de Statistiekc. Bevolking; kerncijfers. https://opendata.cbs.nl/statline/#/CBS/nl/dataset/37296ned/table?ts=1574154131852 [Accessed April 2017].
[26] Centraal Bureau voor de Statistiekd. Wijk- en Buurtkaart 2015. https://www.cbs.nl/nl-nl/dossier/nederland-regionaal/geografische-data/wijk-en-buurtkaart-2015 [Accessed April 2017].
[27] Sociaal en Cultureel Planbureau. Statusscores. https://www.scp.nl/Onderzoek/Statusscores [Accessed April 2017].
[28] STATA software. Stata: Software for Statistics and Data Science. https://www.stata.com/ [Accessed August 2020].
[29] Peck MD. Epidemiology of burns throughout the world. Part I: Distribution and risk factors. Burns 2011;37:1087-100.

[30] Duke J, Wood F, Semmens J, Spilsbury K, Dale WE, Hendrie D, et al. A 26-year population-based study of burn injury hospital admissions in Western Australia. J Burn Care Res 2011;32 (3):379 86.
[31] Dokter J, Vloemans AF, Beerthuizen GIJM. Epidemiology and trends in severe burns in the Netherlands. Burns 2014;40 (7):1406-14.
[32] Smolle C, Cambiaso-Daniela J, Forbesb AA, Wurzera P, Hundeshagen G. Recent trends in burn epidemiology worldwide: a systematic review. Burns 2017;43(2):249-57.
[33] Remmerswaal M, Boone J, Douven R. Selection and moral hazards effects in healthcare. The Hague: CPB Netherlands Bureau for Economic Policy Analyses; 2019.
[34] Jansen T, de Hoon S, Hek K, Verheij R. Ontwikkelingen op de huisartsenpost. Veranderingen in zorgvraag en gezondheidsproblemen in 2013-2015 [Developments in outof-hours GP care. Changes in health care demand and healthproblems in 2013-2015]. Utrecht: Nivel; 2017.
[35] Flinterman L, Groenewegen P, Verheij R. Zorglandschap en zorggebruik in een veranderende eerste lijn [Healthcare landscape and use of health care in changing primary care]. Utrecht: Nivel; 2018.
[36] Wasiak J, Spinks A, Ashby K, Clapperton A, Cleland H, Gabbe B. The epidemiology of burn injuries in an Australian setting, 2000-2006. Burns 2009;35(8):1124-32.
[37] Spinks A, Wasiak J, Cleland H, Beben N, Macpherson AK. Tenyear epidemiological study of pediatric burns in Canada. J Burn Care Res 2008;29(3):482-8.
[38] Vloemans AF, Dokter J, van Baar ME, Nijhuis I, Beerthuizen GI, Nieuwenhuis MK, et al. Epidemiology of children admitted to the Dutch burn centres. Changes in refferal influence admittance rates in burn centres. Burns 2011;37:1161-7.
[39] Emond A, Sheahan C, Mytton J, Hollén L. Developmental and behavioural associations of burns and scalds in children: a prospective population-based study. Arch Dis Child 2017;102 (5):428-83, doi:http://dx.doi.org/10.1136/archdischild-2016-311644.
[40] Zoni AC, Domínguez-Berjón MF, Esteban-Vasallo MD, Velázquez-Buendía LM, Blaya-Nováková V, Regidor E. Socioeconomic inequalities in injuries treated in primary care in Madrid, Spain. J Public Health (Oxf) 2017;39(1):45-51.
[41] Centraal Bureau voor de Statistieke. Studerende én werkende jongeren gaan later uit huis. https://www.cbs.nl/nl-nl/nieuws/2019/06/studerende-en-werkende-jongeren-gaanlater-uit-huis [Accessed May 2019].
[42] van Zoonen EE, Hagen R, Ruijven C, Tonnaer C, de Witte L. Fire safety and the ageing population. Arnhem: Institute for safety (IFV); 2016.
[43] Mackenbach JP. The persistence of health inequalities in modern welfare states: the explanation of a paradox. Soc Sci Med 2012;75(August (4)):761-9, doi:http://dx.doi.org/10.1016/j. socscimed.2012.02.031.
[44] Phelan JC, Link BG, Tehranifar P. Social conditions as fundamental causes of health inequalities: theory, evidence, and policy implications. J Health Soc Behav 2010;51 Suppl:S28-40, doi:http://dx.doi.org/10.1177/0022146510383498.
[45] Othman N, Kendrick D. Risk factors for burns at home in Kurdish preschool children: a case-control study. Inj Prev 2013;19:184-90.

Tables and figures

Table 1 Prevalence of burns in patients that contacted their GP during daytime and in out-of-hours care, by year, with 95% confidence intervals (95% CI).

	Daytime GP care per 1000 person-years of registered GP patients (95% CI)	Out-of-hours GP care per 1000 inhabitants of the out-of-hours service area (95% CI)
2010	4.07 (3.84–4.32)	
2011	4.17 (4.01–4.33)	
2012	4.41 (4.28–4.53)	
2013	4.43 (4.31–4.54)	1.40 (1.38–1.42)
2014	4.65 (4.53–4.77)	1.46 (1.44–1.49)
2015	4.66 (4.54–4.78)	1.55 (1.53–1.58)

Figure 1 Proportion of patients that contacted their GP for burns in daytime care, in out-of-hours care and both in daytime and out-of-hours care for the same burns in 2013, 2014 and 2015

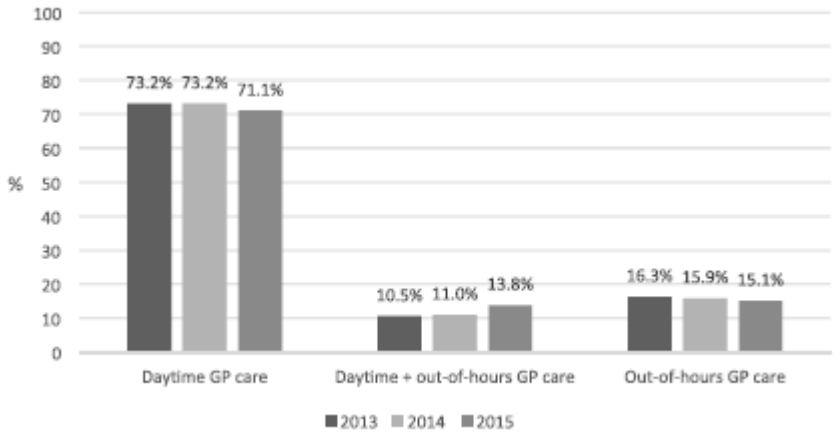

Table 2 Prevalence of burns in patients that contacted their GP during daytime and in out-of-hours care, by gender, and year, with 95% confidence intervals (95% CI).

	Daytime GP care per 1000 person-years of registered GP patients (95% CI)					
	2010	2011	2012	2013	2014	2015
0–4 years	7.97 (6.64–9.58)	9.49 (8.44–10.67)	10.44 (9.59–11.37)	11.33 (10.53–12.18)	11.05 (10.23–11.93)	11.68 (10.83–12.60)
5–14 years	3.59 (3.01–4.28)	3.70 (3.30–4.15)	4.21 (3.87–4.57)	4.14 (3.83–4.47)	4.38 (4.05–4.73)	4.40 (4.08–4.75)
15–29 years	5.52 (4.91–6.20)	5.43 (5.01–5.87)	5.65 (5.33–6.00)	5.68 (5.38–5.99)	6.07 (5.75–6.40)	5.90 (5.59–6.23)
30–59 years	3.72 (3.39–4.08)	3.87 (3.64–4.11)	4.08 (3.90–4.27)	3.93 (3.77–4.10)	4.34 (4.16–4.52)	4.30 (4.13–4.48)
60–89 years	2.86 (2.45–3.34)	2.84 (2.57–3.14)	2.84 (2.64–3.07)	3.06 (2.87–3.27)	2.93 (2.74–3.14)	3.13 (2.94–3.34)
90 and older	1.29 (0.32–5.17)	2.79 (1.51–5.15)	3.18 (2.10–4.83)	3.15 (2.16–4.60)	4.63 (3.39–6.33)	4.50 (3.30–6.14)
	Out-of-hours GP care per 1000 inhabitants of the out-of-hours service area (95% CI)					
	2013		2014		2015	
0–4 years	4.40 (4.24–4.57)		4.51 (4.34–4.68)		4.83 (4.66–5.01)	
5–14 years	1.54 (1.47–1.6)		1.61 (1.54–1.68)		1.80 (1.73–1.87)	
15–29 years	2.04 (1.98–2.11)		2.17 (2.11–2.23)		2.38 (2.32–2.45)	
30–59 years	1.18 (1.15–1.22)		1.26 (1.22–1.29)		1.31 (1.28–1.34)	
60–89 years	0.46 (0.43–0.49)		0.47 (0.44–0.49)		0.50 (0.47–0.53)	
90 and older	0.34 (0.22–0.51)		0.36 (0.24–0.53)		0.50 (0.36–0.68)	

Table 3 Prevalence of burns in patients that contacted their GP during daytime and in out-of-hours care, by age groups, and year, with 95% confidence intervals (95% CI).

	Daytime GP care per 1000 person-years of registered GP patients (95% CI)					
	2010	2011	2012	2013	2014	2015
0–4 years	7.97 (6.64–9.58)	9.49 (8.44–10.67)	10.44 (9.59–11.37)	11.33 (10.53–12.18)	11.05 (10.23–11.93)	11.68 (10.83–12.60)
5–14 years	3.59 (3.01–4.28)	3.70 (3.30–4.15)	4.21 (3.87–4.57)	4.14 (3.83–4.47)	4.38 (4.05–4.73)	4.40 (4.08–4.75)
15–29 years	5.52 (4.91–6.20)	5.43 (5.01–5.87)	5.65 (5.33–6.00)	5.68 (5.38–5.99)	6.07 (5.75–6.40)	5.90 (5.59–6.23)
30–59 years	3.72 (3.39–4.08)	3.87 (3.64–4.11)	4.08 (3.90–4.27)	3.93 (3.77–4.10)	4.34 (4.16–4.52)	4.30 (4.13–4.48)
60–89 years	2.86 (2.45–3.34)	2.84 (2.57–3.14)	2.84 (2.64–3.07)	3.06 (2.87–3.27)	2.93 (2.74–3.14)	3.13 (2.94–3.34)
90 and older	1.29 (0.32–5.17)	2.79 (1.51–5.15)	3.18 (2.10–4.83)	3.15 (2.16–4.60)	4.63 (3.39–6.33)	4.50 (3.30–6.14)
	Out-of-hours GP care per 1000 inhabitants of the out-of-hours service area (95% CI)					
	2013		2014		2015	
0–4 years	4.40 (4.24–4.57)		4.51 (4.34–4.68)		4.83 (4.66–5.01)	
5–14 years	1.54 (1.47–1.6)		1.61 (1.54–1.68)		1.80 (1.73–1.87)	
15–29 years	2.04 (1.98–2.11)		2.17 (2.11–2.23)		2.38 (2.32–2.45)	
30–59 years	1.18 (1.15–1.22)		1.26 (1.22–1.29)		1.31 (1.28–1.34)	
60–89 years	0.46 (0.43–0.49)		0.47 (0.44–0.49)		0.50 (0.47–0.53)	
90 and older	0.34 (0.22–0.51)		0.36 (0.24–0.53)		0.50 (0.36–0.68)	

Figure. 2 Annual distribution of patients that contacted their GP for burns during daytime (2010 2015) and in out-of-hours care (2013 2015).

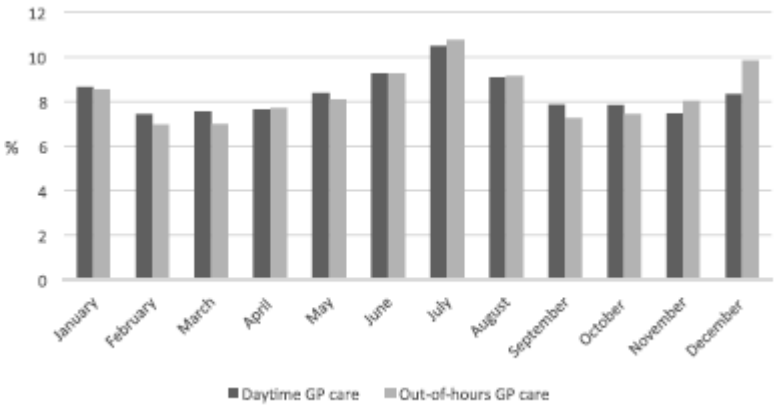

Table 4 Associations of demographic and socioeconomic factors with burn injury presented to the GP in daytime and in outof-hours care (odds ratios (OR) and 95% confidence intervals (CI)).

Factor	Comparison groups	Daytime GP care		Out-of-hours GP care	
		OR	95% CI	OR	95% CI
Gender	Male (reference)	1.00		1.00	
	Female	1.46	1.40–1.52	1.35	1.31–1.39
Age (years)	0–4	2.56	2.35–2.78	3.68	3.53–3.85
	5–14	1.03	0.94–1.12	1.37	1.31–1.44
	15–29	1.38	1.29–1.47	1.81	1.75–1.88
	30–59 (reference)	1.00		1.00	
	60–89	0.73	0.68–0.79	0.38	0.36–0.40
	≥90	1.03	0.76–1.39	0.39	0.29–0.53
Low income in neighbourhood	1 Many with low income	1.21	1.11–1.32		
	2	1.06	0.95–1.19		
	3	1.13	1.03–1.25		
	4	1.12	1.02–1.23		
	5	1.08	0.98–1.20		
	6	1.14	1.04–1.24		
	7 (reference) Few with low income	1.00			
SES score in neighbourhood	1 Low SES	1.26	1.14–1.40		
	2	1.28	1.14–1.43		
	3	1.02	0.90–1.16		
	4	1.14	1.01–1.28		
	5	1.06	0.93–1.20		
	6	1.02	0.90–1.16		
	7	1.02	0.91–1.15		
	8	1.06	0.93–1.20		
	9	1.09	0.97–1.22		
	10 (reference) High SES	1.00			
Urbanity in neighbourhood	1 (reference) Non-urban	1.00			
	2	0.97	0.89–1.06		
	3	1.07	0.98–1.16		
	4	1.12	1.03–1.21		
	5 Strong urban	1.28	1.18–1.39		
% non-western migration background in neighbourhood	1 (reference) Low percentage	1.00			
	2	1.19	0.95–1.50		
	3	1.18	0.94–1.47		
	4	1.12	0.89–1.41		
	5	1.16	0.93–1.45		
	6	1.27	1.02–1.58		
	7 High percentage	1.47	1.18–1.82		