

## Home visits made by general practitioners in the canton of Vaud between 2006 and 2015

Mueller Yolanda K., David Stéphane, Cohidon Christine, Locatelli Isabella, Senn Nicolas

Department of Family Medicine / Center for Primary Care and Public Health (Unisanté), University of Lausanne, Switzerland

### Summary

**AIM OF THE STUDY:** Although physicians' home visits are highly valued by patients, and are among the measures that contribute to maintaining elderly patients at home, their number is decreasing worldwide. We aimed to describe the trends in home visits made by general practitioners (GPs) in the canton of Vaud in Switzerland between 2006 and 2015, and to explore their associated characteristics.

**METHODS:** We retrospectively analysed billing data from family physicians (internists, generalists and practicing physicians) transmitted to the cantonal trust centre between 2006 and 2015. We explored physician and patient characteristics, first over the entire 10-year study period and then averaged by year. To explore factors associated with the number of home visits, we fitted a mixed effect negative binomial regression of the annual number of home visits per physician.

**RESULTS:** Over ten years, 631 physicians billed a total of 451,634 home visits, of which 19.8% (n = 89,966) were emergency visits, and 9.7% (n = 43,915) were over the weekend. Home visits represented 2.5% of all consultations. Although the average annual number of physicians doing home visits remained stable at around 400, the mean annual number of visits per physician decreased from 125 in 2006 to 75 in 2015, resulting in a 40% decline in the absolute number of visits. Male physicians undertook more home visits than their female counterparts did, although the difference diminished over time. Visits to elderly patients (65+) represented 84.2% of the home visits.

**CONCLUSIONS:** Although most physicians in the canton of Vaud continue to visit patients at home, the overall number of home visits is declining. Most home visits consist of routine visits to elderly patients. Physicians' gender, age and speciality are associated with the number of home visits. In the rapidly evolving context of an ageing population and the development of home care, physicians' role in home care provision should be revised, taking into account patient expectations and current health system constraints.

**Keywords:** house calls, home visits, primary care, family medicine, Switzerland

### Introduction

Population ageing is a major challenge for health systems, as they are confronted with an increase in the number of multimorbid and frail patients. In addition to the somatic challenges in the care of these patients, mental health [1–3] and social issues such as isolation and deprivation become increasingly important. Still, patients wish to remain at home as long as possible [4], which is also in line with current public health strategies, both to limit costs and because of the limited availability of institutional beds. In addition, palliative home care caters to the wishes of most patients when they are approaching end-of-life [5].

General practitioners' (GPs') home visits are an important component of home care [6]. By home visits we mean visits to a patient's home by professional personnel for the purpose of diagnosis and/or treatment. Reasons to undertake home visits are diverse, and include routine follow-up, emergency visits [7], palliative care [8, 9] and post-discharge follow-up [10] for patients that are usually unable to travel to the GP practice. GP home visits are highly valued by patients [4], and among the measures that contribute to maintaining elderly patients at home [11].

Indeed, regular home visits have been shown to reduce unnecessary emergency department visits and hospital admissions [12], reduce readmissions [13, 14], and prevent falls [15], functional decline and long-term institutionalisation [16]. GP home visits used to be the main mode of care delivery in Europe before the Second World War, but their number has since decreased progressively in all industrialised countries [17–22]. In Switzerland, most GPs do carry out home visits, but only 43% do so frequently (compared with 6% in the USA and 88% in the Netherlands, for example) [23]. Swiss GPs tend to do fewer home visits than their European counterparts [24, 25], and the mean weekly number of home visits per week has decreased from 7.7 in 1992 to 3.2 in 2012 [26]. In a population survey conducted in the canton of Vaud in Western Switzerland, only 36% of older individuals thought of GP home visits as easily accessible [27].

Various factors have been reported to influence the number of home visits [28]. These include factors at GP level (age, gender, personal preferences, workload), patient level (multimorbidity, age, psychosocial factors) and organisational level (practice location, practice type, financial as-

### Correspondence:

Yolanda Mueller, MD, MHI,  
Department of Family Medicine,  
Center for Primary Care and Public Health  
(Unisanté), University of Lausanne,  
Rue du Bugnon 44, CH-1011 Lausanne,  
yolanda.mueller[at]hos-pvd.ch

pects). In addition, both the health system and society have evolved in recent years, especially with respect to the development of home-based care and changing patterns of emergency care use (development of walk-in clinics and private companies specialising in home visits). Changes have also occurred in transportation (driving ability control policy for the elderly, evolution of public transport networks) which may have modified access to GP practices. Within this context, the aim of this study was to describe the trends in home visits made by GPs in the canton of Vaud over a period of ten years (2006–2015), and to explore patient and physician characteristics associated with the number of visits.

## Material and methods

This is a retrospective analysis of billing data voluntarily transmitted by physicians to the cantonal trust centre (Centre de confiance de la Société Vaudoise de Médecine) between 2006 and 2015. The canton of Vaud is the most populous canton in French-speaking Switzerland, with a resident population of 708,177 in 2010 (study mid-period) and 540 general practitioners (general internal medicine specialists or practicing physicians) active in the ambulatory sector according to national statistics [29]. This project used anonymised data that did not contain personal health-related information. It was therefore not under the scope of the Swiss human research law and did not require formal ethical review.

Remuneration of Swiss GPs is based on a fee-for-service system. In addition, GPs can bill consultation time according to a unified payment system (Tarmed). Within this system, home visits can be identified by a specific tariff heading corresponding to transportation time. Visits to residential patients are included in these data and cannot be differentiated from the other visits. In addition, there is a separate heading for emergency visits, which are defined as pressing unscheduled visits, or visits that occur outside regular consultation time (evenings, nights and weekends).

The dataset consisted of billing data from every physician that was either a general internal medicine specialist (title corresponding to five years of post-graduate training in Switzerland) or a practicing physician (title corresponding to three years of post-graduate training), and who had billed at least one consultation in the canton of Vaud between 2006 and 2015. Data from paediatricians were not included. The physicians' variables were age, gender, specialty title, postal code, annual number of consultations, annual number of home visits and annual total duration of home visits. For each home visit, information was provided on the patient's coded identifier, gender and age, the date, the amount and type of medical services billed, and whether the home visit was an emergency visit (defined as an unplanned visit that took place immediately after being requested by the patient or the patient's "entourage").

We first examined physician and patient characteristics for the entire 10-year study period. The total number of visits was categorised by day of the week and whether or not they were emergency visits. We then categorised the patients according to the number of visits per patient and explored factors associated with the number of visits. Hypothesis testing was based on a chi square test for cat-

egorical variables and Poisson regression for count variables.

We looked at the total number of visits, number of visits per GP and patient characteristics according to year. We calculated visit rates by dividing the number of visits by the resident population of the canton of Vaud. We observed the relative difference between 2006 and 2015 in the calculated indicators.

Finally, we further explored factors associated with the number of home visits per GP and their evolution over time, as this parameter showed the most variation. For this, we fitted a mixed effect negative binomial regression model of the annual number of home visits per physician, including a random intercept for each physician. Year, physician gender, physician age at baseline (2006) and physician specialty were the covariates. Linear, quadratic and cubic time effects were considered. Interactions between time and all the covariates were tested, and only the significant ones were kept. GPs who had billed more than 500 visits in at least one year were excluded in order to have a distribution of the outcome variable close to the chosen regression model, and because these were considered to be "frequent visitors" whose behaviour was likely to differ from that of other physicians. The fit of the model was assessed by comparing observed and predicted values according to year. In a sensitivity analysis, the model was rerun without the exclusion of "frequent visitors".

## Results

### GP and patient characteristics, entire 2006–2015 period

Between 2006 and 2015, 631 physicians out of 688 (91.7%) billed at least one consultation (68.8% men, median age in 2010 52 years, IQR 42 to 60). Most held a specialist title either in general internal, general or internal medicine, while 10.3% (71/688) were medical practitioners. Overall, 87,062 patients received a total of 451,634 visits, which represented 2.5% of all consultations. One in five home visits (19.9%, 89,966/451,634; [table 1](#)) was billed as emergency visit, and 9.7% (43,915/451,634) took place over the weekend. More than half of patients (55.6%) received only a single visit, which was then mostly an emergency visit (in 71.2% of cases; [table 1](#)). The mean age of visit beneficiaries was 67.1 years (SD 23.2), with 58.7% of them women. Both age and proportion of women increased with the number of visits ( $p < 0.001$ , [table 1](#)). Visits to older patients (65+) represented 84.3% of the total number of visits (380,469/451,333; age missing for 148 patients = 301 visits), and visits to very old patients (85+) represented 43.4% ( $n = 195,727$ ).

### Time trends

We analysed the variation over time in the number of consultations and patient characteristics between 2006 and 2015 in the canton of Vaud ([table 2](#)). There was a slight increase in the annual number of both consulting physicians (+5.7%) and physicians doing home visits (+5.8%), while the number of consultations per physician remained stable (−1.9%). However, the mean annual number of home visits per physician decreased from 125 (SD 165) in 2006 to

75 (SD 136) in 2015, resulting in a 36.9% decline in the absolute number of home visits. While the number of visits per patient remained stable (three per patient on average), the total number of beneficiaries decreased by 41.4% despite the fact that the resident population of the canton increased by 16.5%. The proportion of women among visit beneficiaries remained stable over time, but the propor-

tion of patients aged 65+ increased from 66.7% to 76.5% of all beneficiaries. The relative increase was even more pronounced in the proportion of beneficiaries aged 85+ (+45.5%).

**Table 1:** Number and proportion of patients, sex/gender, age, total number of home visits and number of emergency home visits, by category of number of visits per patient.

	Patients		Women		Age in years		Total home visits		Emergency visits	
	n	Column %	n	Row %	Mean	Standard deviation	n	Column %	n	Row %
<b>Number of home visits per patient</b>										
A single home visit	48,383	55.6	26,453	54.7	58.9	24.3	48,383	10.7	34,451	71.2
2 to 10 home visits	28,661	32.9	17,734	61.9	75.5	18.2	113,638	25.2	32,921	29.0
More than 10 home visits	10,018	11.5	6,947	69.4	82.1	12.3	289,613	64.1	22,594	7.8
<b>Total</b>	<b>87,062</b>	<b>100.0</b>	<b>51,134</b>	<b>58.7</b>	<b>67.1</b>	<b>23.2</b>	<b>451,634</b>	<b>100.0</b>	<b>89,966</b>	<b>19.9</b>
<b>p-value</b>			<0.001*		<0.001†				<0.001*	

\* Chi<sup>2</sup> test for categorical variables against number of visits category † Likelihood ratio test in simple Poisson model of number of visits per patient

**Table 2:** Number and characteristics of GP home visits made in the canton of Vaud, Switzerland, by year, and relative difference between 2006 and 2015.

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Annual mean	% difference between 2006 and 2015
Number of physicians who billed at least one consultation	455	447	440	437	454	462	475	487	482	481	462	+5.7%
Number of physicians who billed at least one home visit, %	397, 87%	402, 90%	384, 87%	387, 89%	390, 86%	400, 87%	422, 89%	432, 89%	425, 88%	420, 87%	406, 88%	+5.8%
Total annual number of home visits	57 034	56 481	53 980	50 557	46 384	41 248	38 964	35 947	35 068	35 971	45 163	-36.9%
Mean number of home visits per physician (SD)	125 (165)	126 (162)	123 (156)	116 (142)	102 (137)	89 (133)	82 (127)	74 (108)	73 (129)	75 (136)	98 (142)	-40.0%
Mean number of consultations per physician (SD)	3 894 (2605)	4 078 (2588)	4 155 (2620)	4 076 (2573)	3 999 (2554)	3 859 (2585)	3 772 (2540)	3 764 (2558)	3 767 (2563)	3 821 (2464)	3 918 (2566)	-1.9%
Proportion of all consultations which are home visits	3.2%	3.1%	3.0%	2.8%	2.6%	2.3%	2.2%	2.0%	1.9%	2.0%	2.5%	-39.2%
Number of emergency calls, %	11 221, 19.7%	11 250, 19.9%	11 421, 21.2%	10 476, 20.7%	9 404, 20.3%	7 963, 19.3%	6 882, 17.7%	6 878, 19.1%	7 514, 21.4%	6 960, 19.4%	9848, 19.8%	-38.0%
Number of beneficiaries of home visits	19 418	18 798	18 108	17 546	15 965	13 887	12 712	12 094	11 569	11 373	15 147	-41.4%
Mean number of home visits per patient (SD)	2.94 (4.35)	3.01 (4.44)	2.98 (4.29)	2.88 (3.96)	2.91 (3.91)	2.97 (4.00)	3.01 (3.92)	3.07 (3.92)	2.98 (3.88)	3.17 (4.24)	2.98 (4.11)	+7.8%
Resident population	658 659	668 581	684 922	697 802	708 177	721 561	729 971	743 317	755 369	767 497	707 877	+16.5%
Proportion of beneficiaries among total resident population	2.95%	2.81%	2.64%	2.51%	2.25%	1.92%	1.74%	1.63%	1.53%	1.48%	2.14%	-49.7%
Proportion of women among beneficiaries	68.2%	68.5%	69.7%	68.2%	68.4%	68.3%	67.6%	67.0%	67.8%	67.9%	68.1%	-0.5%
Proportion of beneficiaries ≥65 years old	66.7%	68.4%	69.9%	69.2%	72.1%	73.8%	75.2%	75.9%	75.2%	76.5%	72.3%	14.7%
Proportion of beneficiaries ≥85 years old	27.5%	29.7%	31.2%	30.9%	33.7%	35.2%	37.4%	38.4%	39.3%	40.0%	34.3%	45.5%

SD = standard deviation

### GP characteristics associated with number of visits

The annual number of home visits varied greatly between physicians and fluctuated over time for the same physician (fig. 1). Twenty-seven physicians (3.9% of total) made over 500 visits in one year, and were responsible for 23.7% of all home visits. These physicians were not different from other physicians in terms of specialty title, gender or age, although they did carry out fewer emergency visits (16.5 vs 21.0%,  $p < 0.001$ ) and the mean age of their patients was slightly lower (77.9 v. 78.7 years old,  $p < 0.001$ ). After excluding these “frequent visitors”, we constructed a random effect negative binomial regression model of the annual number of home visits per physician (table 3; fig. 1), which estimated that 69% of the total variability could be explained by the inter-physician variability (ICC). The estimated annual number of home visits per physician decreased over time, with a stabilisation observed during the final years of the study (table 3, fig 1). At baseline (2006), the number of home visits was higher for male and older physicians ( $p < 0.001$  and  $p = 0.006$ , respectively). General internal specialists carried out more home visits compared with medical practitioners ( $p = 0.002$ ). The differences according to gender, age class and specialist title decreased over time, as shown by the interaction terms with time in the model that counterbalance the direct effect

of the covariates. The parameters of the model did not differ markedly when frequent visitors were included.

## Discussion

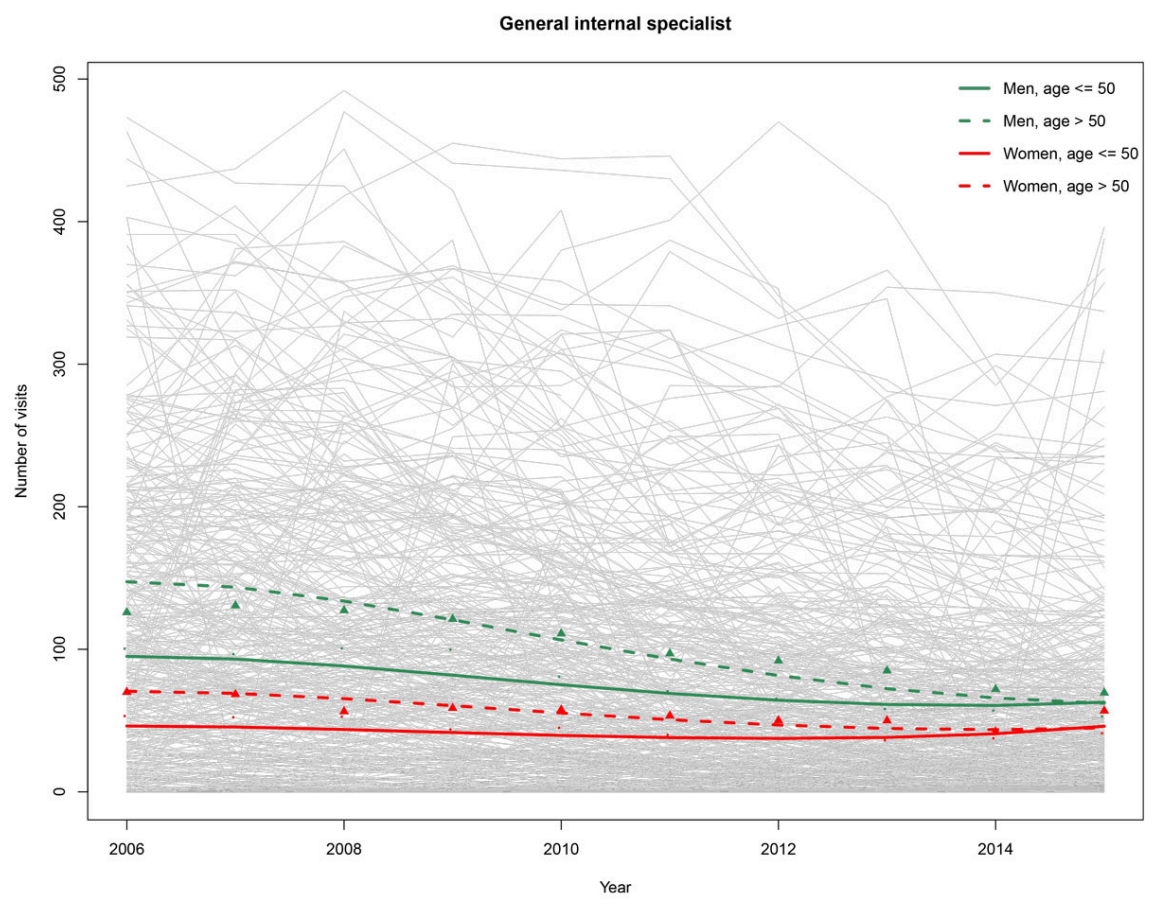
### Main findings

Physicians of the canton of Vaud undertook almost half a million (451,634) home visits between 2006 and 2015. Almost two thirds of all visits were to about 10,000 patients, mostly women and older individuals, representing 1.4% of the resident population. Over 85% of physicians provided home visits throughout the study period. However, the number of visits per physician decreased by 40%, reducing both the absolute number of visits and the proportion of beneficiaries in the population.

### Decrease in home visits

This decrease in home visits has been described throughout industrialised countries, including Switzerland [22, 26, 30–32], with the exception of the US, where a recent increase in home visits to Medicare patients has been reported [21]. The mean number of home visits per physician is even lower in our study than in self-reported figures from a sample of Swiss GPs (82 per year vs 3.2 per week in 2012)

**Figure 1:** Evolution of home visits made by general internists in the canton of Vaud between 2006 and 2015, by gender and baseline age. Grey solid lines: spaghetti plot of annual number of visits per physician; 1 line = 1 physician. Dots: observed average number of home visits per year per physician, physicians up to 50 years old, green = men, red = women. Triangles: observed average number of home visits per year per physician, physicians older than 50 years, green = men, red = women. Green and red lines: predicted values of average number of home visits from the regression model, green = men, red = women, solid line = physicians up to 50 years old, dashed line = physicians older than 50 years.



**Table 3:** Mixed effect negative binomial regression model of annual number of home visits per physician. Frequent visitors, defined as physicians who billed more than 500 visits during a single year, were excluded (n = 27).

	Coefficient	95% confidence interval	p-value
Male physician	0.965	0.621–1.310	<0.001
Physician's baseline age >50 years	0.424	0.104–0.744	0.009
Specialty (practitioner vs general internal specialist)	-0.859	-1.404 – -0.314	0.002
Year <sup>2</sup>	-0.017	-0.023 – -0.012	<0.001
Year <sup>3</sup>	0.002	0.001–0.002	<0.001
Year <sup>2</sup> * male	-0.005	-0.007 – -0.003	<0.001
Year <sup>2</sup> * (age >50)	-0.006	-0.008 – -0.004	<0.001
Year <sup>2</sup> * specialty	0.005	0.001–0.010	0.018

[33]. This could be due to an overestimation in self-reported data compared to actual billing data, but we cannot exclude the possibility that figures in the canton of Vaud are lower than national figures. Indeed, compared with the rest of the country, Western Switzerland has a high density of home care on offer [34], and the number of home care beneficiaries increased by 26% during the study period (source: Statistique Vaud). This relatively high level of home care provision in Vaud (in comparison with other areas of Switzerland) could play a role in the number of home visits. However, collecting data to assess this association was beyond the scope of the current study.

#### Emergency home visits

In our study, routine visits to elderly patients represented the bulk of all home visits, and emergency care only a small part (20%). This is important, as the public debate around home visits often focusses on the emergency response. Indeed, there are an increasing number of professional medical companies that specialise in the provision of emergency home visits. As of 2015, these do not appear to play an important role in care provision in the canton of Vaud, where most home visits were still undertaken by traditional practice physicians. We identified some “frequent visitors” in our data, corresponding to GPs who had billed at least 500 visits during a single year. However, based on GP and patient characteristics, these did not correspond to either emergency professionals or GPs affiliated with residential homes.

#### GP characteristics

Physician characteristics such as age and gender were associated with a decrease in the number of home visits. This was supported by the results of the regression model, thereby confirming earlier findings [24, 35]. While the effect of physicians' age tends to disappear in final years of the study, the ongoing feminisation of family medicine in Switzerland could result in a further decrease in the overall number of home visits. It is also of concern that the resident population is growing three times faster than the number of general practitioners, potentially resulting in increased time pressure on GPs. Indeed, the decrease in home visits was not related to a general decrease in physicians' activity, as shown by the stable number of consultations per physician in our study. If a GP has to serve a larger fraction of the population, there might be less time available for home visits. Furthermore, this would lead to questions about the ability of the GP to systematically visit chronic patients at home. There may be less burn out among physicians that carry out home visits [36], and it is certainly beneficial in terms of the patient-doctor relation-

ship, but other health professionals such as nurses, especially nurses working in the same practice as the GP, could perform some of these visits. Such models of care exist in North America and Europe [37, 38] and are being developed in Switzerland [39]. Home visits could be among the tasks delegated by GPs in these new models.

#### Study limitations

There are several limitations to our results. The main limitation is that we cannot differentiate between visits to patients' private homes and visits to patients in residential homes, but the fact that the mean age of home visit beneficiaries was much lower than the mean age of patients in residential homes (85 years) indicates that this was not a major phenomenon. It was also not possible to differentiate between home visits made in the context of medical duty service and home visits made to a physician's own patients. More detailed data, including the motive and the context of the visit, will be collected through the Sentinella Surveillance Network in 2019, which should be a useful adjunct to our results. The absence of data from paediatricians and other specialists who may also perform home visits may preclude extrapolation to the paediatric population. In addition, not all physicians are members of the Société Vaudoise de Médecine and some underreporting cannot be excluded, although we estimate that this is a minor phenomenon based on the comparison between the number of physicians in our dataset and national statistics on number of practicing physicians in the ambulatory sector. In addition, we may have underestimated the number of home visits if physicians omitted to bill the transport costs associated with a visit, resulting in the classification of the visit as a normal practice consultation.

#### Conclusion

In summary, although the vast majority of physicians in the Canton of Vaud continue to visit patients at home, the overall number of home visits is declining. In the rapidly evolving context of an ageing population and the development of home care, the role of physicians and the way they provide care are changing. An in-depth assessment of the reasons for home visits and home care from the perspective of physicians, patients and home care actors, for example using qualitative methods, would be needed in order to characterise potential gaps and inform policy-makers on possible improvements to the system so that it better meets patient needs. In addition, new models of care currently being developed should address the demand for home visits.

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**Potential competing interests**

SD and NS are practicing GPs and members of the Société Vaudoise de Médecine, which was in charge of organising the duty service in the canton of Vaud.

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