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Trends in the receipt of medicines information among Finnish adults in 1999–2014: a nationwide repeated cross-sectional survey

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Title	**Trends in the receipt of medicines information among Finnish adults in 1999–2014: a nationwide repeated cross-sectional survey**
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ABSTRACT

Objective

The aim of this study is to examine long-term trends in the receipt of medicines information (MI) among adult medicine users from 1999 to 2014.

Design

Annually repeated cross-sectional postal survey from years 1999, 2002, 2005 and 2008-2014.

Setting

Survey was sent to a nationally representative sample of the Finnish population aged 15-64 years drawn from the population register.

Participants

In total, 29465 men and women of whom 18862 (64%) reported using medicines, the range of annual respondents 2545-3371 and response rates 51-67%.

Outcome measures

Receipt of information on medicines in use within 12 months prior to the survey from a given list of consumer MI sources available in Finland.

Results

Physicians, community pharmacists and package leaflets were the most common MI sources throughout the study period of 1999-2014. Receipt of MI increased most from the Internet (from 1% in 1999 to 16% in 2014), while decreased most from physicians (62% to 47%) and package leaflets (44% to 34%), and remained stable from community pharmacists (46% to 45%) and nurses (14% to 14%). In 1999, of the medicine users 4% did not report receipt of MI from any of the sources listed in the survey, while this proportion had remarkably increased to 28% in 2014.

Conclusions

In this longitudinal analysis of adult medicine users' receipt of MI about the medicines they use, healthcare professionals and package leaflets had still a dominating importance in 2014 despite the growing number of novel and innovative MI sources available. Internet is still quite a rare source of MI when considering the entire adult population. Factors contributing to a growing number of adult medicine users not receiving MI from any sources should be better understood and focused in future research.

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Strengths and limitations of this study

- The key strength of this study is that it examines trends in the receipt of medicines information among adult population during ten years period between 1999 and 2014, covering all medicine user groups.
- The annual response rates were reasonably high, and the repeated nationally representative population surveys allow for examination of trends over time at the population level and make the results generalizable to the Finnish adult population.
- Due to the cross-sectional method without cohorts, it is not possible to follow up changes in the receipt of medicines information over time at the individual level.
- The data did not provide any information about the quality, validity or amount of the medicines information received.
- Factors contributing to a growing number of adult medicine users not receiving medicines information from any sources should be better understood and focused in future research.

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INTRODUCTION

Consumer access to health and medicines information (MI) has dramatically improved during the last decades.[1-7] Driving forces for more open access to MI have been drug safety issues, patients' right to know about medicinal interventions that they are exposed to and tendency to empower people in taking more responsibility for self-management of their diseases.[2,4,7] These changes have been facilitated by improved availability of balanced MI, first on paper and after the breakthrough of the Internet via websites and databases, then via electronic devices such as smartphones. The electronic applications are evolving fast towards digitalized systems for growingly customized MI, interactive communications and follow up treatments.[1,3,4,8-10] Improved communications on medications have also been a strategic priority of healthcare providers taken into account in national and international medicines policies, e.g. within the European Union.[2,4,11-16]

Consumers' health information seeking, including MI seeking from various information sources and factors influencing it have been widely researched.[17-20] Previous research on the receipt of MI among the adult population have either focused on 1) particular patient groups such as asthmatics,[21] people with cancer,[22] cardiovascular diseases,[23] HIV/AIDS,[24] mental disorders[25] or vasculitis,[26] 2) pregnant women,[27,28] or 3) focused on certain medicine user groups such as users of hormone replacement therapies,[29-31]analgesics,[32,33] antidepressants,[34] antihypertensives,[35] cardiovascular medicines[36] or psychotropics.[37] Studies involving heterogenous medicine user groups have mostly applied single cross-sectional study designs.[38-46] We found only one study that compared results from two years, covering a 7-year period.[47] The consistent findings from the previous studies are that physicians, community pharmacists and package leaflets are the most common sources of MI regardless of the research method, the study year, the research population or the country where the research was conducted.[21-47] It is known that consumers usually sought MI from one or two information sources.[28,34,39,43,44] The use of the Internet as a source of MI has become more common over time, but it is not yet as common as healthcare professionals for seeking MI among most patients and medicine users.[22,24-26,30,31,33-35,38-40,42,44-46] However, there is a lack of long-term population-based studies describing trends in the receipt of MI among adult medicine users. The aim of this study was to examine long-term trends in the receipt of MI among Finnish adult medicine users in 1999-2014.

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METHODS

Context

Similarly to many developed countries, availability of and access to consumer MI has dramatically improved in Finland during the last decades.[2,4,7] Until 1983, people received information about medicines they used solely from physicians.[7,48] The remarkable landmarks towards more open access to MI have been pharmacists' duty counsel on prescription and non-prescription medicines in 1983, followed soon after in 1986 by the launch of the first computerized database system to produce leaflets for consumers in community pharmacies. Package leaflets became mandatory in Finland as in other European Union countries in 1999.[49] About the same time, the Internet and mobile phones started to become more common and eventually revolutionized access to health and MI. "From paper the cyber" shift has improved access to statutory MI, e.g. by making package leaflets available online in written and audio format,[50,51] but most powerful has been the diversification of MI sources and empowering people to access MI by themselves. A wide range of stakeholders from the drug industry to non-profit professional and patient organisations have been involved in developing new databases and modes for communicating on medicines to consumers. To coordinate MI practices and enhance public-private partnerships, the European Union has recommended its member states to establish national MI programs and strategies.[13] Such a strategy was established for the first time in Finland in 2012 by the Finnish Medicines Agency.[2] The ultimate goal of the Finnish MI strategy is to improve adherence to long-term therapies by enhanced MI by 2020.

Study design

The study was conducted as an annually repeated cross-sectional postal survey using a national representative sample of the Finnish adult population aged 15-64 years. The data were derived from the national postal survey "Health Behaviour and Health among the Finnish Adult Population" which has been conducted annually from 1978 to 2014 by the National Institute for Health and Welfare (formerly the National Public Health Institute).[52] The primary objective of the survey has been to obtain evidence on the health behaviour of the working-age population and on its short- and long-term changes.

Annually, a random representative sample of 5000 Finnish citizens, aged 15-64 years and residing permanently in Finland was derived from the National Population Register Centre. The sample was made nationally representative of the non-institutionalized adult population.[52] A postal survey was mailed each year in the spring followed by three reminders to non-respondents within the following two months. The current study focuses on a question related to receipt of MI from various sources

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available at the point of the survey. Data from the years 1999, 2002, 2005, 2008-2014 was compared as these are the years when the survey instrument included the question on the receipt of MI.

Survey instrument and measures

The main outcome measure was the receipt of MI on medicines in use. The structured survey instrument contained the following question "In the past year (12 months), from which sources did you receive information on the medicines you have been using?" The question was followed by a list of MI sources available for consumers in Finland at the time of the study (Fig. 1). Respondents could indicate from the list as many information sources as applicable. It was not possible to report other sources than those mentioned in the survey. In 2002, package leaflets and telephone services (call centre) were added to the list of MI sources.

Socio-demographic variables used in this study were gender and age the year of birth. Health-related variables used were respondents' medicine use and diagnosed diseases. Use of medicines was assessed by the question "Have you used any tablets, powders, or other medicines within the past week (7 days)?" This question was followed by a list of commonly used prescription and non-prescription medicines for common chronic and acute conditions (Table 1). Respondents could indicate from the list as many medicines as they had been using within 7 days' time frame prior to the survey. It was not possible to report any other medicines other than those mentioned in the list. Diagnosed diseases were asked about with a question "Within the past year (12 months), have you had any of the following diagnosed diseases or diseases treated by the physicians?" This question was followed by a list of chronic and acute diseases common in Finland (Table 1). Respondents could indicate from the list as many diseases as they had been suffering from within the year prior to the survey. It was not possible to report any other diseases than those mentioned in the list.

Analysis

Descriptive statistics were conducted using the Statistical Package for Social Sciences software (IBM SPSS Statistics for Windows, Released 2016, Version 24.0. Armonk, NY: IBM Corp.). Only respondents who reported using at least one prescription or non-prescription medicine during the given 7 days' time frame prior to the survey were included in the analysis as medicine users.

Trends in the receipt of MI from different information sources and the number of MI sources used by the respondent were counted for each study year 1999-2014 (Fig. 1 and 2). The number of MI sources from which the respondents had received information on the medicines they used was divided into seven groups: no sources, one, two, three, four, five and six or more sources.

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The receipt of MI from different information sources was plotted against gender, age, number of medicines in use and number of diagnosed diseases for each study year 1999-2014 (Appendix A, B). Age calculation was based on the year of birth, and the respondents were divided into five age groups (Table 1).

The number of medicines in use was counted for each respondent and respondents were divided into four groups accordingly: people with one, two, three, and four or more medicines in use (Table 1). The receipt of MI was compared between all these four medicine user groups (Appendix B). Also, the number of diagnosed diseases was counted for each respondent and respondents were divided into four groups: no diseases, one, two, three or more diseases (Table 1). The receipt of MI was compared between all these groups (Appendix B).

Finally, a ratio between the mean number of medicines in use and the mean number of diagnosed diseases compared to the mean number of MI sources from which MI was received was calculated to indicate whether any remarkable changes were seen over time in the number of MI sources used in relation to morbidity and medicine use.

Patient and public involvement

Patient perspective was taken into account in designing the research question, method and developing the survey instrument by reviewing previous international and national research on receipt of MI in different populations and patient groups.[6,53-55] The survey instrument on MI sources was piloted by a convenience sample of the target group. The results of the study have not been sent to the study participants for comments, but the annual reports of the Health Behaviour and Health among the Finnish Adult Population Survey are available on the website of the Finnish National Institute for Health and Welfare.[52]

Research ethics

As this study was a secondary analysis using routinely collected and fully anonymized data, ethics approval was not applicable, because anonymous surveys are exempt from ethical approval in Finland.[56] Responding to the survey was voluntary and considered as giving an informed consent. All study procedures were conducted according to good scientific practice.

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RESULTS

A total of 29465 responses were included in this study, of which 18862 (64%) reported use of medicines (Table 1). The number of respondents varied annually from 2545 to 3371 (response rate 51% to 67%) during the study period 1999-2014 (Table 1). The gender distribution of the respondents who reported using medicines (n=18862) remained similar throughout the study period with almost two thirds of the respondents being female (61% to 64%). Age groups of 45-54 and 55-64 years were the largest, and the annual mean age varied between 41 and 45 years. Most of the respondents had more than primary school education (>9 years, 73% to 88%), and the majority were at work (79% to 83%). The respondents used most commonly one medicine (54% to 63%, including prescription and non-prescription medicines), reported using medicines most commonly for headaches (50% to 53%) and other aches or pains (28% to 31%). More than a quarter of the medicine users reported having at least one diagnosed disease of the diseases listed in the survey (26% to 29%). The most common diseases reported were high blood pressure or hypertension (18% to 25%), high blood cholesterol (13% to 21%), hay or allergic rhinitis (15% to 18%), and degenerative disk disease or other back illness (13% to 15%).

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Table 1. Characteristics of the respondents (n=29465) according to study year. The percentages are calculated from the total number of the respondents each year or of the respondents reporting use of at least one prescription or non-prescription medicine within 7 days prior to survey (n=18862)[a].

		Study year									
Characteristics	Total[b] n (%)	1999 n (%)	2002 n (%)	2005 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)	2013 n (%)	2014 n (%)
Number of respondents (response rate)	29465 (59)	3371 (67)	3259 (65)	3287 (66)	3216 (64)	2943 (59)	2826 (57)	2787 (56)	2601 (52)	2545 (51)	2630 (53)
Respondents using medicines	18862	1944	2000	2038	2101	1957	1871	1844	1759	1677	1671
Gender[c]											
Female	11859 (63)	1217 (63)	1278 (64)	1258 (62)	1332 (63)	1235 (63)	1181 (63)	1128 (61)	1101 (63)	1061 (63)	1068 (64)
Male	7003 (37)	727 (37)	722 (36)	780 (38)	769 (37)	722 (37)	690 (37)	716 (39)	658 (37)	616 (37)	603 (36)
Age (years)[c]											
15-24	2535 (13)	314 (16)	308 (15)	269 (13)	270 (13)	263 (13)	255 (14)	231 (13)	211 (12)	199 (12)	215 (13)
25-34	2798 (15)	331 (17)	308 (15)	302 (15)	305 (15)	287 (15)	258 (14)	277 (15)	251 (14)	240 (14)	239 (14)
35-44	3409 (18)	419 (22)	411 (21)	394 (19)	376 (18)	335 (17)	304 (16)	318 (17)	292 (17)	275 (16)	285 (17)
45-54	4558 (24)	481 (25)	486 (24)	491 (24)	490 (23)	460 (24)	484 (26)	438 (24)	430 (24)	411 (25)	387 (23)
55-64	5562 (29)	399 (21)	487 (24)	582 (29)	660 (31)	612 (31)	570 (31)	580 (32)	575 (32)	552 (33)	545 (33)
Mean age (Standard deviation)	43.9 (14.1)	41.2 (13.9)	42.1 (14.0)	43.6 (14.0)	44.3 (14.1)	44.2 (14.3)	44.3 (14.3)	44.4 (14.1)	44.9 (14.1)	45.0 (14.1)	44.6 (14.3)
Education level[c]											
Primary school or lower (≤9 years)	3048 (16)	499 (26)	444 (22)	402 (20)	351 (17)	306 (16)	253 (14)	226 (12)	222 (13)	170 (10)	175 (10)
Higher than primary school (>9 years)	15495 (82)	1420 (73)	1499 (75)	1608 (79)	1705 (81)	1621 (83)	1590 (85)	1591 (86)	1517 (86)	1482 (88)	1462 (87)
Working status[c]											
Working[d]	12043 (81)	-	-	1601 (79)	1701 (81)	1588 (81)	1495 (80)	1516 (82)	1426 (81)	1331 (79)	1385 (83)
Not working[e]	2766 (19)	-	-	430 (31)	396 (19)	366 (19)	373 (20)	299 (16)	310 (18)	315 (19)	277 (17)
Respondents using medicines for[c]											
Headache	9806 (52)	1039 (53)	1032 (52)	1026 (50)	1073 (51)	1024 (52)	980 (52)	981 (53)	901 (51)	866 (52)	884 (53)
Ache, pain (other than headache)	5467 (29)	556 (29)	549 (28)	592 (29)	604 (29)	541 (28)	531 (29)	550 (30)	544 (31)	508 (30)	492 (29)
High blood pressure	4077 (22)	291 (15)	367 (18)	429 (21)	465 (22)	450 (23)	434 (23)	446 (24)	409 (23)	395 (24)	391 (23)
Contraception (oral)	2310 (12)	264 (14)	296 (15)	247 (12)	258 (12)	238 (12)	223 (12)	193 (11)	188 (11)	199 (12)	204 (12)
High blood cholesterol	2196 (12)	98 (5)	143 (7)	217 (11)	263 (13)	296 (15)	290 (16)	235 (13)	217 (12)	211 (13)	226 (14)
Women's hormone replacement therapy	2036 (11)	233 (12)	266 (13)	233 (11)	222 (11)	188 (10)	188 (10)	166 (9)	198 (11)	174 (10)	168 (10)
Cough	1316 (7)	220 (11)	186 (9)	168 (8)	160 (8)	113 (6)	77 (4)	111 (6)	101 (6)	103 (6)	77 (5)
Insomnia	1497 (8)	136 (7)	153 (8)	153 (8)	179 (9)	177 (9)	140 (8)	139 (8)	134 (8)	146 (9)	140 (8)
Sedation	915 (5)	133 (7)	93 (5)	121 (6)	102 (5)	94 (5)	70 (4)	85 (5)	76 (4)	69 (4)	72 (4)
Men's sexual potency dysfunction	252 (1)	13 (1)	20 (1)	28 (1)	26 (1)	21 (1)	26 (1)	37 (2)	34 (2)	19 (1)	28 (2)
Depression	1314 (7)	-	111 (6)	143 (7)	148 (7)	176 (9)	136 (5)	147 (8)	173 (10)	134 (8)	146 (9)
Diabetes (other than insulin)	705 (4)	-	-	72 (4)	82 (4)	88 (4)	88 (5)	80 (4)	98 (6)	91 (5)	106 (6)
Diabetes (insulin)	361 (2)	-	-	46 (2)	49 (2)	46 (2)	47 (3)	51 (3)	36 (2)	50 (3)	36 (2)
Number of medicines in use/person[c]											
1	10558 (56)	1215 (63)	1183 (59)	1143 (56)	1154 (55)	1060 (54)	1029 (55)	1011 (55)	946 (54)	907 (54)	910 (54)
2	5116 (27)	505 (26)	559 (28)	566 (28)	584 (28)	536 (27)	512 (27)	491 (27)	492 (28)	442 (26)	429 (26)

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3	1984 (11)	161 (8)	166 (8)	198 (10)	221 (11)	220 (11)	210 (11)	210 (11)	191 (11)	208 (12)	199 (12)
>3	1204 (6)	63 (3)	92 (5)	131 (6)	142 (7)	141 (7)	120 (6)	132 (7)	130 (7)	120 (7)	133 (8)
Respondents with diagnosed diseases[c,f]											
High blood pressure, hypertension	4297 (23)	345 (18)	426 (21)	465 (23)	496 (24)	478 (24)	443 (24)	468 (25)	421 (24)	379 (22)	376 (23)
Degenerative disc disease, other back illness	2712 (14)	262 (14)	284 (14)	314 (15)	321 (15)	263 (13)	260 (14)	272 (15)	260 (15)	227 (14)	249 (15)
Asthma	1163 (6)	113 (6)	114 (6)	112 (6)	120 (6)	132 (7)	125 (7)	113 (6)	120 (7)	99 (6)	115 (7)
Digestive illness (gastritis catarrh, gastritis, ulcer)	904 (5)	96 (5)	97 (5)	108 (5)	110 (5)	93 (5)	91 (5)	70 (4)	85 (5)	89 (5)	65 (4)
Coronary disease, angina pectoris (= chest pain during exercise)	414 (2)	66 (3)	48 (2)	52 (3)	47 (2)	35 (2)	41 (2)	34 (2)	31 (2)	26 (2)	30 (2)
Diabetes	1092 (6)	50 (2)	78 (4)	113 (6)	121 (6)	129 (7)	121 (7)	110 (6)	124 (7)	108 (6)	138 (8)
Rheumatoid arthritis	396 (2)	46 (2)	36 (2)	37 (2)	46 (2)	37 (2)	40 (2)	41 (2)	44 (3)	37 (2)	32 (2)
Chronic bronchitis, pulmonary emphysema	322 (2)	34 (2)	30 (2)	35 (2)	38 (2)	52 (3)	28 (2)	36 (2)	20 (1)	22 (1)	27 (2)
Coronary thrombosis, myocardial infarction	118 (1)	9 (1)	13 (1)	13 (1)	13 (1)	8 (<1)	11 (1)	17 (1)	10 (1)	9 (1)	15 (1)
High blood cholesterol	2913 (17)	-	267 (13)	338 (17)	356 (17)	409 (21)	368 (20)	319 (17)	282 (16)	287 (16)	287 (17)
Depression	1242 (8)	-	-	173 (9)	175 (8)	178 (9)	134 (7)	150 (8)	161 (9)	124 (7)	147 (9)
Other mental health disorder	534 (4)	-	-	64 (3)	73 (4)	66 (3)	47 (3)	82 (4)	65 (4)	73 (4)	64 (4)
Cancer	206 (1)	-	-	29 (1)	26 (1)	26 (1)	28 (2)	23 (1)	34 (2)	23 (1)	17 (1)
Hay or allergic rhinitis	2044 (16)	-	-	-	340 (16)	292 (15)	275 (15)	272 (15)	283 (16)	275 (16)	307 (18)
Food allergy	580 (5)	-	-	-	85 (4)	84 (4)	92 (4)	78 (4)	85 (5)	72 (4)	84 (5)
Number of diagnosed diseases/person[c,f]											
0	8590 (46)	1228 (63)	1121 (56)	971 (48)	850 (40)	772 (39)	796 (43)	746 (40)	705 (40)	712 (42)	689 (41)
1	5176 (27)	502 (26)	527 (26)	593 (29)	605 (29)	546 (28)	482 (26)	517 (28)	499 (28)	455 (27)	450 (27)
2	2924 (16)	151 (8)	232 (12)	270 (13)	367 (17)	358 (18)	335 (18)	345 (19)	302 (17)	279 (17)	285 (17)
>2	2172 (12)	63 (5)	120 (6)	204 (10)	279 (13)	281 (14)	258 (14)	236 (13)	253 (14)	231 (14)	247 (15)

[a]Discrepancies in totals are due to rounding errors, [b]Calculated from study years available, [c]Percentages have been calculated for the respondents of each year who reported using medicines, including prescription and non-prescription medicines (list in the survey) during the last week (7 days), [d]Including at work, partly at work, laid off, student, homemaker, on sick leave (>6 months), or otherwise out of work, [e]Including retired and unemployed, [f]Respondents who had a disease (list in the survey) diagnosed by a physician during the last year (12 months).

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Medicines information sources among adult medicine users

The most commonly reported MI sources were physicians, community pharmacists and package leaflets throughout the study period 1999-2014 among adult medicine users (n=18862) (Fig. 1). These information sources were most common despite gender, age, number of medicines in use or diagnosed diseases (Appendix A,B). Receipt of MI from physicians (from 62% in 1999 to 47% in 2014) and package leaflets (44% to 34%) decreased most during the study period, while remained stable from community pharmacists (46% to 45%) and nurses (14% to 14%) (Fig. 1). In 1999, of the medicine users 17% (n=335/1944) did not report any healthcare professionals (physicians, community pharmacists or nurses) as their source of MI, and by 2014 the proportion had grown to 38% (n=639/1671). The use of the Internet as MI source increased rather steadily being 1% in 1999 and 16% in 2014.

Add figure 1 in here.

The number of MI sources from which medicine users (n=18862) reported receipt of MI changed over the study period 1999-2014 (Fig. 2). The most noticeable decreases occurred in those who reported receipt of MI from one (47% to 21%) or two (30 % to 22%) sources. The number of medicine users receiving MI from more than two sources increased moderately. In 1999, of the medicine users 4% (n=77/1944) did not report receipt of MI from any of the information sources listed in the survey, while this proportion had increased to 28% (n=467/1671) in 2014.

Add figure 2 in here.

Receipt of medicines information and associated factors

Gender and age influenced the receipt of MI throughout the study period 1999-2014 (Appendix A). Women reported receiving MI from all information sources listed in the survey more commonly than men during the study period. Receipt of MI from physicians decreased most among women (from 66% in 1999 to 48% in 2014) and among medicine users aged over 45 years (75% to 52%). Receipt of MI from package leaflets decreased both in women (48% to 38%) and men (36% to 26%), while remained nearly unchanged from community pharmacists (51% to 47% in women vs. 37% to 42% in men). The receipt of MI from community pharmacists increased most among medicine users aged 55-64 years (34% to 46%), and decreased most among medicine users aged 33-44 years (55% to 43%). Package leaflets, relatives and friends were reported to be most common MI sources for medicine users under 25 years, although receipt of MI from package leaflets (59% to 37%) and from relatives and friends (35% to 16%) decreased most in this age group. Receipt of MI from the Internet increased

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in both genders, slightly more in women than in men (2% to 18% vs. 1% to 12%, respectively), and in all age groups, most among medicine users aged 25-34 years (2% to 21%) and 15-24 years (2% to 20%). More male (6% to 33%) than female (3% to 25%) and more medicine users under 45 years (5% to 33%) than medicine users 45 years or older (3% to 25%) did not report receipt of MI from any of the information sources listed in the survey during the study period.

The number of medicines in use and the number of diagnosed diseases influenced the receipt of MI (Appendix B). In general, as the number of medicines in use or the number of diagnosed diseases increased, the number of different MI sources increased. However, the opposite changes occurred in the receipt of MI from physicians, the proportion of medicine users receiving MI from physicians decreased 14-26% depending on the number of medicines in use or the number of diagnosed diseases, the highest decline occurring for medicine users with two medicines (76% to 52%) and for medicine users with two diagnosed diseases (83% to 57%). The number of medicines and the number of diagnosed diseases had the opposite influence on the receipt of MI from community pharmacists. The receipt of MI from community pharmacists increased most in medicine users with three medicines (47% to 59%) and in those with three or more diagnosed diseases (49% to 63%), whereas the receipt of MI decreased most in medicine users with one medicine (44% to 38%) and in those medicine users without any diagnosed diseases (45% to 34%). Receipt of MI package leaflets decreased mainly in all medicine users, most in those with one (40% to 28%) or two (48% to 35%) medicines in use and in medicine users without any diagnosed diseases (44% to 30%) or in those with one diagnosed disease (43% to 31%). Receipt of MI from the Internet increased in all medicine users regardless the number of medicines in use or the number of diagnosed diseases, most among respondents with two (1% to 19%) and four or more medicines (5% to 22%), and respondents with three or more diagnosed diseases (3% to 23%). Respondents using one (6% to 35%) or two (1% to 24%) medicines and medicine users without any diagnosed disease listed in the survey (5% to 38%) or with one disease (2% to 25%) most commonly did not report receipt of MI from any of the information sources listed in the survey during the study period.

Overall, the mean number of medicines in use and the mean number of diagnosed diseases increased slightly among medicine users, while the mean number of MI sources from which MI was received remained relatively stable during the study period 1999-2014 (Fig. 3). The ratio between the mean number of medicines in use and the mean number of MI sources from which MI was received remained relatively stable, but the ratio between the mean number of diagnosed diseases and the mean number of MI sources increased.

Add figure 3. in here.

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DISCUSSION

To our knowledge, this is the first study analyzing long-term national trends in the receipt of MI among adult population. The 15-year period covered in this study (1999-2014) provides unique insights into how improved consumer access to MI and the shift from paper to cyber have influenced receipt of MI from various sources. It seems that the key MI sources (physicians, community pharmacists, package leaflets) have remained similar which is in line with previous studies.[21-47] Surprising was that even though the availability and the use of MI sources has diversified among the adult population, an increasing number of medicine users did not report receipt of MI from any of the sources. The proportion of medicine users who did not reporting receiving MI from any of the listed sources became 7-fold during the study period (4% to 28%). Furthermore, the proportion of those who did not report receiving MI on medicines they used from any of the healthcare professionals more than doubled from 17% in 1999 to 38% in 2014. Particularly, MI received from the physicians declined over time. The decline was similar (22-26%) in respondents using 2 or more medicines or having or not having diagnosed diseases. According to age, the decline was most evident among medicine users 45 years and older. These findings may indicate the fact that physicians' involvement in patient care has diminished due to changes in the healthcare system and limited resources. Consequently, those medicine users who were dependent on MI received from their physicians do not have that source available anymore. It also seems that community pharmacists have become more common sources of MI for people with multiple medications instead of physicians, but nurses have not replaced physicians as a MI source. In the future, special attention should be paid to the receipt of MI among people with multiple diseases and medications and the aging populations whose proportion is growing.

Our findings indicate that MI is not evenly distributed among medicine users, it may have become more unevenly distributed over time. According to the present study, gender, age, number of medicines in use and number of diseases influence the receipt of MI. During the study period, women, people aged 45 years or older, people with three or more medicines in use and people with three or more diagnosed diseases received MI more commonly on their medicines than other adult medicine users. These findings are in line with other cross-sectional studies.[23,25,26,40,41] Other previous studies have shown that MI seeking behavior and the use of MI sources is usually influenced by gender and age, but also education, ethnic background, income, employment, health status and medical history.[27,34,39] Potential reasons and system-based root causes for differences in the receipt of MI among medicine users need to be addressed in future research. Our example from Finland demonstrates that availability of a wide range of MI sources does not necessarily guarantee their actual and evenly distributed use among medicine users.

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This study indicates that the receipt of MI from the Internet is still quite rare when the entire adult population is considered. By 2014, only 16% of medicine users reported that they had received information on medicines they used from the Internet. According to previous studies, use of the Internet as a source of MI has varied between 4% and 29% in the 2000s.[22,25,31,33,34,39,40,42,44-46] It is also known that some patient and medicine user groups use the Internet considerably more (59-68%) than the adult population in general, e.g. patients with chronic conditions and pregnant women.[27,28,41] Thus, if we want to reach the majority of the adult population, we could not solely count on the Internet-based MI sources and services. Further population-based research is needed to get a more comprehensive understanding of the importance and usage patterns of the Internet as a MI source, also the opportunities it provides for improving MI for various medication user segments.

Strengths and limitations of this study

The annual response rates were reasonably high, and the repeated nationally representative population surveys allow for examination of trends over time at the population level and make the results generalizable to the Finnish adult population. The overall annual response rates decreased from 67% to 53% during the study period, but the response rates of medicine users increased from 58% to 64%. The decreasing response rates in our study follow a more general phenomenon of decreasing response rates for postal population surveys.[57] Due to the cross-sectional method without cohorts, it is not possible to follow up changes in the receipt of MI over time at the individual level. The respondents did not have the opportunity to report MI from other sources than those listed in the survey and to report separately MI sources on prescription and non-prescription medicines. The data did not provide any information about the quality, validity or amount of the MI received.

Implications and future research

The strategic development of MI will continue both nationally and internationally in order to ensure the availability and access to reliable, up-to-date and high quality MI and MI sources.[2,4,13,58] As part of this work, it is necessary to continue research on trends in the receipt of MI at the population level and to identify population groups needing special attention in this respect. Consumers' MI literacy skills should be further investigated and MI literacy should be included in the development of MI for different patient and medicine user groups, e.g. the question related to MI literacy could be included in population surveys. Factors contributing to a growing number of medicine users not receiving MI from any sources should be focused on in future research.

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CONCLUSIONS

In this longitudinal analysis of adult medicine users' receipt of MI about the medicines they use, physicians, community pharmacists and package leaflets still had a dominating importance in 2014 despite the growing number of novel and innovative MI sources available. Internet is still quite a rare source of MI when the entire adult population is considered. Factors contributing to a growing number of adult medicine users not receiving MI from any sources should be better understood and focused on in future research.

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Competing interests: None declared.

Patient consent: Not required.

Ethical approval: As this study was a secondary analysis using routinely collected and fully anonymized data, ethics approval was not applicable. Answering the survey was considered as giving informed consent. The study followed the national ethical guidelines for researchers[56]. All study procedures were conducted in accordance with good research practice.

Data sharing: No additional data available.

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LEGENDS OF THE FIGURES

Fig. 1 Trends in the receipt of medicines information among adult medicine users (n=18862) in 1999-2014 (% of the respondents who reported use of at least one prescription or non-prescription medicine within 7 days prior to the survey). The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

Fig. 2 Number of medicines information sources from which the adult medicine users (n=18862) had received information on the medicines they used. The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

Fig. 3 Ratio between mean number of medicines in use and mean number of diagnosed diseases compared to the mean number of medicines information sources from which the medicine users (n=18862) received medicines information. The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

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FIGURES 1-3

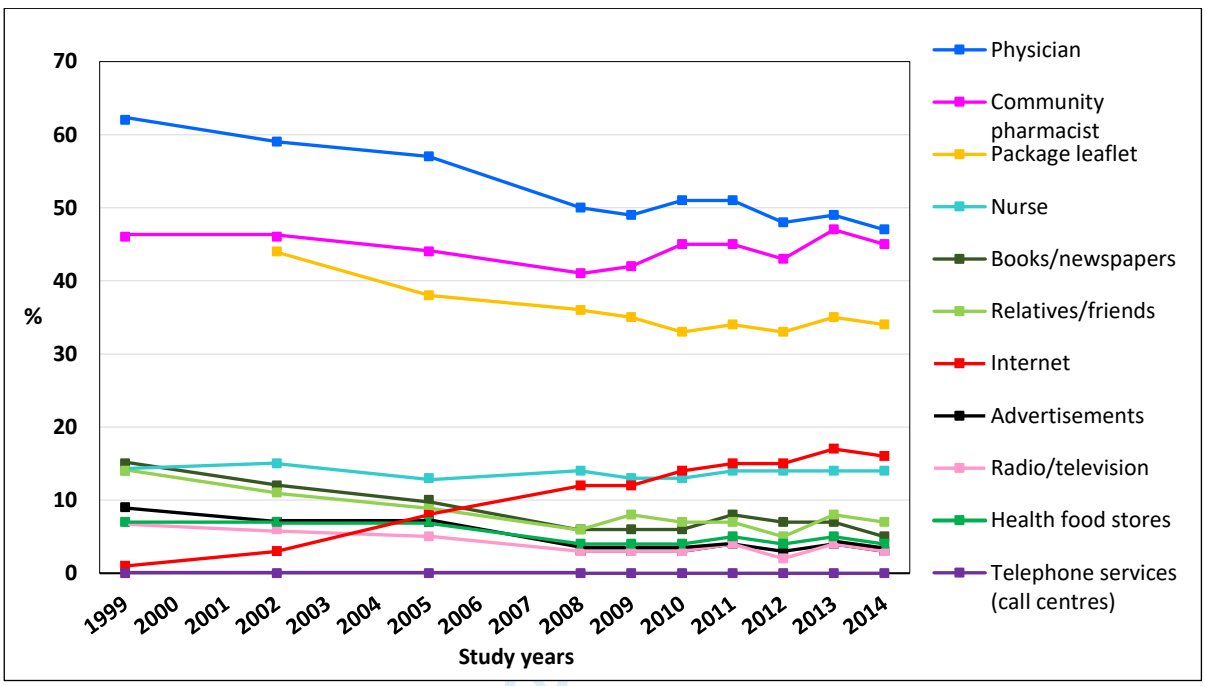

Fig 1 Trends in the receipt of medicines information among adult medicine users (n=18862) in 1999-2014 (% of the respondents who reported use of at least one prescription or non-prescription medicine within 7 days prior to the survey). The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

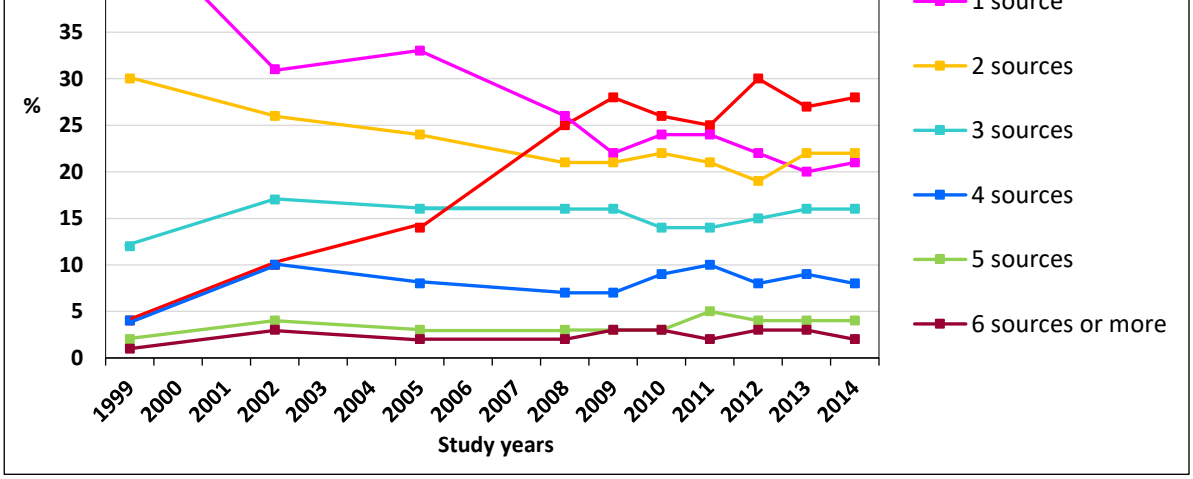

Fig 2 Number of medicines information sources from which the adult medicine users (n=18862) had received information on the medicines they used. The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

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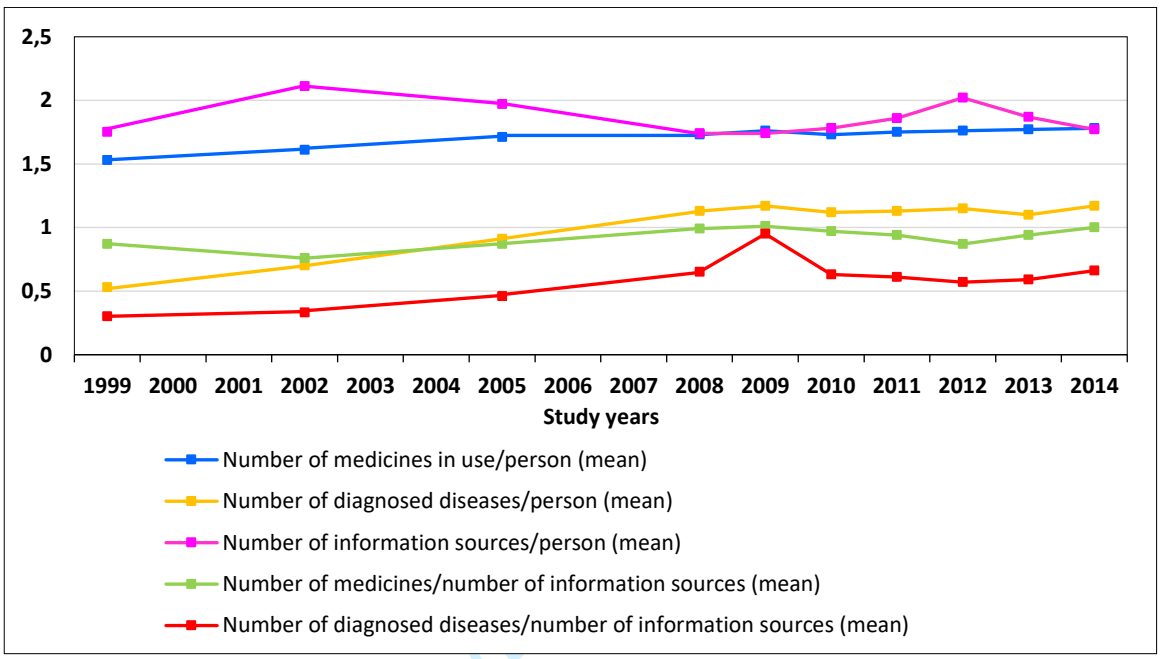

Fig 3 Ratio between mean number of medicines in use and mean number of diagnosed diseases compared to the mean number of medicines information sources from which the medicine users (n=18862) received medicines information. The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

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Appendix A. Trends in the receipt of medicines information among medicine users (n=18862) by gender and age. The percentages are calculated from the variables within each subcategory (e.g. gender, age)[a].

		Study year									
Characteristics	**Total[b] n (%)**	**1999 n (%)**	**2002 n (%)**	**2005 n (%)**	**2008 n (%)**	**2009 n (%)**	**2010 n (%)**	**2011 n (%)**	**2012 n (%)**	**2013 n (%)**	**2014 n (%)**
Respondents using medicines	18862	1944	2000	2038	2101	1957	1871	1844	1759	1677	1671
Gender[c]											
Female	11859	1217	1278	1258	1332	1235	1181	1128	1101	1061	1068
Physician	6345 (54)	798 (66)	779 (61)	738 (59)	663 (50)	616 (50)	596 (50)	578 (51)	529 (48)	537 (51)	511 (48)
Community pharmacist	5673 (48)	617 (51)	616 (48)	591 (47)	595 (45)	548 (44)	563 (48)	561 (50)	523 (48)	554 (52)	505 (47)
Package leaflet	4332 (41)	-	615 (48)	539 (43)	527 (40)	494 (40)	462 (39)	439 (39)	411 (37)	437 (41)	408 (38)
Nurse	1687 (14)	187 (15)	183 (14)	159 (13)	195 (15)	173 (14)	157 (13)	158 (14)	168 (15)	155 (15)	152 (14)
Books/newspapers	1201 (10)	226 (19)	198 (15)	162 (13)	95 (7)	92 (7)	83 (7)	109 (10)	74 (7)	85 (8)	77 (7)
Relatives/friends	1078 (9)	160 (13)	143 (11)	121 (10)	92 (7)	113 (9)	89 (8)	111 (10)	82 (7)	90 (8)	77 (7)
Internet	1500 (13)	19 (2)	47 (4)	99 (8)	178 (13)	178 (14)	189 (16)	195 (17)	192 (17)	212 (20)	191 (18)
Advertisements	621 (5)	123 (10)	100 (8)	101 (8)	42 (3)	48 (4)	37 (3)	60 (5)	33 (3)	45 (4)	32 (3)
Radio/television	496 (4)	71 (6)	80 (6)	69 (5)	35 (3)	38 (3)	42 (4)	62 (5)	34 (3)	38 (4)	27 (3)
Health food stores	803 (7)	119 (10)	121 (9)	108 (9)	67 (5)	69 (6)	64 (5)	73 (6)	57 (5)	68 (6)	57 (5)
Telephone services (call centres)	34 (<1)	-	4 (<1)	5 (<1)	4 (<1)	7 (<1)	1 (<1)	3 (<1)	3 (<1)	3 (<1)	4 (<1)
No medicines information sources	2190 (18)	33 (3)	97 (8)	133 (11)	309 (23)	307 (25)	282 (24)	234 (21)	299 (27)	229 (22)	267 (25)
Male	7003	727	722	780	769	722	690	716	658	616	603
Physician	3526 (50)	408 (56)	407 (56)	415 (53)	387 (50)	334 (46)	357 (52)	355 (50)	310 (47)	279 (45)	274 (45)
Community pharmacist	2684 (38)	275 (37)	296 (41)	310 (40)	266 (35)	264 (37)	279 (40)	264 (37)	237 (36)	239 (39)	254 (42)
Package leaflet	1712 (27)	-	261 (36)	243 (31)	218 (28)	191 (26)	158 (23)	179 (25)	161 (24)	143 (23)	158 (26)
Nurse	910 (13)	87 (12)	124 (17)	95 (12)	102 (13)	84 (12)	86 (12)	100 (14)	79 (11)	77 (13)	76 (13)
Books/newspapers	315 (4)	66 (9)	49 (7)	41 (5)	30 (4)	20 (3)	21 (3)	28 (4)	20 (3)	26 (4)	14 (2)
Relatives/friends	507 (7)	109 (15)	70 (10)	63 (8)	35 (5)	47 (7)	41 (6)	34 (5)	38 (6)	35 (6)	35 (6)
Internet	651 (9)	7 (1)	21 (3)	58 (7)	65 (8)	65 (9)	72 (10)	81 (11)	75 (11)	71 (12)	71 (12)
Advertisements	225 (3)	57 (8)	35 (5)	36 (5)	24 (3)	9 (1)	14 (2)	9 (1)	17 (3)	15 (2)	9 (1)
Radio/television	251 (4)	59 (8)	47 (7)	32 (4)	20 (3)	12 (2)	15 (2)	19 (3)	9 (1)	22 (4)	16 (3)
Health food stores	186 (3)	22 (3)	20 (3)	28 (4)	21 (3)	10 (1)	13 (2)	17 (2)	9 (1)	9 (1)	9 (1)
Telephone services (call centres)	4 (<1)	-	0 (0)	0 (0)	2 (<1)	0 (0)	0 (0)	1 (<1)	0 (0)	0 (0)	1 (<1)
No medicines information sources	1806 (26)	44 (6)	99 (14)	143 (18)	221 (29)	246 (34)	197 (29)	217 (30)	224 (34)	215 (35)	200 (33)
Age group[c] (years)											
15-24	2535	314	308	269	270	263	255	231	211	199	215
Physician	1077 (42)	157 (50)	154 (50)	122 (45)	102 (38)	96 (37)	96 (38)	93 (40)	88 (42)	80 (40)	89 (41)
Community pharmacist	933 (37)	132 (42)	126 (41)	93 (35)	87 (32)	86 (33)	88 (35)	77 (33)	84 (40)	76 (38)	84 (39)
Package leaflet	911 (45)	-	183 (59)	131 (49)	106 (39)	98 (38)	89 (35)	66 (29)	80 (38)	78 (39)	80 (37)
Nurse	522 (21)	65 (21)	73 (24)	48 (18)	54 (20)	55 (21)	51 (20)	44 (19)	48 (23)	41 (21)	43 (20)
Books/newspapers	199 (8)	41 (13)	45 (15)	26 (10)	10 (4)	20 (8)	8 (3)	18 (8)	17 (8)	6 (3)	8 (4)
Relatives/friends	540 (21)	110 (35)	76 (25)	60 (22)	48 (18)	52 (20)	40 (16)	50 (22)	40 (19)	29 (15)	35 (16)
Internet	323 (13)	7 (2)	14 (5)	23 (9)	36 (13)	39 (15)	36 (14)	43 (19)	42 (20)	41 (21)	42 (20)
Advertisements	143 (6)	31 (10)	26 (8)	30 (11)	9 (3)	12 (5)	9 (4)	8 (3)	7 (3)	5 (3)	6 (3)
Radio/television	129 (5)	30 (10)	24 (8)	21 (8)	7 (3)	14 (5)	7 (3)	11 (5)	8 (4)	4 (2)	3 (1)
Health food stores	66 (3)	11 (4)	12 (4)	9 (3)	5 (2)	1 (<1)	4 (2)	5 (2)	7 (3)	7 (4)	5 (2)
Telephone services (call cnetres)	6 (<1)	-	3 (1)	0 (0)	0 (0)	1 (<1)	0 (0)	0 (0)	0 (0)	1 (1)	1 (<1)
No medicines information sources	657 (26)	16 (5)	37 (12)	46 (17)	85 (31)	94 (36)	89 (35)	74 (32)	75 (36)	72 (36)	69 (32)
25-34	2798	331	308	302	305	287	258	277	251	240	239
Physician	1305 (47)	176 (53)	152 (46)	139 (46)	144 (47)	136 (48)	119 (46)	127 (46)	108 (43)	116 (48)	88 (37)
Community pharmacist	1333 (48)	183 (55)	141 (43)	137 (45)	140 (46)	122 (43)	126 (49)	136 (49)	116 (46)	115 (48)	117 (49)
Package leaflet	1024 (42)	-	160 (48)	132 (44)	129 (42)	119 (42)	100 (39)	107 (39)	101 (40)	89 (37)	87 (36)

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Nurse	470 (17)	59 (17)	48 (15)	41 (14)	42 (14)	40 (14)	32 (12)	36 (13)	32 (13)	42 (18)	30 (13)
Books/newspapers	191 (7)	47 (14)	34 (10)	29 (10)	14 (5)	12 (4)	10 (4)	12 (4)	11 (4)	9 (4)	13 (5)
Relatives/friends	329 (12)	57 (17)	38 (11)	51 (17)	23 (8)	28 (10)	25 (10)	38 (14)	17 (7)	33 (14)	19 (8)
Internet	415 (15)	5 (2)	20 (6)	31 (10)	45 (15)	52 (18)	49 (19)	56 (20)	48 (19)	60 (25)	49 (21)
Advertisements	137 (5)	31 (9)	29 (9)	28 (9)	8 (3)	8 (3)	9 (3)	7 (3)	6 (2)	6 (3)	5 (2)
Radio/television	117 (4)	31 (9)	23 (7)	23 (8)	4 (1)	9 (3)	8 (3)	5 (2)	5 (2)	3 (1)	6 (3)
Health food stores	141 (5)	16 (5)	16 (5)	28 (9)	12 (4)	13 (5)	6 (2)	10 (4)	9 (4)	13 (5)	8 (3)
Telephone services (call centres)	13 (1)	-	0 (0)	3 (1)	1 (<1)	1 (<1)	0 (0)	1 (<1)	2 (1)	1 (<1)	4 (2)
No medicines information sources	736 (26)	15 (5)	35 (11)	54 (18)	85 (28)	95 (33)	74 (29)	89 (32)	84 (33)	67 (28)	78 (32)
35-44	3409	419	411	394	376	335	304	318	292	275	285
Physician	1609 (47)	220 (55)	221 (54)	200 (51)	164 (44)	146 (44)	145 (48)	145 (46)	127 (43)	121 (44)	120 (42)
Community pharmacist	1568 (46)	230 (55)	213 (52)	183 (47)	165 (44)	132 (39)	141 (47)	130 (41)	119 (41)	134 (49)	121 (43)
Package leaflet	1130 (38)	-	182 (44)	181 (46)	141 (38)	122 (37)	96 (32)	112 (35)	105 (36)	105 (38)	86 (30)
Nurse	380 (11)	40 (10)	46 (11)	41 (10)	46 (12)	44 (13)	29 (10)	34 (11)	37 (13)	26 (9)	37 (13)
Books/newspapers	274 (8)	77 (18)	57 (14)	33 (8)	24 (6)	16 (5)	12 (4)	19 (6)	10 (3)	14 (5)	12 (4)
Relatives/friends	239 (7)	37 (9)	35 (9)	24 (6)	29 (8)	25 (7)	21 (7)	15 (5)	21 (7)	16 (6)	16 (6)
Internet	381 (11)	9 (2)	17 (4)	43 (11)	54 (14)	44 (13)	45 (15)	42 (13)	37 (13)	54 (20)	36 (13)
Advertisements	188 (6)	61 (15)	33 (8)	26 (7)	18 (5)	6 (2)	7 (2)	7 (2)	9 (3)	7 (3)	14 (5)
Radio/television	134 (4)	34 (8)	31 (8)	13 (3)	11 (3)	3 (1)	7 (2)	12 (4)	6 (2)	9 (3)	8 (3)
Health food stores	196 (6)	41 (10)	39 (9)	25 (6)	19 (5)	10 (3)	15 (5)	13 (4)	13 (4)	12 (4)	9 (3)
Telephone services (call centres)	9 (<1)	-	1 (<1)	0 (0)	3 (1)	2 (1)	0 (0)	2 (<1)	1 (<1)	0 (0)	0 (0)
No medicines information sources	893 (26)	19 (5)	45 (11)	60 (15)	106 (28)	103 (31)	94 (31)	97 (31)	97 (33)	85 (31)	97 (34)
45-54	4558	481	486	491	490	460	484	438	430	411	387
Physician	2539 (56)	342 (71)	314 (65)	297 (60)	275 (56)	232 (50)	237 (49)	229 (52)	210 (49)	200 (49)	203 (52)
Community pharmacist	2101 (46)	210 (44)	218 (45)	227 (46)	201 (41)	203 (44)	231 (48)	216 (49)	196 (46)	196 (48)	187 (48)
Package leaflet	1453 (36)	-	185 (38)	181 (37)	176 (36)	169 (37)	163 (34)	160 (37)	136 (32)	145 (35)	138 (36)
Nurse	544 (12)	59 (12)	65 (13)	53 (11)	72 (15)	47 (10)	46 (10)	59 (13)	48 (11)	53 (13)	42 (11)
Books/newspapers	410 (9)	81 (17)	60 (12)	57 (12)	40 (8)	32 (7)	32 (5)	38 (9)	20 (5)	33 (8)	17 (4)
Relatives/friends	236 (5)	37 (8)	31 (6)	21 (4)	18 (4)	31 (7)	24 (5)	18 (4)	20 (5)	21 (5)	15 (4)
Internet	481 (11)	3 (1)	12 (2)	38 (8)	61 (12)	58 (13)	63 (13)	68 (16)	58 (13)	60 (15)	60 (16)
Advertisements	199 (4)	32 (7)	31 (6)	30 (6)	17 (3)	16 (3)	15 (3)	20 (5)	14 (3)	18 (4)	6 (2)
Radio/television	156 (3)	22 (5)	26 (5)	15 (3)	17 (3)	13 (3)	10 (2)	17 (4)	10 (2)	20 (5)	6 (2)
Health food stores	251 (6)	43 (9)	38 (8)	29 (6)	10 (2)	28 (6)	22 (5)	32 (7)	13 (3)	20 (5)	16 (4)
Telephone services (call centres)	5 (<1)	-	0 (0)	0 (0)	1 (<1)	2 (<1)	1 (<1)	0 (0)	0 (0)	1 (<1)	0 (0)
No medicines information sources	932 (20)	15 (3)	40 (8)	56 (11)	107 (22)	107 (23)	120 (25)	97 (22)	125 (29)	104 (25)	100 (26)
55-64	5562	399	487	582	660	612	570	580	575	552	545
Physician	3341 (60)	311 (78)	345 (71)	395 (68)	365 (55)	340 (56)	356 (62)	339 (58)	306 (53)	299 (54)	285 (52)
Community pharmacist	2438 (44)	137 (34)	214 (44)	261 (45)	268 (41)	269 (44)	256 (45)	266 (46)	245 (43)	272 (49)	250 (46)
Package leaflet	1526 (30)	-	166 (34)	157 (27)	193 (29)	177 (29)	172 (30)	173 (30)	150 (26)	163 (30)	175 (32)
Nurse	749 (13)	51 (13)	75 (15)	71 (12)	83 (13)	71 (12)	85 (15)	85 (15)	82 (14)	70 (13)	76 (14)
Books/newspapers	442 (8)	46 (12)	51 (10)	58 (10)	37 (6)	32 (5)	42 (7)	50 (9)	36 (6)	49 (9)	41 (8)
Relatives/friends	241 (4)	28 (7)	33 (7)	28 (5)	9 (1)	24 (4)	20 (4)	24 (4)	22 (4)	26 (5)	27 (5)
Internet	449 (8)	2 (1)	5 (1)	22 (4)	47 (7)	50 (8)	68 (12)	67 (12)	82 (14)	68 (12)	75 (14)
Advertisements	180 (3)	25 (6)	16 (3)	23 (4)	14 (7)	15 (2)	12 (2)	27 (5)	14 (2)	24 (4)	10 (2)
Radio/television	211 (4)	13 (3)	23 (5)	29 (5)	16 (2)	11 (2)	25 (4)	36 (6)	14 (2)	24 (4)	20 (4)
Health food stores	329 (6)	30 (8)	36 (7)	45 (8)	42 (6)	27 (4)	30 (5)	42 (6)	24 (4)	25 (5)	28 (5)
Telephone services (call centres)	5 (<1)	-	0 (0)	2 (<1)	1 (<1)	1 (1)	0 (0)	1 (<1)	0 (0)	0 (0)	0 (0)
No medicines information sources	1072 (19)	12 (3)	39 (8)	60 (10)	147 (22)	154 (25)	102 (18)	155 (27)	142 (25)	116 (21)	123 (23)

[a]Discrepancies in totals are due to rounding errors, [b]Calculated from study years available, [c]Percentages have been calculated for the respondents of each year who reported using medicines (list in survey) during the last week (7 days).

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Appendix B. Trends in the receipt of medicines information among medicine users (n=18862) by number of medicines in use and number of diagnosed diseases. The percentages are calculated from the variables within each subcategory (e.g. number of medicines in use, number of diagnosed diseases)[a].

		Study year									
Characteristics	**Total[b] n (%)**	**1999 n (%)**	**2002 n (%)**	**2005 n (%)**	**2008 n (%)**	**2009 n (%)**	**2010 n (%)**	**2011 n (%)**	**2012 n (%)**	**2013 n (%)**	**2014 n (%)**
Respondents using medicines	18862	1944	2000	2038	2101	1957	1871	1844	1759	1677	1671
Number of medicines in use/person[c]											
1 medicine	10558	1215	1183	1143	1154	1060	1029	1011	946	907	910
Physician	4449 (42)	628 (52)	559 (47)	508 (44)	465 (40)	410 (39)	414 (40)	410 (41)	344 (36)	366 (40)	345 (38)
Community pharmacist	3992 (38)	540 (44)	461 (39)	408 (36)	405 (35)	369 (35)	386 (38)	375 (37)	333 (35)	368 (41)	347 (38)
Package leaflet	2952 (32)	-	478 (40)	401 (35)	354 (31)	317 (30)	293 (28)	312 (31)	261 (28)	278 (31)	258 (28)
Nurse	1056 (10)	138 (11)	124 (10)	104 (9)	129 (11)	103 (10)	84 (8)	104 (10)	90 (10)	92 (10)	88 (10)
Books/newspapers	719 (7)	184 (15)	124 (10)	92 (8)	48 (4)	43 (4)	43 (4)	62 (6)	39 (4)	45 (5)	39 (4)
Relatives/friends	823 (8)	168 (14)	113 (10)	94 (8)	70 (6)	76 (7)	64 (6)	78 (8)	55 (6)	56 (6)	48 (5)
Internet	887 (8)	10 (1)	37 (3)	78 (7)	99 (9)	90 (8)	114 (11)	120 (12)	105 (11)	117 (13)	117 (13)
Advertisements	497 (5)	127 (10)	86 (7)	74 (6)	38 (3)	28 (3)	29 (3)	36 (4)	26 (3)	27 (3)	26 (3)
Radio/television	373 (4)	88 (7)	67 (6)	48 (4)	26 (2)	20 (2)	30 (3)	37 (4)	16 (2)	27 (3)	14 (2)
Health food stores	477 (5)	77 (6)	71 (6)	60 (5)	36 (3)	41 (4)	44 (4)	46 (5)	28 (3)	39 (4)	35 (4)
Telephone services (call centres)	20 (<1)	-	4 (<1)	2 (<1)	3 (<1)	3 (<1)	1 (<1)	2 (<1)	2 (<1)	0 (0)	3 (<1)
No medicines information sources	2851 (27)	68 (6)	164 (14)	219 (19)	386 (33)	379 (36)	338 (33)	322 (32)	363 (38)	292 (32)	320 (35)
2 medicines	5116	505	559	566	584	536	512	491	492	442	429
Physician	3107 (61)	386 (76)	396 (71)	371 (66)	336 (58)	297 (55)	299 (58)	278 (57)	284 (58)	236 (53)	224 (52)
Community pharmacist	2482 (49)	237 (47)	299 (53)	290 (51)	256 (44)	235 (44)	247 (48)	245 (50)	238 (48)	224 (51)	211 (49)
Package leaflet	1769 (38)	-	270 (48)	225 (40)	231 (40)	205 (38)	189 (37)	168 (34)	172 (35)	158 (36)	151 (35)
Nurse	794 (16)	94 (19)	117 (21)	84 (15)	90 (15)	72 (13)	68 (13)	72 (15)	76 (15)	59 (13)	62 (14)
Books/newspapers	468 (9)	73 (14)	83 (15)	62 (11)	39 (7)	38 (7)	31 (6)	35 (7)	30 (6)	45 (5)	32 (7)
Relatives/friends	488 (10)	75 (15)	66 (12)	62 (11)	38 (7)	54 (10)	45 (9)	42 (9)	39 (8)	38 (9)	29 (7)
Internet	671 (13)	7 (1)	25 (4)	46 (8)	85 (15)	81 (15)	81 (16)	83 (17)	90 (18)	90 (20)	83 (19)
Advertisements	224 (4)	40 (8)	34 (6)	43 (8)	17 (3)	17 (3)	14 (3)	16 (3)	14 (3)	19 (4)	10 (2)
Radio/television	201 (4)	23 (5)	37 (7)	28 (5)	16 (3)	17 (3)	16 (3)	21 (4)	16 (3)	16 (4)	11 (3)
Health food stores	297 (6)	38 (8)	48 (9)	51 (9)	31 (5)	18 (3)	22 (4)	27 (5)	23 (5)	22 (5)	17 (4)
Telephone services (call centres)	10 (<1)	-	0 (0)	1 (<1)	2 (<1)	2 (<1)	0 (0)	1 (<1)	1 (<1)	2 (<1)	1 (<1)
No medicines information sources	801 (16)	5 (1)	25 (4)	47 (8)	105 (18)	122 (23)	101 (20)	83 (17)	111 (23)	99 (22)	103 (24)
3 medicines	1984	161	166	198	221	220	210	210	191	208	199
Physician	1388 (70)	133 (83)	139 (84)	158 (80)	147 (67)	140 (64)	149 (71)	150 (71)	116 (61)	134 (64)	122 (61)
Community pharmacist	1101 (55)	76 (47)	94 (57)	112 (57)	111 (50)	118 (54)	130 (62)	110 (52)	106 (55)	127 (61)	117 (59)
Package leaflet	797 (44)	-	83 (50)	88 (44)	97 (44)	90 (41)	87 (41)	80 (38)	77 (40)	100 (48)	95 (48)
Nurse	413 (21)	28 (17)	41 (25)	33 (17)	37 (17)	45 (20)	57 (27)	44 (21)	40 (21)	42 (20)	46 (23)
Books/newspapers	197 (10)	25 (16)	22 (13)	24 (12)	20 (9)	13 (6)	20 (10)	21 (10)	17 (9)	23 (11)	12 (6)
Relatives/friends	165 (8)	14 (9)	26 (16)	15 (8)	10 (5)	10 (5)	16 (8)	14 (7)	20 (10)	19 (9)	21 (11)
Internet	311 (16)	6 (4)	4 (2)	23 (12)	37 (17)	37 (17)	42 (20)	44 (21)	38 (20)	47 (23)	33 (17)
Advertisements	78 (4)	8 (5)	13 (8)	12 (6)	5 (2)	5 (2)	6 (3)	11 (5)	6 (3)	9 (4)	3 (2)
Radio/television	93 (5)	13 (8)	17 (10)	9 (5)	5 (2)	5 (2)	9 (4)	13 (6)	5 (3)	11 (5)	6 (3)
Health food stores	103 (5)	19 (12)	11 (7)	12 (6)	8 (4)	12 (5)	7 (3)	8 (4)	7 (4)	10 (5)	9 (5)
Telephone services (call centres)	4 (<1)	-	0 (0)	1 (1)	1 (<1)	0 (0)	0 (0)	1 (<1)	0 (0)	1 (<1)	0 (0)
No medicines information sources	238 (12)	4 (2)	4 (2)	9 (5)	28 (13)	39 (18)	26 (12)	33 (16)	34 (18)	36 (17)	25 (13)
4 medicines or more	1206	63	92	131	142	141	120	132	130	120	133
Physician	913 (76)	59 (94)	78 (85)	116 (89)	102 (72)	103 (73)	91 (76)	95 (72)	95 (72)	80 (67)	94 (71)
Community pharmacist	780 (65)	39 (62)	58 (63)	91 (69)	89 (63)	90 (64)	79 (66)	95 (72)	83 (63)	72 (60)	84 (63)
Package leaflet	526 (44)	-	45 (39)	68 (52)	63 (44)	73 (52)	51 (43)	58 (44)	62 (48)	44 (37)	62 (47)
Nurse	334 (28)	14 (22)	25 (27)	33 (25)	41 (29)	37 (26)	34 (28)	38 (29)	41 (32)	39 (33)	32 (24)

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Books/newspapers	148 (12)	10 (16)	18 (20)	25 (19)	18 (13)	18 (13)	10 (8)	19 (14)	8 (6)	14 (12)	8 (6)
Relatives/friends	110 (9)	12 (19)	8 (9)	13 (10)	9 (6)	20 (14)	5 (4)	11 (8)	6 (5)	12 (10)	14 (11)
Internet	217 (18)	3 (5)	2 (2)	10 (8)	22 (15)	35 (25)	24 (20)	29 (22)	34 (26)	29 (24)	29 (22)
Advertisements	47 (4)	5 (8)	2 (2)	8 (6)	6 (4)	7 (5)	2 (2)	6 (5)	4 (3)	5 (4)	2 (2)
Radio/television	80 (7)	6 (10)	6 (7)	16 (12)	8 (6)	8 (6)	2 (2)	10 (8)	6 (5)	6 (5)	12 (9)
Health food stores	84 (7)	7 (11)	11 (12)	13 (10)	13 (9)	8 (6)	4 (3)	9 (7)	8 (6)	6 (5)	5 (4)
Telephone services (call centres)	4 (<1)	-	0 (0)	1 (1)	0 (0)	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
No medicines information sources	106 (9)	0 (0)	3 (5)	1 (1)	11 (8)	13 (9)	14 (12)	13 (10)	15 (12)	17 (14)	19 (14)
Number of diagnosed diseases/person[c,d]											
None	8660	1228	1121	971	864	787	811	754	712	723	689
Physician	3418 (39)	633 (52)	536 (48)	384 (40)	286 (33)	273 (35)	300 (37)	272 (36)	249 (35)	268 (36)	217 (31)
Community pharmacist	3277 (38)	558 (45)	470 (42)	371 (38)	299 (35)	258 (33)	293 (36)	267 (35)	250 (35)	275 (38)	236 (34)
Package leaflet	2538 (34)	-	496 (44)	387 (40)	282 (33)	251 (32)	246 (30)	237 (31)	202 (28)	230 (32)	207 (30)
Nurse	909 (10)	157 (13)	146 (13)	91 (9)	88 (10)	67 (9)	80 (10)	71 (9)	70 (10)	75 (10)	64 (9)
Books/newspapers	698 (8)	194 (16)	134 (12)	95 (10)	42 (5)	35 (4)	39 (5)	50 (7)	34 (5)	38 (5)	37 (5)
Relatives/friends	851 (10)	196 (16)	135 (12)	117 (12)	55 (6)	66 (8)	66 (8)	71 (9)	55 (8)	50 (7)	40 (6)
Internet	744 (9)	15 (1)	38 (3)	65 (7)	77 (9)	71 (9)	99 (12)	93 (12)	84 (12)	109 (15)	93 (13)
Advertisements	488 (6)	141 (12)	88 (8)	81 (8)	35 (4)	21 (3)	25 (3)	30 (4)	19 (3)	24 (3)	24 (3)
Radio/television	358 (4)	96 (8)	65 (6)	52 (5)	20 (2)	18 (2)	21 (3)	33 (4)	12 (2)	23 (3)	18 (3)
Health food stores	446 (5)	85 (7)	84 (8)	72 (7)	37 (4)	22 (3)	34 (4)	31 (4)	17 (2)	35 (5)	29 (4)
Telephone services (call centres)	20 (<1)	-	3 (<1)	4 (<1)	2 (<1)	2 (<1)	0 (0)	2 (<1)	2 (<1)	2 (<1)	3 (<1)
No medicines information sources	2337 (27)	65 (5)	155 (14)	187 (19)	311 (36)	295 (37)	272 (34)	254 (34)	283 (40)	251 (35)	264 (38)
1 disease	5262	502	527	593	616	557	492	539	521	465	450
Physician	3055 (58)	389 (77)	364 (69)	394 (66)	348 (57)	290 (52)	261 (53)	276 (51)	251 (48)	245 (53)	237 (53)
Community pharmacist	2342 (45)	224 (45)	259 (49)	260 (44)	241 (39)	231 (42)	221 (45)	245 (45)	218 (42)	231 (50)	212 (47)
Package leaflet	1620 (34)	-	228 (43)	202 (34)	205 (33)	197 (35)	156 (32)	168 (31)	156 (30)	169 (36)	139 (31)
Nurse	699 (13)	70 (14)	81 (15)	68 (12)	90 (15)	84 (15)	53 (11)	68 (13)	69 (13)	57 (12)	59 (13)
Books/newspapers	410 (8)	75 (15)	66 (13)	54 (9)	33 (5)	34 (6)	25 (5)	41 (8)	27 (5)	36 (8)	19 (4)
Relatives/friends	386 (7)	53 (11)	56 (11)	32 (5)	37 (6)	46 (8)	36 (7)	38 (7)	30 (6)	34 (7)	24 (5)
Internet	591 (11)	8 (2)	19 (4)	49 (8)	78 (13)	68 (12)	67 (14)	68 (13)	73 (14)	95 (20)	66 (15)
Advertisements	200 (4)	32 (6)	30 (6)	35 (6)	11 (2)	18 (3)	13 (3)	16 (3)	14 (3)	20 (4)	11 (2)
Radio/television	190 (4)	22 (4)	42 (8)	24 (4)	12 (2)	11 (2)	16 (3)	18 (3)	18 (3)	20 (4)	7 (2)
Health food stores	268 (5)	44 (9)	36 (7)	30 (5)	18 (3)	28 (5)	17 (3)	28 (5)	25 (5)	23 (5)	19 (4)
Telephone services (call centres)	8 (<1)	-	0 (0)	0 (0)	2 (<1)	2 (<1)	1 (<1)	0 (0)	1 (<1)	1 (<1)	1 (<1)
No medicines information sources	1010 (19)	11 (2)	26 (5)	65 (11)	138 (22)	153 (27)	124 (25)	118 (22)	153 (29)	110 (24)	112 (25)
2 diseases	2900	151	232	270	368	350	331	337	296	280	285
Physician	1930 (67)	126 (83)	183 (79)	203 (75)	240 (65)	208 (59)	224 (68)	229 (68)	193 (64)	161 (58)	163 (57)
Community pharmacist	1506 (52)	79 (52)	116 (50)	140 (52)	179 (49)	172 (49)	179 (54)	177 (53)	156 (53)	152 (54)	156 (55)
Package leaflet	1033 (36)	-	98 (42)	98 (36)	142 (39)	131 (37)	120 (36)	120 (36)	118 (40)	98 (35)	108 (38)
Nurse	470 (16)	34 (23)	43 (19)	39 (14)	50 (14)	52 (15)	52 (16)	59 (18)	50 (17)	55 (20)	36 (13)
Books/newspapers	202 (7)	11 (7)	28 (12)	24 (9)	25 (7)	23 (7)	20 (6)	16 (5)	21 (7)	17 (6)	17 (6)
Relatives/friends	208 (7)	11 (7)	18 (8)	18 (7)	23 (6)	26 (7)	13 (4)	23 (7)	20 (7)	27 (10)	29 (10)
Internet	417 (14)	1 (1)	9 (4)	28 (10)	56 (15)	57 (16)	48 (15)	67 (20)	64 (22)	40 (14)	47 (16)
Advertisements	85 (3)	3 (2)	12 (5)	10 (4)	8 (2)	7 (2)	7 (2)	13 (4)	11 (4)	10 (4)	4 (1)
Radio/television	96 (3)	7 (5)	11 (5)	7 (3)	9 (2)	9 (3)	10 (3)	16 (5)	9 (3)	11 (4)	7 (2)
Health food stores	140 (5)	5 (3)	15 (7)	15 (6)	18 (5)	21 (6)	13 (4)	20 (6)	16 (5)	9 (3)	8 (3)
Telephone services (call centres)	3 (<1)	-	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1)	0 (0)	0 (0)	0 (0)
No medicines information sources	430 (15)	1 (1)	10 (4)	19 (7)	58 (16)	71 (20)	55 (17)	53 (16)	48 (16)	57 (20)	58 (20)
3 diseases or more	2040	63	120	204	253	263	237	214	230	209	247
Physician	1473 (72)	58 (92)	103 (86)	172 (84)	176 (70)	179 (68)	168 (71)	156 (73)	151 (66)	142 (68)	168 (68)
Community pharmacist	1232 (60)	31 (49)	67 (56)	130 (64)	142 (56)	151 (57)	149 (63)	136 (64)	136 (59)	135 (65)	155 (63)
Package leaflet	853 (43)	-	54 (45)	95 (47)	116 (46)	106 (40)	98 (41)	93 (43)	96 (42)	83 (40)	112 (45)
Nurse	483 (24)	13 (21)	37 (31)	56 (28)	69 (27)	54 (21)	58 (24)	24 (11)	58 (25)	45 (22)	69 (28)

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Books/newspapers	185 (9)	12 (19)	19 (16)	30 (15)	25 (10)	20 (8)	20 (8)	22 (10)	12 (5)	7 (3)	18 (7)
Relatives/friends	140 (7)	9 (14)	4 (3)	17 (8)	12 (5)	22 (8)	15 (6)	13 (6)	15 (7)	14 (7)	19 (8)
Internet	334 (16)	2 (3)	2 (2)	15 (7)	32 (13)	47 (18)	47 (20)	48 (22)	46 (20)	39 (19)	56 (23)
Advertisements	153 (8)	4 (6)	5 (4)	11 (5)	12 (5)	11 (4)	86 (3)	10 (5)	6 (3)	6 (3)	2 (1)
Radio/television	104 (5)	5 (8)	9 (8)	18 (9)	14 (6)	12 (5)	10 (4)	14 (7)	4 (2)	7 (3)	11 (4)
Health food stores	107 (5)	7 (11)	6 (5)	19 (9)	15 (6)	8 (3)	13 (5)	11 (5)	8 (3)	10 (5)	10 (4)
Telephone services (call centres)	7 (<1)	-	0 (0)	1 (1)	2 (1)	3 (1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (<1)
No medicines information sources	219 (11)	0 (0)	5 (4)	5 (2)	23 (9)	34 (13)	28 (12)	26 (12)	39 (17)	26 (12)	33 (13)

[a]Discrepancies in totals are due to rounding errors, [b]Calculated from study years available, [c]Percentages have been calculated for the respondents of each year who reported using medicines (list in survey) during the last week (7 days), [d]Respondents who had disease (list in survey) diagnosed by a physician during the last year (12 months).

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5,6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5,6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	14
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6,7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6,7
		(*b*) Describe any methods used to examine subgroups and interactions	6,7
		(*c*) Explain how missing data were addressed	6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	6,8
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-10
		(b) Indicate number of participants with missing data for each variable of interest	9-10
Outcome data	15*	Report numbers of outcome events or summary measures	11,12
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted	NA

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		estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	12, Appendix 1&2
Discussion			
Key results	18	Summarise key results with reference to study objectives	14,15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15,16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	15
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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BMJ Open

Trends in the receipt of medicines information among Finnish adults in 1999–2014: a nationwide repeated cross-sectional survey

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Primary Subject Heading:	Health informatics
Secondary Subject Heading:	Health policy
Keywords:	Medicines information, Medicines information sources, Population study, Repeated cross-sectional survey, Finland

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Title	**Trends in the receipt of medicines information among Finnish adults in 1999–2014: a nationwide repeated cross-sectional survey**
Authors' names	Niina Mononen, Marja Airaksinen, Katri Hämeen-Anttila, Satu Helakorpi, Marika Pohjanoksa-Mäntylä
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Word count: 3952

Keywords: Medicines information, Medicines information sources, Population study, Repeated cross-sectional survey, Finland

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ABSTRACT

Objective

The aim of this study was to examine long-term trends in the receipt of medicines information (MI) among adult medicine users from 1999 to 2014.

Design

Repeated cross-sectional postal survey from the years 1999, 2002, 2005 and 2008-2014.

Setting

Each study year, a new nationally representative sample of 5000 Finns aged 15-64 years was drawn from the Population Register Centre of Finland.

Participants

The range of annual respondents varied from 2545 to 3371 and response rates from 53% to 67%. Of the total responses (n=29465) 64% were from medicine users (n=18862, ranging by year from 58% to 68%).

Outcome measures

Receipt of information on medicines in use within 12 months prior to the survey from a given list of consumer MI sources available in Finland.

Results

Physicians, community pharmacists and package leaflets were the most common MI sources throughout the study period of 1999-2014. Receipt of MI increased most from the Internet (from 1% in 1999 to 16% in 2014), while decreased most from physicians (62% to 47%) and package leaflets (44% to 34%), and remained stable from community pharmacists (46% to 45%) and nurses (14% to 14%). In 1999, of the medicine users 4% did not report receipt of MI from any of the sources listed in the survey, while this proportion had remarkably increased to 28% in 2014.

Conclusions

Healthcare professionals and package leaflets had still a dominating importance in 2014 despite the growing number of MI sources over time, but still a minority of adult medicine users reported receiving MI via the Internet in 2014. Worrying is that the proportion of adult medicine users who did not receive MI from any of the sources became 7-fold during the study period.

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Strengths and limitations of this study

- The key strength of this national population study is that it examines trends in the receipt of medicines information among adult medicine users within a 15-year time period by using representative random population samples with high enough response rates for generalizable results.
- Repeated surveys are necessary to indicate population level changes in the utilization of available MI sources and reveal needs to develop MI practices and policies at the national level.
- Due to the cross-sectional method without cohorts, it is not possible to follow up changes in the receipt of medicines information over time at the individual level.
- The data did not provide any information about the quality, validity or amount of the medicines information received.
- Factors contributing to a growing number of adult medicine users not receiving medicines information from any sources should be better understood and focused on in future research.

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INTRODUCTION

Consumer access to medicines information (MI) has dramatically improved during the last decades.[1-7] Driving forces for more open access to MI have been drug safety issues, patients' right to know about medicinal interventions that they are exposed to and tendency to empower people in taking more responsibility for self-management of their diseases.[2,4,7] These changes have led to improved availability of MI, first on paper and later via the Internet and electronic applications in smartphones and other electronic devices. The applications are evolving fast towards systems enabling customized MI, interactive communications and following up treatments.[1,3,4,8-10] Improved communication on medications have also been a strategic priority in national and international medicines policies, e.g. within the European Union.[2,4,11-16]

Consumers' health information seeking, including MI seeking from various information sources, have been widely researched.[17-20] Previous research on the receipt of MI among the adult population have either focused on 1) particular patient groups such as asthmatics,[21] people with cancer,[22] cardiovascular diseases,[23] HIV/AIDS,[24] mental disorders[25] or vasculitis,[26] and pregnant women,[27,28] or 2) focused on certain medicine user groups such as users of hormone replacement therapies,[29-31] analgesics,[32,33] antidepressants,[34] antihypertensives,[35] cardiovascular medicines[36] or psychotropics.[37] Previous studies have mostly applied single cross-sectional study designs.[38-46] We found only one study that compared results from two years, covering a 7-year period.[47] The consistent findings from the previous studies are that physicians, pharmacists and package leaflets are the most common sources of MI regardless of the research method, the study year, the country and the research population.[21-47] Consumers usually sought MI from only one or two information sources.[28,34,39,43,44] The use of the Internet as a source of MI has become more common over time, but it is not yet as commonly used source of MI for consumers as healthcare professionals.[22,24-26,30,31,33-35,38-40,42,44-46] However, there is a lack of long-term population-based studies describing trends in the receipt of MI among adult medicine users. Repeated surveys are necessary to indicate population level changes in the utilization of available MI sources and to reveal needs to develop MI practices and policies at the national level. In Finland, improving the accessibility and quality of MI have been among the key strategic medicines policy goals over the last decades.[2,15] The long-term comparative information in the receipt of MI and the proportion of people receiving MI are important measures to indicate whether the desired outcomes are met. Therefore, this study examined long-term trends in the receipt of MI among Finnish adult medicine users in 1999-2014.

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METHODS

Context

Similarly to many developed countries, availability of consumer MI has dramatically improved in Finland during the last decades.[2,4,7] Until 1983, patients and medicine users received information about their medicines exclusively from their physicians.[7,48] The remarkable landmarks towards more open access to MI have been pharmacists' duty to counsel on prescription and non-prescription medicines in 1983, followed in 1986 by the launch of the first computerized database providing leaflets for consumers in community pharmacies. Package leaflets became mandatory across the European Union in 1999.[49] About the same time, the Internet and mobile phones became more common and eventually revolutionized access to health and MI. "From paper the cyber" shift has improved access to statutory MI, e.g. by making package leaflets available online in written and audio format.[50,51] A wide range of stakeholders from the drug industry to non-profit professional and patient organisations have been developing new databases and modes for communicating on medicines to consumers. To coordinate MI practices and enhance public-private partnerships, the European Union has recommended its member states to establish national MI programs and strategies.[13] Such a strategy was established for the first time in Finland in 2012 by the Finnish Medicines Agency.[2] The ultimate goal of the strategy is to improve adherence to long-term therapies by enhanced MI by 2020.

Study design

The study was conducted as a repeated cross-sectional postal survey using each year a new nationally representative sample (n=5000) of the Finnish adult population aged 15-64 years.[52] The national health behavior survey used in this study has its origins in the North Karelia Project, started in 1972, which has been instrumental in improving public health in Finland.[53] The annual "Health Behaviour and Health among the Finnish Adult Population" survey was established in 1978 to perform as an indicator for changes in the population health and related risk factors, such as smoking, food and alcohol consumption and physical activity.[52] The survey has been targeted to the adult working age population of 15-64 years old. The survey has been repeated every year in the same way to yield comparable results. In addition to the original standard set of structured questions, some other questions have been added to the survey instrument over the years. One of the added questions was the one used in our study concerning receipt of MI from different sources available for consumers/medicine users in Finland (added to the survey instrument in 1999).

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The sample has been derived from the Population Register Centre of Finland which is a government-based register where all Finnish citizens and permanent residents are obliged to be registered.[52,54] The survey has been conducted every year (1978-2014) as a postal survey.[52] The distribution of the questionnaires by mail has assured better coverage of the entire study population than e.g., using online surveys. This is because the Population Register Centre has the current address available for all Finns and permanent residents. In order to maintain response rate high enough for generalizable results, three reminders were sent during the study period covered in our study (1999-2014).[55] Data from the years 1999, 2002, 2005, 2008-2014 was compared as these are the years when the survey instrument included the question on the receipt of MI.

Survey instrument and measures

The main outcome measure was the receipt of MI on medicines in use. The survey instrument contained the question "In the past year (12 months), from which sources did you receive information on the medicines you have been using?" The question was followed by a list of MI sources available for consumers in Finland at the time of the study (Fig. 1). Respondents could indicate from the list as many information sources as applicable. It was not possible to report other sources than those mentioned in the survey. In 2002, package leaflets and telephone services were added to the list of MI sources.

Socio-demographic variables used in this study were gender and age. Health-related variables were respondents' medicine use and diagnosed diseases. Use of medicines was assessed by the question "Have you used any tablets, powders, or other medicines within the past week (7 days)?" This question was followed by a list of commonly used prescription and non-prescription medicines for common chronic and acute conditions (Table 1). Respondents could indicate from the list as many medicines as they had been using within 7 days prior to the survey. It was not possible to report any other medicines other than those mentioned in the list. The use of medication within the past 7 days was used as a measure in order to control recall bias.[56] Diagnosed diseases were asked by a question "Within the past year (12 months), have you had any of the following diagnosed diseases or diseases treated by the physicians?" This question was followed by a list of chronic and acute diseases common in Finland (Table 1). Respondents could indicate from the list as many diseases as they had been suffering from within the year prior to the survey. It was not possible to report any other diseases than those mentioned in the list.

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Analysis

Descriptive statistics were conducted with the Statistical Package for Social Sciences software (IBM SPSS Statistics for Windows, Released 2016, Version 24.0. Armonk, NY: IBM Corp.). Only respondents who reported using at least one prescription or non-prescription medicine during the 7 days' time frame prior to the survey were included in the analysis as medicine users.

Trends in the receipt of MI from different information sources and the number of MI sources used by the respondent were counted for each study year 1999-2014 (Fig. 1 and 2). The number of MI sources from which the respondents had received information on the medicines they used was divided into following groups: no sources, one, two, three, four, five and six or more sources.

The receipt of MI from different sources was plotted against gender, age, number of medicines in use and number of diagnosed diseases for each study year 1999-2014 (Appendix A, B). Age calculation was based on the year of birth, and the respondents were divided into five age groups (Table 1).

The number of medicines in use was counted for each respondent and respondents were divided into following groups: people using one, two, three, and four or more medicines (Table 1). The receipt of MI was compared between all these medicine user groups (Appendix B). Also, the number of diagnosed diseases was counted for each respondent and respondents were divided into following groups: no diseases, one, two, three or more diseases (Table 1). The receipt of MI was compared between all these groups (Appendix B).

Finally, a ratio between the mean number of medicines in use and the mean number of diagnosed diseases compared to the mean number of MI sources from which MI was received was calculated to indicate whether any remarkable changes were seen over time in the number of MI sources used in relation to morbidity and medicine use.

Patient and public involvement

Patient perspective was taken into account in designing the research question on MI by reviewing previous international and national research on the topic.[6,57-59] The question as it appears in the survey instrument is a result of extensive work by senior researchers in public health and medicines information. The question was piloted in several formats with the target group (5-10 individuals from the target group recruited as a convenience sample) and the current version was found to be most valid for the primary purpose of the survey that was to indicate long-term trends. The results of the study

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have not been sent to the study participants for comments, but the annual reports of the "Health Behaviour and Health among the Finnish Adult Population" surveys are available online.[52]

Research ethics

As this study was a secondary analysis using routinely collected and fully anonymized data, ethics approval was not applicable.[60] Responding to the survey was voluntary and considered as giving an informed consent. All study procedures were conducted according to good scientific practice.

RESULTS

The number of respondents varied by year from 2545 to 3371, and the response rate decreased from 67% in 1999 to 53% in 2014 (Table 1). Of the total responses (n=29465) 64% were from medicine users (n=18862, ranging by year from 58% to 68%). The gender distribution of the respondents who reported using medicines remained the same throughout the study period, 61-64% being female (Table 1). The annual mean age varied between 41 and 45 years. The respondents used most commonly one medicine, ranging from 63% in 1999 to 54% in 2014 (included prescription and non-prescription medicines). The respondents reported using medicines most commonly for headaches (range 50% to 53%), other aches or pains (28% to 31%) and high blood pressure (15% to 23%). More than a third of the medicine users reported having at least one diagnosed disease of the diseases listed in the survey, increasing from 37% in 1999 to 59% in 2014). The most common diseases reported were high blood pressure or hypertension (range 18% to 25%), high blood cholesterol (13% to 21%), hay or allergic rhinitis (15% to 18%), and degenerative disk disease or other back illness (13% to 15%).

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Table 1. Characteristics of the respondents (n=29465) according to study year. The percentages are calculated from the total number of the respondents each year or of the respondents reporting use of at least one prescription or non-prescription medicine within 7 days prior to survey (n=18862)[a].

Characteristics	Total[b] n (%)	Study years 1999 n (%)	2002 n (%)	2005 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)	2013 n (%)	2014 n (%)
Number of respondents (response rate)	29465 (59)	3371 (67)	3259 (65)	3287 (66)	3216 (64)	2943 (59)	2826 (57)	2787 (56)	2601 (52)	2545 (51)	2630 (53)
Respondents using medicines[c]	18862 (64)	1944 (58)	2000 (61)	2038 (62)	2101 (65)	1957 (66)	1871 (66)	1864 (66)	1759 (68)	1677 (66)	1671 (64)
Gender[d]											
Female	11859 (63)	1217 (63)	1278 (64)	1258 (62)	1332 (63)	1235 (63)	1181 (63)	1168 (61)	1101 (63)	1061 (63)	1068 (64)
Male	7003 (37)	727 (37)	722 (36)	780 (38)	769 (37)	722 (37)	690 (37)	696 (39)	658 (37)	616 (37)	603 (36)
Age (years)[d]											
15-24	2535 (13)	314 (16)	308 (15)	269 (13)	270 (13)	263 (13)	255 (14)	236 (13)	211 (12)	199 (12)	215 (13)
25-34	2798 (15)	331 (17)	308 (15)	302 (15)	305 (15)	287 (15)	258 (14)	284 (15)	251 (14)	240 (14)	239 (14)
35-44	3409 (18)	419 (22)	411 (21)	394 (19)	376 (18)	335 (17)	304 (16)	312 (17)	292 (17)	275 (16)	285 (17)
45-54	4558 (24)	481 (25)	486 (24)	491 (24)	490 (23)	460 (24)	484 (26)	451 (24)	430 (24)	411 (25)	387 (23)
55-64	5562 (29)	399 (21)	487 (24)	582 (29)	660 (31)	612 (31)	570 (31)	604 (32)	575 (32)	552 (33)	545 (33)
Mean age (Standard deviation)	43.9 (14.1)	41.2 (13.9)	42.1 (14.0)	43.6 (14.0)	44.3 (14.1)	44.2 (14.3)	44.3 (14.3)	44.4 (14.1)	44.9 (14.1)	45.0 (14.1)	44.6 (14.3)
Education level[d]											
Primary school or lower (≤9 years)	3048 (16)	499 (26)	444 (22)	402 (20)	351 (17)	306 (16)	253 (14)	222 (12)	222 (13)	170 (10)	175 (10)
Higher than primary school (>9 years)	15495 (82)	1420 (73)	1499 (75)	1608 (79)	1705 (81)	1621 (83)	1590 (85)	1591 (86)	1517 (86)	1482 (88)	1462 (87)
Working status[d]											
Working[e]	12043 (81)	-	-	1601 (79)	1701 (81)	1588 (81)	1495 (80)	1556 (82)	1426 (81)	1331 (79)	1385 (83)
Not working[f]	2766 (19)	-	-	430 (31)	396 (19)	366 (19)	373 (20)	294 (16)	310 (18)	315 (19)	277 (17)
Respondents using medicines for[d]											
Headache	9806 (52)	1039 (53)	1032 (52)	1026 (50)	1073 (51)	1024 (52)	980 (52)	987 (53)	901 (51)	866 (52)	884 (53)
Ache, pain (other than headache)	5467 (29)	556 (29)	549 (28)	592 (29)	604 (29)	541 (28)	531 (29)	559 (30)	544 (31)	508 (30)	492 (29)
High blood pressure	4077 (22)	291 (15)	367 (18)	429 (21)	465 (22)	450 (23)	434 (23)	442 (24)	409 (23)	395 (24)	391 (23)
Contraception (oral)	2310 (12)	264 (14)	296 (15)	247 (12)	258 (12)	238 (12)	223 (12)	197 (11)	188 (11)	199 (12)	204 (12)
High blood cholesterol	2196 (12)	98 (5)	143 (7)	217 (11)	263 (13)	296 (15)	290 (16)	235 (13)	217 (12)	211 (13)	226 (14)
Women's hormone replacement therapy	2036 (11)	233 (12)	266 (13)	233 (11)	222 (11)	188 (10)	188 (10)	165 (9)	198 (11)	174 (10)	168 (10)
Cough	1316 (7)	220 (11)	186 (9)	168 (8)	160 (8)	113 (6)	77 (4)	115 (6)	101 (6)	103 (6)	77 (5)
Insomnia	1497 (8)	136 (7)	153 (8)	153 (8)	179 (9)	177 (9)	140 (8)	132 (8)	134 (8)	146 (9)	140 (8)
Sedation	915 (5)	133 (7)	93 (5)	121 (6)	102 (5)	94 (5)	70 (4)	85 (5)	76 (4)	69 (4)	72 (4)
Men's sexual potency dysfunction	252 (1)	13 (1)	20 (1)	28 (1)	26 (1)	21 (1)	26 (1)	37 (2)	34 (2)	19 (1)	28 (2)
Depression[h]	1314 (7)	-	111 (6)	143 (7)	148 (7)	176 (9)	136 (5)	142 (8)	173 (10)	134 (8)	146 (9)
Diabetes (other than insulin)[i]	705 (4)	-	-	72 (4)	82 (4)	88 (4)	88 (5)	80 (4)	98 (6)	91 (5)	106 (6)
Diabetes (insulin)[i]	361 (2)	-	-	46 (2)	49 (2)	46 (2)	47 (3)	51 (3)	36 (2)	50 (3)	36 (2)
Number of medicines in use/person[d]											
1	10558 (56)	1215 (63)	1183 (59)	1143 (56)	1154 (55)	1060 (54)	1029 (55)	1041 (55)	946 (54)	907 (54)	910 (54)
2	5116 (27)	505 (26)	559 (28)	566 (28)	584 (28)	536 (27)	512 (27)	492 (27)	492 (28)	442 (26)	429 (26)

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3	1984 (11)	161 (8)	166 (8)	198 (10)	221 (11)	220 (11)	210 (11)	215 (11)	191 (11)	208 (12)	199 (12)
>3	1204 (6)	63 (3)	92 (5)	131 (6)	142 (7)	141 (7)	120 (6)	137 (7)	130 (7)	120 (7)	133 (8)
Respondents with diagnosed diseases[d,e]											
High blood pressure, hypertension	4297 (23)	345 (18)	426 (21)	465 (23)	496 (24)	478 (24)	443 (24)	464 (25)	421 (24)	379 (22)	376 (23)
Degenerative disc disease, other back illness	2712 (14)	262 (14)	284 (14)	314 (15)	321 (15)	263 (13)	260 (14)	277 (15)	260 (15)	227 (14)	249 (15)
Asthma	1163 (6)	113 (6)	114 (6)	112 (6)	120 (6)	132 (7)	125 (7)	111 (6)	120 (7)	99 (6)	115 (7)
Digestive illness (gastritis catarrh, gastritis, ulcer)	904 (5)	96 (5)	97 (5)	108 (5)	110 (5)	93 (5)	91 (5)	84 (4)	85 (5)	89 (5)	65 (4)
Coronary disease, angina pectoris (= chest pain during exercise)	414 (2)	66 (3)	48 (2)	52 (3)	47 (2)	35 (2)	41 (2)	42 (2)	31 (2)	26 (2)	30 (2)
Diabetes	1092 (6)	50 (2)	78 (4)	113 (6)	121 (6)	129 (7)	121 (7)	111 (6)	124 (7)	108 (6)	138 (8)
Rheumatoid arthritis	396 (2)	46 (2)	36 (2)	37 (2)	46 (2)	37 (2)	40 (2)	42 (2)	44 (3)	37 (2)	32 (2)
Chronic bronchitis, pulmonary emphysema	322 (2)	34 (2)	30 (2)	35 (2)	38 (2)	52 (3)	28 (2)	26 (2)	20 (1)	22 (1)	27 (2)
Coronary thrombosis, myocardial infarction	118 (1)	9 (1)	13 (1)	13 (1)	13 (1)	8 (<1)	11 (1)	11 (1)	10 (1)	9 (1)	15 (1)
High blood cholesterol[h]	2913 (17)	-	267 (13)	338 (17)	356 (17)	409 (21)	368 (20)	317 (17)	282 (16)	287 (16)	287 (17)
Depression[i]	1242 (8)	-	-	173 (9)	175 (8)	178 (9)	134 (7)	157 (8)	161 (9)	124 (7)	147 (9)
Other mental health disorder[i]	534 (4)	-	-	64 (3)	73 (4)	66 (3)	47 (3)	82 (4)	65 (4)	73 (4)	64 (4)
Cancer[i]	206 (1)	-	-	29 (1)	26 (1)	26 (1)	28 (2)	23 (1)	34 (2)	23 (1)	17 (1)
Hay or allergic rhinitis[j]	2044 (16)	-	-	-	340 (16)	292 (15)	275 (15)	277 (15)	283 (16)	275 (16)	307 (18)
Food allergy[j]	580 (5)	-	-	-	85 (4)	84 (4)	92 (4)	78 (4)	85 (5)	72 (4)	84 (5)
Number of diagnosed diseases/person[d,e]											
0	8590 (46)	1228 (63)	1121 (56)	971 (48)	864 (41)	787 (40)	811 (43)	751 (41)	712 (40)	723 (43)	689 (41)
1	5176 (27)	502 (26)	527 (26)	593 (29)	616 (29)	557 (29)	492 (26)	536 (29)	521 (30)	465 (28)	450 (27)
2	2924 (16)	151 (8)	232 (12)	270 (13)	368 (18)	350 (18)	331 (18)	331 (18)	296 (17)	280 (17)	285 (17)
>2	2172 (12)	63 (3)	120 (6)	204 (10)	253 (12)	263 (13)	237 (13)	219 (12)	230 (13)	209 (13)	247 (15)

[a]Discrepancies in totals are due to rounding errors, [b]Calculated from study years available, [c]Percentages have been calculated from the respondents of each year, [d]Percentages have been calculated from the respondents of each year who reported using medicines, including prescription and non-prescription medicines (list in the survey) during the last week (7 days), [e]Including at work, partly at work, laid off, student, homemaker, on sick leave (>6 months), or otherwise out of work (added to the survey instrument in 2005), [f]Including retired and unemployed (added to the survey instrument in 2005), [g]Respondents who had a disease (list in the survey) diagnosed by a physician during the last year (12 months), [h]Added to the survey instrument in 2002, [i]Added to the survey instrument in 2005, [j]Added to the survey instrument in 2008.

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Medicines information sources among adult medicine users

The most commonly reported MI sources were physicians, community pharmacists and package leaflets throughout the study period 1999-2014 among adult medicine users (Fig. 1). These information sources were most common despite gender, age, number of medicines in use or diagnosed diseases (Appendix A,B). Receipt of MI from physicians (from 62% in 1999 to 47% in 2014) and package leaflets (44% to 34%) decreased most during the study period, while remained stable from community pharmacists (46% to 45%) and nurses (14% to 14%) (Fig. 1). In 1999, of the medicine users 17% (n=335/1944) did not report any healthcare professionals (physicians, community pharmacists or nurses) as their source of MI, and by 2014 the proportion had grown to 38% (n=639/1671). The use of the Internet as MI source increased rather steadily being 1% in 1999 and 16% in 2014.

Add figure 1 in here.

The number of MI sources from which medicine users reported receipt of MI changed over the study period 1999-2014 (Fig. 2). The most noticeable decreases occurred in those who reported receipt of MI from one (47% to 21%) or two (30 % to 22%) sources. The number of medicine users receiving MI from more than two sources increased moderately. In 1999, of the medicine users 4% (n=77/1944) did not report receipt of MI from any of the information sources listed in the survey, while this proportion had increased to 28% (n=467/1671) in 2014.

Add figure 2 in here.

Receipt of medicines information and associated factors

Women reported receiving MI from all information sources listed in the survey more commonly than men during the study period (Appendix A). Receipt of MI from physicians decreased most among women (from 66% in 1999 to 48% in 2014) and among medicine users aged over 45 years (75% to 52%). Receipt of MI from package leaflets decreased both in women (48% to 38%) and men (36% to 26%), while remained nearly unchanged from community pharmacists (51% to 47% in women vs. 37% to 42% in men). The receipt of MI from community pharmacists increased most among medicine users aged 55-64 years (34% to 46%), and decreased most among medicine users aged 33-44 years (55% to 43%). Package leaflets, relatives and friends were reported to be most common MI sources for medicine users under 25 years, although receipt of MI from package leaflets (59% to 37%) and from relatives and friends (35% to 16%) decreased most in this age group. Receipt of MI from the Internet increased in both genders, slightly more in women than in men (2% to 18% vs. 1% to 12%, respectively), and in all age groups, most among medicine users aged 25-34 years (2% to 21%) and 15-24 years (2% to 20%).

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More male (6% to 33%) than female (3% to 25%) and more medicine users under 45 years (5% to 33%) than medicine users 45 years or older (3% to 25%) did not report receipt of MI from any of the information sources listed in the survey during the study period.

As the number of medicines in use or the number of diagnosed diseases increased, the number of different MI sources increased (Appendix B). However, the opposite changes occurred in the receipt of MI from physicians, the proportion of medicine users receiving MI from physicians decreased 14-26% depending on the number of medicines in use or the number of diagnosed diseases, the highest decline occurring for medicine users with two medicines (76% to 52%) and for medicine users with two diagnosed diseases (83% to 57%). The number of medicines and the number of diagnosed diseases had the opposite influence on the receipt of MI from community pharmacists. The receipt of MI from community pharmacists increased most in medicine users with three medicines (47% to 59%) and in those with three or more diagnosed diseases (49% to 63%), whereas the receipt of MI decreased most in medicine users with one medicine (44% to 38%) and in those medicine users without any diagnosed diseases (45% to 34%). Receipt of MI package leaflets decreased mainly in all medicine users, most in those with one (40% to 28%) or two (48% to 35%) medicines in use and in medicine users without any diagnosed diseases (44% to 30%) or in those with one diagnosed disease (43% to 31%). Receipt of MI from the Internet increased in all medicine users regardless the number of medicines in use or the number of diagnosed diseases, most among respondents with two (1% to 19%) and four or more medicines (5% to 22%), and respondents with three or more diagnosed diseases (3% to 23%). Respondents using one (6% to 35%) or two (1% to 24%) medicines and medicine users without any diagnosed disease listed in the survey (5% to 38%) or with one disease (2% to 25%) most commonly did not report receipt of MI from any of the information sources listed in the survey during the study period.

Overall, the mean number of medicines in use and the mean number of diagnosed diseases increased slightly among medicine users, while the mean number of MI sources from which MI was received remained relatively stable during the study period 1999-2014 (Fig. 3). The ratio between the mean number of medicines in use and the mean number of MI sources from which MI was received remained relatively stable, but the ratio between the mean number of diagnosed diseases and the mean number of MI sources increased.

Add figure 3. in here.

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DISCUSSION

To our knowledge, this is the first study analyzing long-term national trends in the receipt of MI among adult population. The 15-year period covered in this study (1999-2014) provides unique insights into how improved consumer access to MI and the shift from paper to cyber have influenced receipt of MI from various sources. It seems that the key MI sources (physicians, community pharmacists, package leaflets) have remained similar which is in line with previous studies.[21-47] Surprising was that even though the availability and the use of MI sources has diversified among the adult population, an increasing number of medicine users did not report receipt of MI from any of the sources.

The proportion of medicine users who did not report receiving MI from any of the listed sources became 7-fold during the study period (4% to 28%). Furthermore, the proportion of those who did not report receiving MI on medicines they used from any of the healthcare professionals more than doubled from 17% in 1999 to 38% in 2014. Particularly, MI received from the physicians declined over time. The decline was similar (22-26%) in respondents using 2 or more medicines or having or not having diagnosed diseases. According to age, the decline was most evident among medicine users 45 years and older. These findings may indicate that physicians are becoming less involved in actual patient care as the healthcare has become more fragmented. Thus, time allocated for physician office visits has shortened, leading to a situation that physicians do not have time to concentrate on their patients' medications.[61-64] Consequently, those medicine users who were dependent on MI received from their physicians do not have that source available anymore. It also seems that community pharmacists have become more common sources of MI for people with multiple medications instead of physicians, but nurses have not replaced physicians as a MI source. In the future, special attention should be paid to the receipt of MI among people with multiple diseases and medications and the aging populations whose proportion is growing.

Our findings indicate that MI is not evenly distributed among medicine users, it may have become more unevenly distributed over time. According to the present study, gender, age, number of medicines in use and number of diseases were associated with the receipt of MI. During the study period, women, people aged 45 years or older, people with three or more medicines in use and people with three or more diagnosed diseases received MI more commonly on their medicines than other adult medicine users. These findings are in line with previous cross-sectional studies.[23,25,26,40,41] Other previous studies have shown that MI seeking behavior and the use of MI sources is usually influenced by gender and age, but also education, ethnic background, income, employment, health status and medical history.[27,34,39] Potential reasons and system-based root causes for differences in the receipt of MI among medicine users need to be addressed in future research. Our example from Finland demonstrates that availability

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of a wide range of MI sources does not necessarily guarantee their actual and evenly distributed use among medicine users.

This study indicates that the receipt of MI from the Internet was quite rare as more than 90% of the Finns aged 16-64 years were Internet users in 2014.[65] There are no similar population-based long-term trend studies from other countries to compare our results. According to previous studies, use of the Internet as a source of MI has varied between 4% and 29% in the 2000s.[22,25,31,33,34,39,40,42,44-46] It is also known that some patient and medicine user groups use the Internet considerably more (59-68%) than the adult population in general, e.g. patients with chronic conditions and pregnant women.[27,28,41] Thus, if we want to reach the majority of the adult population, we could not solely count on the Internet-based MI sources and services. Further population-based research is needed to get a more comprehensive understanding of the importance and usage patterns of the Internet as a MI source, also the opportunities it provides for improving MI for various medication user segments.

Strengths and limitations of this study

As a repeated national population survey, this study allows for examination of trends over time at the population level. Although the response rate decreased from 67% to 53% during the study period, reflecting that the representativeness of the results to the entire population is getting weaker, it is still adequate for generalizable results.[66,67] The non-respondents more often tended to be young men, unmarried or single and with a lower level of education.[55] Due to the cross-sectional method without cohorts, it is not possible to follow up changes in the receipt of MI over time at the individual level. The respondents did not have the opportunity to report MI from other sources than those listed in the survey, to report separately MI sources on prescription and non-prescription medicines, and to distinguish between active MI seeking or passive receipt of MI. This should be taken account when interpreting results and potential implications. For example, the gender difference in the use of MI sources may differ depending on whether these are discrepancies in the information being provided or gender differences in information seeking-behaviors.[23,25,26,33,40,41,45] Furthermore, people using prescription vs. non-prescription medicines may differ in the amount and use of different MI sources. However, in Finland all medicine users should receive MI from their healthcare providers while prescribing and dispensing both prescription and non-prescription medicines.[68,69] The data did not provide any information about the quality, validity or amount of the MI received.

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Implications and future research

The strategic development of MI will continue both nationally and internationally to ensure the availability and access to reliable, up-to-date and high quality MI and MI sources.[2,4,13,70] As part of this work, it is necessary to continue research on trends in the receipt of MI at the population level and to identify population groups needing special attention, such as older adults. Consumers' MI literacy should be further investigated and considered in the development of MI for different patient and medicine user groups, e.g. by including the question related to MI literacy in population surveys. The present study provides a foundation for further analysis that could go deeper in understanding receipt of MI in various population groups, changes over time and factors influencing it. Further studies are needed also on factors contributing to a growing number of medicine users not receiving MI from any sources.

CONCLUSIONS

Healthcare professionals and package leaflets had still a dominating importance in 2014 despite the growing number of MI sources over time, but still a minority of adult medicine users reported receiving MI via the Internet in 2014. Worrying is that the proportion of adult medicine users who did not receive MI from any of the sources became 7-fold during the study period.

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Contributors: SH has been involved in designing the survey. SH and MA have been involved in developing the survey instrument concerning the receipt of medicines information. NM, MA, KH and MPM planned the analysis and reporting this particular study. The data were applied from the National Institute for Health and Welfare. NM performed the data analysis, and MA, KH, SH and MPM contributed in the interpretation of the data. NM prepared the initial draft of the manuscript. MA, KH, SH and MPM critically reviewed and revised the manuscript. All authors read and gave the final approval of the version to be published.

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Patient consent: Not required.

Ethical approval: As this study was a secondary analysis using routinely collected and fully anonymized data, ethics approval was not applicable. Answering the survey was considered as giving informed consent. The study followed the national ethical guidelines for researchers[60]. All study procedures were conducted in accordance with good research practice.

Data sharing: No additional data available.

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LEGENDS OF THE FIGURES

Figure 1 Trends in the receipt of medicines information among adult medicine users (n=18862) in 1999-2014 (% of the respondents who reported use of at least one prescription or non-prescription medicine within 7 days prior to the survey). The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

Figure 2 Number of medicines information sources from which the adult medicine users (n=18862) had received information on the medicines they used. The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

Figure 3 Ratio between mean number of medicines in use and mean number of diagnosed diseases compared to the mean number of medicines information sources from which the medicine users (n=18862) received medicines information. The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

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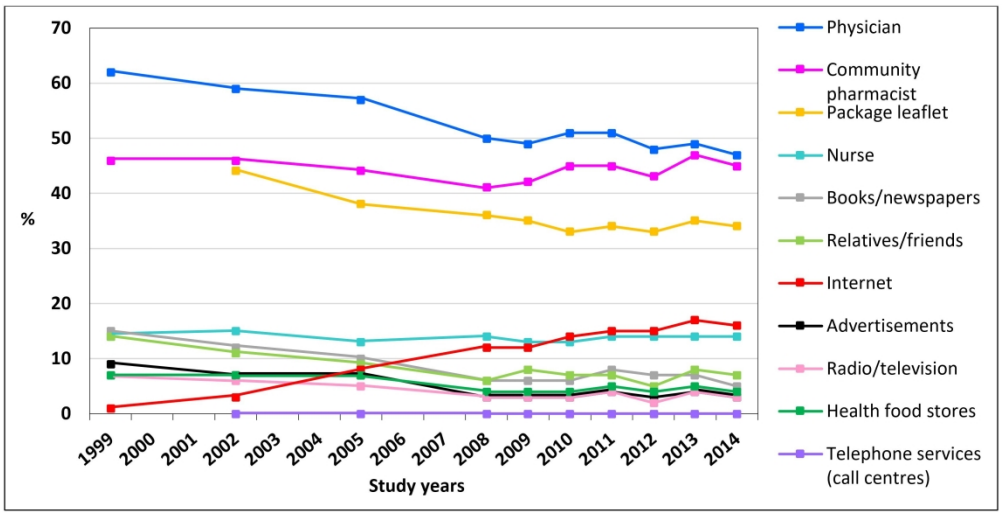

Figure 1 Trends in the receipt of medicines information among adult medicine users (n=18862) in 1999-2014 (% of the respondents who reported use of at least one prescription or non-prescription medicine within 7 days prior to the survey). The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

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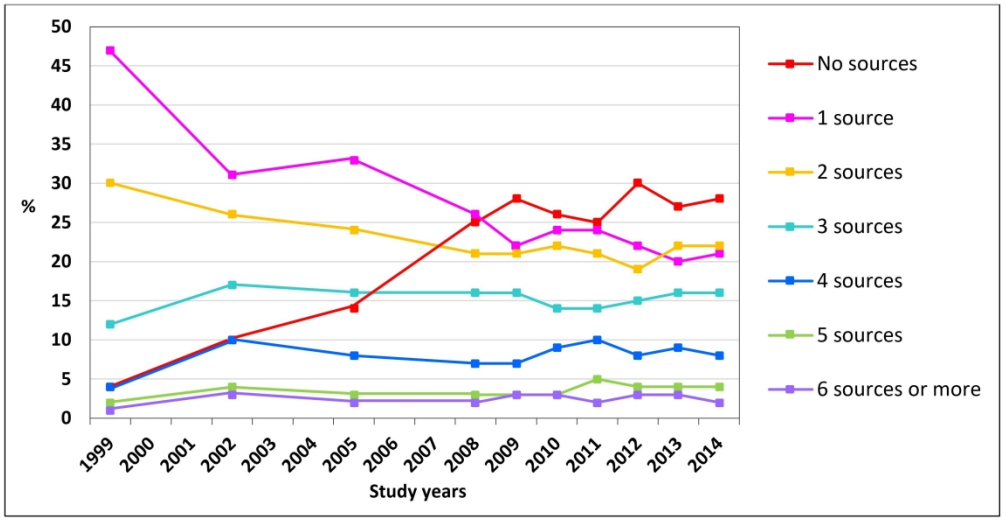

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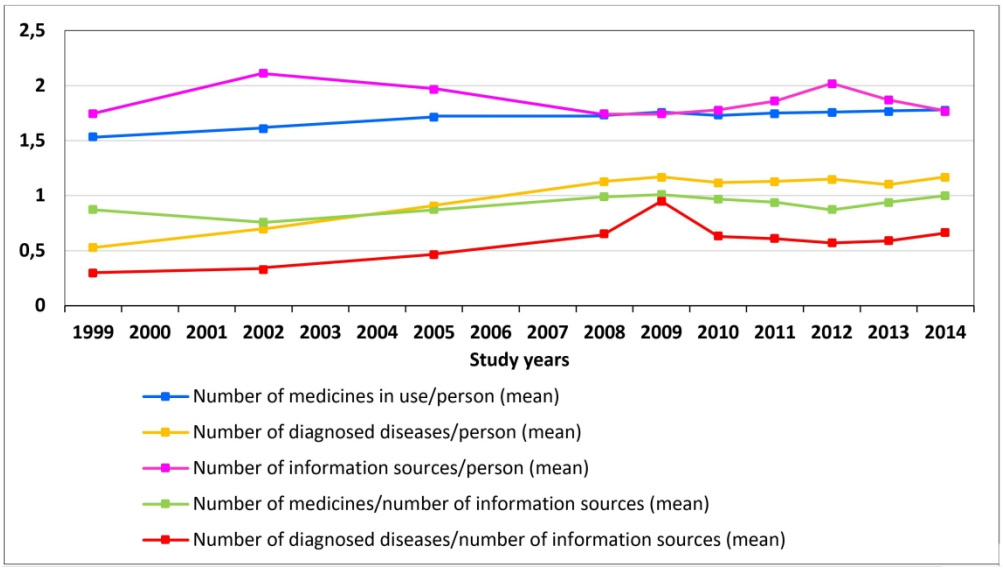

Figure 3 Ratio between mean number of medicines in use and mean number of diagnosed diseases compared to the mean number of medicines information sources from which the medicine users (n=18862) received medicines information. The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

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Appendix A. Trends in the receipt of medicines information among medicine users by gender and age. The percentages are calculated from the variables within each subcategory (e.g. gender, age)[a].

Characteristics	Total[b] n (%)	Study years 1999 n (%)	2002 n (%)	2005 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)	2013 n (%)	2014 n (%)
Respondents using medicines	18862	1944	2000	2038	2101	1957	1871	1944	1759	1677	1671
Gender											
Female	11859 (63)	1217 (63)	1278 (64)	1258 (62)	1332 (63)	1235 (63)	1181 (63)	1228 (63)	1101 (63)	1061 (63)	1068 (64)
Physician	6345 (54)	798 (66)	779 (61)	738 (59)	663 (50)	616 (50)	596 (50)	588 (51)	529 (48)	537 (51)	511 (48)
Community pharmacist	5673 (48)	617 (51)	616 (48)	591 (47)	595 (45)	548 (44)	563 (48)	581 (50)	523 (48)	554 (52)	505 (47)
Package leaflet	4332 (41)	-	615 (48)	539 (43)	527 (40)	494 (40)	462 (39)	459 (39)	411 (37)	437 (41)	408 (38)
Nurse	1687 (14)	187 (15)	183 (14)	159 (13)	195 (15)	173 (14)	157 (13)	178 (15)	168 (15)	155 (15)	152 (14)
Books/newspapers	1201 (10)	226 (19)	198 (15)	162 (13)	95 (7)	92 (7)	83 (7)	128 (11)	74 (7)	85 (8)	77 (7)
Relatives/friends	1078 (9)	160 (13)	143 (11)	121 (10)	92 (7)	113 (9)	89 (8)	141 (12)	82 (7)	90 (8)	77 (7)
Internet	1500 (13)	19 (2)	47 (4)	99 (8)	178 (13)	178 (14)	189 (16)	181 (15)	192 (17)	212 (20)	191 (18)
Advertisements	621 (5)	123 (10)	100 (8)	101 (8)	42 (3)	48 (4)	37 (3)	68 (5)	33 (3)	45 (4)	32 (3)
Radio/television	496 (4)	71 (6)	80 (6)	69 (5)	35 (3)	38 (3)	42 (4)	63 (5)	34 (3)	38 (4)	27 (3)
Health food stores	803 (7)	119 (10)	121 (9)	108 (9)	67 (5)	69 (6)	64 (5)	72 (6)	57 (5)	68 (6)	57 (5)
Telephone services (call centres)	34 (<1)	-	4 (<1)	5 (<1)	4 (<1)	7 (<1)	1 (<1)	3 (<1)	3 (<1)	3 (<1)	4 (<1)
No medicines information sources	2190 (18)	33 (3)	97 (8)	133 (11)	309 (23)	307 (25)	282 (24)	221 (17)	299 (27)	229 (22)	267 (25)
Male	7003 (37)	727 (37)	722 (36)	780 (38)	769 (37)	722 (37)	690 (37)	716 (37)	658 (37)	616 (37)	603 (36)
Physician	3526 (50)	408 (56)	407 (56)	415 (53)	387 (50)	334 (46)	357 (52)	357 (50)	310 (47)	279 (45)	274 (45)
Community pharmacist	2684 (38)	275 (37)	296 (41)	310 (40)	266 (35)	264 (37)	279 (40)	261 (36)	237 (36)	239 (39)	254 (42)
Package leaflet	1712 (27)	-	261 (36)	243 (31)	218 (28)	191 (26)	158 (23)	174 (24)	161 (24)	143 (23)	158 (26)
Nurse	910 (13)	87 (12)	124 (17)	95 (12)	102 (13)	84 (12)	86 (12)	106 (14)	79 (11)	77 (13)	76 (13)
Books/newspapers	315 (4)	66 (9)	49 (7)	41 (5)	30 (4)	20 (3)	21 (3)	28 (4)	20 (3)	26 (4)	14 (2)
Relatives/friends	507 (7)	109 (15)	70 (10)	63 (8)	35 (5)	47 (7)	41 (6)	34 (5)	38 (6)	35 (6)	35 (6)
Internet	651 (9)	7 (1)	21 (3)	58 (7)	65 (8)	65 (9)	72 (10)	81 (11)	75 (11)	71 (12)	71 (12)
Advertisements	225 (3)	57 (8)	35 (5)	36 (5)	24 (3)	9 (1)	14 (2)	9 (1)	17 (3)	15 (2)	9 (1)
Radio/television	251 (4)	59 (8)	47 (7)	32 (4)	20 (3)	12 (2)	15 (2)	19 (3)	9 (1)	22 (4)	16 (3)
Health food stores	186 (3)	22 (3)	20 (3)	28 (4)	21 (3)	10 (1)	13 (2)	17 (2)	9 (1)	9 (1)	9 (1)
Telephone services (call centres)	4 (<1)	-	0 (0)	0 (0)	2 (<1)	0 (0)	0 (0)	1 (<1)	0 (0)	0 (0)	1 (<1)
No medicines information sources	1806 (26)	44 (6)	99 (14)	143 (18)	221 (29)	246 (34)	197 (29)	217 (30)	224 (34)	215 (35)	200 (33)
Age group (years)											
15-24	2535 (13)	314 (16)	308 (15)	269 (13)	270 (13)	263 (13)	255 (14)	231 (12)	211 (12)	199 (12)	215 (13)
Physician	1077 (42)	157 (50)	154 (50)	122 (45)	102 (38)	96 (37)	96 (38)	93 (40)	88 (42)	80 (40)	89 (41)
Community pharmacist	933 (37)	132 (42)	126 (41)	93 (35)	87 (32)	86 (33)	88 (35)	77 (33)	84 (40)	76 (38)	84 (39)
Package leaflet	911 (45)	-	183 (59)	131 (49)	106 (39)	98 (38)	89 (35)	66 (29)	80 (38)	78 (39)	80 (37)
Nurse	522 (21)	65 (21)	73 (24)	48 (18)	54 (20)	55 (21)	51 (20)	44 (19)	48 (23)	41 (21)	43 (20)
Books/newspapers	199 (8)	41 (13)	45 (15)	26 (10)	10 (4)	20 (8)	8 (3)	18 (8)	17 (8)	6 (3)	8 (4)
Relatives/friends	540 (21)	110 (35)	76 (25)	60 (22)	48 (18)	52 (20)	40 (16)	50 (22)	40 (19)	29 (15)	35 (16)
Internet	323 (13)	7 (2)	14 (5)	23 (9)	36 (13)	39 (15)	36 (14)	43 (19)	42 (20)	41 (21)	42 (20)
Advertisements	143 (6)	31 (10)	26 (8)	30 (11)	9 (3)	12 (5)	9 (4)	8 (3)	7 (3)	5 (3)	6 (3)
Radio/television	129 (5)	30 (10)	24 (8)	21 (8)	7 (3)	14 (5)	7 (3)	11 (5)	8 (4)	4 (2)	3 (1)
Health food stores	66 (3)	11 (4)	12 (4)	9 (3)	5 (2)	1 (<1)	4 (2)	5 (2)	7 (3)	7 (4)	5 (2)
Telephone services (call centres)	6 (<1)	-	3 (1)	0 (0)	0 (0)	1 (<1)	0 (0)	0 (0)	0 (0)	1 (1)	1 (<1)
No medicines information sources	657 (26)	16 (5)	37 (12)	46 (17)	85 (31)	94 (36)	89 (35)	74 (32)	75 (36)	72 (36)	69 (32)

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25-34	2798 (15)	331 (17)	308 (15)	302 (15)	305 (15)	287 (15)	258 (14)	27 (15)	251 (14)	240 (14)	239 (14)
Physician	1305 (47)	176 (53)	152 (46)	139 (46)	144 (47)	136 (48)	119 (46)	12 (46)	108 (43)	116 (48)	88 (37)
Community pharmacist	1333 (48)	183 (55)	141 (43)	137 (45)	140 (46)	122 (43)	126 (49)	13 (49)	116 (46)	115 (48)	117 (49)
Package leaflet	1024 (42)	-	160 (48)	132 (44)	129 (42)	119 (42)	100 (39)	10 (39)	101 (40)	89 (37)	87 (36)
Nurse	470 (17)	59 (17)	48 (15)	41 (14)	42 (14)	40 (14)	32 (12)	3 (13)	32 (13)	42 (18)	30 (13)
Books/newspapers	191 (7)	47 (14)	34 (10)	29 (10)	14 (5)	12 (4)	10 (4)	1 (4)	11 (4)	9 (4)	13 (5)
Relatives/friends	329 (12)	57 (17)	38 (11)	51 (17)	23 (8)	28 (10)	25 (10)	3 (14)	17 (7)	33 (14)	19 (8)
Internet	415 (15)	5 (2)	20 (6)	31 (10)	45 (15)	52 (18)	49 (19)	5 (20)	48 (19)	60 (25)	49 (21)
Advertisements	137 (5)	31 (9)	29 (9)	28 (9)	8 (3)	8 (3)	9 (3)	7 (3)	6 (2)	6 (3)	5 (2)
Radio/television	117 (4)	31 (9)	23 (7)	23 (8)	4 (1)	9 (3)	8 (3)	5 (2)	5 (2)	3 (1)	6 (3)
Health food stores	141 (5)	16 (5)	16 (5)	28 (9)	12 (4)	13 (5)	6 (2)	1 (4)	9 (4)	13 (5)	8 (3)
Telephone services (call centres)	13 (1)	-	0 (0)	3 (1)	1 (<1)	1 (<1)	0 (0)	1 (<1)	2 (1)	1 (<1)	4 (2)
No medicines information sources	736 (26)	15 (5)	35 (11)	54 (18)	85 (28)	95 (33)	74 (29)	8 (33)	84 (33)	67 (28)	78 (32)
35-44	3409 (18)	419 (22)	411 (21)	394 (19)	376 (19)	335 (17)	304 (16)	31 (17)	292 (17)	275 (16)	285 (17)
Physician	1609 (47)	220 (55)	221 (54)	200 (51)	164 (44)	146 (44)	145 (48)	14 (45)	127 (43)	121 (44)	120 (42)
Community pharmacist	1568 (46)	230 (55)	213 (52)	183 (47)	165 (44)	132 (39)	141 (47)	13 (42)	119 (41)	134 (49)	121 (43)
Package leaflet	1130 (38)	-	182 (44)	181 (46)	141 (38)	122 (37)	96 (32)	12 (39)	105 (36)	105 (38)	86 (30)
Nurse	380 (11)	40 (10)	46 (11)	41 (10)	46 (12)	44 (13)	29 (10)	3 (10)	37 (13)	26 (9)	37 (13)
Books/newspapers	274 (8)	77 (18)	57 (14)	33 (8)	24 (6)	16 (5)	12 (4)	1 (3)	10 (3)	14 (5)	12 (4)
Relatives/friends	239 (7)	37 (9)	35 (9)	24 (6)	29 (8)	25 (7)	21 (7)	1 (3)	21 (7)	16 (6)	16 (6)
Internet	381 (11)	9 (2)	17 (4)	43 (11)	54 (14)	44 (13)	45 (15)	4 (13)	37 (13)	54 (20)	36 (13)
Advertisements	188 (6)	61 (15)	33 (8)	26 (7)	18 (5)	6 (2)	7 (2)	1 (3)	9 (3)	7 (3)	14 (5)
Radio/television	134 (4)	34 (8)	31 (8)	13 (3)	11 (3)	3 (1)	7 (2)	1 (3)	6 (2)	9 (3)	8 (3)
Health food stores	196 (6)	41 (10)	39 (9)	25 (6)	19 (5)	10 (3)	15 (5)	1 (3)	13 (4)	12 (4)	9 (3)
Telephone services (call centres)	9 (<1)	-	1 (<1)	0 (0)	3 (1)	2 (1)	0 (0)	2 (1)	1 (<1)	0 (0)	0 (0)
No medicines information sources	893 (26)	19 (5)	45 (11)	60 (15)	106 (28)	103 (31)	94 (31)	9 (31)	97 (33)	85 (31)	97 (34)
45-54	4558 (24)	481 (25)	486 (24)	491 (24)	490 (23)	460 (24)	484 (26)	43 (24)	430 (24)	411 (25)	387 (23)
Physician	2539 (56)	342 (71)	314 (65)	297 (60)	275 (56)	232 (50)	237 (49)	22 (52)	210 (49)	200 (49)	203 (52)
Community pharmacist	2101 (46)	210 (44)	218 (45)	227 (46)	201 (41)	203 (44)	231 (48)	21 (49)	196 (46)	196 (48)	187 (48)
Package leaflet	1453 (36)	-	185 (38)	181 (37)	176 (36)	169 (37)	163 (34)	16 (37)	136 (32)	145 (35)	138 (36)
Nurse	544 (12)	59 (12)	65 (13)	53 (11)	72 (15)	47 (10)	46 (10)	5 (13)	48 (11)	53 (13)	42 (11)
Books/newspapers	410 (9)	81 (17)	60 (12)	57 (12)	40 (8)	32 (7)	32 (5)	3 (9)	20 (5)	33 (8)	17 (4)
Relatives/friends	236 (5)	37 (8)	31 (6)	21 (4)	18 (4)	31 (7)	24 (5)	1 (4)	20 (5)	21 (5)	15 (4)
Internet	481 (11)	3 (1)	12 (2)	38 (8)	61 (12)	58 (13)	63 (13)	6 (16)	58 (13)	60 (15)	60 (16)
Advertisements	199 (4)	32 (7)	31 (6)	30 (6)	17 (3)	16 (3)	15 (3)	2 (5)	14 (3)	18 (4)	6 (2)
Radio/television	156 (3)	22 (5)	26 (5)	15 (3)	17 (3)	13 (3)	10 (2)	1 (4)	10 (2)	20 (5)	6 (2)
Health food stores	251 (6)	43 (9)	38 (8)	29 (6)	10 (2)	28 (6)	22 (5)	3 (7)	13 (3)	20 (5)	16 (4)
Telephone services (call centres)	5 (<1)	-	0 (0)	0 (0)	1 (<1)	2 (<1)	1 (<1)	0 (0)	0 (0)	1 (<1)	0 (0)
No medicines information sources	932 (20)	15 (3)	40 (8)	56 (11)	107 (22)	107 (23)	120 (25)	9 (22)	125 (29)	104 (25)	100 (26)
55-64	5562 (29)	399 (21)	487 (24)	582 (29)	660 (31)	612 (31)	570 (30)	58 (31)	575 (33)	552 (33)	545 (33)
Physician	3341 (60)	311 (78)	345 (71)	395 (68)	365 (55)	340 (56)	356 (62)	33 (58)	306 (53)	299 (54)	285 (52)
Community pharmacist	2438 (44)	137 (34)	214 (44)	261 (45)	268 (41)	269 (44)	256 (45)	26 (46)	245 (43)	272 (49)	250 (46)
Package leaflet	1526 (30)	-	166 (34)	157 (27)	193 (29)	177 (29)	172 (30)	17 (30)	150 (26)	163 (30)	175 (32)
Nurse	749 (13)	51 (13)	75 (15)	71 (12)	83 (13)	71 (12)	85 (15)	8 (15)	82 (14)	70 (13)	76 (14)
Books/newspapers	442 (8)	46 (12)	51 (10)	58 (10)	37 (6)	32 (5)	42 (7)	5 (9)	36 (6)	49 (9)	41 (8)
Relatives/friends	241 (4)	28 (7)	33 (7)	28 (5)	9 (1)	24 (4)	20 (4)	2 (4)	22 (4)	26 (5)	27 (5)
Internet	449 (8)	2 (1)	5 (1)	22 (4)	47 (7)	50 (8)	68 (12)	6 (12)	82 (14)	68 (12)	75 (14)
Advertisements	180 (3)	25 (6)	16 (3)	23 (4)	14 (7)	15 (2)	12 (2)	1 (5)	14 (2)	24 (4)	10 (2)
Radio/television	211 (4)	13 (3)	23 (5)	29 (5)	16 (2)	11 (2)	25 (4)	2 (6)	14 (2)	24 (4)	20 (4)
Health food stores	329 (6)	30 (8)	36 (7)	45 (8)	42 (6)	27 (4)	30 (5)	2 (6)	24 (4)	25 (5)	28 (5)
Telephone services (call centres)	5 (<1)	-	0 (0)	2 (<1)	1 (<1)	1 (1)	0 (0)	1 (<1)	0 (0)	0 (0)	0 (0)
No medicines information sources	1072 (19)	12 (3)	39 (8)	60 (10)	147 (22)	154 (25)	102 (18)	15 (27)	142 (25)	116 (21)	123 (23)

[a]Discrepancies in totals are due to rounding errors, [b]Calculated from study years available.

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Appendix B. Trends in the receipt of medicines information among medicine users (n=18862) by number of medicines in use and number of diagnosed diseases. The percentages are calculated from the variables within each subcategory (e.g. number of medicines in use, number of diagnosed diseases)[a].

Characteristics	Total[b] n (%)	Study years 1999 n (%)	2002 n (%)	2005 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)	2013 n (%)	2014 n (%)
Respondents using medicines	18862	1944	2000	2038	2101	1957	1871	1844	1759	1677	1671
Number of medicines in use/person											
1 medicine	10558 (56)	1215 (63)	1183 (59)	1143 (56)	1154 (55)	1060 (54)	1029 (55)	1001 (54)	946 (54)	907 (54)	910 (54)
Physician	4449 (42)	628 (52)	559 (47)	508 (44)	465 (40)	410 (39)	414 (40)	419 (41)	344 (36)	366 (40)	345 (38)
Community pharmacist	3992 (38)	540 (44)	461 (39)	408 (36)	405 (35)	369 (35)	386 (38)	370 (37)	333 (35)	368 (41)	347 (38)
Package leaflet	2952 (32)	-	478 (40)	401 (35)	354 (31)	317 (30)	293 (28)	312 (31)	261 (28)	278 (31)	258 (28)
Nurse	1056 (10)	138 (11)	124 (10)	104 (9)	129 (11)	103 (10)	84 (8)	104 (10)	90 (10)	92 (10)	88 (10)
Books/newspapers	719 (7)	184 (15)	124 (10)	92 (8)	48 (4)	43 (4)	43 (4)	62 (6)	39 (4)	45 (5)	39 (4)
Relatives/friends	823 (8)	168 (14)	113 (10)	94 (8)	70 (6)	76 (7)	64 (6)	78 (8)	55 (6)	56 (6)	48 (5)
Internet	887 (8)	10 (1)	37 (3)	78 (7)	99 (9)	90 (8)	114 (11)	122 (12)	105 (11)	117 (13)	117 (13)
Advertisements	497 (5)	127 (10)	86 (7)	74 (6)	38 (3)	28 (3)	29 (3)	36 (4)	26 (3)	27 (3)	26 (3)
Radio/television	373 (4)	88 (7)	67 (6)	48 (4)	26 (2)	20 (2)	30 (3)	37 (4)	16 (2)	27 (3)	14 (2)
Health food stores	477 (5)	77 (6)	71 (6)	60 (5)	36 (3)	41 (4)	44 (4)	46 (5)	28 (3)	39 (4)	35 (4)
Telephone services (call centres)	20 (<1)	-	4 (<1)	2 (<1)	3 (<1)	3 (<1)	1 (<1)	2 (<1)	2 (<1)	0 (0)	3 (<1)
No medicines information sources	2851 (27)	68 (6)	164 (14)	219 (19)	386 (33)	379 (36)	338 (33)	321 (32)	363 (38)	292 (32)	320 (35)
2 medicines	5116 (27)	505 (26)	559 (28)	566 (28)	584 (28)	536 (27)	512 (27)	493 (27)	492 (28)	442 (26)	429 (26)
Physician	3107 (61)	386 (76)	396 (71)	371 (66)	336 (58)	297 (55)	299 (58)	272 (55)	284 (58)	236 (53)	224 (52)
Community pharmacist	2482 (49)	237 (47)	299 (53)	290 (51)	256 (44)	235 (44)	247 (48)	241 (49)	238 (48)	224 (51)	211 (49)
Package leaflet	1769 (38)	-	270 (48)	225 (40)	231 (40)	205 (38)	189 (37)	168 (34)	172 (35)	158 (36)	151 (35)
Nurse	794 (16)	94 (19)	117 (21)	84 (15)	90 (15)	72 (13)	68 (13)	76 (15)	76 (15)	59 (13)	62 (14)
Books/newspapers	468 (9)	73 (14)	83 (15)	62 (11)	39 (7)	38 (7)	31 (6)	35 (7)	30 (6)	45 (5)	32 (7)
Relatives/friends	488 (10)	75 (15)	66 (12)	62 (11)	38 (7)	54 (10)	45 (9)	42 (9)	39 (8)	38 (9)	29 (7)
Internet	671 (13)	7 (1)	25 (4)	46 (8)	85 (15)	81 (15)	81 (16)	83 (17)	90 (18)	90 (20)	83 (19)
Advertisements	224 (4)	40 (8)	34 (6)	43 (8)	17 (3)	17 (3)	14 (3)	16 (3)	14 (3)	19 (4)	10 (2)
Radio/television	201 (4)	23 (5)	37 (7)	28 (5)	16 (3)	17 (3)	16 (3)	21 (4)	16 (3)	16 (4)	11 (3)
Health food stores	297 (6)	38 (8)	48 (9)	51 (9)	31 (5)	18 (3)	22 (4)	27 (5)	23 (5)	22 (5)	17 (4)
Telephone services (call centres)	10 (<1)	-	0 (0)	1 (<1)	2 (<1)	2 (<1)	0 (0)	1 (<1)	1 (<1)	2 (<1)	1 (<1)
No medicines information sources	801 (16)	5 (1)	25 (4)	47 (8)	105 (18)	122 (23)	101 (20)	83 (17)	111 (23)	99 (22)	103 (24)
3 medicines	1984 (11)	161 (8)	166 (8)	198 (10)	221 (11)	220 (11)	210 (11)	210 (11)	191 (11)	208 (12)	199 (12)
Physician	1388 (70)	133 (83)	139 (84)	158 (80)	147 (67)	140 (64)	149 (71)	151 (71)	116 (61)	134 (64)	122 (61)
Community pharmacist	1101 (55)	76 (47)	94 (57)	112 (57)	111 (50)	118 (54)	130 (62)	110 (52)	106 (55)	127 (61)	117 (59)
Package leaflet	797 (44)	-	83 (50)	88 (44)	97 (44)	90 (41)	87 (41)	80 (38)	77 (40)	100 (48)	95 (48)
Nurse	413 (21)	28 (17)	41 (25)	33 (17)	37 (17)	45 (20)	57 (27)	44 (21)	40 (21)	42 (20)	46 (23)
Books/newspapers	197 (10)	25 (16)	22 (13)	24 (12)	20 (9)	13 (6)	20 (10)	21 (10)	17 (9)	23 (11)	12 (6)
Relatives/friends	165 (8)	14 (9)	26 (16)	15 (8)	10 (5)	10 (5)	16 (8)	14 (7)	20 (10)	19 (9)	21 (11)
Internet	311 (16)	6 (4)	4 (2)	23 (12)	37 (17)	37 (17)	42 (20)	44 (21)	38 (20)	47 (23)	33 (17)
Advertisements	78 (4)	8 (5)	13 (8)	12 (6)	5 (2)	5 (2)	6 (3)	11 (5)	6 (3)	9 (4)	3 (2)
Radio/television	93 (5)	13 (8)	17 (10)	9 (5)	5 (2)	5 (2)	9 (4)	13 (6)	5 (3)	11 (5)	6 (3)
Health food stores	103 (5)	19 (12)	11 (7)	12 (6)	8 (4)	12 (5)	7 (3)	8 (4)	7 (4)	10 (5)	9 (5)
Telephone services (call centres)	4 (<1)	-	0 (0)	1 (1)	1 (<1)	0 (0)	0 (0)	1 (<1)	0 (0)	1 (<1)	0 (0)
No medicines information sources	238 (12)	4 (2)	4 (2)	9 (5)	28 (13)	39 (18)	26 (12)	33 (16)	34 (18)	36 (17)	25 (13)
4 medicines or more	1204 (6)	63 (3)	92 (5)	131 (6)	142 (7)	141 (7)	120 (6)	132 (7)	130 (7)	120 (7)	133 (8)
Physician	913 (76)	59 (94)	78 (85)	116 (89)	102 (72)	103 (73)	91 (76)	95 (72)	95 (72)	80 (67)	94 (71)
Community pharmacist	780 (65)	39 (62)	58 (63)	91 (69)	89 (63)	90 (64)	79 (66)	95 (72)	83 (63)	72 (60)	84 (63)
Package leaflet	526 (44)	-	45 (39)	68 (52)	63 (44)	73 (52)	51 (43)	58 (44)	62 (48)	44 (37)	62 (47)
Nurse	334 (28)	14 (22)	25 (27)	33 (25)	41 (29)	37 (26)	34 (28)	38 (29)	41 (32)	39 (33)	32 (24)
Books/newspapers	148 (12)	10 (16)	18 (20)	25 (19)	18 (13)	18 (13)	10 (8)	19 (14)	8 (6)	14 (12)	8 (6)
Relatives/friends	110 (9)	12 (19)	8 (9)	13 (10)	9 (6)	20 (14)	5 (4)	11 (8)	6 (5)	12 (10)	14 (11)
Internet	217 (18)	3 (5)	2 (2)	10 (8)	22 (15)	35 (25)	24 (20)	29 (22)	34 (26)	29 (24)	29 (22)
Advertisements	47 (4)	5 (8)	2 (2)	8 (6)	6 (4)	7 (5)	2 (2)	6 (5)	4 (3)	5 (4)	2 (2)
Radio/television	80 (7)	6 (10)	6 (7)	16 (12)	8 (6)	8 (6)	2 (2)	10 (8)	6 (5)	6 (5)	12 (9)

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Health food stores	84 (7)	7 (11)	11 (12)	13 (10)	13 (9)	8 (6)	4 (3)	9 (7)	8 (6)	6 (5)	5 (4)
Telephone services (call centres)	4 (<1)	-	0 (0)	1 (1)	0 (0)	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
No medicines information sources	106 (9)	0 (0)	3 (5)	1 (1)	11 (8)	13 (9)	14 (12)	13 (10)	15 (12)	17 (14)	19 (14)
Number of diagnosed diseases/person[c]											
None	8660	1228 (63)	1121 (56)	971 (48)	864 (41)	787 (40)	811 (43)	757 (41)	712 (41)	723 (43)	689 (41)
Physician	3418 (39)	633 (52)	536 (48)	384 (40)	286 (33)	273 (35)	300 (37)	272 (36)	249 (35)	268 (36)	217 (31)
Community pharmacist	3277 (38)	558 (45)	470 (42)	371 (38)	299 (35)	258 (33)	293 (36)	266 (35)	250 (35)	275 (38)	236 (34)
Package leaflet	2538 (34)	-	496 (44)	387 (40)	282 (33)	251 (32)	246 (30)	232 (31)	202 (28)	230 (32)	207 (30)
Nurse	909 (10)	157 (13)	146 (13)	91 (9)	88 (10)	67 (9)	80 (10)	71 (9)	70 (10)	75 (10)	64 (9)
Books/newspapers	698 (8)	194 (16)	134 (12)	95 (10)	42 (5)	35 (4)	39 (5)	50 (7)	34 (5)	38 (5)	37 (5)
Relatives/friends	851 (10)	196 (16)	135 (12)	117 (12)	55 (6)	66 (8)	66 (8)	71 (9)	55 (8)	50 (7)	40 (6)
Internet	744 (9)	15 (1)	38 (3)	65 (7)	77 (9)	71 (9)	99 (12)	93 (12)	84 (12)	109 (15)	93 (13)
Advertisements	488 (6)	141 (12)	88 (8)	81 (8)	35 (4)	21 (3)	25 (3)	30 (4)	19 (3)	24 (3)	24 (3)
Radio/television	358 (4)	96 (8)	65 (6)	52 (5)	20 (2)	18 (2)	21 (3)	33 (4)	12 (2)	23 (3)	18 (3)
Health food stores	446 (5)	85 (7)	84 (8)	72 (7)	37 (4)	22 (3)	34 (4)	31 (4)	17 (2)	35 (5)	29 (4)
Telephone services (call centres)	20 (<1)	-	3 (<1)	4 (<1)	2 (<1)	2 (<1)	0 (0)	2 (<1)	2 (<1)	2 (<1)	3 (<1)
No medicines information sources	2337 (27)	65 (5)	155 (14)	187 (19)	311 (36)	295 (37)	272 (34)	253 (34)	283 (40)	251 (35)	264 (38)
1 disease	5262	502 (26)	527 (26)	593 (29)	616 (29)	557 (29)	492 (26)	534 (29)	521 (30)	465 (28)	450 (27)
Physician	3055 (58)	389 (77)	364 (69)	394 (66)	348 (57)	290 (52)	261 (53)	272 (51)	251 (48)	245 (53)	237 (53)
Community pharmacist	2342 (45)	224 (45)	259 (49)	260 (44)	241 (39)	231 (42)	221 (45)	241 (45)	218 (42)	231 (50)	212 (47)
Package leaflet	1620 (34)	-	228 (43)	202 (34)	205 (33)	197 (35)	156 (32)	161 (30)	156 (30)	169 (36)	139 (31)
Nurse	699 (13)	70 (14)	81 (15)	68 (12)	90 (15)	84 (15)	53 (11)	68 (13)	69 (13)	57 (12)	59 (13)
Books/newspapers	410 (8)	75 (15)	66 (13)	54 (9)	33 (5)	34 (6)	25 (5)	41 (8)	27 (5)	36 (8)	19 (4)
Relatives/friends	386 (7)	53 (11)	56 (11)	32 (5)	37 (6)	46 (8)	36 (7)	38 (7)	30 (6)	34 (7)	24 (5)
Internet	591 (11)	8 (2)	19 (4)	49 (8)	78 (13)	68 (12)	67 (14)	68 (13)	73 (14)	95 (20)	66 (15)
Advertisements	200 (4)	32 (6)	30 (6)	35 (6)	11 (2)	18 (3)	13 (3)	16 (3)	14 (3)	20 (4)	11 (2)
Radio/television	190 (4)	22 (4)	42 (8)	24 (4)	12 (2)	11 (2)	16 (3)	16 (3)	18 (3)	20 (4)	7 (2)
Health food stores	268 (5)	44 (9)	36 (7)	30 (5)	18 (3)	28 (5)	17 (3)	23 (5)	25 (5)	23 (5)	19 (4)
Telephone services (call centres)	8 (<1)	-	0 (0)	0 (0)	2 (<1)	2 (<1)	1 (<1)	0 (0)	1 (<1)	1 (<1)	1 (<1)
No medicines information sources	1010 (19)	11 (2)	26 (5)	65 (11)	138 (22)	153 (27)	124 (25)	118 (22)	153 (29)	110 (24)	112 (25)
2 diseases	2900	151 (8)	232 (12)	270 (13)	368 (18)	350 (18)	331 (18)	337 (18)	296 (17)	280 (17)	285 (17)
Physician	1930 (67)	126 (83)	183 (79)	203 (75)	240 (65)	208 (59)	224 (68)	224 (68)	193 (64)	161 (58)	163 (57)
Community pharmacist	1506 (52)	79 (52)	116 (50)	140 (52)	179 (49)	172 (49)	179 (54)	177 (53)	156 (53)	152 (54)	156 (55)
Package leaflet	1033 (36)	-	98 (42)	98 (36)	142 (39)	131 (37)	120 (36)	128 (38)	118 (40)	98 (35)	108 (38)
Nurse	470 (16)	34 (23)	43 (19)	39 (14)	50 (14)	52 (15)	52 (16)	59 (18)	50 (17)	55 (20)	36 (13)
Books/newspapers	202 (7)	11 (7)	28 (12)	24 (9)	25 (7)	23 (7)	20 (6)	16 (5)	21 (7)	17 (6)	17 (6)
Relatives/friends	208 (7)	11 (7)	18 (8)	18 (7)	23 (6)	26 (7)	13 (4)	23 (7)	20 (7)	27 (10)	29 (10)
Internet	417 (14)	1 (1)	9 (4)	28 (10)	56 (15)	57 (16)	48 (15)	67 (20)	64 (22)	40 (14)	47 (16)
Advertisements	85 (3)	3 (2)	12 (5)	10 (4)	8 (2)	7 (2)	7 (2)	13 (4)	11 (4)	10 (4)	4 (1)
Radio/television	96 (3)	7 (5)	11 (5)	7 (3)	9 (2)	9 (3)	10 (3)	16 (5)	9 (3)	11 (4)	7 (2)
Health food stores	140 (5)	5 (3)	15 (7)	15 (6)	18 (5)	21 (6)	13 (4)	20 (6)	16 (5)	9 (3)	8 (3)
Telephone services (call centres)	3 (<1)	-	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1)	0 (0)	0 (0)	0 (0)
No medicines information sources	430 (15)	1 (1)	10 (4)	19 (7)	58 (16)	71 (20)	55 (17)	53 (16)	48 (16)	57 (20)	58 (20)
3 diseases or more	2040	63 (5)	120 (6)	204 (10)	253 (12)	263 (13)	237 (13)	211 (12)	230 (13)	209 (13)	247 (15)
Physician	1473 (72)	58 (92)	103 (86)	172 (84)	176 (70)	179 (68)	168 (71)	156 (73)	151 (66)	142 (68)	168 (68)
Community pharmacist	1232 (60)	31 (49)	67 (56)	130 (64)	142 (56)	151 (57)	149 (63)	136 (64)	136 (59)	135 (65)	155 (63)
Package leaflet	853 (43)	-	54 (45)	95 (47)	116 (46)	106 (40)	98 (41)	93 (43)	96 (42)	83 (40)	112 (45)
Nurse	483 (24)	13 (21)	37 (31)	56 (28)	69 (27)	54 (21)	58 (24)	24 (11)	58 (25)	45 (22)	69 (28)
Books/newspapers	185 (9)	12 (19)	19 (16)	30 (15)	25 (10)	20 (8)	20 (8)	22 (10)	12 (5)	7 (3)	18 (7)
Relatives/friends	140 (7)	9 (14)	4 (3)	17 (8)	12 (5)	22 (8)	15 (6)	13 (6)	15 (7)	14 (7)	19 (8)
Internet	334 (16)	2 (3)	2 (2)	15 (7)	32 (13)	47 (18)	47 (20)	48 (22)	46 (20)	39 (19)	56 (23)
Advertisements	153 (8)	4 (6)	5 (4)	11 (5)	12 (5)	11 (4)	86 (3)	10 (5)	6 (3)	6 (3)	2 (1)
Radio/television	104 (5)	5 (8)	9 (8)	18 (9)	14 (6)	12 (5)	10 (4)	14 (7)	4 (2)	7 (3)	11 (4)
Health food stores	107 (5)	7 (11)	6 (5)	19 (9)	15 (6)	8 (3)	13 (5)	11 (5)	8 (3)	10 (5)	10 (4)
Telephone services (call centres)	7 (<1)	-	0 (0)	1 (1)	2 (1)	3 (1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (<1)
No medicines information sources	219 (11)	0 (0)	5 (4)	5 (2)	23 (9)	34 (13)	28 (12)	26 (12)	39 (17)	26 (12)	33 (13)

[a]Discrepancies in totals are due to rounding errors, [b]Calculated from study years available, [c]Respondents who had disease (list in the survey) diagnosed by a physician during the last year (12 months).

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5,6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5,6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	14
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6,7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6,7
		(*b*) Describe any methods used to examine subgroups and interactions	6,7
		(*c*) Explain how missing data were addressed	6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	6,8
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-10
		(b) Indicate number of participants with missing data for each variable of interest	9-10
Outcome data	15*	Report numbers of outcome events or summary measures	11,12
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted	NA

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		estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	12, Appendix 1&2
Discussion			
Key results	18	Summarise key results with reference to study objectives	14,15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15,16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	15
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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BMJ Open

Trends in the receipt of medicines information among Finnish adults in 1999–2014: a nationwide repeated cross-sectional survey

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Primary Subject Heading:	Health informatics
Secondary Subject Heading:	Health policy
Keywords:	Medicines information, Medicines information sources, Population study, Repeated cross-sectional survey, Finland

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Title	**Trends in the receipt of medicines information among Finnish adults in 1999–2014: a nationwide repeated cross-sectional survey**
Authors' names	Niina Mononen, Marja Airaksinen, Katri Hämeen-Anttila, Satu Helakorpi, Marika Pohjanoksa-Mäntylä
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Word count: 3993

Keywords: Medicines information, Medicines information sources, Population study, Repeated cross-sectional survey, Finland

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ABSTRACT

Objective

The aim of this study was to examine long-term trends in the receipt of medicines information (MI) among adult medicine users from 1999 to 2014.

Design

Repeated cross-sectional postal survey from the years 1999, 2002, 2005 and 2008-2014.

Setting

Each study year, a new nationally representative sample of 5000 Finns aged 15-64 years was drawn from the Population Register Centre of Finland.

Participants

The range of annual respondents varied from 2545 to 3371 and response rates from 53% to 67%. Of the total responses (n=29465) 64% were from medicine users (n=18862, ranging by year from 58% to 68%).

Outcome measures

Receipt of information on medicines in use within 12 months prior to the survey from a given list of consumer MI sources available in Finland.

Results

Physicians, community pharmacists and package leaflets were the most common MI sources throughout the study period. Receipt of MI increased most from the Internet (from 1% in 1999 to 16% in 2014), while decreased most from physicians (62% to 47%) and package leaflets (44% to 34%), and remained stable from community pharmacists (46% to 45%) and nurses (14% to 14%). In 1999, of the medicine users 4% did not report receipt of MI from any of the sources listed in the survey, while this proportion had remarkably increased to 28% in 2014.

Conclusions

Healthcare professionals and package leaflets had still a dominating importance in 2014 despite the growing number of MI sources over time, but still a minority of adult medicine users reported receiving MI via the Internet in 2014. Worrying is that the proportion of adult medicine users who did not receive MI from any of the sources became 7-fold during the study period.

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Strengths and limitations of this study

- The key strength of this national population study is that it examines trends in the receipt of medicines information among adult medicine users within a 15-year time period by using representative random population samples with high enough response rates for generalizable results.
- Repeated surveys are necessary to indicate population level changes in the utilization of available MI sources and reveal needs to develop MI practices and policies at the national level.
- Due to the cross-sectional method without cohorts, it is not possible to follow up changes in the receipt of medicines information over time at the individual level.
- The data did not provide any information about the quality, validity or amount of the medicines information received.
- Factors contributing to a growing number of adult medicine users not receiving medicines information from any sources should be better understood and focused on in future research.

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INTRODUCTION

Consumer access to medicines information (MI) has dramatically improved during the last decades.[1-7] Driving forces for more open access to MI have been drug safety issues, patients' right to know about medicinal interventions that they are exposed to and tendency to empower people in taking more responsibility for self-management of their diseases.[2,4,7] These changes have led to improved availability of MI, first on paper and later via the Internet and electronic applications in smartphones and other electronic devices. The applications are evolving fast towards systems enabling customized MI, interactive communications and following up treatments.[1,3,4,8-10] Improved communication on medications have also been a strategic priority in national and international medicines policies, e.g. within the European Union.[2,4,11-16]

Consumers' health information seeking, including MI seeking from various information sources, have been widely researched.[17-20] Previous research on the receipt of MI among the adult population have either focused on 1) particular patient groups such as asthmatics,[21] people with cancer,[22] cardiovascular diseases,[23] HIV/AIDS,[24] mental disorders[25] or vasculitis,[26] and pregnant women,[27,28] or 2) focused on certain medicine user groups such as users of hormone replacement therapies,[29-31] analgesics,[32,33] antidepressants,[34] antihypertensives,[35] cardiovascular medicines[36] or psychotropics.[37] Previous studies have mostly applied single cross-sectional study designs.[38-46] We found only one study that compared results from two years, covering a 7-year period.[47] The consistent findings from the previous studies are that physicians, pharmacists and package leaflets are the most common sources of MI regardless of the research method, the study year, the country and the research population.[21-47] Consumers usually sought MI from only one or two information sources.[28,34,39,43,44] The use of the Internet as a source of MI has become more common over time, but it is not yet as commonly used source of MI for consumers as healthcare professionals.[22,24-26,30,31,33-35,38-40,42,44-46] However, there is a lack of long-term population-based studies describing trends in the receipt of MI among adult medicine users. Repeated surveys are necessary to indicate population level changes in the utilization of available MI sources and to reveal needs to develop MI practices and policies at the national level. In Finland, improving the accessibility and quality of MI have been among the key strategic medicines policy goals over the last decades.[2,15] The long-term comparative information in the receipt of MI and the proportion of people receiving MI are important measures to indicate whether the desired outcomes are met. Therefore, this study examined long-term trends in the receipt of MI among Finnish adult medicine users in 1999-2014.

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METHODS

Context

Similarly to many developed countries, availability of consumer MI has dramatically improved in Finland during the last decades.[2,4,7] Until 1983, patients and medicine users received information about their medicines exclusively from their physicians.[7,48] The remarkable landmarks towards more open access to MI have been pharmacists' duty to counsel on prescription and non-prescription medicines in 1983, followed in 1986 by the launch of the first computerized database providing leaflets for consumers in community pharmacies. Package leaflets became mandatory across the European Union in 1999.[49] About the same time, the Internet and mobile phones became more common and eventually revolutionized access to health and MI. "From paper the cyber" shift has improved access to statutory MI, e.g. by making package leaflets available online in written and audio format.[50,51] A wide range of stakeholders from the drug industry to non-profit professional and patient organisations have been developing new databases and modes for communicating on medicines to consumers. To coordinate MI practices and enhance public-private partnerships, the European Union has recommended its member states to establish national MI programs and strategies.[13] Such a strategy was established for the first time in Finland in 2012 by the Finnish Medicines Agency.[2] The ultimate goal of the strategy is to improve adherence to long-term therapies by enhanced MI by 2020.

Study design

The study was conducted as a repeated cross-sectional postal survey using each year a new nationally representative sample (n=5000) of the Finnish adult population aged 15-64 years.[52] The national health behavior survey used in this study has its origins in the North Karelia Project, started in 1972, which has been instrumental in improving public health in Finland.[53] The annual "Health Behaviour and Health among the Finnish Adult Population" survey was established in 1978 to perform as an indicator for changes in the population health and related risk factors, such as smoking, food and alcohol consumption and physical activity.[52] The survey has been targeted to the adult working age population of 15-64 years old. The survey has been repeated every year in the same way to yield comparable results. In addition to the original standard set of structured questions, some other questions have been added to the survey instrument over the years. One of the added questions was the one used in our study concerning receipt of MI from different sources available for consumers/medicine users in Finland (added to the survey instrument in 1999).

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The sample has been derived from the Population Register Centre of Finland which is a government-based register where all Finnish citizens and permanent residents are obliged to be registered.[52,54] The survey has been conducted every year (1978-2014) as a postal survey.[52] The distribution of the questionnaires by mail has assured better coverage of the entire study population than e.g., using online surveys. This is because the Population Register Centre has the current address available for all Finns and permanent residents. In order to maintain response rate high enough for generalizable results, three reminders were sent during the study period covered in our study (1999-2014).[55] Data from the years 1999, 2002, 2005, 2008-2014 was compared as these are the years when the survey instrument included the question on the receipt of MI.

Survey instrument and measures

The main outcome measure was the receipt of MI on medicines in use. The survey instrument contained the question "In the past year (12 months), from which sources did you receive information on the medicines you have been using?" The question was followed by a list of MI sources available for consumers in Finland at the time of the study (Fig. 1). Respondents could indicate from the list as many information sources as applicable. It was not possible to report other sources than those mentioned in the survey. In 2002, package leaflets and telephone services were added to the list of MI sources.

Socio-demographic variables used in this study were gender, age and education. Health-related variables were respondents' medicine use and diagnosed diseases. Use of medicines was assessed by the question "Have you used any tablets, powders, or other medicines within the past week (7 days)?" This question was followed by a list of commonly used prescription and non-prescription medicines for common chronic and acute conditions (Table 1). Respondents could indicate from the list as many medicines as they had been using within 7 days prior to the survey. It was not possible to report any other medicines other than those mentioned in the list. The use of medication within the past 7 days was used as a measure in order to control recall bias.[56] Diagnosed diseases were asked by a question "Within the past year (12 months), have you had any of the following diagnosed diseases or diseases treated by the physicians?" This question was followed by a list of chronic and acute diseases common in Finland (Table 1). Respondents could indicate from the list as many diseases as they had been suffering from within the year prior to the survey. It was not possible to report any other diseases than those mentioned in the list.

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Analysis

Statistical analyses were conducted with the Statistical Package for Social Sciences software (IBM SPSS Statistics for Windows, Released 2016, Version 24.0. Armonk, NY: IBM Corp.). Only respondents who reported using at least one prescription or non-prescription medicine during the 7 days' time frame prior to the survey were included in the analysis as medicine users.

Age calculation was based on the year of birth, and the respondents' age were divided into five age groups. Education was measured as the total number of self-reported school years and were divided into two educational level. The number of medicines in use was counted for each respondent, and respondents were divided into following groups: people using one, two, three, and four or more medicines. Also, the number of diagnosed diseases was counted for each respondent, and respondents were divided into following groups: no diseases, one, two, three or more diseases. The receipt of MI was presented by all these medicine user groups and diagnosed diseases. The number of MI sources from which the respondents had received information on the medicines they used was divided into following groups: no sources, one, two, three, four, five and six or more sources.

Trends in the receipt of MI from different information sources and the number of MI sources used by the respondent were counted for each study year 1999, 2002, 2005, 2008-2014. The significance of the change in the receipt of MI between the study years was analysed with logistic regression. Analyses were adjusted for potential confounding factors (i.e. age, gender, educational, number of medicines in use and number of diagnosed diseases). The receipt of MI from different sources was calculated by gender, age, number of medicines in use and number of diagnosed diseases for each study year.

Finally, a ratio between the mean number of medicines in use and the mean number of diagnosed diseases compared to the mean number of MI sources from which MI was received was calculated to indicate whether any remarkable changes were seen over time in the number of MI sources used in relation to morbidity and medicine use.

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Patient and public involvement

Patient perspective was taken into account in designing the research question on MI by reviewing previous international and national research on the topic.[6,57-59] The question as it appears in the survey instrument is a result of extensive work by senior researchers in public health and medicines information. The question was piloted in several formats with the target group (5-10 individuals from the target group recruited as a convenience sample) and the current version was found to be most valid for the primary purpose of the survey that was to indicate long-term trends. The results of the study have not been sent to the study participants for comments, but the annual reports of the "Health Behaviour and Health among the Finnish Adult Population" surveys are available online.[52]

Research ethics

As this study was a secondary analysis using routinely collected and fully anonymized data, ethics approval was not applicable.[60] Responding to the survey was voluntary and considered as giving an informed consent. All study procedures were conducted according to good scientific practice.

RESULTS

The number of respondents varied by year from 2545 to 3371, and the response rate decreased from 67% in 1999 to 53% in 2014 (Table 1). Of the total responses (n=29465) 64% were from medicine users (n=18862, ranging by year from 58% to 68%). The gender distribution of the respondents who reported using medicines remained the same throughout the study period, 61-64% being female (Table 1). The annual mean age varied between 41 and 45 years. The respondents used most commonly one medicine, ranging from 63% in 1999 to 54% in 2014 (included prescription and non-prescription medicines). The respondents reported using medicines most commonly for headaches (range 50% to 53%), other aches or pains (28% to 31%) and high blood pressure (15% to 23%). More than a third of the medicine users reported having at least one diagnosed disease of the diseases listed in the survey, increasing from 37% in 1999 to 59% in 2014). The most common diseases reported were high blood pressure or hypertension (range 18% to 25%), high blood cholesterol (13% to 21%), hay or allergic rhinitis (15% to 18%), and degenerative disk disease or other back illness (13% to 15%).

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Table 1. Characteristics of the respondents (n=29465) according to study year. The percentages are calculated from the total number of the respondents each year or of the respondents reporting use of at least one prescription or non-prescription medicine within 7 days prior to survey (n=18862)[a].

Characteristics	Total[b] n (%)	Study years 1999 n (%)	2002 n (%)	2005 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)	2013 n (%)	2014 n (%)
Number of respondents (response rate)	29465 (59)	3371 (67)	3259 (65)	3287 (66)	3216 (64)	2943 (59)	2826 (57)	2787 (56)	2601 (52)	2545 (51)	2630 (53)
Respondents using medicines[c]	18862 (64)	1944 (58)	2000 (61)	2038 (62)	2101 (65)	1957 (66)	1871 (66)	1864 (66)	1759 (68)	1677 (66)	1671 (64)
Gender[d]											
Female	11859 (63)	1217 (63)	1278 (64)	1258 (62)	1332 (63)	1235 (63)	1181 (63)	1158 (61)	1101 (63)	1061 (63)	1068 (64)
Male	7003 (37)	727 (37)	722 (36)	780 (38)	769 (37)	722 (37)	690 (37)	706 (39)	658 (37)	616 (37)	603 (36)
Age (years)[d]											
15-24	2535 (13)	314 (16)	308 (15)	269 (13)	270 (13)	263 (13)	255 (14)	236 (13)	211 (12)	199 (12)	215 (13)
25-34	2798 (15)	331 (17)	308 (15)	302 (15)	305 (15)	287 (15)	258 (14)	284 (15)	251 (14)	240 (14)	239 (14)
35-44	3409 (18)	419 (22)	411 (21)	394 (19)	376 (18)	335 (17)	304 (16)	312 (17)	292 (17)	275 (16)	285 (17)
45-54	4558 (24)	481 (25)	486 (24)	491 (24)	490 (23)	460 (24)	484 (26)	447 (24)	430 (24)	411 (25)	387 (23)
55-64	5562 (29)	399 (21)	487 (24)	582 (29)	660 (31)	612 (31)	570 (31)	607 (32)	575 (32)	552 (33)	545 (33)
Mean age (Standard deviation)	43.8 (14.2)	41.2 (13.9)	42.1 (14.0)	43.6 (14.0)	44.3 (14.1)	44.2 (14.3)	44.3 (14.3)	44.4 (14.1)	44.9 (14.1)	45.0 (14.1)	44.6 (14.3)
Education[d]											
Primary school or lower (≤9 years)	3048 (16)	499 (26)	444 (23)	402 (20)	351 (17)	306 (16)	253 (14)	222 (12)	222 (13)	170 (10)	175 (11)
Higher than primary school (>9 years)	15495 (84)	1420 (74)	1499 (77)	1608 (80)	1705 (83)	1621 (84)	1590 (86)	1651 (88)	1517 (87)	1482 (90)	1462 (89)
Respondents using medicines for[d]											
Headache	9806 (52)	1039 (53)	1032 (52)	1026 (50)	1073 (51)	1024 (52)	980 (52)	987 (53)	901 (51)	866 (52)	884 (53)
Ache, pain (other than headache)	5467 (29)	556 (29)	549 (28)	592 (29)	604 (29)	541 (28)	531 (29)	553 (30)	544 (31)	508 (30)	492 (29)
High blood pressure	4077 (22)	291 (15)	367 (18)	429 (21)	465 (22)	450 (23)	434 (23)	440 (24)	409 (23)	395 (24)	391 (23)
Contraception (oral)	2310 (12)	264 (14)	296 (15)	247 (12)	258 (12)	238 (12)	223 (12)	197 (11)	188 (11)	199 (12)	204 (12)
High blood cholesterol	2196 (12)	98 (5)	143 (7)	217 (11)	263 (13)	296 (15)	290 (16)	236 (13)	217 (12)	211 (13)	226 (14)
Women's hormone replacement therapy	2036 (11)	233 (12)	266 (13)	233 (11)	222 (11)	188 (10)	188 (10)	162 (9)	198 (11)	174 (10)	168 (10)
Cough	1316 (7)	220 (11)	186 (9)	168 (8)	160 (8)	113 (6)	77 (4)	111 (6)	101 (6)	103 (6)	77 (5)
Insomnia	1497 (8)	136 (7)	153 (8)	153 (8)	179 (9)	177 (9)	140 (8)	133 (8)	134 (8)	146 (9)	140 (8)
Sedation	915 (5)	133 (7)	93 (5)	121 (6)	102 (5)	94 (5)	70 (4)	85 (5)	76 (4)	69 (4)	72 (4)
Men's sexual potency dysfunction	252 (1)	13 (1)	20 (1)	28 (1)	26 (1)	21 (1)	26 (1)	37 (2)	34 (2)	19 (1)	28 (2)
Depression[e]	1314 (7)	-	111 (6)	143 (7)	148 (7)	176 (9)	136 (5)	147 (8)	173 (10)	134 (8)	146 (9)
Diabetes (other than insulin)[f]	705 (4)	-	-	72 (4)	82 (4)	88 (4)	88 (5)	80 (4)	98 (6)	91 (5)	106 (6)
Diabetes (insulin)[f]	361 (2)	-	-	46 (2)	49 (2)	46 (2)	47 (3)	51 (3)	36 (2)	50 (3)	36 (2)
Number of medicines in use/person[d]											
1	10558 (56)	1215 (63)	1183 (59)	1143 (56)	1154 (55)	1060 (54)	1029 (55)	1021 (55)	946 (54)	907 (54)	910 (54)
2	5116 (27)	505 (26)	559 (28)	566 (28)	584 (28)	536 (27)	512 (27)	492 (27)	492 (28)	442 (26)	429 (26)
3	1984 (11)	161 (8)	166 (8)	198 (10)	221 (11)	220 (11)	210 (11)	215 (11)	191 (11)	208 (12)	199 (12)
>3	1204 (6)	63 (3)	92 (5)	131 (6)	142 (7)	141 (7)	120 (6)	136 (7)	130 (7)	120 (7)	133 (8)
Respondents with diagnosed diseases[d,g]											

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High blood pressure, hypertension	4297 (23)	345 (18)	426 (21)	465 (23)	496 (24)	478 (24)	443 (24)	463 (25)	421 (24)	379 (22)	376 (23)
Degenerative disc disease, other back illness	2712 (14)	262 (14)	284 (14)	314 (15)	321 (15)	263 (13)	260 (14)	277 (15)	260 (15)	227 (14)	249 (15)
Asthma	1163 (6)	113 (6)	114 (6)	112 (6)	120 (6)	132 (7)	125 (7)	111 (6)	120 (7)	99 (6)	115 (7)
Digestive illness (gastritis catarrh, gastritis, ulcer)	904 (5)	96 (5)	97 (5)	108 (5)	110 (5)	93 (5)	91 (5)	70 (4)	85 (5)	89 (5)	65 (4)
Coronary disease, angina pectoris (= chest pain during exercise)	414 (2)	66 (3)	48 (2)	52 (3)	47 (2)	35 (2)	41 (2)	34 (2)	31 (2)	26 (2)	30 (2)
Diabetes	1092 (6)	50 (2)	78 (4)	113 (6)	121 (6)	129 (7)	121 (7)	119 (6)	124 (7)	108 (6)	138 (8)
Rheumatoid arthritis	396 (2)	46 (2)	36 (2)	37 (2)	46 (2)	37 (2)	40 (2)	52 (2)	44 (3)	37 (2)	32 (2)
Chronic bronchitis, pulmonary emphysema	322 (2)	34 (2)	30 (2)	35 (2)	38 (2)	52 (3)	28 (2)	36 (2)	20 (1)	22 (1)	27 (2)
Coronary thrombosis, myocardial infarction	118 (1)	9 (1)	13 (1)	13 (1)	13 (1)	8 (<1)	11 (1)	11 (1)	10 (1)	9 (1)	15 (1)
High blood cholesterol[e]	2913 (17)	-	267 (13)	338 (17)	356 (17)	409 (21)	368 (20)	319 (17)	282 (16)	287 (16)	287 (17)
Depression[f]	1242 (8)	-	-	173 (9)	175 (8)	178 (9)	134 (7)	148 (8)	161 (9)	124 (7)	147 (9)
Other mental health disorder[f]	534 (4)	-	-	64 (3)	73 (4)	66 (3)	47 (3)	74 (4)	65 (4)	73 (4)	64 (4)
Cancer[f]	206 (1)	-	-	29 (1)	26 (1)	26 (1)	28 (2)	31 (1)	34 (2)	23 (1)	17 (1)
Hay or allergic rhinitis[h]	2044 (16)	-	-	-	340 (16)	292 (15)	275 (15)	287 (15)	283 (16)	275 (16)	307 (18)
Food allergy[h]	580 (5)	-	-	-	85 (4)	84 (4)	92 (4)	78 (4)	85 (5)	72 (4)	84 (5)
Number of diagnosed diseases/person[d,g]											
0	8590 (46)	1228 (63)	1121 (56)	971 (48)	850 (40)	772 (39)	796 (43)	744 (40)	705 (42)	721 (42)	689 (41)
1	5176 (27)	502 (26)	527 (26)	593 (29)	605 (29)	546 (28)	482 (26)	517 (28)	499 (28)	455 (27)	450 (27)
2	2924 (16)	151 (8)	232 (12)	270 (13)	367 (17)	358 (22)	335 (18)	343 (19)	302 (17)	279 (17)	285 (17)
>2	2172 (12)	63 (3)	120 (6)	204 (10)	279 (13)	281 (14)	258 (14)	233 (13)	253 (14)	231 (14)	247 (15)

[a]Discrepancies in totals are due to rounding errors, [b]Calculated from study years available, [c]Percentages have been calculated from the respondents of each year, [d]Percentages have been calculated from the respondents of each year who reported using medicines, including prescription and non-prescription medicines (list in the survey) during the last week (7 days), [e]Added to the survey instrument in 2002, [f]Added to the survey instrument in 2005, [g]Respondents who had a disease (list in the survey) diagnosed by a physician during the last year (12 months), [h]Added to the survey instrument in 2008.

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Medicines information sources among adult medicine users

The most commonly reported MI sources were physicians, community pharmacists and package leaflets throughout the study period among adult medicine users (Fig. 1, Table 2). These information sources were most common despite gender, age, number of medicines in use or diagnosed diseases (Appendix A,B). Receipt of MI from physicians (62% to 47%) and package leaflets (44% to 34%) decreased most during the study period, while remained stable from community pharmacists (46% to 45%) and nurses (14% to 14%) (Fig. 1). In 1999, of the medicine users 17% (n=335/1944) did not report any healthcare professionals (physicians, community pharmacists or nurses) as their source of MI, and by 2014 the proportion had grown to 38% (n=639/1671). The use of the Internet as MI source increased rather steadily being 1% in 1999 and 16% in 2014.

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Table 2. Trends in the receipt of medicines information among adult medicine users. Results of age, gender, educational, number of medicines in use and number of diagnosed diseases adjusted logistic regression.

Characteristics	Study years[a]										
	1999 n (%)	2002 n (%)	2005 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)	2013 n (%)	2014 n (%)	P-value[b]
Respondents using medicines	1944	2000	2038	2101	1957	1871	1844	1775	1677	1671	
Physician	1206 (62)	1186 (59)	1153 (57)	1050 (50)	950 (49)	953 (51)	933 (51)	832 (47)	816 (49)	785 (47)	
OR (95% CI)	1	0.80 (0.70-0.91)	0.63 (0.55-0.72)	0.43 (0.37-0.49)	0.39 (0.34-0.45)	0.45 (0.39-0.52)	0.43 (0.37-0.49)	0.37 (0.32-0.43)	0.40 (0.34-0.46)	0.36 (0.31-0.41)	<0.0001
Community pharmacist	892 (46)	912 (46)	901 (44)	861 (41)	812 (42)	842 (45)	825 (45)	764 (43)	793 (47)	759 (46)	
OR (95% CI)	1	0.92 (0.81-1.04)	0.82 (0.72-0.93)	0.68 (0.59-0.77)	0.67 (0.59-0.77)	0.79 (0.70-0.91)	0.78 (0.68-0.89)	0.72 (0.62-0.82)	0.86 (0.75-0.99)	0.78 (0.68-0.90)	<0.0001
Package leaflet[c]	-	876 (44)	782 (38)	745 (36)	685 (35)	620 (33)	618 (34)	571 (32)	3 (<1)	566 (34)	
OR (95% CI)	-	1	0.76 (0.66-0.86)	0.65 (0.57-0.74)	0.62 (0.54-0.71)	0.57 (0.50-0.65)	0.58 (0.51-0.67)	0.55 (0.47-0.63)	0.61 (0.53-0.70)	0.58 (0.50-0.67)	<0.0001
Nurse	274 (14)	307 (15)	254 (13)	297 (14)	257 (13)	243 (13)	258 (14)	247 (14)	232 (14)	228 (14)	
OR (95% CI)	1	1.06 (0.89-1.28)	0.78 (0.65-0.94)	0.84 (0.70-1.01)	0.75 (0.62-0.91)	0.76 (0.62-0.92)	0.84 (0.69-1.02)	0.85 (0.70-1.03)	0.83 (0.68-1.01)	0.78 (0.64-0.96)	0.003
Books/newspapers	292 (15)	247 (12)	203 (10)	125 (6)	112 (6)	104 (6)	137 (7)	111 (6)	111 (7)	91 (5)	
OR (95% CI)	1	0.75 (0.62-0.90)	0.56 (0.46-0.68)	0.31 (0.25-0.39)	0.29 (0.23-0.37)	0.28 (0.22-0.36)	0.39 (0.31-0.49)	0.27 (0.22-0.35)	0.34 (0.27-0.43)	0.27 (0.21-0.35)	<0.0001
Relatives/friends	269 (14)	213 (11)	184 (9)	127 (6)	160 (8)	130 (7)	145 (8)	120 (7)	125 (8)	112 (7)	
OR (95% CI)	1	0.73 (0.60-0.89)	0.61 (0.50-0.76)	0.40 (0.32-0.50)	0.54 (0.44-0.67)	0.46 (0.36-0.58)	0.51 (0.41-0.64)	0.46 (0.37-0.58)	0.51 (0.41-0.65)	0.44 (0.34-0.56)	<0.0001
Internet	26 (1)	68 (3)	157 (8)	243 (12)	243 (12)	261 (14)	276 (15)	267 (15)	283 (17)	262 (16)	
OR (95% CI)	1	2.46 (1.56-3.90)	5.57 (3.65-8.49)	8.44 (5.59-12.8)	8.84 (5.85-13.4)	10.2 (6.79-15.5)	11.0 (7.26-16.5)	11.3 (7.55-17.1)	12.9 (8.53-19.4)	11.5 (7.60-17.3)	<0.0001
Advertisements	180 (9)	135 (7)	137)7)	66 (3)	57 (3)	51 (3)	69 (4)	51 (3)	60 (4)	41 (3)	
OR (95% CI)	1	0.71 (0.56-0.90)	0.74 (0.58-0.93)	0.33 (0.25-0.45)	0.31 (0.23-0.42)	0.29 (0.21-0.40)	0.39 (0.29-0.52)	0.30 (0.22-0.42)	0.38 (0.28-0.51)	0.25 (0.18-0.36)	<0.0001
Radio/television	130 (7)	127 (6)	101 (5)	55 (3)	50 (3)	57 (3)	81 (4)	51 (2)	60 (4)	43 (3)	
OR (95% CI)	1	0.90 (0.69-1.16)	0.68 (0.51-0.89)	0.34 (0.25-0.48)	0.33 (0.24-0.47)	0.40 (0.29-0.56)	0.57 (0.43-0.77)	0.32 (0.22-0.45)	0.47 (0.34-0.65)	0.33 (0.23-0.47)	<0.0001
Health food stores	141 (7)	141 (7)	136 (7)	88 (4)	79 (4)	77 (4)	90 (5)	72 (4)	77 (5)	66 (4)	
OR (95% CI)	1	0.94 (0.73-1.20)	0.88 (0.68-1.13)	0.52 (0.39-0.69)	0.50 (0.37-0.66)	0.51 (0.38-0.61)	0.59 (0.51-0.79)	0.46 (0.36-0.62)	0.57 (0.42-0.76)	0.48 (0.35-0.65)	<0.0001
Telephone services[c]	-	4 (<1)	5 (<1)	6 (<1)	7 (<1)	1 (<1)	4 (<1)	3 (<1)	3 (<1)	5 (<1)	
OR (95% CI)	-	1	1.28 (0.34-4.79)	1.22 (0.32-4.60)	1.81 (0.52-6.30)	0.28 (0.03-2.53)	1.15 (0.28-4.69)	0.91 (0.20-4.11)	0.64 (0.12-3.52)	1.52 (0.40-5.77)	0.784
MI received from at least one source[d]	1867 (96)	1804 (90)	1762 (87)	1571 (75)	1404 (72)	1392 (74)	1393 (76)	1256 (70)	1233 (74)	1204 (72)	
OR (95% CI)	1	0.33 (0.25-0.44)	0.21 (0.16-0.28)	0.09 (0.07-0.11)	0.07 (0.06-0.09)	0.09 (0.07-0.11)	0.09 (0.07-0.12)	0.07 (0.05-0.09)	0.08 (0.06-0.10)	0.07 (0.06-0.10)	<0.0001

[a]Calculated from study years available, [b]P-value for the difference in the receipt of medicines information between the study years, [c]Added to the survey instrument in 2002, [d]Medicine information (MI) sources listed in the survey.
OR = Age, gender, educational, number of medicines in use and number of diagnosed diseases adjusted odds ratio; CI = 95% confidence intervals of logistic regression.

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The number of MI sources from which medicine users reported receipt of MI changed over the study period 1999-2014 (Fig. 2). The most noticeable decreases occurred in those who reported receipt of MI from one (47% to 21%) or two (30 % to 22%) sources. The number of medicine users receiving MI from more than two sources increased moderately. In 1999, of the medicine users 4% (n=77/1944) did not report receipt of MI from any of the information sources listed in the survey, while this proportion had increased to 28% (n=467/1671) in 2014.

Add figure 2 in here.

Receipt of medicines information among subgroups

Women reported receiving MI from all information sources listed in the survey more commonly than men during the study period (Appendix A). Receipt of MI from physicians decreased most among women (66% to 48%) and among medicine users aged over 45 years (75% to 52%). Receipt of MI from package leaflets decreased both in women (48% to 38%) and men (36% to 26%), while remained nearly unchanged from community pharmacists (51% to 47% in women vs. 37% to 42% in men). The receipt of MI from community pharmacists increased most among medicine users aged 55-64 years (34% to 46%), and decreased most among medicine users aged 33-44 years (55% to 43%). Package leaflets, relatives and friends were reported to be most common MI sources for medicine users under 25 years, although receipt of MI from package leaflets (59% to 37%) and from relatives and friends (35% to 16%) decreased most in this age group. Receipt of MI from the Internet increased in both genders, slightly more in women than in men (2% to 18% vs. 1% to 12%, respectively), and in all age groups, most among medicine users aged 25-34 years (2% to 21%) and 15-24 years (2% to 20%). More male (6% to 33%) than female (3% to 25%) and more medicine users under 45 years (5% to 33%) than medicine users 45 years or older (3% to 25%) did not report receipt of MI from any of the information sources listed in the survey during the study period.

As the number of medicines in use or the number of diagnosed diseases increased, the number of different MI sources increased (Appendix B). However, the opposite changes occurred in the receipt of MI from physicians, the proportion of medicine users receiving MI from physicians decreased 14-26% depending on the number of medicines in use or the number of diagnosed diseases, the highest decline occurring for medicine users with two medicines (76% to 52%) and for medicine users with two diagnosed diseases (83% to 57%). The number of medicines and the number of diagnosed diseases had the opposite influence on the receipt of MI from community pharmacists. The receipt of MI from community pharmacists increased most in medicine users with three medicines (47% to 59%) and in those with three or more diagnosed diseases (49% to 63%), whereas the receipt of MI decreased most in medicine users with one medicine (44% to 38%) and in those medicine users without any diagnosed

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diseases (45% to 34%). Receipt of MI package leaflets decreased mainly in all medicine users, most in those with one (40% to 28%) or two (48% to 35%) medicines in use and in medicine users without any diagnosed diseases (44% to 30%) or in those with one diagnosed disease (43% to 31%). Receipt of MI from the Internet increased in all medicine users regardless the number of medicines in use or the number of diagnosed diseases, most among respondents with two (1% to 19%) and four or more medicines (5% to 22%), and respondents with three or more diagnosed diseases (3% to 23%). Respondents using one (6% to 35%) or two (1% to 24%) medicines and medicine users without any diagnosed disease listed in the survey (5% to 38%) or with one disease (2% to 25%) most commonly did not report receipt of MI from any of the information sources listed in the survey during the study period.

Overall, the mean number of medicines in use and the mean number of diagnosed diseases increased slightly among medicine users, while the mean number of MI sources from which MI was received remained relatively stable during the study period 1999-2014 (Fig. 3). The ratio between the mean number of medicines in use and the mean number of MI sources from which MI was received remained relatively stable, but the ratio between the mean number of diagnosed diseases and the mean number of MI sources increased.

Add figure 3. in here.

DISCUSSION

To our knowledge, this is the first study analysing long-term national trends in the receipt of MI among adult population. The 15-year period covered in this study (1999-2014) provides unique insights into how improved consumer access to MI and the shift from paper to cyber have influenced receipt of MI from various sources. It seems that the key MI sources (physicians, community pharmacists, package leaflets) have remained similar which is in line with previous studies.[21-47] Surprising was that even though the availability and the use of MI sources has diversified among the adult population, an increasing number of medicine users did not report receipt of MI from any of the sources.

The proportion of medicine users who did not report receiving MI from any of the listed sources became 7-fold during the study period (4% to 28%). Furthermore, the proportion of those who did not report receiving MI on medicines they used from any of the healthcare professionals more than doubled from 17% in 1999 to 38% in 2014. Particularly, MI received from the physicians declined over time. The decline was similar (22-26%) in respondents using 2 or more medicines or having or not having diagnosed diseases. According to age, the decline was most evident among medicine users 45 years and

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older. These findings may indicate that physicians are becoming less involved in actual patient care as the healthcare has become more fragmented. Thus, time allocated for physician office visits has shortened, leading to a situation that physicians do not have time to concentrate on their patients' medications.[61-64] Consequently, those medicine users who were dependent on MI received from their physicians do not have that source available anymore. It also seems that community pharmacists have become more common sources of MI for people with multiple medications instead of physicians, but nurses have not replaced physicians as a MI source. In the future, special attention should be paid to the receipt of MI among people with multiple diseases and medications and the aging populations whose proportion is growing.

Our findings indicate that MI is not evenly distributed among medicine users, it may have become more unevenly distributed over time. During the study period, women, people aged 45 years or older, people with three or more medicines in use and people with three or more diagnosed diseases received MI more commonly on their medicines than other adult medicine users. These findings are in line with previous cross-sectional studies.[23,25,26,40,41] Other previous studies have shown that MI seeking behavior and the use of MI sources is usually influenced by gender and age, but also education, ethnic background, income, employment, health status and medical history.[27,34,39] Potential reasons and system-based root causes for differences in the receipt of MI among medicine users need to be addressed in future research. Our example from Finland demonstrates that availability of a wide range of MI sources does not necessarily guarantee their actual and evenly distributed use among medicine users.

This study indicates that the receipt of MI from the Internet was quite rare as more than 90% of the Finns aged 16-64 years were Internet users in 2014.[65] There are no similar population-based long-term trend studies from other countries to compare our results. According to previous studies, use of the Internet as a source of MI has varied between 4% and 29% in the 2000s.[22,25,31,33,34,39,40,42,44-46] It is also known that some patient and medicine user groups use the Internet considerably more (59-68%) than the adult population in general, e.g. patients with chronic conditions and pregnant women.[27,28,41] Thus, if we want to reach the majority of the adult population, we could not solely count on the Internet-based MI sources and services. Further population-based research is needed to get a more comprehensive understanding of the importance and usage patterns of the Internet as a MI source, also the opportunities it provides for improving MI for various medication user segments.

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Strengths and limitations of this study

As a repeated national population survey, this study allows for examination of trends over time at the population level. Although the response rate decreased from 67% to 53% during the study period, reflecting that the representativeness of the results to the entire population is getting weaker, it is still adequate for generalizable results.[66,67] The non-respondents more often tended to be young men, unmarried or single and with a lower level of education.[55] Due to the cross-sectional method without cohorts, it is not possible to follow up changes in the receipt of MI over time at the individual level. The respondents did not have the opportunity to report MI from other sources than those listed in the survey, to report separately MI sources on prescription and non-prescription medicines, and to distinguish between active MI seeking or passive receipt of MI. This should be taken account when interpreting results and potential implications. For example, the gender difference in the use of MI sources may differ depending on whether these are discrepancies in the information being provided or gender differences in information seeking-behaviors.[23,25,26,33,40,41,45] Furthermore, people using prescription vs. non-prescription medicines may differ in the amount and use of different MI sources. However, in Finland all medicine users should receive MI from their healthcare providers while prescribing and dispensing both prescription and non-prescription medicines.[68,69] The data did not provide any information about the quality, validity or amount of the MI received.

Implications and future research

The strategic development of MI will continue both nationally and internationally to ensure the availability and access to reliable, up-to-date and high quality MI and MI sources.[2,4,13,70] As part of this work, it is necessary to continue research on trends in the receipt of MI at the population level and to identify population groups needing special attention, such as older adults. Consumers' MI literacy should be further investigated and considered in the development of MI for different patient and medicine user groups, e.g. by including the question related to MI literacy in population surveys. The present study provides a foundation for further analysis that could go deeper in understanding receipt of MI in various population groups, changes over time and factors influencing it. Further studies are needed also on factors contributing to a growing number of medicine users not receiving MI from any sources.

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CONCLUSIONS

Healthcare professionals and package leaflets had still a dominating importance in 2014 despite the growing number of MI sources over time, but still a minority of adult medicine users reported receiving MI via the Internet in 2014. Worrying is that the proportion of adult medicine users who did not receive MI from any of the sources became 7-fold during the study period.

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Contributors: SH has been involved in designing the survey. SH and MA have been involved in developing the survey instrument concerning the receipt of medicines information. NM, MA, KH and MPM planned the analysis and reporting this particular study. The data were applied from the National Institute for Health and Welfare. NM performed the data analysis, and MA, KH, SH and MPM contributed in the interpretation of the data. NM prepared the initial draft of the manuscript. MA, KH, SH and MPM critically reviewed and revised the manuscript. All authors read and gave the final approval of the version to be published.

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Ethical approval: As this study was a secondary analysis using routinely collected and fully anonymized data, ethics approval was not applicable. Answering the survey was considered as giving informed consent. The study followed the national ethical guidelines for researchers[60]. All study procedures were conducted in accordance with good research practice.

Data sharing: No additional data available.

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LEGENDS OF THE FIGURES

Figure 1 Trends in the receipt of medicines information among adult medicine users (n=18862) in 1999-2014 (% of the respondents who reported use of at least one prescription or non-prescription medicine within 7 days prior to the survey). The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

Figure 2 Number of medicines information sources from which the adult medicine users (n=18862) had received information on the medicines they used. The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

Figure 3 Ratio between mean number of medicines in use and mean number of diagnosed diseases compared to the mean number of medicines information sources from which the medicine users (n=18862) received medicines information. The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

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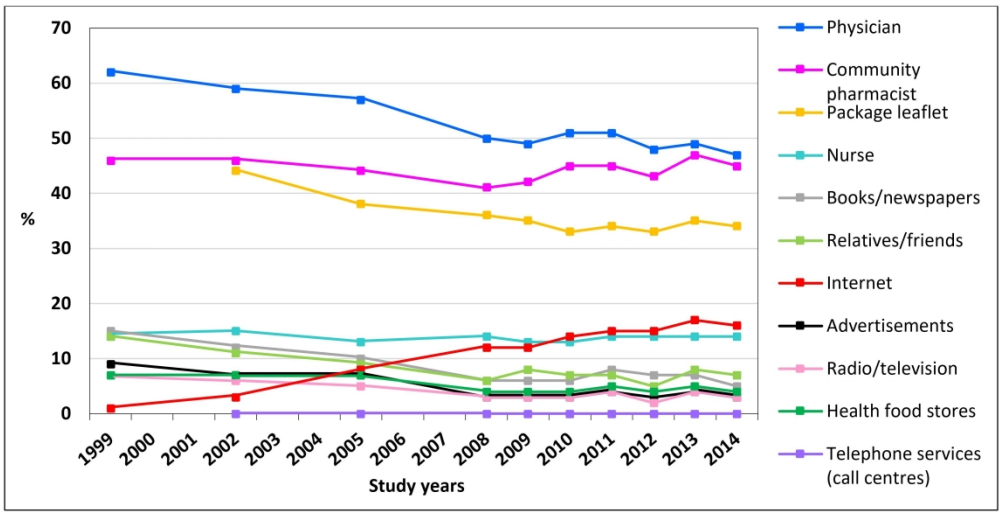

Figure 1 Trends in the receipt of medicines information among adult medicine users (n=18862) in 1999-2014 (% of the respondents who reported use of at least one prescription or non-prescription medicine within 7 days prior to the survey). The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

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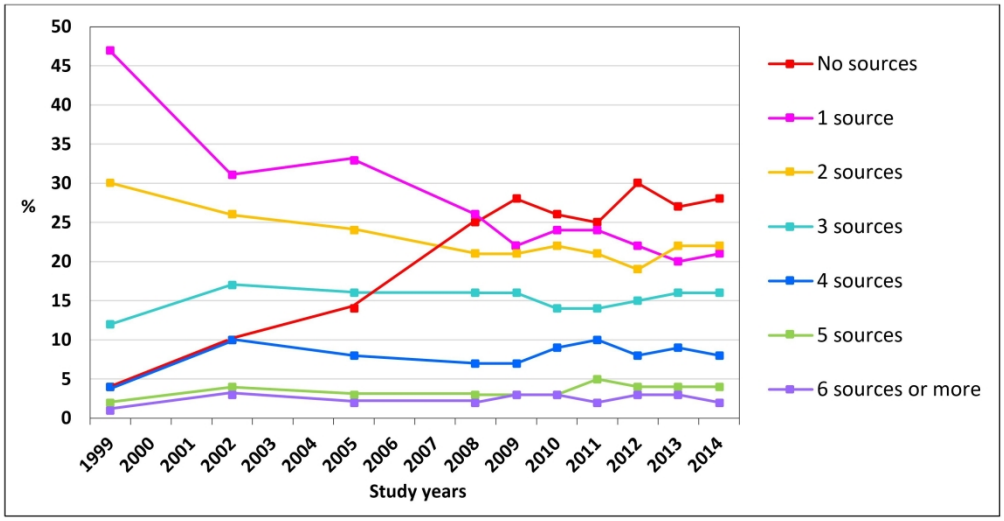

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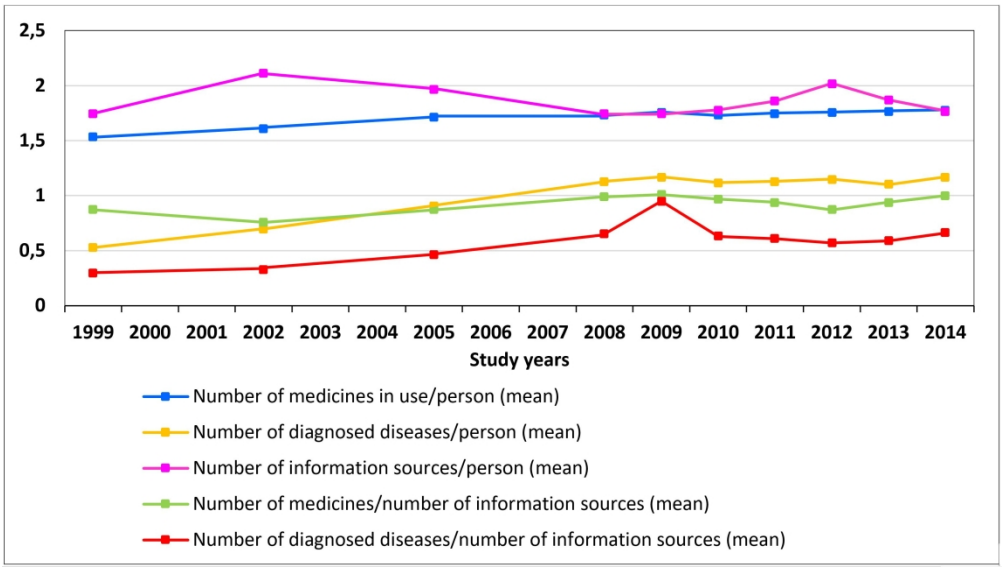

Figure 3 Ratio between mean number of medicines in use and mean number of diagnosed diseases compared to the mean number of medicines information sources from which the medicine users (n=18862) received medicines information. The survey was not conducted in 2000, 2001, 2003, 2004, 2006 and 2007.

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Appendix A. Trends in the receipt of medicines information among medicine users by gender and age. The percentages are calculated from the variables within each subcategory (i.e. gender, age)[a].

Characteristics	Study years[b]										
	1999 n (%)	2002 n (%)	2005 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)	2013 n (%)	2014 n (%)	P-value[c]
Respondents using medicines	1944	2000	2038	2101	1957	1871	1844	1759	1677	1671	
Gender											
Female	1217 (63)	1278 (64)	1258 (62)	1332 (63)	1235 (63)	1181 (63)	1128 (61)	1101 (63)	1061 (63)	1068 (64)	
Physician	798 (66)	779 (61)	738 (59)	663 (50)	616 (50)	596 (50)	578 (51)	559 (51)	537 (51)	511 (48)	<0.0001
Community pharmacist	617 (51)	616 (48)	591 (47)	595 (45)	548 (44)	563 (48)	561 (50)	533 (48)	554 (52)	505 (47)	<0.0001
Package leaflet	-	615 (48)	539 (43)	527 (40)	494 (40)	462 (39)	439 (39)	419 (38)	437 (41)	408 (38)	<0.0001
Nurse	187 (15)	183 (14)	159 (13)	195 (15)	173 (14)	157 (13)	158 (14)	138 (13)	155 (15)	152 (14)	0.278
Books/newspapers	226 (19)	198 (15)	162 (13)	95 (7)	92 (7)	83 (7)	109 (10)	74 (7)	85 (8)	77 (7)	<0.0001
Relatives/friends	160 (13)	143 (11)	121 (10)	92 (7)	113 (9)	89 (8)	111 (10)	82 (8)	90 (8)	77 (7)	<0.0001
Internet	19 (2)	47 (4)	99 (8)	178 (13)	178 (14)	189 (16)	195 (17)	192 (18)	212 (20)	191 (18)	<0.0001
Advertisements	123 (10)	100 (8)	101 (8)	42 (3)	48 (4)	37 (3)	60 (5)	34 (3)	45 (4)	32 (3)	<0.0001
Radio/television	71 (6)	80 (6)	69 (5)	35 (3)	38 (3)	42 (4)	62 (5)	33 (3)	38 (4)	27 (3)	<0.0001
Health food stores	119 (10)	121 (9)	108 (9)	67 (5)	69 (6)	64 (5)	73 (6)	57 (5)	68 (6)	57 (5)	<0.0001
Telephone services (call centres)	-	4 (<1)	5 (<1)	4 (<1)	7 (<1)	1 (<1)	3 (<1)	3 (<1)	3 (<1)	4 (<1)	0.728
MI received from at least one source[d]	1185 (97)	1181 (92)	1125 (89)	1023 (77)	928 (75)	899 (76)	894 (79)	822 (77)	832 (78)	801 (75)	<0.0001
Male	727 (37)	722 (36)	780 (38)	769 (37)	722 (37)	690 (37)	716 (39)	658 (37)	616 (37)	603 (36)	
Physician	408 (56)	407 (56)	415 (53)	387 (50)	334 (46)	357 (52)	355 (50)	310 (47)	279 (45)	274 (45)	<0.0001
Community pharmacist	275 (37)	296 (41)	310 (40)	266 (35)	264 (37)	279 (40)	264 (37)	277 (42)	239 (39)	254 (42)	0.005
Package leaflet	-	261 (36)	243 (31)	218 (28)	191 (26)	158 (23)	179 (25)	151 (23)	143 (23)	158 (26)	<0.0001
Nurse	87 (12)	124 (17)	95 (12)	102 (13)	84 (12)	86 (12)	100 (14)	73 (11)	77 (13)	76 (13)	0.001
Books/newspapers	66 (9)	49 (7)	41 (5)	30 (4)	20 (3)	21 (3)	28 (4)	21 (3)	26 (4)	14 (2)	<0.0001
Relatives/friends	109 (15)	70 (10)	63 (8)	35 (5)	47 (7)	41 (6)	34 (5)	35 (6)	35 (6)	35 (6)	<0.0001
Internet	7 (1)	21 (3)	58 (7)	65 (8)	65 (9)	72 (10)	81 (11)	74 (11)	71 (12)	71 (12)	<0.0001
Advertisements	57 (8)	35 (5)	36 (5)	24 (3)	9 (1)	14 (2)	9 (1)	11 (3)	15 (2)	9 (1)	<0.0001
Radio/television	59 (8)	47 (7)	32 (4)	20 (3)	12 (2)	15 (2)	19 (3)	9 (1)	22 (4)	16 (3)	<0.0001
Health food stores	22 (3)	20 (3)	28 (4)	21 (3)	10 (1)	13 (2)	17 (2)	9 (1)	9 (1)	9 (1)	0.013
Telephone services (call centres)	-	0 (0)	0 (0)	2 (<1)	0 (0)	0 (0)	1 (<1)	0 (0)	0 (0)	1 (<1)	1.000
MI received from at least one source[d]	683 (94)	623 (86)	637 (82)	548 (71)	476 (66)	493 (71)	499 (70)	444 (68)	401 (65)	403 (67)	<0.0001
Age group (years)											
15-24	314 (16)	308 (15)	269 (13)	270 (13)	263 (13)	255 (14)	231 (13)	211 (12)	199 (12)	215 (13)	
Physician	157 (50)	154 (50)	122 (45)	102 (38)	96 (37)	96 (38)	93 (40)	87 (42)	80 (40)	89 (41)	<0.0001
Community pharmacist	132 (42)	126 (41)	93 (35)	87 (32)	86 (33)	88 (35)	77 (33)	84 (40)	76 (38)	84 (39)	0.001
Package leaflet	-	183 (59)	131 (49)	106 (39)	98 (38)	89 (35)	66 (29)	78 (38)	78 (39)	80 (37)	<0.0001
Nurse	65 (21)	73 (24)	48 (18)	54 (20)	55 (21)	51 (20)	44 (19)	48 (23)	41 (21)	43 (20)	0.550
Books/newspapers	41 (13)	45 (15)	26 (10)	10 (4)	20 (8)	8 (3)	18 (8)	17 (8)	6 (3)	8 (4)	<0.0001
Relatives/friends	110 (35)	76 (25)	60 (22)	48 (18)	52 (20)	40 (16)	50 (22)	39 (19)	29 (15)	35 (16)	<0.0001
Internet	7 (2)	14 (5)	23 (9)	36 (13)	39 (15)	36 (14)	43 (19)	41 (20)	41 (21)	42 (20)	<0.0001
Advertisements	31 (10)	26 (8)	30 (11)	9 (3)	12 (5)	9 (4)	8 (3)	7 (3)	5 (3)	6 (3)	<0.0001
Radio/television	30 (10)	24 (8)	21 (8)	7 (3)	14 (5)	7 (3)	11 (5)	8 (4)	4 (2)	3 (1)	<0.0001
Health food stores	11 (4)	12 (4)	9 (3)	5 (2)	1 (<1)	4 (2)	5 (2)	7 (3)	7 (4)	5 (2)	0.277
Telephone services (call centres)	-	3 (1)	0 (0)	0 (0)	1 (<1)	0 (0)	0 (0)	0 (0)	1 (1)	1 (<1)	0.995
MI received from at least one source[d]	298 (95)	271 (88)	223 (83)	185 (69)	169 (64)	166 (65)	158 (68)	136 (64)	127 (64)	146 (68)	<0.0001

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25-34	331 (17)	308 (15)	302 (15)	305 (15)	287 (15)	258 (14)	277 (15)	241 (14)	240 (14)	239 (14)	
Physician	176 (53)	152 (46)	139 (46)	144 (47)	136 (48)	119 (46)	127 (46)	108 (45)	116 (48)	88 (37)	<0.0001
Community pharmacist	183 (55)	141 (43)	137 (45)	140 (46)	122 (43)	126 (49)	136 (49)	116 (48)	115 (48)	117 (49)	0.011
Package leaflet	-	160 (48)	132 (44)	129 (42)	119 (42)	100 (39)	107 (39)	101 (42)	89 (37)	87 (36)	<0.0001
Nurse	59 (17)	48 (15)	41 (14)	42 (14)	40 (14)	32 (12)	36 (13)	31 (13)	42 (18)	30 (13)	0.350
Books/newspapers	47 (14)	34 (10)	29 (10)	14 (5)	12 (4)	10 (4)	12 (4)	10 (4)	9 (4)	13 (5)	<0.0001
Relatives/friends	57 (17)	38 (11)	51 (17)	23 (8)	28 (10)	25 (10)	38 (14)	17 (7)	33 (14)	19 (8)	<0.0001
Internet	5 (2)	20 (6)	31 (10)	45 (15)	52 (18)	49 (19)	56 (20)	44 (19)	60 (25)	49 (21)	<0.0001
Advertisements	31 (9)	29 (9)	28 (9)	8 (3)	8 (3)	9 (3)	7 (3)	6 (2)	6 (3)	5 (2)	<0.0001
Radio/television	31 (9)	23 (7)	23 (8)	4 (1)	9 (3)	8 (3)	5 (2)	5 (2)	3 (1)	6 (3)	<0.0001
Health food stores	16 (5)	16 (5)	28 (9)	12 (4)	13 (5)	6 (2)	10 (4)	9 (4)	13 (5)	8 (3)	0.009
Telephone services (call centres)	-	0 (0)	3 (1)	1 (<1)	1 (<1)	0 (0)	1 (<1)	2 (1)	1 (<1)	4 (2)	0.795
MI received from at least one source[d]	316 (95)	273 (89)	248 (82)	220 (72)	192 (67)	184 (71)	191 (69)	166 (69)	173 (72)	161 (67)	<0.0001
35-44	419 (22)	411 (21)	394 (19)	376 (19)	335 (17)	304 (16)	318 (17)	282 (16)	275 (16)	285 (17)	
Physician	220 (55)	221 (54)	200 (51)	164 (44)	146 (44)	145 (48)	145 (46)	124 (44)	121 (44)	120 (42)	<0.0001
Community pharmacist	230 (55)	213 (52)	183 (47)	165 (44)	132 (39)	141 (47)	130 (41)	109 (39)	134 (49)	121 (43)	<0.0001
Package leaflet	-	182 (44)	181 (46)	141 (38)	122 (37)	96 (32)	112 (35)	105 (38)	105 (38)	86 (30)	<0.0001
Nurse	40 (10)	46 (11)	41 (10)	46 (12)	44 (13)	29 (10)	34 (11)	32 (11)	26 (9)	37 (13)	0.861
Books/newspapers	77 (18)	57 (14)	33 (8)	24 (6)	16 (5)	12 (4)	19 (6)	13 (5)	14 (5)	12 (4)	<0.0001
Relatives/friends	37 (9)	35 (9)	24 (6)	29 (8)	25 (7)	21 (7)	15 (5)	21 (8)	16 (6)	16 (6)	0.294
Internet	9 (2)	17 (4)	43 (11)	54 (14)	44 (13)	45 (15)	42 (13)	31 (13)	54 (20)	36 (13)	<0.0001
Advertisements	61 (15)	33 (8)	26 (7)	18 (5)	6 (2)	7 (2)	7 (2)	8 (3)	7 (3)	14 (5)	<0.0001
Radio/television	34 (8)	31 (8)	13 (3)	11 (3)	3 (1)	7 (2)	12 (4)	2 (1)	9 (3)	8 (3)	<0.0001
Health food stores	41 (10)	39 (9)	25 (6)	19 (5)	10 (3)	15 (5)	13 (4)	8 (3)	12 (4)	9 (3)	<0.0001
Telephone services (call centres)	-	1 (<1)	0 (0)	3 (1)	2 (1)	0 (0)	2 (<1)	0 (0)	0 (0)	0 (0)	0.992
MI received from at least one source[d]	400 (95)	366 (89)	334 (85)	270 (72)	232 (69)	210 (69)	219 (69)	185 (67)	190 (69)	188 (66)	<0.0001
45-54	481 (25)	486 (24)	491 (24)	490 (23)	460 (24)	484 (26)	438 (24)	430 (24)	411 (25)	387 (23)	
Physician	342 (71)	314 (65)	297 (60)	275 (56)	232 (50)	237 (49)	229 (52)	210 (49)	200 (49)	203 (52)	<0.0001
Community pharmacist	210 (44)	218 (45)	227 (46)	201 (41)	203 (44)	231 (48)	216 (49)	196 (46)	196 (48)	187 (48)	0.240
Package leaflet	-	185 (38)	181 (37)	176 (36)	169 (37)	163 (34)	160 (37)	146 (34)	145 (35)	138 (36)	0.281
Nurse	59 (12)	65 (13)	53 (11)	72 (15)	47 (10)	46 (10)	59 (13)	49 (11)	53 (13)	42 (11)	0.212
Books/newspapers	81 (17)	60 (12)	57 (12)	40 (8)	32 (7)	32 (5)	38 (9)	20 (5)	33 (8)	17 (4)	<0.0001
Relatives/friends	37 (8)	31 (6)	21 (4)	18 (4)	31 (7)	24 (5)	18 (4)	22 (5)	21 (5)	15 (4)	0.018
Internet	3 (1)	12 (2)	38 (8)	61 (12)	58 (13)	63 (13)	68 (16)	57 (13)	60 (15)	60 (16)	<0.0001
Advertisements	32 (7)	31 (6)	30 (6)	17 (3)	16 (3)	15 (3)	20 (5)	13 (3)	18 (4)	6 (2)	0.004
Radio/television	22 (5)	26 (5)	15 (3)	17 (3)	13 (3)	10 (2)	17 (4)	11 (2)	20 (5)	6 (2)	0.019
Health food stores	43 (9)	38 (8)	29 (6)	10 (2)	28 (6)	22 (5)	32 (7)	14 (3)	20 (5)	16 (4)	0.001
Telephone services (call centres)	-	0 (0)	0 (0)	1 (<1)	2 (<1)	1 (<1)	0 (0)	0 (0)	1 (<1)	0 (0)	1.000
MI received from at least one source[d]	466 (97)	446 (92)	435 (89)	383 (78)	353 (77)	364 (75)	353 (81)	335 (78)	307 (75)	287 (74)	<0.0001
55-64	399 (21)	487 (24)	582 (29)	660 (31)	612 (31)	570 (30)	580 (31)	555 (33)	552 (33)	545 (33)	
Physician	311 (78)	345 (71)	395 (68)	365 (55)	340 (56)	356 (62)	339 (58)	306 (55)	299 (54)	285 (52)	<0.0001
Community pharmacist	137 (34)	214 (44)	261 (45)	268 (41)	269 (44)	256 (45)	266 (46)	245 (44)	272 (49)	250 (46)	0.025
Package leaflet	-	166 (34)	157 (27)	193 (29)	177 (29)	172 (30)	173 (30)	150 (27)	163 (30)	175 (32)	0.009
Nurse	51 (13)	75 (15)	71 (12)	83 (13)	71 (12)	85 (15)	85 (15)	82 (14)	70 (13)	76 (14)	0.128
Books/newspapers	46 (12)	51 (10)	58 (10)	37 (6)	32 (5)	42 (7)	50 (9)	36 (6)	49 (9)	41 (8)	<0.0001
Relatives/friends	28 (7)	33 (7)	28 (5)	9 (1)	24 (4)	20 (4)	24 (4)	22 (4)	26 (5)	27 (5)	<0.0001
Internet	2 (1)	5 (1)	22 (4)	47 (7)	50 (8)	68 (12)	67 (12)	82 (14)	68 (12)	75 (14)	<0.0001
Advertisements	25 (6)	16 (3)	23 (4)	14 (7)	15 (2)	12 (2)	27 (5)	14 (2)	24 (4)	10 (2)	0.001
Radio/television	13 (3)	23 (5)	29 (5)	16 (2)	11 (2)	25 (4)	36 (6)	14 (2)	24 (4)	20 (4)	0.004
Health food stores	30 (8)	36 (7)	45 (8)	42 (6)	27 (4)	30 (5)	42 (6)	24 (4)	25 (5)	28 (5)	0.027
Telephone services (call centres)	-	0 (0)	2 (<1)	1 (<1)	1 (1)	0 (0)	1 (<1)	0 (0)	0 (0)	0 (0)	1.000
MI received from at least one source[d]	387 (97)	448 92)	522 (90)	513 (78)	458 (75)	468 (82)	472 (81)	433 (78)	436 (79)	422 (77)	<0.0001

[a]Discrepancies in totals are due to rounding errors, [b]Calculated from study years available, [c]Statistical significance for the change in the receipt of medicines information between the study years. Age, educational level, number of medicines in use and number of diagnosed diseases adjusted logistic regression was used in gender stratified analysis; and gender, educational level, number of medicines in use and number of diagnosed diseases adjusted logistic regression in age group stratified analysis, [d]Medicines information (MI) sources listed in the survey.

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Appendix B. Trends in the receipt of medicines information among medicine users by number of medicines in use and number of diagnosed diseases. The percentages are calculated from the variables within each subcategory (i.e. number or medicines in use, number of diagnosed diseases)[a].

Characteristics	Study years[b]										
	1999 n (%)	2002 n (%)	2005 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)	2013 n (%)	2014 n (%)	P-value[c]
Respondents using medicines	1944	2000	2038	2101	1957	1871	1844	1759	1677	1671	
Number of medicines in use/person											
1 medicine	1215 (63)	1183 (59)	1143 (56)	1154 (55)	1060 (54)	1029 (55)	1011 (55)	976 (56)	907 (54)	910 (54)	
Physician	628 (52)	559 (47)	508 (44)	465 (40)	410 (39)	414 (40)	410 (41)	384 (39)	366 (40)	345 (38)	<0.0001
Community pharmacist	540 (44)	461 (39)	408 (36)	405 (35)	369 (35)	386 (38)	375 (37)	333 (34)	368 (41)	347 (38)	<0.0001
Package leaflet	-	478 (40)	401 (35)	354 (31)	317 (30)	293 (28)	312 (31)	271 (28)	278 (31)	258 (28)	<0.0001
Nurse	138 (11)	124 (10)	104 (9)	129 (11)	103 (10)	84 (8)	104 (10)	91 (9)	92 (10)	88 (10)	0.114
Books/newspapers	184 (15)	124 (10)	92 (8)	48 (4)	43 (4)	43 (4)	62 (6)	38 (4)	45 (5)	39 (4)	<0.0001
Relatives/friends	168 (14)	113 (10)	94 (8)	70 (6)	76 (7)	64 (6)	78 (8)	51 (5)	56 (6)	48 (5)	<0.0001
Internet	10 (1)	37 (3)	78 (7)	99 (9)	90 (8)	114 (11)	120 (12)	115 (11)	117 (13)	117 (13)	<0.0001
Advertisements	127 (10)	86 (7)	74 (6)	38 (3)	28 (3)	29 (3)	36 (4)	24 (2)	27 (3)	26 (3)	<0.0001
Radio/television	88 (7)	67 (6)	48 (4)	26 (2)	20 (2)	30 (3)	37 (4)	24 (2)	27 (3)	14 (2)	<0.0001
Health food stores	77 (6)	71 (6)	60 (5)	36 (3)	41 (4)	44 (4)	46 (5)	29 (3)	39 (4)	35 (4)	<0.0001
Telephone services (call centres)	-	4 (<1)	2 (<1)	3 (<1)	3 (<1)	1 (<1)	2 (<1)	2 (<1)	0 (0)	3 (<1)	0.985
MI received from at least one source[d]	1147 (94)	1019 (86)	924 (81)	768 (67)	681 (64)	691 (67)	689 (68)	583 (60)	615 (68)	590 (65)	<0.0001
2 medicines	505 (26)	559 (28)	566 (28)	584 (28)	536 (27)	512 (27)	491 (27)	482 (27)	442 (26)	429 (26)	
Physician	386 (76)	396 (71)	371 (66)	336 (58)	297 (55)	299 (58)	278 (57)	244 (51)	236 (53)	224 (52)	<0.0001
Community pharmacist	237 (47)	299 (53)	290 (51)	256 (44)	235 (44)	247 (48)	245 (50)	208 (43)	224 (51)	211 (49)	0.012
Package leaflet	-	270 (48)	225 (40)	231 (40)	205 (38)	189 (37)	168 (34)	152 (32)	158 (36)	151 (35)	<0.0001
Nurse	94 (19)	117 (21)	84 (15)	90 (15)	72 (13)	68 (13)	72 (15)	71 (15)	59 (13)	62 (14)	0.002
Books/newspapers	73 (14)	83 (15)	62 (11)	39 (7)	38 (7)	31 (6)	35 (7)	30 (6)	45 (5)	32 (7)	<0.0001
Relatives/friends	75 (15)	66 (12)	62 (11)	38 (7)	54 (10)	45 (9)	42 (9)	37 (8)	38 (9)	29 (7)	<0.0001
Internet	7 (1)	25 (4)	46 (8)	85 (15)	81 (15)	81 (16)	83 (17)	91 (18)	90 (20)	83 (19)	<0.0001
Advertisements	40 (8)	34 (6)	43 (8)	17 (3)	17 (3)	14 (3)	16 (3)	16 (3)	19 (4)	10 (2)	<0.0001
Radio/television	23 (5)	37 (7)	28 (5)	16 (3)	17 (3)	16 (3)	21 (4)	14 (3)	16 (4)	11 (3)	0.029
Health food stores	38 (8)	48 (9)	51 (9)	31 (5)	18 (3)	22 (4)	27 (5)	23 (5)	22 (5)	17 (4)	0.001
Telephone services (call centres)	-	0 (0)	1 (<1)	2 (<1)	2 (<1)	0 (0)	1 (<1)	1 (<1)	2 (<1)	1 (<1)	0.954
MI received from at least one source[d]	500 (99)	534 (96)	519 (92)	479 (82)	414 (77)	411 (80)	408 (83)	381 (79)	343 (78)	326 (76)	<0.0001
3 medicines	161 (8)	166 (8)	198 (10)	221 (11)	220 (11)	210 (11)	210 (11)	191 (11)	208 (12)	199 (12)	
Physician	133 (83)	139 (84)	158 (80)	147 (67)	140 (64)	149 (71)	150 (71)	126 (66)	134 (64)	122 (61)	<0.0001
Community pharmacist	76 (47)	94 (57)	112 (57)	111 (50)	118 (54)	130 (62)	110 (52)	106 (55)	127 (61)	117 (59)	0.302
Package leaflet	-	83 (50)	88 (44)	97 (44)	90 (41)	87 (41)	80 (38)	77 (40)	100 (48)	95 (48)	0.152
Nurse	28 (17)	41 (25)	33 (17)	37 (17)	45 (20)	57 (27)	44 (21)	40 (21)	42 (20)	46 (23)	0.268
Books/newspapers	25 (16)	22 (13)	24 (12)	20 (9)	13 (6)	20 (10)	21 (10)	19 (9)	23 (11)	12 (6)	0.025
Relatives/friends	14 (9)	26 (16)	15 (8)	10 (5)	10 (5)	16 (8)	14 (7)	21 (10)	19 (9)	21 (11)	0.010
Internet	6 (4)	4 (2)	23 (12)	37 (17)	37 (17)	42 (20)	44 (21)	42 (20)	47 (23)	33 (17)	<0.0001
Advertisements	8 (5)	13 (8)	12 (6)	5 (2)	5 (2)	6 (3)	11 (5)	6 (3)	9 (4)	3 (2)	0.094
Radio/television	13 (8)	17 (10)	9 (5)	5 (2)	5 (2)	9 (4)	13 (6)	5 (3)	11 (5)	6 (3)	0.003
Health food stores	19 (12)	11 (7)	12 (6)	8 (4)	12 (5)	7 (3)	8 (4)	7 (4)	10 (5)	9 (5)	0.099
Telephone services (call centres)	-	0 (0)	1 (1)	1 (<1)	0 (0)	0 (0)	1 (<1)	0 (0)	1 (<1)	0 (0)	1.000
MI received from at least one source[d]	157 (98)	162 (98)	189 (95)	193 (87)	181 (82)	184 (88)	177 (84)	157 (82)	172 (83)	174 (87)	<0.0001
4 medicines or more	63 (3)	92 (5)	131 (6)	142 (7)	141 (7)	120 (6)	132 (7)	130 (7)	120 (7)	133 (8)	
Physician	59 (94)	78 (85)	116 (89)	102 (72)	103 (73)	91 (76)	95 (72)	95 (72)	80 (67)	94 (71)	<0.0001
Community pharmacist	39 (62)	58 (63)	91 (69)	89 (63)	90 (64)	79 (66)	95 (72)	83 (63)	74 (62)	84 (63)	0.842
Package leaflet	-	45 (39)	68 (52)	63 (44)	73 (52)	51 (43)	58 (44)	62 (48)	44 (37)	62 (47)	0.397
Nurse	14 (22)	25 (27)	33 (25)	41 (29)	37 (26)	34 (28)	38 (29)	41 (32)	39 (33)	32 (24)	0.737
Books/newspapers	10 (16)	18 (20)	25 (19)	18 (13)	18 (13)	10 (8)	19 (14)	8 (6)	14 (12)	8 (6)	0.031
Relatives/friends	12 (19)	8 (9)	13 (10)	9 (6)	20 (14)	5 (4)	11 (8)	6 (5)	12 (10)	14 (11)	0.097
Internet	3 (5)	2 (2)	10 (8)	22 (15)	35 (25)	24 (20)	29 (22)	34 (26)	29 (24)	29 (22)	<0.0001
Advertisements	5 (8)	2 (2)	8 (6)	6 (4)	7 (5)	2 (2)	6 (5)	4 (3)	5 (4)	2 (2)	0.357
Radio/television	6 (10)	6 (7)	16 (12)	8 (6)	8 (6)	2 (2)	10 (8)	6 (5)	6 (5)	12 (9)	0.218
Health food stores	7 (11)	11 (12)	13 (10)	13 (9)	8 (6)	4 (3)	9 (7)	8 (6)	6 (5)	5 (4)	0.125

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Telephone services (call centres)	-	0 (0)	1 (1)	0 (0)	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	1.000
MI received from at least one source[d]	63 (100)	89 (97)	130 (99)	131 (92)	128 (91)	106 (88)	119 (90)	105 (88)	103 (86)	114 (86)	0.074
Number of diagnosed diseases/person[e]											
None	1228 (63)	1121 (56)	971 (48)	850 (40)	772 (39)	796 (43)	746 (40)	735 (42)	721 (42)	689 (41)	
Physician	633 (52)	536 (48)	384 (40)	281 (33)	266 (34)	295 (37)	268 (36)	227 (31)	264 (37)	217 (31)	<0.0001
Community pharmacist	558 (45)	470 (42)	371 (38)	294 (35)	252 (33)	289 (36)	264 (35)	247 (34)	272 (38)	236 (34)	<0.0001
Package leaflet	-	496 (44)	387 (40)	275 (32)	246 (32)	239 (30)	233 (31)	199 (28)	226 (32)	207 (30)	<0.0001
Nurse	157 (13)	146 (13)	91 (9)	87 (10)	64 (8)	76 (10)	69 (9)	66 (10)	72 (10)	64 (9)	0.030
Books/newspapers	194 (16)	134 (12)	95 (10)	41 (5)	34 (4)	39 (5)	49 (7)	34 (5)	38 (5)	37 (5)	<0.0001
Relatives/friends	196 (16)	135 (12)	117 (12)	54 (6)	65 (8)	63 (8)	69 (9)	55 (8)	49 (7)	40 (6)	<0.0001
Internet	15 (1)	38 (3)	65 (7)	75 (9)	70 (9)	95 (12)	92 (12)	88 (12)	108 (15)	93 (13)	<0.0001
Advertisements	141 (12)	88 (8)	81 (8)	34 (4)	20 (3)	25 (3)	29 (4)	17 (2)	24 (3)	24 (3)	<0.0001
Radio/television	96 (8)	65 (6)	52 (5)	19 (2)	17 (2)	21 (3)	31 (4)	14 (2)	23 (3)	18 (3)	<0.0001
Health food stores	85 (7)	84 (8)	72 (7)	37 (4)	22 (3)	33 (4)	30 (4)	21 (3)	35 (5)	29 (4)	<0.0001
Telephone services (call centres)	-	3 (<1)	4 (<1)	2 (<1)	2 (<1)	0 (0)	2 (<1)	1 (<1)	2 (<1)	3 (<1)	0.963
MI received from at least one source[d]	1163 (95)	966 (86)	784 (81)	543 (64)	481 (62)	528 (66)	493 (66)	464 (66)	466 (65)	425 (62)	<0.0001
1 disease	502 (26)	527 (26)	593 (29)	605 (29)	546 (28)	482 (26)	517 (28)	469 (26)	455 (27)	450 (27)	
Physician	389 (77)	364 (69)	394 (66)	337 (40)	282 (52)	252 (52)	265 (51)	210 (45)	237 (52)	237 (53)	<0.0001
Community pharmacist	224 (45)	259 (49)	260 (44)	235 (39)	223 (41)	213 (44)	234 (45)	217 (46)	221 (49)	212 (47)	0.020
Package leaflet	-	228 (43)	202 (34)	206 (34)	188 (34)	154 (32)	160 (31)	117 (25)	163 (36)	139 (31)	<0.0001
Nurse	70 (14)	81 (15)	68 (12)	87 (14)	81 (15)	54 (11)	67 (13)	61 (13)	56 (12)	59 (13)	0.558
Books/newspapers	75 (15)	66 (13)	54 (9)	36 (6)	33 (6)	23 (5)	38 (7)	24 (5)	31 (7)	19 (4)	<0.0001
Relatives/friends	53 (11)	56 (11)	32 (5)	36 (6)	40 (7)	39 (8)	36 (7)	24 (5)	30 (7)	24 (5)	<0.0001
Internet	8 (2)	19 (4)	49 (8)	76 (13)	66 (12)	67 (14)	63 (12)	48 (10)	89 (20)	66 (15)	<0.0001
Advertisements	32 (6)	30 (6)	35 (6)	11 (2)	16 (3)	12 (2)	16 (3)	11 (2)	19 (4)	11 (2)	<0.0001
Radio/television	22 (4)	42 (8)	24 (4)	13 (2)	10 (2)	15 (3)	17 (3)	13 (3)	18 (4)	7 (2)	<0.0001
Health food stores	44 (9)	36 (7)	30 (5)	16 (3)	25 (5)	18 (4)	26 (5)	24 (5)	19 (4)	19 (4)	0.005
Telephone services (call centres)	-	0 (0)	0 (0)	2 (<1)	2 (<1)	1 (<1)	0 (0)	1 (<1)	1 (<1)	1 (<1)	1.000
MI received from at least one source[d]	491 (98)	501 (95)	528 (89)	467 (77)	392 (72)	360 (75)	405 (78)	341 (73)	342 (75)	338 (75)	<0.0001
2 diseases	151 (8)	232 (12)	270 (13)	367 (17)	358 (22)	335 (18)	345 (19)	332 (19)	279 (17)	285 (17)	
Physician	126 (83)	183 (79)	203 (75)	240 (65)	214 (60)	221 (66)	229 (66)	185 (56)	160 (57)	163 (57)	<0.0001
Community pharmacist	79 (52)	116 (50)	140 (52)	180 (49)	181 (51)	176 (53)	177 (51)	155 (47)	152 (54)	156 (55)	0.941
Package leaflet	-	98 (42)	98 (36)	137 (37)	135 (38)	116 (35)	125 (36)	106 (32)	99 (35)	108 (38)	0.370
Nurse	34 (23)	43 (19)	39 (14)	52 (14)	55 (15)	50 (15)	59 (17)	57 (17)	53 (19)	36 (13)	0.276
Books/newspapers	11 (7)	28 (12)	24 (9)	23 (6)	25 (7)	21 (6)	27 (8)	24 (7)	21 (8)	17 (6)	0.045
Relatives/friends	11 (7)	18 (8)	18 (7)	22 (6)	31 (9)	10 (3)	22 (6)	22 (6)	29 (10)	29 (10)	0.044
Internet	1 (1)	9 (4)	28 (10)	56 (15)	56 (16)	45 (13)	65 (19)	68 (20)	44 (16)	47 (16)	<0.0001
Advertisements	3 (2)	12 (5)	10 (4)	8 (2)	10 (3)	7 (2)	13 (4)	14 (4)	10 (4)	4 (1)	0.229
Radio/television	7 (5)	11 (5)	7 (3)	8 (2)	11 (3)	9 (3)	19 (6)	14 (4)	11 (4)	7 (2)	0.293
Health food stores	5 (3)	15 (7)	15 (6)	20 (5)	24 (7)	13 (4)	23 (7)	18 (5)	11 (4)	8 (3)	0.208
Telephone services (call centres)	-	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1)	0 (0)	0 (0)	0 (0)	1.000
MI received from at least one source[d]	150 (99)	222 (96)	251 (93)	311 (85)	287 (80)	277 (83)	290 (84)	260 (78)	224 (80)	227 (80)	<0.0001
3 diseases or more	63 (5)	120 (6)	204 (10)	279 (13)	281 (14)	258 (14)	236 (13)	233 (14)	231 (14)	247 (15)	
Physician	58 (92)	103 (86)	172 (84)	192 (69)	188 (67)	185 (71)	171 (72)	167 (68)	155 (67)	168 (68)	<0.0001
Community pharmacist	31 (49)	67 (56)	130 (64)	152 (54)	156 (56)	164 (64)	150 (64)	151 (62)	148 (64)	155 (63)	0.229
Package leaflet	-	54 (45)	95 (47)	127 (46)	116 (41)	111 (43)	100 (42)	110 (45)	92 (40)	112 (45)	0.738
Nurse	13 (21)	37 (31)	56 (28)	71 (25)	57 (20)	63 (24)	63 (27)	64 (25)	51 (22)	69 (28)	0.440
Books/newspapers	12 (19)	19 (16)	30 (155	28 (10)	20 (7)	21 (8)	23 (10)	16 (6)	21 (9)	18 (7)	0.003
Relatives/friends	9 (14)	4 (3)	17 (8)	15 (5)	24 (9)	18 (7)	18 (8)	20 (8)	17 (7)	19 (8)	0.307
Internet	2 (3)	2 (2)	15 (7)	36 (13)	51 (18)	54 (21)	56 (24)	56 (22)	42 (18)	56 (23)	<0.0001
Advertisements	4 (6)	5 (4)	11 (5)	13 (5)	11 (4)	7 (3)	11 (5)	7 (3)	7 (3)	2 (1)	0.263
Radio/television	5 (8)	9 (8)	18 (9)	15 (5)	12 (4)	12 (5)	14 (6)	4 (2)	7 (3)	11 (4)	0.190
Health food stores	7 (11)	6 (5)	19 (9)	15 (5)	8 (3)	13 (5)	11 (5)	11 (4)	12 (5)	10 (4)	0.111
Telephone services (call centres)	-	0 (0)	1 (1)	2 (1)	3 (1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (<1)	0.998
MI received from at least one source[d]	63 (100)	115 (96)	199 (98)	250 (90)	244 (87)	227 (88)	205 (87)	211 (88)	201 (231)	214 (87)	0.001

[a]Discrepancies in totals are due to rounding errors, [b]Calculated from study years available, [c]Statistical significance for the change in the receipt of medicines information between the study years. Age, gender, educational level, number of medicines in use and number of diagnosed diseases adjusted logistic regression was used in number of medicines in use and number of diagnosed diseases stratified analysis, [d]Medicines information (MI) sources listed in the survey, [e]Respondents who had diseases (list in the survey) diagnosed by a physician during the last year (12 months).

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5,6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5,6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	14
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6,7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6,7
		(*b*) Describe any methods used to examine subgroups and interactions	6,7
		(*c*) Explain how missing data were addressed	6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	6,8
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-10
		(b) Indicate number of participants with missing data for each variable of interest	9-10
Outcome data	15*	Report numbers of outcome events or summary measures	11,12
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted	NA

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		estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	12, Appendix 1&2
Discussion			
Key results	18	Summarise key results with reference to study objectives	14,15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15,16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	15
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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