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## **Concurrent heavy use of general and oral health services among Finnish adults**

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**Objective:** The aim was to identify heavy users of public health (PHS) and public oral health (POHS) services and combined and concurrent users of these services.

**Material and methods:** Numbers of 18+ year-old patients and their visits to POHS (12,124 patients) and PHS (28,479 patients) were collected from two patient registers in a Finnish town in 2013. The combined dataset consists of 32,481 patients. Using a highest decile criterion for both for POHS and PHS, those patients who had made 8 or more visits were categorised as heavy users. Patients who had made total of 10 or more visits to the POHS and/or PHS were categorized as combined heavy users. Patients who had made 8 or more visits to both the POHS and PHS were categorised as concurrent heavy users (195 patients).

**Results:** Heavy users of POHS were more often men and those of PHS more often women. Combined heavy users were likely to be women and to be older. The combined heavy users accounted for 40% of all visits of POHS and/or PHS. Among them 30% did not have any POHS visits and 4% did not have any PHS visits. Concurrent heavy use was rare, involving 0.06% of all patients, but made 3.4% of all visits.

**Conclusions:** Of the patients making 10 or more POHS and/or PHS visits, only five percent were concurrent heavy users of both services. As many non-communicable diseases share common risk factors the combined heavy users of PHS should be directed to use POHS and vice versa.

## **Introduction**

Heavy use of services has been defined either as a proportion of the population attending more frequently or as a certain number of visits in a given time (Gill and Sharpe, 1999). The heavy use of general health services has been investigated (Gill and Sharpe, 1999; Vedsted and Christensen, 2005), but heavy use of the oral health care services has been studied less, and mainly in Denmark in older people (Christensen *et al.*, 2014) and in Finland (Nihtilä, 2014). The highest decile of service users accounted for 30–50% of all visits in general practice according to a literature review of 54 studies (Vedsted and Christensen, 2005).

The definition of heavy use (also called frequent attendance) of health services has varied greatly. In general health services it has been defined as a proportion, most often the highest decile or quartile, of patients making the most visits or consultations, or those exceeding a threshold for the number of visits (ranging from 6 to 20), in a given time (Gill and Sharpe, 1999). Studies of oral health services have categorized attendance into deciles (Christensen *et al.*, 2014) or used a threshold of six or more visits (Nihtilä, 2014).

Heavy users of general health services have more often been women, older, unmarried or widowed, have been unemployed or of lower income, and have more often reported loneliness, social problems and problems with alcohol use than non-heavy users (Gill and Sharpe, 1999).

Heavy user patients were also categorized into five subgroups with: a) physical or b) psychiatric illnesses, c) temporarily ongoing severe life situations, d) multiple problems and e) somatizers in a Finnish study (Karlsson *et al.*, 1997). The patients in the multiple problem group had at least three of following conditions: psychiatric illness, one or more chronic physical illnesses, major social difficulties leading to use of social welfare services and interpersonal problems. The somatizers were described as patients with at least three long-lasting physical symptoms that could not be explained by her/his physical illnesses, even though the patients linked the symptoms to the illness.

Other studies have reported comorbidity of physical and psychiatric illnesses and more illnesses such as hypertension, diabetes, obesity and depression among heavy service users (Savageau *et al.*, 2006). Heavy users also attended Emergency Departments more often and missed fewer appointments than non-heavy users.

Finnish adult heavy users of oral health services were shown to be more likely to be women, older, blue-collar workers and pensioners (Nihtilä *et al.*, 2010). Such users had more treating dentists and made more emergency and dental hygienist visits than non-heavy users. They also had more periodontal diseases, more teeth needing restorations, and more general health problems than non-heavy users.

We are not aware of any studies on the concurrent heavy use of general and oral health services, especially in a setting where the entire population is entitled to subsidized public general and oral health services (Niiranen *et al.*, 2008). As many diseases of public health importance share common risk factors such as diet, hygiene, tobacco and

alcohol use, (Sheiham and Watt, 2000) it is likely that same heavy users visit both general and oral health services frequently and might be considered as a burden for general and oral health services. Thus, the aim was to identify heavy users of public health and public oral health services and combined and concurrent users of these services.

## **Materials and methods**

This register study was based on the Public Oral Health Service (POHS) and the Public Health Service (PHS) patient registers of Lohja in Southern Finland. Number of personnel (counted in person-years) providing services for the total population of 47,000 was 119 in PHS and 66 in POHS. Lohja Town Administration, the legal owner of the patient registers, gave research permission for this study in April 2015.

The registers of the POHS and the PHS were combined. We collected information for the numbers of visits by patients aged 18-years or older in the POHS (12,124 patients and 43,582 visits) and PHS (28,479 patients and 102,042 visits) or both (total of 32,481 patients and 145,624 visits) during 2013. Additionally, information on year of birth, gender, visits according staff group i.e. physicians, nurses, dentists and dental hygienists were available. The data were anonymized according to the requirements of the data owner and research ethics.

As suggested in the literature review, the 10% of patients making the most visits were defined as heavy users (Vedsted and Christensen, 2005). According to this criterion

those having made 8 or more visits were categorised as heavy users, both for the POHS and PHS. Those who had made 10 or more visits to the POHS and/or to the PHS were, according to same criteria categorized as combined heavy users. Patients who had made 8 or more visits to both POHS and PHS were categorised as concurrent heavy users.

The distribution of patients, visits and heavy users were calculated according to gender and age. Chi squared tests were used to assess whether the distributions of heavy users differed according to gender and age. Mean numbers of visits per patient and heavy user were calculated, and differences according to gender and age were assessed using Mann-Whitney U test and Kruskal-Wallis test. The level of statistical significance was set to 5% level. SPSS 23 was used for the statistical analyses.

## **Results**

Of the participants, 63% had 0 visits, 10% had 1 visit, 17% had 2–4 visits, 6% had 5–7, and 4% had  $\geq 8$  visits to POHS. Corresponding figures for PHS were: 12% (0 visits), 31% (1 visit), 35% (2–4 visits), 12% (5–7 visits), and 10% ( $\geq 8$  visits).

More women than men attended the POHS (Table 1). The mean number of visits was 3.6. Men made more visits per patient and were more often heavy users than women. Older persons made more visits per patient and were more often heavy users than younger people, except for patients 75+ years old. The heavy users, i.e. the 10% of patients making the most visits, accounted for 29.3% (n=12,757) of all visits.

More women than men attended the PHS (Table 2). The mean number of visits was 3.6. Women made more visits per patient and were more often heavy users than men. Older people made more visits per patient and were more often heavy users than younger people. The heavy users accounted for 37.9% (n=38,663) of all visits.

More women than men were combined patients of the POHS and PHS (Table 3). The mean number of visits was 4.5. Women made more visits per patient and were more often combined heavy users than men. Older people made more visits per patient and were more often combined heavy users than younger people. The combined heavy users accounted for 37.3% (n=54,366) of all visits of POHS and/or PHS.

Associations between visits to POHS and PHS are presented in Table 4. Of the combined heavy users, i.e. those with 10 or more visits to POHS and/or PHS (n=3,660), 195 (5.3%) were concurrent heavy users of POHS and PHS ( $\geq 8$  visits in both), 1042 (28.5%) were heavy users of PHS ( $\geq 8$  visits), 810 (22.1%) heavy users of POHS ( $\geq 8$  visits), and the rest 1613 (44.1%) had 10 or more visits to POHS and/or PHS but were not heavy users in either alone. Among the combined heavy users, 29.9% did not have any POHS visits and 3.8% did not have any PHS visits. The small group of patients that were concurrent heavy users in both the POHS and the PHS (n=195) consisted of 0.6% of all patients but visited 3.4% (n=4903) of all visits with a mean value of 25.1 visits per patient.

## **Discussion**



Of those users who had 10 or more POHS and/or PHS visits, only five percent were concurrent heavy users of both POHS and PHS. One third of them were heavy users of PHS and a quarter were heavy users of POHS. Heavy users were more likely to be women, used 40 percent of all visits and visited the PHS more often than the POHS. The highest proportion of heavy users was found among older people. The heavy users of PHS accounted for 36 percent of PHS visits and the heavy users of POHS accounted for 30 percent of POHS visits. This group of less than one percent of patients used over three percent of all visits.

The strength of this work is that it was possible to easily combine both POHS and PHS registers using social security numbers and the data included all user visits. The population aged 18 years or over in Lohja was 37 500 in the study year, of whom 32% visited POHS and 76% visited POH that year. The difference in attendance might reflect historically accumulated demand as the adult population was only been entitled to subsidized public dental care after 2001-2002 (Niiranen *et al.*, 2008). The coverage of POHS was higher than in a national survey (24%). We did not have information on the proportion of the Lohja population using private dental care, which was 34% on a national level (Suominen *et al.*, 2017). The data did not contain information on dental needs or further demographics such as marital or socio-economic status. Thus, the results cannot be generalized to national or international level.

We could not find other studies on concurrent use of POHS and PHS, but our results are similar to those of other studies where heavy users of either oral or general health services were more likely to be women and older than the non-heavy users. The

proportion of heavy users accounting for all visits was also rather similar to the 24% and 32% found in previous Finnish studies (Nihtilä, 2014; Jyväskylä, 2001) but lower than the 52% among the elderly in Denmark (Christensen *et al.*, 2014). The 10% of heaviest users also accounted for 81% of all health expenses in a Finnish study (Leskelä *et al.*, 2013).

There was also a difference in visiting in the POHS and the PHS according to staff group. The proportion of visits to the PHS for nurses was almost treble to the visits to the POHS for hygienists. The difference in the number of visits was even greater. This might lead to different cost-effectiveness between the POHS and the PHS. The number of visits to PHS nurses was more than double the number to hygienists in the POHS. The POHS could learn from PHS to make more use of skill mix, especially in preventive and periodontal care. There has been a division of work from dentists towards dental hygienists but this change has been slow due to challenges faced after the major reform (Widström *et al.*, 2019). More detailed information about patients' health and persistent heavy use would also help to develop the services in the most cost-effective way.

A novel finding in the combined group of the POHS and PHS was that a large proportion of PHS heavy users did not use POHS. According to the Finnish National Health 2000 Survey, 74% of men and 70% of women had periodontal pocketing and the corresponding figures in 2011 were 61% and 58% (Suominen *et al.*, 2018). Apical periodontitis was observed in 31% of men and in 23% of women in 2000 (Huumonen *et al.*, 2017). Oral infections may cause systemic low grade infection, which is associated

to many general illnesses (Holmstrup *et al.*, 2017). The heavy users of the oral or general health services are also known to have more illnesses than non-heavy users (Savageau *et al.*, 2006; Nihtilä, 2014). Thus, it would be important that heavy users of either POHS or PHS are examined by both dentists and physicians. Referring patients with chronic conditions such as diabetes or cardiovascular diseases from PHS (where patients visit regularly), to the POHS which has lower coverage is important as treating oral diseases can improve their chronic conditions. Thus, PHS and POHS could collaborate closely to find ways to improve access for those at high risk.

One way to support heavy users of POHS and/or PHS is to arrange their health services by the chronic care model (CCM) (Davy *et al.*, 2015). The primary aim of CCM and related models is to reduce fragmentation, while at the same time improving health outcomes at an acceptable cost to the healthcare system by addressing health systems, self-management support, delivery system designs as well as community and family support. In addition, the common risk factor approach addresses risk factors such as diet, hygiene, tobacco and alcohol use, that are common to many chronic conditions, within a wider socio-environmental context (Sheiham and Watt, 2000).

## **Conclusion**

The small proportion of concurrent heavy users of both PHS and POHS indicates that these services cover different patient groups. As many non-communicable diseases share common risk factors and as POHS have lower coverage, heavy PHS users should be directed to use POHS.

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**Table 1. Patient attendance at Public Oral Health Services by type of clinician, heavy use ( $\geq 8$  visits), gender and age.**

	Patients (n=12,124) %	Visits (n=43,582) %	Dentist visits (n=36,456) %	Hygienist visits (n=7,126) %	Heavy users (n=1,213) %	$p^1$	Visits by the heavy users (n=12,757) %	Mean number of visits	$p^2$
All			83.6	16.4	10.0		29.3	3.6	
Female	57.2	56.4	82.9	17.1	9.5	0.043	28.4	3.5	<0.001
Male	42.8	43.6	84.6	15.4	10.6		30.5	3.7	
18-34y	26.1	25.0	83.7	16.3	8.6	0.002	25.6	3.5	
35-49y	29.0	28.2	83.7	16.3	9.6		28.4	3.5	
50-64y	25.5	26.6	83.7	16.3	10.7		30.8	3.8	
65-74y	11.9	12.5	83.8	16.2	12.1		33.5	3.8	
75+	$p^2$	7.6	82.7	17.3	10.8		32.3	3.5	

$p^1$ , chi squared test for differences in the proportion of heavy users by age and gender;

$p^2$ , Mann-Whitney U test for difference in number of visits by gender and Kruskal-Wallis test for age.



**Table 2. Patient attendance at Public Health Services by type of clinician, heavy use ( $\geq 8$  visits), gender and age.**

	Patients n=28,479 %	Visits n=102,042 %	Physician visits n=60,388 %	Nurse visits n=41,654 %	Heavy users n=3105 %	$p^1$	Visits by the heavy users n=38,663 %	Mean number of visits	$p^2$
All			59.2	40.8	10.9		37.9	3.6	
Female	56.3	60.0	61.3	38.7	12.4	<0.001	40.0	3.8	<0.001
Male	43.7	40.0	56.0	44.0	9.0		34.7	3.3	
18-34y	24.0	21.0	60.7	39.3	8.6	<0.001	32.3	3.1	<0.001
35-49y	21.4	19.4	62.7	37.3	8.9		35.6	3.2	
50-64y	23.2	22.1	62.3	37.7	9.7		35.2	3.4	
65-74y	17.3	19.1	53.8	46.2	12.1		38.6	4.0	
75+	14.1	18.4	55.5	44.5	18.4		49.1	4.7	

$p^1$ , chi squared test for differences in the proportion of heavy users by age and gender;

$p^2$ , Mann-Whitney U test for difference in number of visits by gender and Kruskal-Wallis test for age.

Table 3. Patient attendance at Public Oral Health Services and/or Public Health Services Combined by type of clinician, heavy use ( $\geq 10$  visits), gender and age.

	Patients n=32,481 %	Visits n=145,624 %	Dentist or physician visits n=96,844 %	Hygienist or nurse visits n=48,780 %	Heavy users n=3,660 %	$p^1$	Visits by the heavy users n=54,366 %	Mean number of visits	$p^2$
All			66.5	33.5	11.3		37.3	4.5	
Female	55.3	58.9	67.5	32.5	12.6	<0.001	39.3	4.8	<0.001
Male	44.7	41.1	65.1	34.9	9.6		34.6	4.1	
18-34y	24.1	22.2	68.4	31.6	9.7	<0.001	33.6	4.1	<0.001
35-49y	23.3	22.0	70.7	29.3	10.1		35.8	4.2	
50-64y	23.9	23.5	69.6	30.4	10.6		35.9	4.4	
65-74y	15.8	17.1	60.4	39.6	12.4		38.9	4.8	
75+	12.9	15.2	59.6	40.4	16.0		45.5	5.3	

$p^1$ , chi squared test for differences in the proportion of heavy users by age and gender;

$p^2$ , Mann-Whitney U test for difference in number of visits by gender and Kruskal-Wallis test for age

**Table 4. Numbers of visits per patient to Public Oral Health Service (POHS) and Public Health Service (PHS).**

		Visits to POHS											Total	n <sub>CHU</sub>
		0	1	2	3	4	5	6	7	8	9	10+		
Visits to PHS	0	0	1,300	787	569	435	302	170	140	103	58	138	4,002	138
	1	8,113	561	374	290	210	162	112	68	47	44	95	10,076	139
	2	4,105	382	281	249	197	108	100	49	43	30	78	5,622	151
	3	2,372	294	195	162	113	109	65	47	40	27	62	3,486	176
	4	1,547	205	187	127	89	65	44	26	30	19	46	2,385	165
	5	1,092	140	113	77	70	48	35	35	21	21	34	1,686	194
	6	742	112	93	65	47	44	30	21	20	7	21	1,202	190
	7	579	91	71	54	32	25	18	13	11	6	17	917	176
	8	409	61	42	40	28	18	22	20	<b>4</b>	<b>5</b>	<b>21</b>	670	200
	9	304	63	43	27	18	14	15	7	<b>6</b>	<b>6</b>	<b>11</b>	514	210
	10+	1,094	163	130	124	96	75	48	49	<b>30</b>	<b>34</b>	<b>78</b>	1,921	827
Total		20,357	3,372	2,316	1,784	1,335	970	659	475	355	257	601	32,481	
n <sub>CHU</sub>		1,094	226	215	245	221	224	212	218	205	199	601		3,660

**Grey area:** Combined heavy users (CHU) of POHS and/or PHS (total of  $\geq 10$  visits to the POHS and/or to the PHS). Square with bolded numbers indicates concurrent heavy users of both POHS and PHS ( $\geq 8$  visits to both POHS and PHS, n=195)

