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A PHARMACOEPIDEMIOLOGICAL STUDY OF MEDICINE USE AMONG FINNISH CONSCRIPTS

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A pharmacoepidemiological study of medicine use among Finnish conscripts

Kari Linden

Academic dissertation

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To my parents

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ABSTRACT

Relatively little is known about the use of medicines and its predictors in adolescents and young adults. However, individuals of this age frequently use medicines, in particular over-the-counter ones. In addition, their knowledge of medicine use is often poor and their health behavior often comprises risky characteristics that increase a risk for medication related problems. Stress caused by the military service, for example, is suggested to increase the use of medicines and other health care services. Of Finnish young men, 80% perform compulsory military service for 6–12 months.

The aim of this study was to investigate the prevalence and predictors of the use of medicines among the Finnish conscripts performing common military service as well as to describe a drug information campaign to the conscripts and to evaluate the conscripts' attitudes towards it.

The data for this cross-sectional questionnaire study were drawn from three samples: overall prescribed and nonprescribed medicine use and their predictors among the male conscripts were examined in February 1999 (Sample 1, studies I and V, N = 3725, from 8 brigades, response rate 97%) and among the female conscripts in April 1999 (Sample 3, study IV, N = 177, 68% of all the women on duty). Self-medication patterns among the male conscripts were investigated in July 1999 (Sample 2, studies II and III, N = 857, from 8 brigades, 95%). In the self-medications studies II and III, Andersen's *et al.* (1968 and 1995) theoretical health care utilization model was employed. Univariate, bivariate and multivariate analyses were done. Study I was carried out as part of a nationwide "Drug Information for Conscripts" -campaign.

Of the male conscripts, 71% had used medicines in 2 weeks in February 1999 (I), and 61 % of the female conscripts in April 1999 (IV). Of the men, 60% (44% of women) used prescribed and 42% (31%) nonprescribed medicines. Solely nonprescribed medicines were used by 15% of the men. In July 1999 (II), 65% of the men reported self-medication at least for one indication in the last 2 weeks. Most of the self-medication was for pains or common cold symptoms (54% of all respondents) or for cough. Of the men (I), 63% had used nonprescribed analgesics at least few times a week (15% daily or almost daily). In April 1999, 79% of the female conscripts reported self-medication. Nonprescribed analgesics were used at least few times a week by 71%. Vitamins were taken by 20% of the men in February 1999 (III) and by 36% of the women in April (IV). Use of caffeine tablets or other stimulants was reported by approximately 9% of individuals of both genders.

Overall use of prescribed medicines was associated with the male and female conscripts' sociodemographic, health and health behavior variables (I,IV). Among the men (II,III), overall self-medication and vitamin use was associated with predisposing and health behavior variables, but not with need ones. Instead, along with predisposing and health behavior variables, need variables predicted self-medication for pain or common cold symptoms or use of caffeine tablets or other stimulants. Potentially risky health behaviors with overall use of prescribed medicines and self-medication were detected.

In general, the conscripts had a positive attitude to the drug information campaign, received new information from it, and found this information useful.

The study showed that Finnish male and female conscripts commonly use prescribed medicines and self-medication. In particular among the male conscripts, the prevalence of the use of medicines seemed to be at the same or a little higher level than reported among adolescents and young adults under civilian circumstances. The prevalence of the use of prescribed and nonprescribed medicines among the conscripts can be seen high, because it is reported by probably the healthiest individuals of the age group. The results underline the importance of appropriate medical and pharmaceutical services and drug information provided to the conscripts.

CONTENTS

ABBREVIATIONS AND DEFINITIONS

ATC classification system	Anatomical Therapeutic Chemical classification system (WHO 1990)
DDD	Defined Daily Dose, defined as the assumed average maintenance dose per day for a drug used for its main indication in adults (WHO 1990)
Drug information	Drug information is general or personal advice by competent staff, and it probably accompanied by written information. Its emphasis is on the clinical information, *i.e.*, the medical properties and safe handling of the medicine, and on the procedure by which it is provided. It is aimed to increase the familiarity, awareness, and comprehension acquired about the medication. Drug information may also be defined, for example, from the perspective of a patient, pharmaceutical industry, medical jurisprudence, media or society (Airaksinen 1996; USP 2002; Nordic Pharmacy Association 2004; Wahlroos 2003)
FDF	The Finnish Defence Forces
MP	The Military Pharmacy of the Finnish Defence Forces
Nonprescribed medicines	A medicine obtained without a visit to a physician (in this study)
OTC medicine	Over-the-counter medicine
PO medicine	Prescription-only medicine
Prescribed medicine	A medicine prescribed during a visit to a physician (in this study)

LIST OF ORIGINAL PUBLICATIONS

I Linden K, Jormanainen V, Kennedy LA, Pietilä K (2003) Prevalence and predictors of the medicine use in males during common military service in Finland. J Soc Adm Pharm 20: 172-81 and 259.

II Linden K, Jormanainen V, Swigonski NL, Pietilä K (2005) Self-medication among Finnish young men in the beginning of common military service. Pharmacoepidemiol Drug Saf 14: 193-201.

III Linden K, Jormanainen V, Pietilä K (2004) Varusmiespalvelusta aloittavien miesten vitamiinien käyttö. Sosiaalilääk Aikak 41: 118-27. [In Finnish, English summary: Use of vitamins among Finnish male conscripts. J Soc Med 41: 127.]

IV Linden K, Jormanainen V, Pietilä K, Sahi T. Patterns of medicine use among Finnish female conscripts during voluntary military service. Mil Med. [In press]

V Linden K, Jormanainen V, Pietilä K (2002) Self-evaluated knowledge of use of medicines by Finnish male conscripts and reactions to medication information campaign. Ann Med Milit Fenn 77: 109-20.

These publications are referred in the text by their Roman numerals.

This dissertation includes results beyond the original publications.

1 INTRODUCTION

The life situation of adolescents and young adults often includes health risks that are caused and contributed by physical, psychological and social changes between childhood and adulthood (Ross and Woodward 1994; Koskenvuo 1996; Portner 1996; European Commission 2002; Staples and Bravender 2002; RCPHC 2003). Their lifestyle also often comprises risky health behaviors such as occasional intensive use of alcohol, experiments with illegal drugs, and slight use of health services, in particular in young men (Chamberlayne *et al*. 1989; Poulin 2001; Rimpelä *et al*. 2003; Viner and Macfarlane 2005).

Approximately 80% of Finnish men perform compulsory military service of 6–12 months, typically at the age of 18–19 years. Women may do military service on a voluntary basis. Military service often causes physical and psychological stress (Ross and Woodward 1994; Koskenvuo 1996; Norheim *et al.* 2002). Despite profound medical check-ups of draftees and comprehensive and easily accessible medical services during the conscription, approximately 8% of conscripts discontinue their military service for medical reasons; 60% of these for mental health and 20% for musculoskeletal diagnoses (Sahi and Korpela 2002). Health and the health behavior of the conscripts are important issues for individual young men and women as well as for effective and safe military training and public health, and thus, health education is seen as an important part of the military education (Lewis 1952; Kannas 1978; Collins 1993; Koskenvuo and Jormanainen 1996; Vertio *et al.* 1996).

The literature provides only a limited number of studies on the determinants and the prevalence of medicine use, the knowledge of medicine use and the attitudes towards drug information among adolescents and young adults (*e.g.*, Rahkonen *et al*. 1987; Dengler and Roberts 1996; Sansgiry and Cady 1996; Chambers *et al*. 1997; Lieb *et al*. 1998; Stakes 1998-2005; Helakorpi *et al*. 1999; Yearbook of Health and Medical Care 1999; Stoelben *et al*. 2000; Sloand and Vessey 2002; Thomson and Poulton 2002; Tobi *et al*. 2003; Holstein *et al*. 2004; Hämeen-Anttila *et al.* 2005). In addition, the results of these studies often have considerable discrepancies. Many studies on this age group concentrate mainly on the use of alcohol, tobacco or illegal drugs.

The medication patterns of adolescents and young adults, however, differ from those of other age groups. Although the prevalence of overall medicine use is lower in adolescents and young adults than in older individuals or in children, they commonly use medicines, in particular over-the-counter (OTC) medicines (Eggen 1997; Arinen *et al*. 1998; Hansen *et al.* 2003; Paulose-Ram *et al*. 2003; Turunen *et al.* 2005). In special groups such as in young athletes or students, use of OTC medicines and vitamins has been shown to be common (DesJardins 2002; Warner *et al.* 2002). The pharmaceuticals may be misused or abused, for example, for enhancing performance, for psychological

symptoms or just for "feeling better" (Sobal and Marquat 1994; Figueiras *et al*. 2000; Light 2000; Martins *et al.* 2002; Warner *et al.* 2002; PDFA 2004).

Inadequate use of medicines may cause health risks such as adverse effects or delayed or inappropriate treatment of illnesses or symptoms (Nakahura *et al*. 1998; Burak and Damico 2000; Neutel and Appel 2000; Sihvo *et al.* 2000; National Agency for Medicines 2005; Wazaify *et al.* 2005b). Health behaviors characteristic for adolescents and young adults, as described above, contribute to these risks. In addition, few published reports suggest that the knowledge of medicine use of adolescents and young adults is often poor (Krupka and Vener 1987; Gilbertson *et al*. 1996; Peremans *et al*. 2000; Stoelben *et al*. 2000; Cohen *et al*. 2003). In addition, the evidence of their interest in drug information is controversial and they are often shown to consider the use of OTC medicines as having risks less often than older individuals (Portner 1991; Airaksinen *et al*. 1993; Charupatanapong 1994; Sansgiry and Cady 1996; Pommier *et al*. 2002). Compliance to use of medicines is also suggested to be often lower among adolescents than among other individuals (Siegel 1987; Fizgerald 2001; Dundee *et al.* 2003; Zite and Shulman 2003).

Our research provides new information on the prevalence and predictors of the use of prescribed and nonprescribed medicines among Finnish conscripts. Along with the Finnish Defence Forces and its health care, this information is useful for civilian primary health care treating young adults, in particular those exposed to increased physical or psychological stress.

2 REVIEW OF THE LITERATURE

2.1 Use of medicines

2.1.1 Role of medicines in health care

Medicines are an essential part of modern health care and the prescribing of medicines is one of the most common treatments performed in health care (Segall 1990; WHO 2000b; Ministry of Social Affairs and Health 2003; Helmiö *et al.* 2005; PAGB 2005). Consumption of medicines has strongly increased in the last three decades both in outpatient and inpatient settings due to increased supply (*e.g.*, new innovations, marketing, increased number of over-the-counter medicines) and demand (*e.g.*, ageing of the population, new health care technologies and practices, and more health oriented attitudes of lay persons and increased expectations from health care) of pharmaceuticals (Rabin and Bush 1974; Klaukka *et al.* 1990; Vuckovic and Nichter 1997; Holstein *et al.* 2003). Along with other medical technologies, much attention has been paid to appropriateness, effectiveness, safety and cost-effectiveness of medicine use (Parish 1973; Sackett *et al.* 1997; Greenberg *et al.* 1999; Bennett *et al.* 2001).

At the level of an individual, taking a prescribed or nonprescribed medicine is one of the most common means of treating or relieving illnesses or their symptoms (Vener *et al.* 1982; Verbrugge and Ascione 1987; Vingilis *et al.* 1999; Kaufman *et al.* 2002). Shifting several medicines from prescription-only (PO) to over-the-counter (OTC) availability has recently increased the assortment of pharmaceuticals available to customers and has further increased patients' possibilities to affect their own health. On the other hand, it has shifted more health care costs onto patients. (Blenkinsopp and Bradley 1996; WHO 2000b; Brass 2001; Harrington and Shepherd 2002; Wazaify *et al.* 2005b).

The increased role of medicines and the expanded scope of their indications have been criticized as part of medicalisation, *i.e.*, a tendency to define an increasing number of common life's problems as medical problems (Lewis 1971; Zola 1972; Nye 2003).

2.1.2 Prevalence of medicine use among the adult population

The total sales of pharmaceuticals (1.8 billion euros) covered 15.5% of the total expenses of the health care in Finland in 2001 (Finnish Statistics on Medicines 2001). In the same year, the total value of the whole sales of PO pharmaceuticals in the outpatient care comprised 1336 million euros and OTC ones 251 million euros. Approximately 35 million prescriptions were dispensed in Finnish outpatient pharmacies in 2001 (Finnish Statistics on Medicines 2001). The medicine reimbursement expenditure from the

Finnish Health Insurance Scheme was approximately 770 million euros, and PO medicines were refunded for approximately 3 million Finns' (Table 2-1).

Table 2-1. Recipients of refunded medicines in Finland in 2001 (Finnish Statistics on Medicines 2001).

	Number of users of refunded medicines	
	Number	Proportion of a cohort (%)
All		
All	3 363 000	65
Men	1 479 000	58
Women	1 884 000	71
15–19 years of age		
All	151 000	46
Men	68 000	40
Women	83 000	52
20–24 years of age		
All	158 000	49
Men	64 000	38
Women	95 000	59

At the time of interview, 39% of Finns reported use of prescribed medicines and 28% of nonprescribed ones (Arinen *et al.* 1998). Three quarters (73%) of 15–64-year-old respondents have used a medicine in the past 2 weeks (Helakorpi *et al.* 2002). A corresponding prevalence of overall use of medicine (68%) in a 2-week recall period is reported in Sweden (Yearbook of Health and Medical Care 1999). In Norway, 38% of men and 55% of women had taken medicines in 2 weeks (Furu *et al.* 1997). In Denmark, prescribed medicines were used by 26% of men and 39% of women and nonprescribed medicines by 27% and 36% during the last 2 weeks, respectively (Jensen and Kjøller 1997). Higher prevalences are reported in Germany where 59% of men and 83% of women had taken medicines during a week (Beitz *et al.* 2004), and in the USA, where 81% of the adult population had taken a medicine in the preceding week (Kaufman *et al.* 2002). According to another US survey (NCPIE 2002), 54% of US adults had taken prescribed and 59% OTC medicines in the last month.

2.2 Self-medication

2.2.1 Self-medication and self-care

In many contexts, self-medication is seen as part of self-care and it is defined as independent selection and use of medicines by individuals to treat self-recognized illnesses or symptoms (*e.g*, Blenkinsopp and Bradley 1996; Soller 1998; WHO 1998; Nordic Pharmacy Association 2004). Self-medication is widely recognized as a primary public health resource of the health care system, with which most of the ailments and symptoms can be treated (Tibblin 1984; Segall and Goldstein 1989; Soller 1998; Figueiras *et al.* 2000; Stearns *et al.* 2000; WHO 2000b; Pommier *et al.* 2002; Huntzinger 2004). Appropriate self-medication enhances patients' access to medication, their knowledge of medicines, gives responsibility to individuals for their own health and increases the efficiency of the use of resources of the health care system (Palo Stoller 1998; WHO 2000c; Brass 2001; Westerlund *et al.* 2001).

Despite of the many advantages of the increased range of OTC medicines and their use, the optimal role of OTC medicine use in health care has stimulated debate (Friend 1964; Sihvo *et al*. 1999 and 2000; Brass 2001; Huntzinger 2004; Porteus *et al.* 2005). Appropriate use of self-medications requires that people have enough high general knowledge, level of education and socioeconomic status to make effective and safe decisions about their self-medication (Figueiras *et al.* 2000; WHO 2000b; Westerlund *et al.* 2001). Many medical compounds have caused concerns about their appropriateness in OTC availability (Soller 1998; Sihvo *et al.* 1999; Bissell *et al.* 2000a; WHO 2000b and 2000c; MacDonald *et al.* 2002; Cantu *et al.* 2003; Shader and Greenblatt 2003; Gibson 2004; Insley Crouch *et al*. 2004). The appropriateness of OTC medicine use depends on the therapeutic group of the medicine and its indications (Wazaify *et al.* 2005b). For example, studies on self-medication of dyspepsia with antacids and OTC proton pump inhibitors show varying results of its appropriateness (Sihvo and Hemminki 1997; Furu and Straume 1999; Fendrick *et al*. 2004).

As expected, the more common use of OTC medicines has increased misuse and abuse of these medicines (Murray 1993; Brass 2001; Hughes *et al.* 2002; Matheson *et al.* 2002). Use of OTC non-steroidal anti-inflammatory medicines, for example, may cause adverse effects on the gastro-intestinal system, headache by long-term use with high dosing, contribute to an increased risk of liver or kidney damage, and likely to increase the incidence of self-poisonings (Hawton *et al.* 1995; Abbott and Fraser 1998; Nakahura *et al.* 1998; Kim *et al.* 1999; Thomas *et al.* 2002; Zwart *et al.* 2003). These risks of self-medication are higher in long-term medicine use or if the medicine is taken against the instructions, such as in high single doses or with alcohol (Henry *et al.* 1996; MacDonald *et al.* 1997; Hughes *et al.* 1999; Sihvo *et al.* 2000; WHO 2000c; Hughes *et al.* 2001; Brass 2001; Motola *et al.* 2002). For example in Ireland, approximately 40%

of medicine-related overdose cases are caused by the use of OTC medicines (Wazaify *et al.* 2005). Other problems with OTC medicines comprise inappropriate double medication (*e.g.*, taking prescribed and nonprescribed medicines including the same active ingredient), interactions between medicines, delayed consultation of health care professionals, off-label or other misuse of OTC medicines, and from a point of view of a consumer, increased medication expenses because OTC medicines are more rarely covered by third part payer schemes (Ahonen *et al.* 1991; Hughes *et al.* 2001; Sihvo *et al.* 2000; Barnett *et al.* 2000; Brass 2001). In a survey on a general Irish population, a third of the respodents had encountered misuse or abuse of OTC medicines (Wazaify *et al.* 2005b). However, strict pharmacological, toxicological and legislative requirements on the classification of a medicine into OTC availability limit abuse and other problems of self-medicattion products (Medicines Act 395/1987; WHO 2000b; Hughes *et al.* 2001). For example, only few Finnish OTC medicines, such as some cough medicine, anti-allergy products, include active compunds which could be widely abused. In addition to caffeine tabletes, there are not other medical stimulants on the OTC market in Finland.

The literature provides only limited information on the attitudes of users of OTC medicines to the adverse effects of these medicines (Charupatanapong 1994; Bissell *et al.* 2000b; Hughes *et al.* 2002; Sangasubana 2003; PAGB 2005). Widely recognized poor knowledge of medicines and a feeling of confidence in the safety of OTC medicines may contribute to the adverse effects of self-medication (Vener *et al.* 1982; Fincham 1989; Roach and Stacey 1997; Sihvo *et al.* 1999; Bissell *et al.* 2000b; Hughes *et al.* 2002; Sangasubana 2003). For example, over half (54%) of Canadians cannot mention the name of the active compound in the headache medicine that they mostly use (NCPIE 2002; DIRC and NCPIE 2003). The feeling of safety of OTC medicines or ignorance of their possible side-effects may create apparent "expertise" among laypersons that may set challenges to drug information provided by health care professionals (Hawton *et al.* 1995; Bissell *et al.* 2000a). Charupatanapong (1994) found that adolescents and young adult men saw only a few risks with OTC medicine use. Men also pay less attention to OTC medicine dosing than women (NCPIE 2002; DIRC and NCPIE 2003).

2.2.2 Prevalence of self-medication

Use of nonprescribed medicines has increased since the 1980s, in particular if the use of vitamins and herbal medicines is included (Arinen *et al.* 1998; Soller 1998; Yearbook of Health and Medical Care 1999). In Finland, the total sales value of OTC medicines (251 million euros) represented 16% of the total sales of pharmaceuticals in 2001 (Närhi 2003).

Almost a third (28%) of Finns had taken some OTC medicine (excluding vitamins) during the last 2 days in 1995–1996 (Arinen *et al*. 1998). Correspondingly, for example, 30% of men and 40% of women had self-medicated during a week in Germany (Beitz *et al.* 2004) and a fifth in the UK during 2 weeks (PAGB 2005).

According to a recent Finnish study (Turunen *et al*. 2005), almost a quarter of Finns aged 15–74 years used analgesics frequently, *i.e*. daily or a few times a week. Nonprescribed analgesics were taken by 15% of the respondents and prescribed ones by 16%. In Sweden, in a 2-week period, a fifth of men and a third of women had used OTC analgesics, while prescribed analgesics were used by 7% and 12%, respectively (Antonov and Isacson 1998). Among US adults, analgesics were the most commonly used therapeutic group (Kaufman *et al.* 2002). According to another US study, 76% of adults claimed use of OTC analgesics in general, and 9% had used prescribed analgesic in a month (Paulose-Ram *et al.* 2003). In a recent study in Scotland, some 37% of adults reported use of nonprescribed analgesics in the previous two weeks (Porteus *et al.* 2005).

Vitamins and other nutritional supplements are typically used for enhancing health, preventing illness or to supplement regular nutrition (Vener *et al.* 1982; Sobal and Marquat 1994; Arsenault and Kennedy 1999; Neuhouser *et al*. 1999; Coleman and Laurier 2000; Kaufman *et al.* 2002, Sesselberg *et al*. 2003). Use of vitamins may be seen as part of a healthy life-style and they may be used for a variety of reasons such as for supplementing diet, against environmental hazards or life stress, or for a compromised immune system (Klaukka *et al.* 1985; Vuckovic and Nichter 1997). Patients do not often tell to physician which vitamin or nutritional supplements they use (Eisenberg *et al.* 1998).

Use of high-dose vitamin products and so called alternative medicines increased in the USA in the 1990s (Eisenberg *et al.* 1998). In Finland, the sales of vitamin products in pharmacies declined by 13% between the years 1996 and 2001 (Närhi 2003). The rate of consumption, however, is difficult to estimate because many vitamins and nutritional supplements are also sold in groceries and health food shops. Of Finns approximately a third (35%; of men 25% and of women 43%) report use of vitamins or minerals during a week (Helakorpi *et al.* 2002). At the moment of interview, 15% of the respondents had claimed use of these products (Arinen *et al.* 1998). In the USA, 24% of US men and 35% of women used vitamins or minerals in a 1-week period (Kaufman *et al.* 2002).

Traditionally, the most typical consumers of OTC medicines have been women with high education level and incomes, who live in an urban environment, and have a positive attitude towards self-medication and self-care in general, but evaluate the official health care services critically (Rabin 1972; Johnson and Pope 1983; Benrimoj and Chua 1990; Laure 1998; Beitz *et al.* 2004). Self-medication is also shown to be most common among single individuals (Segall 1990; Figueiras *et al.* 2000; Beitz *et al.*

2004). Although self-medication is still common in those population groups (Itterman *et al.* 2003), today it is has become more wide-spread also in other groups such as in men and in people in a rural environment (Jylhä 1994; Aro and Aro 1995).

2.3 Adolescents and young adults as medicine users

2.3.1. Characteristics of adolescents' and young adults' medicine use and other health behavior

Adolescence and young adulthood, often defined as an age range of 13–22 years, is an individual's developing and transition stage between childhood and adulthood when many physical, psychological and social changes occur (Levinson 1986; Siegel 1987; Slusher 1999; Staples and Bravender 2002; RCPCH 2003; Viner and Macfarlane 2005). Adolescents' and young adults' lifestyle more commonly comprises risk-taking behaviors than in other population groups. These behaviors include or are associated with, for example, accidental trauma, alcohol and other substance abuse or misuse, nutrition problems or eating problems, physical and sexual risk-taking or abuse, mental and social problems as well as underuse of health services (Blum 1987; Portner 1996; Adlaf *et al.* 2000; Kunttu 1997; Light 2000; European Commission 2002; Gleeson *et al.* 2002; Marcell 2002; RCPCH 2003; PDFA 2004; McCabe *et al.* 2005; Nilsson *et al.* 2005; Skurtveit *et al.* 2005; Wazaify *et al.* 2005b).

The experiments with substances include, for example, trials with illegal drugs, psychoactive or other PO medicines prescribed to them or to other subjects, intentional overdosing with medicines, mixed use of alcohol and medicines or illegal drugs. In Canada, for example, 4–6% of high school students took tranquillizers obtained with a prescription or acquired in another way in a year, while even 6–10% used any stimulating product (Chamberlayne *et al.* 1989). Further, in Canada, 5% of the adolescents had used or tried prescribed and 9% nonprescribed stimulants such as methylphenidate products during a year (Poulin 2001). Stimulant use was associated with smoking and cannabis use, and their availability, *i.e.*, knowing a person who uses them. Of the German 18–24-year-olds, 0.6–3.3% used psychoactive medicines prescribed for another person or used them in higher doses than prescribed (Lieb *et al.* 1998). During lifetime, 6% of Finnish men, and 8% of women, have used tranquillizers, sleeping medicines or pain medicines for intoxicating purposes (Partanen and Metso 2005).

Several adult health behaviors are established in adolescence or earlier, and many health differences as well as socioeconomic exclusion are suggested to begin at this age (Kannas 1978; Coons *et al*. 1989; McCaleb and Edgil 1994; Slusher 1999; Dickey and Deatrick 2000; Viner and Macfarlane 2005; Rimpelä 2005). For example, experiences

of medicines and medication habits may transfer from childhood to adulthood (Blanz *et al.* 1992; Bush *et al*. 1999; FIP 2001; Allotey *et al.* 2004; Hämeen-Anttila *et al*. 2005). For these reasons, it is important to know the patterns of medicine use and other health behaviors in adolescents (Bush and Rabin 1976; Perry 1994; Portner 1996; Dickey and Deatrick 2000; Pommier *et al.* 2002; Hansen *et al.* 2003).

In the establishment of health behavior in adulthood, parents and other family members have a strong influence (Lapeyre-Mestre *et al.* 1991; Portner and Smith 1994; Bush *et al*. 1999; Martin and Bush 2000; Brook *et al.* 2003; Hämeen-Anttila *et al*. 2005). Other important sources of information and attitudes and of health behavior models, are friends, mass media and health professionals such as pharmacists, nurses and physicians (FIP 2001; Gray *et al.* 1998a, 1998b and 2003; Peremans *et al.* 2000). The attitudes of family, peers and health professionals towards an adolescent's chronic disease and medication have a strong influence on compliance (Friedman *et al.* 1986; Kyngäs 2000). Gray *et al.* (2002) have suggested that adolescents develop "health repertories" which include both medical and non-medical treatment strategies that are triggered after self-diagnosis. These "health repertories" are constructed on their own previous medical experiences and information provided by health professionals and laypersons. On the misuse of medicines, peers and their possible medication (*e.g.*, methylphenidate) have a strong influence (Ellen *et al*. 1998; Poulin 2001; McCabe *et al.* 2005). Adolescents and young adults often exchange medicines with each other, which may increase the risks associated with medicine use (Rudolf *et al.* 1993; Lyon Daniel *et al.* 2003).

Compared to older or younger individuals, adolescents and young adults use medicines often more independently; they use medicines more seldom than older individuals, but independent self-medication dominate in their medicine use (Tse 1996; Del Rio *et al.* 1997; Eggen 1997; Arinen *et al.* 1998; Helakorpi *et al.* 2002; Roe *et al.* 2002; Paulose-Ram *et al.* 2003). For example, the proportion of the use of OTC analgesics of the total frequent (daily or a few times a week) analgesic use among among 15–34-year-old Finns is 63–80% while among 35–74-year-olds it is 48–67% (Turunen *et al.* 2005). Further, compliance to medication use is often at the lowest during the adolescent years (*e.g.*, Zeltner *et al.* 1980; Dajani 1996; Fizgerald 2001; Zite and Shulman 2003). Adolescents may feel stigmatized with their illness or medicines (Siegel 1987; Nordli 2001). For example, only 39% of US adolescents disclose their asthma to their friends and 29% would feel embarrassed about having an asthma attack in front of them (Cohen *et al.* 2003). Adolescents and young adults, and in particular young men, are also usually more unaware of health services and they may be more reluctant to use them, for example, for insufficient confidentiality or lack of trust in health professionals (Aten *et al.* 1996; Oppong-Odiseng and Heycock 1997; Klein *et al.* 1998; Lau *et al.* 2000; Yu *et al.* 2001; Pommier *et al.* 2002). However, adolescents often have questions or concerns regarding their health for which they would like to

consult health professionals (Zimmer-Gembeck *et al.* 1997). Along with the effects of peers, adolescents' compliance to medication is found to be associated with socioeconomic status and social structure such as cohesiveness of the family (Zeltner *et al.* 1980; Barowski and Nader 1985; Staples and Bravander 2002). Among female adolescents, a positive experience of medicines and lack of adverse effects as well as higher socioeconomic background, independent decision on contraception use, and good achievements in studies contribute to good compliance with the use of oral contraceptives (Emans *et al.* 1987).

Adolescents as well as adults under 45-year-old have more positive attitude towards medicines in general than older age groups (Isacson and Bingefors 2002). Adolescents and men also see few risks in the use OTC medicines and "herb" products (Charupatanapong 1994; Sesselberg *et al.* 2002), but the indication of the used medicines also affects attitudes towards it. For example, adolescent women have concerns about the OTC availability of emergency contraceptive pills (Häggström-Nordin and Tydén 2001).

Adolescents are often susceptible to seeking help from alternative or complementary therapies, which are often available without a health professional's consultation (McCaleb and Edgil 1994; Lau *et al.* 2000; Pommier *et al.* 2002; Yussman *et al.* 2003; Ambrose and Samuels 2004). For example, almost half (46%) of French adolescents reported that one had used or would use natural or herbal products for their health problems (Pommier *et al.* 2002). A third (34%) would be interested in using them for psychological or social problems. In 6 months, 11% of adolescents from urban living areas have used high-dose vitamins (Wilson and Klein 2002). Adolescents with lower education and lower socioeconomic status most often lean on alternative therapies, probably due to their easy accessability and lower direct costs (Breuner *et al.* 1998).

Adolescents may often confuse legal medicines and illegal drugs; likely at least partly due to overlapping terms of "drugs" and "medicines" or "lifestyle drugs" (Vener *et al.* 1982; Bush and Davidson 1992; Sesselberg *et al.* 2003; Flower 2004). This may explain why children are often unaware of the difference between "bad" and "good" medicines (Menacker *et al.* 1999).

As in other population groups, medicine use in adolescence is also affected by marketing (Gray *et al.* 1998a and 1998b). For example 89% of the US students had taken any of the most marketed 24 preparations (Burak and Damico 2000). Most of them were OTC analgesics. The effect of medicine advertising is not, however, widely recognized by adolescents (Benrimoj and Chua 1990; Burak and Damico 2000).

2.3.2 Prevalence of medicine use among adolescents and young adults

Studies on medicine consumption and its determinants among adolescents and young adults are relatively scarce (*e.g.*, Rahkonen *et al.* 1987; Lieb *et al.* 1998; Thomson and Poulton 2002; Hansen *et al.* 2003; Holstein *et al.* 2003; Holstein *et al.* 2004). Compared to other age groups, adolescents and young adults relatively more often use self-medication than prescribed medicines (Dengler and Roberts 1996; Eggen 1997; Arinen *et al.* 1998; Pommier *et al.* 2002; Paulose-Ram *et al.* 2003; Turunen *et al.* 2005). The prominence of self-medication may be based on their relatively good health, low morbidity, and their characteristic health behaviour and life-style (Portner 1996; Klaukka and Rajaniemi 1997; Stoelben *et al.* 2000; Thomson and Poulton 2002; RCPCH 2003; Tobi *et al.* 2003).

In Finland, the proportion of 15–24-year-olds in the whole male population comprise 13.2% (335 000) and of female population 12.0% (320 000) (Finnish Statistics on Medicines 2001). According to a Finnish population study (Helakorpi *et al.* 2002), 40% of men and 78% of women of this age had used medicines for suggested indications in the last week (Table 2-2). At the moment of an interview, approximately 28% of Finnish men and women had used a prescribed medication while 10% of men and 17% of women reported use of OTC medicines (Arinen *et al.* 1998). The School Health Promotion Study (Stakes 1998-2005), showed that at the average 55% of the male 2nd grade high school students and 82% of the female students had used medicines during the previous month in 1998-2003. Regular use of prescribed medicines in 2004-2005 was claimed by 10% of men and 22% of women. According to an earlier Finnish study, 45% of 12–18-year-olds (35% of men and 52% of women) had used a medication in the past month (Rahkonen *et al.* 1987). In Sweden, two thirds (68%) of 16–24-year-old respondents had used medication during a 2-week period (Yearbook of Health and Medical Care 1999). Moderately lower prevalences are reported in a Danish (Jensen and Kjøller 1997) and in an earlier US study (Vener *et al*. 1982). In New Zealand, 78% of 26-year-old respondents had taken medicines in 2 weeks (Thomson and Poulton 2002). Medicine use prevalences shown in studies on medicine use among adolescents and young adults are presented in the table 2-4.

Independent use of medicines begins in early adolescence and increases with age (Bush and Iannotti 1988; Rudolf *et al.* 1993; Chambers *et al.* 1997; Jaquier *et al.* 1998; Sloand and Vessey 2001; Hämeen-Anttila *et al.* 2005). For example, independent overall medicine use for headache strongly increases from age of 11 years to 15 years, especially among girls (Hansen *et al.* 2003). Correspondingly, independent use of prescribed medicines becomes more prevalent between years 13 and 19 (Kairuz and Truter 2001).

In accordance with increased overall medicine use in adults in the last two decades, a few studies show that the use of prescribed and nonprescribed has clearly

increased among adolescents and young adults (Rimpelä *et al.* 1997; Holstein *et al.* 2003). In agreement with this finding, medicine use among 16–24-year-old Swedish was 15 %-units higher in 1997 than 1988 (Yearbook of Health and Medical Care 1999). However, this trend was not detected in Finnish population surveys in 1995/96 and 1987 (Arinen *et al.* 1998).

Table 2-2. Proportions of 15–24-year-old and 15–64-year-old (all) individuals using medicines during 2 weeks in Finland in spring 2002 (Helakorpi *et al.* 2002).

Indication	Users (%)	
	Men	Women
Headache medicine		
15–24 years of age	23.5	44.5
All	22.8	39.1
Vitamin or mineral		
15–24 years of age	15.5	28.8
All	24.9	42.5
Coagh medicine		
15–24 years of age	5.6	4.5
All	5.8	5.6
Other aches		
15–24 years of age	5.2	18.2
All	14.3	19.0
Antidepressant		
15–24 years of age	0.8	0.9
All	3.1	3.7
Tranquillizer		
15–24 years of age	0.4	0.0
All	3.0	2.7
Erection medicine		
15–24 years of age	0.4	
All	1.4	
Sleeping pill		
15–24 years of age	0.0	0.3
All	5.7	3.9
Anticholesterol medicine		
15–24 years of age	0.0	0.0
All	5.1	3.8
Hypertension		
15–24 years of age	0.0	0.0
All	13.6	9.3
Preventive pill		
15–24 years of age		37.3
All		16.6
Hormone medicine		
15–24 years of age		0.0
All		15.0
Used any medicine listed above		
15–24 years of age	40.2	78.2
All	59.5	83.5

Most of medicine use by adolescents or young adults is typically for headache or other aches, common cold symptoms or cough, allergic symptoms, skin problems or airway diseases, or antibiotics (*e.g.*, Vener *et al.* 1982; Klaukka and Rajaniemi 1997; Helakorpi et al 1999; Kairuz and Truter 2001; Roe *et al.* 2002; Stakes 1998-2005). In several studies on adolescents or young adults, use of analgesics or self-medication for aches dominates medication consumption (Vener *et al.* 1982; Rahkonen *et al.* 1987; LaPeyre-Mestre *et al.* 1991; Blanz *et al.* 1992; Rudolf *et al.* 1993; Dengler and Roberts 1996; Kaufman *et al.* 2002; Thomson and Poulton 2002; Hansen *et al.* 2003; Abahussain *et al.* 2005). For example, according to a population survey in 1999 (Helakorpi *et al.* 2002), 24% of 15–24-year-old Finnish men had used medicines for headache and 5% for other aches during a week, while, respectively, 45% and 18% of women had taken medicines for these purposes (table 2-3). Of 1st grade high school students, 41% has used self-medication for headache, 10% for fever and 3–9% for other aches during a week (Hämeen-Anttila *et al.* 2005).

Table 2-3. Use of medicines (%) during a month by Finnish 2nd grade men and women high school students: overall use of medicines and use of medicine for specific indications 1998-2003 (**A**), and daily or almost daily use of medicine prescribed by a physician 2004-2005 (**B**). Aver. = average.

A

	Use of medicines during a month (%)													
	Men							Women						
	1998	1999	2000	2001	2002	2003	Aver.	1998	1999	2000	2001	2002	2003	Aver.
Overall use	52	54	55	57	57	55	55	80	80	82	82	84	83	82
Heacahde	64	36	70	71	68	68	63	78	64	81	81	80	81	78
Other ache	29	18	37	38	36	38	33	66	53	71	69	69	68	66
Cold symptoms	53	29	55	59	52	55	51	55	45	55	59	53	57	54
Sleeplessness	2	1	2	2	2	3	2	2	2	2	3	4	3	3
Tension, anxiety	2	1	2	2	2	2	2	2	2	3	2	3	3	3
Stomach, constipation	8	3	7	7	6	7	6	18	14	17	19	17	18	17
Vitamins, minerals	39	23	40	43	40	41	38	53	44	51	54	53	54	52

B

	Use of medicines during a month (%)					
	Men			Women		
	2004	2005	Aver.	2004	2005	Aver.
Daily or almost daily use of prescribed medicine	9	10	10	21	22	22

According to the statistics on medicine refunds by the Finnish Social Insurance Institution, the most frequently refunded prescribed medicines for 10–19-year-olds (660 000 persons) comprised dermatologicals, antibiotics and medicines for obstructive airway diseases and antihistamines (Klaukka and Rajaniemi 1997). Systemic antibiotics were refunded for 182 000 patients (28% of all patient with refunded medicines in this age group), acne medicines and other dermatologicals for 44 000 (7%), antihistamines for 42 000 (6%), decongestants and other nasal preparations for topical use for 30 000 (5%), and medicines for musculo-skeletal system for 38 000 (6%). Higher special refund was most frequently granted for anti-asthma medication (15 000 patients, 2.3 % of the age cohort). Of the total number of DDD-units of the refunded medicines for 16–24-year-old men in Finland in 2004, approximately 10-11% comprised psychoanaleptics, psycholeptics, diabetes medicines, medicines for obstructive airway diseases, and antihistamises for systemic use each (Linden *et al.* 2005). For the ATC/DDD categorization system, for example, most of dertmaologicals were excluded from this analysis. Further, also in the US and South-Africa, most common prescribed medicines of this age group comprise antibiotics, analgesics, cough and flu medicines, antihistamines, dermatologicals, medicines on the central nervous system, and hormone preparations for women (Vener *et al.* 1982; Kairuz and Truter 2001; Roe *et al.* 2002).

In Finland, medicines for central nervous system indications were refunded for less than 2% and sleeping medicines for less than 0.1% of 10–19-year-olds (Kalukka and Rajaniemi 1997). In accordance, the School Health Promotion Study showed that only approximately 1-4% of 2nd grade high school students reported use of medicines for sleeplessness, or for tension or anxiety each (Stakes 1998-2005). In addition, very low use of medicines effecting on central nervous sytem is reported in the age group of 15–24-year-old Finnish by Finnish population surveys conducted by the National Public Health Institute (KTL) (Helakorpi *et al.* 1999 and 2002). In Norway, approximately 4% of 15–16-year-olds reported use of psychotropic medicines during a month (Skurtveit *et al.* 2005). In French study a fifth (21%) of adolescents and young adults reported use of medication for psychological or social problems; of those, 40% had used OTC medicines and 24% psychoactive preparations (Pommier *et al*. 2002). In Germany (Lieb *et al*. 1998), 0.3–2.4% of 12–24-year-olds had used pharmaceuticals as sleeping medicine or for strain or other central nervous system symptoms. Of US men at the age of 19–27 years, 3–6% (of women 3–11%) had used prescribed psychoactive medicine during lifetime (Fe Caces *et al.* 1998). Without a prescription these medicines were used by 12–24% of men and by 6–21% of women. Further among 18–45-year-old US adults, 18% had used medicines as sleep aids during a year; of them, approximately three-fourths had used nonprescribed and 45% prescribed medicines for this purpose (Johnson *et al*. 1998).

According to the DDD-based delivery statistics of the FDF Military Pharmacy in 2004, the most commonly consumed medicine groups in the FDF health care of

conscripts comprised non-steroidic anti-inflammatory and antirheumatic products, nasal preparations, cough and cold preparations, and medicines for obstructive airway diseases (table 2-5) (Linden *et al.* 2005). Another unpublished study of the FDF (Linden *et al*. 2005b) showed that 23% of male conscripts had used prescribed medicine during a 2-weeks period in summer 2002. In accordance with an earlier finding in a military setting (Stahl and Kerns 2002), however, only 59 % of the respondents could or was willing to report the name of the medicine he was taking. Among the claimed prescribed medicine names, most frequently were claimed antihistamines (29%; ATC-class R06), medicines for obstructive airway diseases (20%; R03), nasal preparations (18%; R01), and anti-inflammatory medicines and analgesics (10%; M01 and N02B).

In a Finnish study (Rahkonen *et al.* 1987), 2% of 15–24-year-old men (7% of women) had used medicines for stomach troubles. Of 14–18-year-old students, 7% have reported medication for stomach problems during a month (Hämeen-Anttila *et al.* 2005). In Sweden, low consumtion of stomach medication is detected; 0.7% of 16–24-year-old men and 2.4% of women used medicines for stomach problems in two weeks (Socialstyrelsen 1999).

Over a third (37%) of Finnish women at the age of 15–24 years had used preventive pills in the last week in spring 2002 (Helakorpi *et al.* 2002). An earlier study showed even a higher proportion (55%) (Kosunen *et al.* 1999). Of the 18–24-year-old Swedish and of 26-year-old New Zealand women approximately 40–45% used preventive pills during a 2-week time (Yearbook of Health and Medical Care 1999; Thomson and Poulton 2002). Further in the USA, a quarter (23%) of women at the age of 18–24 years claimed this medication use during the last year (Roe *et al.* 2002).

Table 2-4. Studies on the prevalence of the use of medicines among adolescents and young adults.

Country	Study	Method	Recall time	Medicine use prevalence among adolescent or young men (women)
Finland	Hämeen-Anttila *et al.* 2005	Questionnaire	A week	54% OTC medicines
	Stakes 1990-2003	Questionnaire	A month	52-57% (80-84%) medicines
	Helakorpi *et al*. 1999	Questionnaire	A week	41% (75%) medicines
	Arinen *et al*. 1998	Interview	2 days	10% (17%) OTC and 16% (42%) PO medicines
	Rahkonen *et al*. 1997	Questionnaire	A month	4-7% (10-12%) regular PO medicine use and 20-30% (40-55%) analgescis
	Rahkonen *et al*. 1987	Questionnaire	A month	35% (52%) medicines
Sweden	Al-Windi *et al*. 2000	Questionnaire	A year	57% OTC medicines
	Yearbook of Health and Medical Care 1999	Interview	2 weeks	68% (86%) medicines
Norway	Furu and Sraume 1999	Questionnaire	2 weeks	6% (6%) antacids
	Furu *et al*. 1997	Questionnaire	2 weeks	31% (52%) medicines; 10% (13%) nonprescribed medicines
Danmark	Holstein *et al*. 2003	Questionnaire	A month	38% (55%) for headache,4% (31%) for stomach ache, 12% (11%) for cough, 12% (15%) for common vild symptoms, 1% (3%) for nervousness, 2% (3%) for sleep disturbances
24 EU countries, Canada, USA, Greenland, Israel	Hansen *et al*. 2003; Currie *et al*. 2000	Questionnaire	A month	37% (53%) for headache, 12% (34%) for stomach aches, 5% (6%) for sleep disturbances, 5% (7%) for nervousness
Germany	Stoelben *et al*. 2000	Questionnaire	2 weeks	57% medicines
	Lieb *et al*. 1998			3% (4%) regularly PO medicines
(West) Germany	Blanz *et al*. 1992	Interview	6 months	64% medicines
France	Pommier *et al*. 2002	Questionnaire		21% medicines for psychological or social problems
	Ledoux *et al*. 1994	Questionnaire	A year	14% (28%) medicines for psychological symptoms; 3% (7%) OTC medicines for psychological symptoms
	La Peyre-Mestre *et al*. 1991		A week	60% medicines; 46% OTC medicines

Table continues...

...continued

Country	Study	Method	Recall time	Medicine use prevalence among adolescent or young men (women)
The Netherlands	Tobi *et al*. 2001 and 2003; Tuinstra *et al*. 1998	Questionnaire	2 weeks	10% (20%) PO and 24% (45%) OTC medicines
	Leufkens *et al*. 1990	Pharmacy records	A year	8% PO analgesics (excluding salicylates) more than during 30 days and 24% irregularly less than during 30 days
Great Britain	Dengler and Roberts 1996	Questionnaire	A week	65% (78%) medicines; 23% (29%) PO medicines
Switzerland	Jaquier *et al*. 1998	Interview	15 days	84% medicines; 7% psychoactive medicines
Spain	Del Rio *et al*. 1997	Interview	2 weeks	30 (35%) medicines
Canada	Campbell and McGrath 1997	Questionnaire (women with menstrual pains)	3 months	70% OTC and 18% PO medicines for this purpose
	Northcott and Bachynsky 1993	Interview	A week	26% PO and 65% OTC medicines
	Chamberlayne *et al*. 1989	Questionnaire	A year	5% (10%) PO and 6% (6%) OTC stimulants; 5% (6%) PO and 4% (5%) OTCtranquillizers
USA	Paulose-Ram *et al*. 2003	Interview	A month	65% (79%) nonprescribed , 4% (6%) prescribed medicines
	Warner *et al*. 2002	Questionnaire	A day, 3 months	75% analgesics/3 months, 15% a day
	Rudolf *et al*. 1993	Interview	A week	37% medicines
	Vener *et al*. 1982	Questionnaire	A week	7% (12% of men and 26% of women) PO, 59% (50% of men and 68% of women) OTC medicines and 41% (33% of men and 49% of women) OTC analgesics
	Krupka *et al*. 1978	Interview	2 weeks	17% (33%) aspirin products
New Zealand	Thomson and Poulton 2002	Interview (young male athletes)	2 weeks	68% (88%) medicines; 24% (68%) prescribed and 33% (37%) nonprescribed medicines
Kuwait	Abahussain *et al.* 2005	Questionnaire	A year	94% (91%) OTC medicines
Brazil	da Silva, Giugliani 2004	Questionnaire	A week	50% medicines
Hong Kong	Lau *et al*. 2000	Questionnaire	3 months	17% OTC medicines

Table 2-5. Consumption of medicines (DDD/1000 conscripts/day) in the FDF health care of conscripts on the basis of delivery statistics of the Military Pharmacy in 2004 (Linden *et al.* 2005). Due to ATC/DDD classification system, for example, several groups of dermatologicals and combined products are not included in the analysis.

ATC		DDD/1000 conscripts/ day	%
M01	Anti-inflammatory and antirheumatic products, non-steroids	85.8	20.3
R01	Nasal preparations	82.6	19.5
R05	Cough and cold preparations	80.5	19.0
R03	Drugs for obstructive airway diseases	36.7	8.7
R06	Antihistamines for systematic use	31.9	7.5
J01	Antibacterials for systemic use	31.5	7.5
N02	Analgesics	10.5	2.5
G03	Sex hormones and modulators of the genital system	6.9	1.6
D10	Anti-acne preparations	6.4	1.5
H02	Systemic hormonal preparations, excl. sex hormones and insulins	5.7	1.3
N06	Psychoanaleptics (eg, antidepressants)	5.2	1.2
N05	Psycholeptics	4.5	1.1
A10	Medicines used in diabetes	3.9	0.9
N03	Antiepileptics	0.6	0.1
	Others	30.8	7.3
Total		423.4	100.0

2.3.3 Self-medication among adolescents and young adults

Adolescents and young adults use commonly self-medication (Vener *et al.* 1982; Antonov and Isacson 1996; Portner 1996; Dengler and Roberts 1996; Eggen 1997; Jensen and Kjøller 1997; Lau *et al.* 2000; Pommier *et al.* 2002; Paulose-Ram *et al.* 2003). In Finland, 10% of 15–24-year-old men and 17% of women used self-medication at the moment of an interview (Arinen *et al.* 1998) and 21% during the last 2 days (Sihvo *et al.* 2000). According to a recent Finnish study (Hämeen-Anttila *et al.* 2005), 54% of students aged 11–17 years used OTC medicines. Further, in Norway, a third of men and two-fifths of women at the age of 16–29 years had self-medicated in the last week (Eggen 1997). In the older age groups, the prevalences of self-medication were respectively 24–38% and 11–34%. Of the Danish 16–24-year-olds men 24% and 37% women reported self-medication (Jensen and Kjøller 1997). In Great-Britain, 14% of 16–24-year-olds reported regular self-medication (Bradley *et al.* 1998). In France, medicine use was detected by 60% of the adolescents; 46% had used self-medication or medicines provided by their parents (Lapeyre-Mestre *et al.* 1991). Further, in

Switzerland, 84% of the adolescents reported medication use while 57% had taken them independently (Jaqueir *et al.* 1998).

Self-medication and other medicine use by adolescents and young adults comprise mostly painkillers, vitamins and medicines for common cold symptoms (Vener *et al*. 1982; Rahkonen *et al.* 1987; Rylance *et al.* 1988; Rudolf *et al.* 1993; Dengler and Roberts 1996; Jaquier *et al.* 1998; Abahussain *et al.* 2005; Hämeen-Anttila *et al.* 2005). Analgesics are the most frequently used therapeutic group of OTC medicines in the adolescence (Vener *et al.* 1982; Jaquier *et al*. 1998; Stoelben *et al.* 2000; Abahussain *et al.* 2005; Hämeen-Anttila *et al.* 2005). In a recent Finnish school survey (Hämeen-Anttila *et al.* 2005), 41% of 1st grade high school students had used OTC medicines for headache, 10% for fever and 3% for common cold symptoms. In accordance, according to an earlier Finnish study (Rahkonen *et al*. 1987), the most common indications of overall medication were headache (among men approximately 20% and women 30%) and symptoms of common cold or cough (13–19% and 16–27%, respectively) which are probably mostly treated with self-medication. In a study among Finnish 19-year-old men at the drafting stage before the military service in 1975, 20% of the respondents had used nonprescribed analgesics (Kannas 1979). In a Norwegian population study, 6% of male and 23% female respondents of the age of 15–19 years had taken analgesics (Eggen 1993) while of US adolescents, 36–79% were reported to have taken analgesics (Chambers *et al.* 1997). Of German 15–17-year-olds, 15% had taken analgesics several times a month for headache during a half-year period (Stoelben *et al*. 2000).

Of Finns adolescents and young adults using self-mediation for headache, 73% used ibuprofen, 24% paracetamol and 3% ketoprofen preparations (Hämeen-Anttila *et al.* 2005). In Canadian adolescents, the most common OTC analgesics were paracetamol (68–89%, among the users of medicines for different indications), ibuprofen (10–32%) and aspirin (6–22%) products (Chambers *et al.* 1997).

In young women, for example, inappropriate infrequent use of self-medication has been detected for dysmenorrhoea. According to Campbell and McGrath (1997), 93% of 14–21-year-old women suffered from dysmenorrhoea while 70% used self-medication to relieve it. Of the non-users of self-medication, over a third (36%) reported moderate or bad pains. Further, over a half (56%) of the self-medication users reported that they take the medication less frequently than instructed. Only 6% of the women used higher dosing than instructed.

Of the French adolescents aged 15–20 years, 21% had used self-medication for school-related stress, 19% for fatigue, and 15% for mood concerns in the 15 days (Jaquier *et al.* 1998). Psychotropics were taken as self-medication by 3% of the respondents. Among Portuguese students, 8% had taken psychoactive medicines during 2 weeks, of which 12% as self-medication (Cabrita *et al.* 2004). According to a French

study (Pommier *et al.* 2002), 21% of the adolescents had used self-medication for emotional or mental problems.

Vitamin or mineral use has been reported approximately by 10% of Finnish and US adolescents (Zive *et al.* 1996, Arinen *et al.* 1998). During a week, 25% of Finnish young men and 43% of young women took these preparations (Helakorpi *et al.* 2002). In another Finnish study (Stakes 1998-2005), during a month, 38% of adolescent men and 52% of women used vitamin or mineral preparations. Among the Swedish adolescents, 24% had used vitamins in the last 2 weeks (Yearbook of Health and Medical Care 1999), and in Germany, 26% in three days (Sicher-Hellert and Kersting 2004). Further, in Denmark, 7% of the young men and 14% of the women at the age of 16–24 years had taken any natural medicine within the 2 weeks (Jensen and Kjøller 1997). According to an earlier US study (Vener *et al.* 1982), within 1-week recall time, 36% of young adults (27% of men and 46% of women) used vitamins. Ambrose and Samuels (2004) have recently reported that even over half of the US students used herbal products. Parallel to the use of vitamins and complementary or alternative medicines in adults, adolescents may use these preparations for relieving physical symptoms and staying healthy but also for enhancing performance or "getting better" (Arsenault and Kennedy 1999; Metzl 1999; Sesselberg *et al*. 2003; Ambrose and Samuels 2004).

2.3.4 Sources of medicines among adolescents and young adults

Adolescents and young adults commonly use medicines that are available at home or which are provided by their family members or friends (Rudolf *et al.* 1993; Jaquier *et al.* 1998; Sloand and Vessey 2001; Lyon Daniel *et al.* 2003; Hämeen-Anttila *et al.* 2005). For that reason, their medication may often include PO medicines not specifically prescribed for them. In Germany, for example, approximately half (49%) of 15–17-year-olds received their medication for an acute ailment most typically with a prescription while a third (32%) got the medication from home, 12% acquired the medication by him/herself and 7% got it from friends (Stoelben *et al.* 2000). The findings by Jaqueir *et al.* (1998) and Lapeyre-Mestren *et al*. (1991) also underline the importance of a home medicine cabinet and parents as a source of medications; nearly half (46%) of the French adolescents used medicines prescribed for their parents. Also among US high school students, the most typical ways to obtain pain killers were from parents or home medicine cabinet (42–81% depending on indication), from physician, nurse or pharmacy (7–18%), or from friends (7–15%) (Chambers *et al.* 1997). A fifth (21%) of adolescent US summer camp attendants changed medicines (Rudolf *et al.* 1993). According to another study, 15% of boys and 29% of girls of the age of 15–18 years had sometimes borrowed medicines from their friends (Lyon Daniel *et al.* 2003).

Although adolescents and young adults frequently consume medicines found at home or provided by family members, they also visit to a pharmacy; 61 % of Finnish men and 86% of women of age of 15–24 years had visited a pharmacy during a year (Helakorpi *et al.* 2002).

2.4 Rationality of medicine use and drug information

2.4.1 Knowledge of medicine use and drug information

Several studies have shown that laypersons' knowledge of medicines and their correct use is often insufficient from the perspective of effective and safe use of medicines (Ascione *et al.* 1986; Busson and Dunn 1986; May 1986; Howard *et al.* 1999; Bissell *et al.* 2000a; Westerlund *et al.* 2001; Anderson *et al.* 2003; Powell-Dunford *et al.* 2003). Appropriate use of medicines can be enhanced by strengthening medicine users' adherence to their medication, for example, by increasing their knowledge of their medicines by drug information or drug counselling provided by pharmacy staff, other health professionals or other information sources such as package information leaflets (Hepler and Strand 1990; Airaksinen *et al.* 1993; Erickson *et al.* 1998; FIP 1998; Pesonen and Pohjola 1999; Claesson *et al*. 1999; Cox *et al*. 2002; USP 2002; Huntzinger 2004; Beney *et al*. 2005; Puumalainen 2005).

Adherence is defined as the extent to which the patient follow medical instructions, or in a wider way, as the extent to which a person's behavior – taking a medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider (WHO 2003). Terms compliance and concordance are often used as synonymies for adherence (Horne 2001; Cox *et al.* 2002; Staples and Bravander 2002). According to Becker and Mainman (1975) and Garrity (1989), compliance is determined by four main domains: characteristics of the patient, of the regimen, of the clinical setting, and of the physician–patient interaction.

Drug information is aimed to increase familiarity, awareness, and comprehension acquired about the medication (USP 2002). It means general or personal advice of essential information related to taking medications, it emphasizes clinical information, *i.e*., medical properties and safe handling of the medicine, it is given by competent staff at a pharmacy, and it is accompanied by written information if possible (Airaksinen 1996; Nordic Pharmacy Association 2004). Drug information may be defined, for example, from a perspective of a patient, pharmaceutical industry, medical jurisprudence, media or society (Wahlroos 2003). Drug information may also be called medication counselling or patient counselling, but recently, the latter terms seen more seen more patient-oriented and interactive (Närhi 2001; USP 2002a; Nordic Pharmacy Association 2004; Vainio 2004; Puumalainen 2005). According to the United States

Pharmacopoeia (USP) (IPSF and FIP 2004; Puumalainen 2005), medication counselling is an approach that focuses on enhancing the problem solving skills of the patient for the purpose of improving or maintaining quality of health and quality of life. Further, the process emphasizes the role of the patient as an expert of his or her own medicationas. The process should be interactive and constitute a collaborative learning process both for the patient and the information provider. The USP (2002a) has also defined patient counselling as a continuum of interaction between the health care professional and the patient with four stages from medication information transfer to interactive and collaborative discussion and learning between the patient and the information provider. A wider concept of pharmaceutical care is also introduced (Hepler and Strand 1990; Airaksinen 1996). Compared to traditional medicine dispensing and drug information, in pharmaceutical care, pharmacists take more responsibility for the management of a patient's medicine therapy by identifying potential problems in the therapy, resolving the in cooperation with the patient and other health professionals, education and counselling the patient, and monitoring the management.

Providing of drug information, or more specifically medicine or patient counselling, is widely seen as a key function of community pharmacies as part of health care (Morris *et al.* 1997; WHO 1998b; Närhi 2001; USP 2002a; Roughead *et al.* 2003; Schantz *et al*. 2003; IPSF and FIP 2004; Katajavuori 2005; Puumalainen 2005). For example, in the Finnish professional strategy for community pharmacies and the Nordic pharmacy guideline drug information and patient counselling comprise an essential part (Association of Finnish Pharmacies 1997; Nordic Pharmacy Association 2004).

Drug information by pharmacists is shown to decrease inappropriate medicine use and increased compliance in outpatient and inpatient settings (Culbertson *et al.* 1988, Airaksinen 1996; Pesonen and Pohjola 1999; Westerlund *et al.* 1999; Riukka *et al.* 2001; Cox *et al.* 2002; Scarsi *et al.* 2002; Anderson *et al.* 2003; Pedersen *et al.* 2004). It has, for example, a strong impact both in choice and use of OTC medication (Rantucci and Segal 1986; Westerlund *et al.* 2001; Hughes *et al.* 2002). In the US, for example, a quarter of OTC medicine purchasers changed their product after drug information (Nichol *et al.* 1992). Pharmacy interventions are suggested to increase adherence to treatments, decrease inappropriate medicine use, have a positive effect on clinical outcomes in long-term illnesses such as in asthma, diabetes and hypertension, and to decrease utilization of other health care services (Jaber *et al*. 1996; Erickson *et al.*1997; Blenkinsopp *et al.* 2000; Närhi *et al.* 2000; Chisholm *et al.* 2001; Beney *et al.* 2005). Drug information is seen to foster appropriate medicine use also in a military pharmacy setting (Pesonen and Pohjola 1999; Huntzinger 2004). However, the literature provides only limited evidence of the effect of drug information or patient counselling on the patient's quality of life and on the cost-effectiveness of these interventions (Cody *et al.*1998; Erickson *et al.*1997; Jaber *et al.*1996; Beney *et al*. 2005).

In Finland, approximately 20–80% of pharmacy purchasers are reported to receive drug information (Airaksinen *et al.* 1998; Talvia *et al.* 2002; Vainio *et al.* 2002). The rate strongly depends on the prescription/OTC status of a medicine, initiative of a customer to ask for drug information, and if the prescription medicine is dispensed on the basis of an original prescription or refilled (TIPPA-project 2002; Puumalainen *et al.* 2005). In US pharmacies, the prevalence of drug information for users of prescription medicines is approximately 30–70 % (Morris *et al.* 1997; Erickson *et al.* 1998; Schatz 2003; Svarstad *et al.* 2004).

Although professional sources are perceived more accurate and reliable, informal sources such as family members and friends as well as commercial sources may be preferred for their easy access. The main sources of drug information in Finland are physicians, pharmacy, and medicine packages (Pesonen *et al.* 2003; Helakorpi *et al.* 2002). Three-quarters (77%) of Finns receive drug information on the medicine they use from health care, mass media, friends, or relatives (Helakorpi *et al.* 2002) (Table 2-6). Over a half (57%) of US adults had received drug information during the last 6 months; 47% from a physician, 38% from a pharmacy, and 34% from a nurse (NCPIE 2002). Among Finnish 1st grade high school students, the main information sources of medicine comprise parents (for 34–91% of the respondents), school nurse (46–51%), physician (48–57%), pharmacy (24–33%), books and magazines (16–27%), and friends (5–16%) (Hämeen-Anttila *et al.* 2005). Half of US students discussed one's medication with a physician and 34% with a pharmacist (Trinkaus 1991). For the Canadian adolescents, the main sources of drug information are parents (70–82%, depending on the indication), medicine package (36-41%), physician or nurse (15–27%), siblings (3–5%), adults (2–7%), mass media (2–10%), and teachers (1–4%) (Chambers *et al.* 1997).

Mass media provide lots of information about medicines and other health issues of strongly fluctuating quality (Gray *et al.* 1998a; Maddox 1999; Abahussain *et al.* 2005). Of the Finnish consumers, for example, 10% received information on their medicine from papers, 6% from advertisements, 5% from radio or television, and 3% from internet in 2002 (Helakorpi *et al.* 2002). In Great-Britain, during a 8-week period, 33 papers aimed at the adolescence included 389 articles or announcements that referred to a specific medicine (Gray *et al.* 1998a). Further, during the same time period, three television and six radio channels broadcasted 107 programs with a reference to medicines (Gray *et al.* 1998b).

The importance of the internet as a source of drug information is increasing (Stergachis *et al.* 2002; Baker *et al.* 2003; Coleman 2003). In particular, young individuals are thought to seek information on medicine and health from the internet (Maddox 1999; Borzekowski and Rickert 2002; Gray *et al.* 2005), but surprisingly, recent population studies have shown that its importance as an information source is still relatively low (Helakorpi *et al.* 2002; Hämeen-Anttila *et al.* 2005). Despite of many advantages of internet-based information, finding reliable and understandable

information from a layperson's perspective is often difficult there (Coleman 2003; Gray *et al.* 2003 and 2005). Several studies on the appropriateness of internet pages of the prescription-only and OTC medicines, and especially of non-medical complementary or alternative preparations, have shown to be insufficient or even misleading (Pandolfini and Bonati 2002; Bessell *et al.* 2003).

Table 2-6. Sources of drug information received by Finnish during a year in 2002 (Helakorpi *et al.* 2002).

	%			
	Men		Women	
	Age (years)		Age (years)	
	15-24	15-64	15-24	15-64
Physician	26	40	48	51
Pharmacist	19	31	39	44
Nurse	11	11	20	13
Relatives or friends	12	8	22	11
Newspaper	3	5	14	14
Radio or TV	4	5	7	5
Advertisement	4	5	8	8
Internet	2	2	4	3
Health food shop	2	2	5	10
Pharmaceutical brochure	28	27	57	45
Service telephone	0	0	1	0
No information	47	34	18	15

2.4.2 Knowledge of medicine use and related risks among adolescents and young adults

Literature provides little information of knowledge of medicine use among adolescents, and it is suggested to be often poor (Vener *et al.* 1982; Krupka and Vener 1987; Aramburuzabala and Polaino-Lorente 1994; Peremans *et al.* 2000; Stoelben *et al.* 2000; Harel *et al.* 2001; Sloand and Vessey 2001; Cohen *et al.* 2003). In a German study (Stoelben *et al.* 2000) on the basic medication knowledge among 15–17-year-olds, an average score was not higher than 5.7 of 13. The questionnaire concerned common possible adverse effects of medications, indications of most common OTC medicines, possible interactions between medicines and alcohol, classification of preventive pills as medicines or not, and questions on package information leaflets. Only a third of the adolescents knew why and when antiobiotics should be used, and only 79% reported they recognize that medication use may result in adverse effects. Further, only half of the adolescents found preventive pills as medicines. In the US, nearly three quarters of

young adults correctly answered on the questions regarding the basic knowledge of illegal drugs and legal medicines (Krupka and Vener 1987). Further, only 2% of the participants were correctly able to answer over 90 % of the questions, and 18% able to answer 80% of the questions. Of the respondents, for example, 54% thought that there were no possible harmful adverse effects of OTC aspirin when taken at recommended doses.

Common misuse of medicines by adolescents is reported (Metzl 2002; Ambrose 2004; ESPAD 2005). Misuse comprises intended abuse such as off-label of prescribed or nonprescribed medicines or use of medicines for recreational purposes (*e.g.*, "getting high" or "feeling better") or for intoxication (Light 2000; Adlaf *et al*. 2000; Poulin 2001; PDFA 2004). In Finland, 5-12% of young students have reported mixed use of medicines and alcohol, or other other abuse of medicines (Niittynen 1997; ESPAD 2005; van der Pahlen and Marttunen 2005). Interestingly, in a survey on pupils in Helsinki in 1997, the prevalence of abuse of medicines with or without alcohol was 4% for young men and 16% for women while several other indicators of intoxication behavior or drug use showed higher prevalence among men (Niittynen 1997). According toan Irish study (Wazaify *et al.* 2005b), abuse or misuse of OTC medicines is much more common among younger individualds. Gender differences also exits; women more frequently misused or abused laxatives while men more commonly mixed medicines and alcohol. In Spain, prevalence of inappropriate self-medication use was the highest among students (Figueiras *et al.* 2000). In a US study among undergraduate students, 36–88% had used common OTC medicines (ephedrine, caffeine, dextrometorphan and pain reliever) in doses exceeding the recommended ones (Ellen *et al*. 1998); unintentional misuse occurred only in 27% of the cases. Most of the uses were intentional as a result of a person's belief that OTC medicines are harmless or relatively ineffective. According to another US study (PDFA 2004), a fifth of 12–17-year-olds had tried strong painkillers or stimulants (*e.g.*, opiod analegesics or methylphenidate products) acquired without a physician's prescription, and 10% reported abuse of OTC cough medicines (*e.g.*, dextromethorphane products).

In most cases, the adolescents' knowledge of the use of medicines is gathered by consuming medicines (May 1986; Krupka and Vener 1987; Stoelben *et al.* 2000) that may pose an increased risk of adverse events of medicines, especially of OTC ones. Compared to older individuals, adolescents pay less attention to the dosing instructions and ask more infrequently further questions about their medicines (Sansgiry and Cady 1996). Two-thirds of the adolescents read the package insert of the medicine and only few of them remembered its essential information afterwards (Stoelben *et al.* 2000). Of the adolescents, 69% read instructions when choosing an OTC medicine, and as few as 38% paid attention to the instructions when considering OTC medication for psychological or social problems (Pommier *et al.* 2002). Students more often deem

information on the dosing or maximum dose more important than one on possible adverse effects (Portner 1991).

Compared to individuals at working age, adolescents know less frequently trade names of their medication (NCPIE 2002; DIRC and NCPIE 2003). Among US adolescents with asthma medication, approximately 40% could not mention the trade name of one's medicine, and almost two-thirds reported uncertainty or anxiety associated with the their recent medication (Cohen *et al.* 2003). According to this study, most of this uncertainty could be removed with adequate drug information. Further, 6–22% of the Canadian students of 7^{th}–9^{th} grade used aspirin products although they are not recommended to under 16-year-olds (Chambers *et al.* 1997). Young adults used relatively more frequently more than one analgesic at a time (Paulose-Ram *et al.* 2003). Further, 43% of the 18–34-year-old respondents would use more than one OTC medicine if they would have more than one symptom while only a third of the adults would do this in the same situation (NCPIE 2002; DIRC and NCPIE 2003). Although most of adolescents recognized that, for example, OTC analgesic can cause adverse effects, only a minor part of them know the level of lethal dosing of the most common OTC analgesics (Gilbertson *et al.* 1996; Huott and Storrow 1997). According to Huott and Storrow (1997), 57% knew that an overdose of OTC paracetamol products could be lethal. Frequent intensive alcohol intake in certain subgroups of the adolescents and young adults may contribute to a higher prevalence of medicine-alcohol interactions (Burak and Damico 2000; Wazaify *et al.* 2005). Misuse or abuse of OTC analgesics with alcohol has caused adverse effects such as kidney damage (Nakahura *et al.* 1998). Self-poisonings with OTC medicines are also reported (Hawton *et al.* 1995; Townsend *et al.* 2001).

Parents' education level or health care profession, or an adolescents' claim that he or she read the package leaflets or other instructions of the medicines do not contribute to the level of the medication knowledge. On the other hand, parents' education is found to enhance adolescent women's awareness of emergency contraceptive pills (Ottesen *et al.* 2002).

Despite the previous examples illustrating potential risks in adolecents' and young adults' use of medicines due to limitede knowledge of medicine use, the adolescents may perceive their own knowledge of medicines as good. For example, of the German adolescents, 66% found it moderate or good (Stoelben *et al.* 2000).

The gender probably affects the risks related to a limited knowledge of medicine use. Although young women more commonly use medicines, young men more frequently use them against instructions (Lieb *et al.* 1998). May (1986) recognized that knowledge of medicine was poorer among young men than women. Further, among young men, medicine use more often comprises risks associated with the frequent use of alcohol, experiments with illegal drugs, and mixed use of these substances (Lieb *et al*. 1998; Tuinstra *et al.* 1998; Perkins 1999; Poulin 2001; Wazaify *et al.* 2005b). Young

women have a stronger basis of knowledge of the use and effects of both illegal drugs and medicines, especially of OTC medicines and contraceptive pills (Krupka and Vener 1987). Young women also more often use pharmacists as a source of drug information and they find it a less inconvenient way to acquire information than young men (Portner and Smith 1994).

Young athletes are known often to use pharmaceuticals as well as preparations beyond pharmaceutical legislation to enhance their performance (Suomela and Henriksson 2001; Metzl 2002; Ambrose 2004). These preparations include, for example, anabolic steroids, diuretics and different nutritional supplements. Young athletes, for example, are shown to use analgesics in clearly too high doses and for longer time than instructed to foster their physical performance (Warner *et al.* 2002). On the other hand, some preparations banned in sports may inappropriately be avoided by athletes (Chester *et al.* 2003), and participation in athletics may reflect a health related life-style including fewer negative health behaviors (Forman *et al.* 1995).

2.4.3 Drug information for adolescents and young adults

Due to the characteristics of medicine use among adolescents appropriate drug information aimed at adolescents and young adults is widely accepted as important (Krupka *et al.* 1978; Vener *et al.* 1982; Portner and Smith 1994; Dengler and Roberts 1996; Portner 1996; Nakahura *et al.* 1998; Burak and Damico 2000; FIP 2001; Pommier *et al.* 2002; Cohen *et al.* 2003). However, rather few initiatives, campaigns or other activities on drug information for this age group are described in the literature (Price *et al.* 1995; Gilbertson *et al.* 1996; Huott and Storrow 1997; Bush 1998; Bush *et al.* 1999; Pesonen and Pohjola 1999; Stoelben *et al.* 2000; FIP 2001; Sloand and Vessey 2001; Dundee *et al.* 2002; Sleath *et al.* 2003). Much more attention has been paid to drug information for older people, children and their parents as well as to information on the risks of illegal drug use and other potentially harmful health behaviors (Krupka *et al.* 1978; Sloand *et al.* 1997; Menacker *et al.* 1999; Anuwong 2000; Hämeen-Anttila *et al.* 2002).

Improper or insufficient communication between adolescents and health professionals as well as lack of systematic education on medicine use and other health issues at schools may contribute to poor knowledge of medicines in this age groups (FIP 2001; Hämeen-Anttila 2002; Sleath *et al.* 2003). In the 1990's, few examples of the drug information initiatives in a school setting have been reported (Committee on School Health 1993; Sloand *et al.* 1997). Frequent medicine use in the adolescents, however, may constitute a problem in the school environment and, for example, in some US schools all medicine use, including self-medication, is prohibited (Mejdell Awbrey and Juarez 2003). In Finland, a basic package of drug information has recently been added

to the curriculum of comprehensive school (Hämeen-Anttila 2003; Englund *et al.* 2004; National Board of Education 2004).

Many adolescents find difficulties with discussing health issues, especially if they feel them confidential (Bissell *et al.* 2000a; Peremans *et al.* 2000). Students seldom discuss the medicines they use with their physician (Burak and Damico 2000). On the other hand, adolescents often see health professionals as an important source of information, which underlines the importance of initiation of health professionals (Portner 1991; Ackard *et al.* 2001).

As discussed above, a reason for not reporting self-medication in health care is that adolescents may pose only insignificant risks on their use (Charupatanapong 1994; Suomela and Henriksson 2001; Pommier *et al.* 2002). On the other hand, health professionals may feel that they do no have enough education, knowledge, or experience with managing with adolescent health care (Blum *et al.* 1990; Ackard *et al.* 2001; Conard *et al.* 2002; Dundee *et al.* 2003). In practice, adolescents are suggested to receive less drug information from pharmacists and physicians than older individuals (Menacker *et al.* 1999).

However, adolescents have positive attitudes towards drug information in general (Bush *et al.* 1999; Menacker *et al.* 1999; Pesonen and Pohjola 1999; Staples and Bravender 2002; Albinson 2005). Airaksinen *et al.* (1993) found that young adults of the age of 20–29 years would appreciate spontaneous drug information from a pharmacy more than individuals from older age groups. However, parallel to older patients, they seldom ask for it themselves. Similar findings are also reported in US students (Trinkaus 1991) and Finnish military pharmacy customers (Pesonen and Pohjola 1999). In Finland, most of the conscripts (67–88%) wanted to receive information on the adverse effects, duration and mechanism of action of their medication, their effects on awareness as well as on the effects on mixed use of medicines and alcohol. In particular, young men are found to be interested in possible interactions between their medicine and alcohol (Howard *et al.* 1999). Adolescent patients with chronic diseases are found to appreciate personal drug information and personalized treatment and time for questions with a physician visit (van Es *et al.* 1998; Kyngäs 2000). Of the German 15–17-year-old students, 62% would prefer including the basics of medicine use in the curriculum (Stoelben *et al.* 2000). Young adults from rural areas more frequently acquire drug information from different sources than individuals from urban areas (Portner and Smith 1994).

2.5 Study methods of medicine use

Pharmacoepidemiological studies provide information about medicine use in populations and their segments, their determinants and changes of consumption (De Vries and de Jong-van den Berg 2001; Thomson and Poulton 2002; Hardon *et al.* 2004). Use of medicines may reflect morbidity and its changes, health behavior and appropriateness of medication use in general, *e.g.*, potential misuse of medicines (Thomson and Poulton 2002, Holstein *et al.* 2003; Najmi and Maqruder 2004; WHO 2004). Detection, assessment, and prevention of adverse effects in individuals is called pharmacovigilance (WHO 2000d). In a pharmacy context, a structured, continuing program to review, analyze, and interpret medicine use patterns in a health care delivery system against predetermined standards, with the major focus on quantitative outcomes is defined as drug utilization review (DUR) (Brodie *et al.* 1977; Summers 1996).

Medicine use and its changes in outpatient populations can be estimated by the statistics on the wholesales of medicines (*e.g.*, in monetary units, in number of packages or tablets or other medicine units, or in the defined daily doses DDD), or by the number or contents of prescriptions in pharmacy, reimbursements or other health care register (Rabin and Bush 1974; Ahonen *et al.* 1988; WHO 1990; Del Rio *et al.* 1997; Klaukka and Rajaniemi 1997; Finnish Statistics on Medicines 2001). More detailed information on the realized medicine consumption of individuals can be reached by inquiries, *e.g.*, questionnaires or medicine use diaries (Enlund *et al.* 1985; Aromaa *et al*. 1986; Holstein *et al.* 2003; Thomson and Poulton 2002).

The method of an inquiry strongly affects the results of pharmacoepidemiological studies. For example, personal interviews with the check of the medicine packages or prescriptions may provide more reliable information than independently completed questionnaires (Aromaa *et al.* 1986; Kimmel *et al.* 2003). In the questionnaires, open questions, general questions on the medicines use, or recalling brand names may result in lower prevalence of medicine use than use of common indications (Klungel *et al*. 2000; Kimmel *et al.* 2003). Compared to cross-sectional studies, longitudinal studies may provide more information, for example, on the changes in medicine consumption, association between the use of medicines and health care services or between the use of prescribed and nonprescribed medicines (Sinclair *et al.* 2001).

Several models to describe and predict the use of medicines and its predictors are presented (Cummings *et al.* 1980; Svarstad 1989; Dolinsky 1996; Hardon *et al.* 2004; WHO 2004b). For example, health belief model (Rosenstock 1966; Eraker *et al.* 1984; Fincham and Wertheimer 1985; Tani *et al.* 1995), related behavioral decision model (Eraker and Politser 1982), and decision analysis (Einarson *et al.* 1984) are employed to describe individuals' medicine use. In accordance with the health belief model, Fishbein's theory of reasoned action and Vroom's expectancy-value theory

(Segal and Hepler 1985; Svarstad 1989) are based on the patient's beliefs, expectancies about the treatment, and normative influences. Other models comprise health locus of control model (Walltson and Walltson 1978) and Andersen's *et al.* health care utilization model (1968 and 1995). Specific models, for example, for self-medication or for use of OTC or PO medicines are presented (*e.g.*, Hedvall 1988; Lilja *et al.* 1996, Montagne and Basara 1996; Sihvo 2000). Many models based on marketing research, in particular on consumer behavior, are also widely used to describe and predict medicine use. These models include, for example, Howard buyer behavior model (Farley and Lehman 1977), Engel-Kollat-Blackwell (EKB) model (Montagne and Basara 1996), model of high and low involvement (Gore *et al.* 1994; Montagne and Basara 1996), and model of transformational and informational purchase motivation (Widrick and Fram 1992).

2.6 Health care utilization model of Andersen's *et al.*

Andersen *et al*. (Andersen 1968; Andersen and Newman 1973; Andersen and Aday 1974; Andersen 1995) have presented a theoretical health care utilization model developed in the late 1960s to explain and predict people's use of health care services. According to the original model (Andersen 1968; Andersen 1995), use of health care services can be described by the predisposing, enabling and need variables characteristic for the population (Fig. 2-1). Also individuals' health practices are later added into the model. Andersen's *et al*. health care utilization model has been used to predict and explain health behaviors such as self-care and use of prescribed and nonprescribed medicines (Bush and Osterweis 1978; Nichol *et al.* 1992; Fillenbaum *et al.* 1993; Aiken ym, 1994; Fleming *et al.* 1994; Hanlon *et al.* 1996; Smith 1996; Antonov and Isacson 1998; Smith and Kirking 1999; Kamal *et al.* 2003; Sangasubana and Dott 2003).

Need variables have often been found to be most important (Fillenbaum *et al*. 1974; Bush and Osterweis 1978; Andersen 1995; Antonov and Isacson 1998). They may be based on the individual's self-perceived health or on evaluation by health professionals. Predisposing variables describe sociodemographic characteristics such as age, gender, living area, marital status, education level, profession or race. Enabling variables describe health care resources or access to them. These variables comprise, *e.g.*, insurance coverage, supply of health care services such as the assortiment of medicines available without prescription, and economic limitations of health care use. Health practices include, *e.g.*, exercising, smoking, alcohol use, and previous use of health care services.

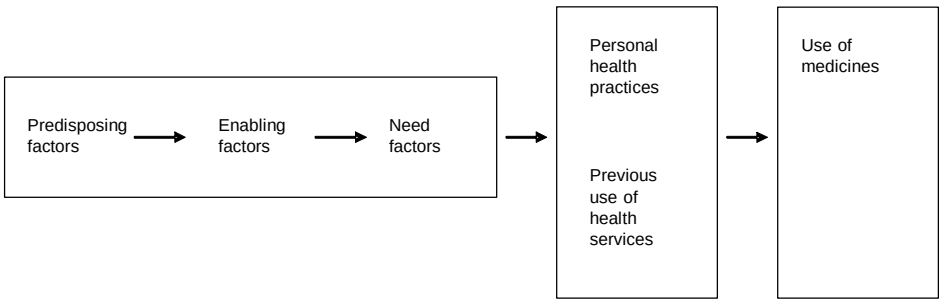


Figure 2-1. Andersen's *et al*. health care utilization model modified to describe medication use (modified from Andersen 1968; Andersen and Aday 1974; Bush and Osterweis 1978; Nichol *et al.* 1992; Andersen 1995; Antonov and Isacson 1998).

2.7 Medical and pharmaceutical services of the Finnish Defence Forces

Since 1999, approximately 30 000 men annually do compulsory military service (personal information, Conscription Division, FDF Defence Staff, 2004). In 2001, 64% of them completed a conscription of 6 months, 26% of 9 months and 10% of 12 months. Approximately half of the men enter the military in January and half in July. For women, voluntary military service has been possible since 1996. Annually, 350–410 women have completed their military service. Of them, 25% performed the 6-month, 66% 9-month and 9% the 12-month service in 2001. The military training and its requirements are equal for both sexes.

Along with improving and maintaining of health of individual conscripts, the FDF health care aims at ensuring and enhancing a safe and effective conscription environment and public health (Koskenvuo 1996; Vertio *et al.* 1996; Kuronen 2005). The FDF health care is also responsible for medical services during possible emergencies involving the FDF. Research on military medicine, especially on field medicine, is also conducted.

All the health care services including medicines are free-of-charge to the conscripts (Act on the arrangement of the health care in the Finnish Defence Forces 322/1987). Conscripts frequently use health services: on average, a conscript visits 9-10 times a physician, 1.4 times a nurse, 3 times a dentist and has 6 inpatient days per year

(Koskenvuo 1996; Sahi 2005). In all, a conscript has 17 contacts with FDF health care during his or her conscription on average (Sahi 2005).

Pharmaceutical services are part of the health care of the FDF (Pesonen and Pohjola 1999; Finnish Defence Forces 2004). The FDF pharmacy function is led by the Health Care Division of the FDF General Staff. Pharmaceutical services are mostly produced by the Military Pharmacy (MP) of the FDF located at the Central Military Hospital in Helsinki. Along with purchase, storage, and delivery of pharmaceuticals to all FDF health care units, the duties of the MP comprise defining financial objectives and calculating resources of the pharmaceutical function, education and training of FDF health care professionals, pharmacy conscripts and pharmacist in the reserve as well as inspections of pharmaceutical services in the FDF health care units. Annually, the MP dispenses approximately a total of 4 million medicine orders, of which approximately 10.000 directly from the MP. The MP is also responsible for working out and maintaining plans of readiness for emergency situations in cooperation with other military and civilian authorities, pharmaceutical manufacturers and wholesalers. The own medicine production comprise cough mixtures and tablets, analgesic tablets, hand and wound ointments and disinfecting liquids, and nose drops. The own products of the MP includes active compounds which are clinically effective and safe and have a low risk for adverse effects and abuse. As part of emergency readiness, the MP can produce infusion liquids on an industrial scale.

In the beginning of year 2006, the organization of pharmaceutical and other health care services of the FDF will be restructured (Kuronen 2005).

3 AIMS OF THE STUDY

The aim of this study was to determine the prevalence and predictors of the medicine use among Finnish conscripts during their common military service. In addition, the aim was to evaluate the conscripts' self-perceived knowledge of medicine use and their attitudes towards drug information.

More specifically, the aims were:

1. To investigate the prevalence and predictors of the overall use of prescribed and nonprescribed medicines and the sources of medicines among male (I) and female conscripts (IV).

2. To investigate the prevalence of the overall self-medication and of self-medication for specific indications among male and female conscripts (II–IV) and their predictors among male conscripts on the basis of Andersen's *et al.* (1968, 1995) health care utilization model (II,III).

3. To investigate the prevalence and indications for the use of OTC analgesics among male and female conscripts (I,IV).

4. To describe a drug information campaign aimed at the conscripts and to evaluate the conscripts' attitudes towards the campaign and their self-perceived knowledge of medicine use (V).

4 SAMPLES AND METHODS

4.1 Samples

The data for the present cross-sectional questionnaire studies I-V were drawn from three samples:

Sample 1 (Studies I and V)
The data of the studies I and V (N = 3725 male conscripts) comprised responses from a cross-sectional questionnaire study on the use of medicines among Finnish male conscripts in February 1999. The study was conducted as part of a "Drug Information to Conscripts" -campaign (V) during the draftees' basic military training period. Before the campaign, 12 garrisons were pre-selected as potential study garrisons. The inclusion criteria of the garrisons were their regional representativeness, large number of conscripts, and representative conscript population (no special, preselected troops). The local garrison staff decided independently if the garrison participated in the campaign including the study, the nature of the campaign (part of conscripts' compulsory daily training program or voluntary participation in free time), and the number of units that participated. The study was conducted in all pre-selected garrisons if they participated in the campaign; the data (N = 4234) were drawn from 10 garrisons. Finally, the analyses were restricted to the 3725 male responses from 8 garrisons in which the attendance in the campaign event and the following study were part of compulsory military training program. The study garrisons were from the Western Command (KaartJR, Guard Jaeger Regiment in Helsinki; TykPr, Artillery Brigade in Niinisalo; PsPr, Armoured Brigade in Hattula; KeSR, Central Finland Regiment in Keuruu; PorPr, Pori Brigade in Säkylä), the Eastern Command (SavPr, Savo Brigade in Mikkeli), and the Northern Command (KaiPr, Kainuu Brigade in Kajaani; JPr Jaeger Brigade in Sodankylä).

The conscript responded to a questionnaire in a class room environment immediately after the campaign lectures. The study events were led by local medical officers and nurses who were comprehensively informed about the study protocol by the Health Care Division of Defence Staff. The overall anonymous of the study was well emphasized. The respondent answered on an optically readable FDF questionnaire sheet that the conscripts had already used to complete for other purposes during their military service. The information of the response sheets was decoded electronically (OpScan 3 or OpScan 4 scanner, Adison Ltd.) by the administration staff at the local garrisons, and the data were electronically transferred into the study database in the Health Care Division of Defence Staff. After removing empty or clearly inadequate responses (130 of 4234), the final response rate was 96.9%. The sample (N = 3725) represented 18.7% of all the conscripts on duty in February 1999.

Sample 2 (Studies II and III)

The data of the studies II and III (N = 857) consisted of male responses from a cross-sectional questionnaire study in July 1999. The sample was drawn from eight Army garrisons (KaartJR, Guard Andeger Regiment in Helsinki; PsPr, Armoured Brigade in Parolannummi; KeSR, Central Finland Regiment in Keuruu; PorPr, Pori Brigade in Säkylä; KarPr, Karelia Brigade in Valkeala; PKarPr, North Karelia Brigare in Kontiolahti; KaiPr, Kainuu Brigade in Kajaani; JPr Andeger Brigade in Sodankylä) and one Navy garrison (Gulf of Finland Naval Command, Kirkkonummi) during the first week of the draftees' basic military training period. The inclusion criteria of the garrisons equaled to ones for the studies I and V. In the sample garrisons, one hundred (100) first conscripts born in January–April months were invited to the study. In case there were too few subjects, sampling was extended to a cohort born May–June. Sampling was carried out locally in the garrisons. The study events were part of compulsory military service and they were conducted by local military officers comprehensively informed about the study protocol. The respondent gave the answers anonymously on questionnaire sheet in a classroom environment, put the questionnaire sheet into an envelope and sealed it closed. The questionnaire sheets were collected and sent directly to in the Health Care Division of Defence Staff where the study database was constructed. After removing totally empty or inadequate responses (45 of 902), the final sample comprised 857 male responses and the response rate was 95.0%.

Sample 3 (Study IV)

The data for the study IV (N = 177) was derived from a questionnaire study aimed at all female conscripts (N = 261) doing their voluntary military service in April 1999. For the study, all the garrisons with female conscripts were informed about the study and ordered by the Health Care Division of Defence Staff to deliver the questionnaire sheets and return envelopes to all female conscripts. The respondents completed the questionnaires anonymously and mailed them directly to the Health Care Division of Defence Staff. The response rate was 67.8%.

All the studies were designed and executed by the FDF Health Care Division of Defence Staff. The questionnaires were pre-tested by conscripts in the Health Care Division of Defence staff and ones without medical education. The detailed characteristics of the samples are shown in the tables 5-1, 5-4 and 5-7.

4.2 Study variables

Dependent variables

Four outcome variables of medicine use were defined for the studies I and IV: the number (0, 1, 2, 3 or more) of the prescribed and nonprescribed medicines used in the 2 weeks preceding the study was asked separately for the medicines received from the FDF health care and those acquired from civilian sources. The medicines were categorized into prescribed or nonprescribed ones depending whether they were obtained with a physician visit or not.

In the studies II, III and IV, self-medication was inquired with dichotomous (yes/no) options on self-medication use in the 2 weeks preceding the study for the following indications: headache, symptoms of common cold (flu, fever or sore throat), other ache (muscle, joint or toothache), cough, skin troubles or yeast, sleeplessness or anxiety, self-medication with stimulants (*e.g.*, caffeine tablets), stomach ache or constipation, use of vitamins or minerals, or for other indication. Medicines obtained by a visit to a physician were excluded. A user of self-medication was defined as a respondent who had an affirmative response to at least one of these questions.

In the studies I, II and IV, the most typical civilian source of self-medication used in the 2 weeks preceding the study was inquired with the following options: self-purchase in a pharmacy, provided by parents, provided by girl/boyfriend or spouse, army friends or other friends, or in another way.

In the studies I and IV, self-medication with OTC analgesics was assessed by asking use of the following active substances (with brand names) in the 2 weeks preceding the study: ibuprofen (7 trade names); aspirin (2 trade names); paracetamol (3 trade names); ketoprofen (3 trade names); combined products (4 trade names); and other analgesics. In addition, we asked the most important indication of use of these product groups with the options: for headache, muscle or joint pain, symptoms of common cold, other aches, other purpose, or not used. The frequency of the most used OTC analgesic during the last 2 weeks was inquired from the male conscripts (I).

In the study concerning the knowledge of medicine use and the attitudes towards a drug information campaign (V), the dependent variables were based on the following questions with dichotomous outcomes (yes/no): Do you have enough information on 1) on the use of medicines in general, 2) effects of medicines on awareness or functioning, and 3) risks of the concomitant use of alcohol and medicines? Opinions regarding the drug information lecture just before the questionnaire were inquired with the following questions: Did you receive new information on 1) the use of medicines in general, 2) the effects of medicines on awareness or functioning and 3) did you find the campaign information beneficial? A question on the campaign content was: Does the red warning triangle on a medicine package totally prohibit driving a motor vehicle?

Independent variables

The independent variables in the study I on the male conscripts comprised sociodemographic and health behavior varibales, in the study IV on the female conscripts, also few self-reported health status were included. In the studies II and III on the self-medication of the male conscripts, the independent variables were categorized as predisposing, need and health behavior variables on the basis of the theoretical health care utilization model by Andersen *et al.* (Andersen 1968 and 1995). Since all the conscripts have free-of-charge health care, enabling factors were excluded from the study.

The detailed list of the dependent and independent variables employed in the studies is presented in Appendix I.

4.3 Statistical methods

The description of the study samples and proportions of medicine users are given in percentages (%). In the bivariate analyses, the Chi-square test with Yates' correction was used with a limit of statistical significance of $p<0.05$. In the multivariate-analyses (I–III,V), backward step-wise logistic regression analyses were carried out on the dichotomous dependent variables (used/not used medicine) and odds ratios (ORs) were calculated for the statistically significant ($p<0.05$) independent variables in the final models with respective 95% confidence intervals (95% CI). Interaction terms were included in all the models if they were based on Pearson's correlation of 0.20 or more and if they statistically significantly ($p<0.05$) contributed to the final model. The construction of the regression models are described in the original publications in detail. Due to the small simple size (N = 177) of the female conscripts (IV), no backward step-wise logistic regression analysis was performed. Instead, potential associations between medicine use and independent variables were evaluated by forcing all the variables showing a statistical significance of $p<0.10$ in the bivariate analyses in the model. The univariate and bivariate analyses were performed with EpiInfo (version 6.04b) and the logistic regression models were constructed with SPSS for Windows (release 10.0.7).

5 RESULTS

5.1 Prevalence and determinants of overall use of prescribed and nonprescribed medicines (I,IV)

5.1.1 Male conscripts (I)

In February 1999, 71% of the male conscripts (N = 3725) reported use of medicines in the 2 weeks preceding the study (I). Of all the respondents, 60% had used prescribed and 42% nonprescribed medicines (Table 5-1). Only 15% used solely nonprescribed medicines. If the users of three or more medicines were categorized as users of three medicines, the average number of the used medicines was 1.6; 1.2 for the prescribed, and 0.7 for nonprescribed ones. Three or more medicines were taken by 34% of the men; three or more prescribed medicines were used by 21% and this number of nonprescribed medicine by 8% (Table 5-2). The number of the nonprescribed medicines increased linearly by the number of prescribed medicines (slope 0.26; $R^2 = 0.96$) (I, Fig. 2).

According to the multivariate analyses on the male conscripts' medicine use in February 1999 (I), the use of prescribed medicines was associated with brigade, age, use of nonprescribed medicines in the last 2 weeks, abundant use of OTC analgesics before the military service, military fitness category B, and frequent physician visits before the military service (Table 5-3; I, Table 2). In the use of nonprescribed medicines, an association was found with brigade, use of prescribed medicines in the last 2 weeks, abundant use of OTC analgesics before the military service as well as with visits to a pharmacy and inpatient days in the last 6 months before the military service. Regarding the nonprescribed medicine use, associations with civilian living area, snuff use and many health care services in the last 6 month before the military service were shown in the bivariate analyses.

Table 5-1. Sample description of the male conscripts in February 1999 (N = 3725) (I,V). Use of prescribed and nonprescribed medicines (%) in the 2 weeks preceding the questionnaire study.

	Use of prescribed medicines			Use of nonprescribed medicines		
	N	%	*p*-value[1]	N	%	*p*-value[1]
All	3598	60.0		3615	41.9	
No answer	127			110		
Age (years)			0.004			0.159
17–18	480	62.4		491	41.5	
19	1997	58.4		2025	41.0	
20	737	58.5		760	43.6	
21	151	68.4		156	38.5	
22	61	70.5		65	49.2	
23	44	72.7		44	59.1	
24 or older	51	75.0		53	45.3	
No answer	148			131		
Brigade			<0.001			<0.001
Northern I (Sodankylä)	236	23.7		240	26.3	
Northern II (Kajaani)	589	58.2		596	42.6	
Western I (Niinisalo)	401	74.4		403	53.6	
Western II (Keuruu)	322	61.4		322	43.5	
Western III (Säkylä)	469	53.0		472	37.1	
Southern I (Helsinki)	401	70.3		410	42.0	
Southren II (Hattula)	743	64.4		788	41.9	
Eastern I (Mikkeli)	377	57.7		384	43.2	
No answer	127			110		
Fitness category			<0.001			0.026
A	3358	59.1		3372	41.3	
B	188	78.7		193	49.7	
No answer	179			160		
Civilian area of residence			<0.001			0.003
Helsinki capital area	501	67.2		513	41.7	
Town (>100.000 inhab.)	506	58.6		519	38.9	
Town (20.000-100.000 inhab.)	877	62.9		897	47.8	
Town (<20.000 inhab.)	579	56.9		588	38.9	
Rural city center	603	57.1		608	40.3	
Countryside	446	56.1		456	40.4	
No answer	161			144		
Educational level			0.016			0.700
Comprehensive school	408	67.9		417	40.5	
Vocational school	1309	58.3		1340	41.3	
Matriculation examination	1180	58.8		1201	42.3	
College	265	62.0		270	42.6	
University studies	243	61.0		245	46.5	
Other	103	61.8		106	39.6	
No answer	165			146		

[1] χ^2-test between the variable levels

Table 5-2. Use of medicines in the 2 weeks preceding the study among the male conscripts in February 1999 (N = 3725) (I,V).

	N		%	
All medicines				
Used	2502		70.7	
1 medicine		*645*		*18.2*
2 medicines		*645*		*18.2*
3 or more medicines		*1212*		*34.3*
No use	1036		29,3	
No answer	187			
Use of nonprescribed medicines				
Used	1516		41.9	
1 medicine		*855*		*23.7*
2 medicines		*374*		*10.3*
3 or more medicines		*287*		*7.9*
No use	2099		58.1	
No answer	110			
Use of prescribed medicines				
Used	2159		60.0	
1 medicine		*714*		*19.8*
2 medicines		*687*		*19.1*
3 or more medicines		*758*		*21.1*
No use	1439		40.0	
No answer	127			

Table 5-3. Multivariate analysis. Summary of predictors (p<0.05) of the use of prescribed and nonprescribed medicines among the male conscripts in the last 2 weeks (I, Table 2).

	Prescribed medicines	Nonprescribed medicines
Brigade	+	+
Number of used non/prescribed medicines[1,2]	+	+
Frequent nonprescribed analgesic use before military service	+	+
Age	+	–
Fitness category	+	–
Frequent physician visits[3]	+	–
Frequent pharmacy visits[3]	–	+
Hospital inpatient[3]	–	+

[1] in the last 2 weeks
[2] number of nonprescribed medicines used concomitantly with prescribed medicines and vice versa
[3] in the last 6 months before military service

5.1.2 Female conscripts (IV)

Among the female conscripts, the prevalence of overall medicine use in the 2 weeks preceding the study was 61% in April 1999 (IV). Prescribed medicines were used by 44% and nonprescribed one by 31% (Table 5-4 and 5-5). At the average, they used 0.9 medicine; 0.7 medicine with a prescription and 0.4 without a prescription when the users of three or more medicines were dropped into the category of users of three medicines. Of the women 6% had used three or medicines; 5% three or more prescribed medicines and 2% three or more nonprescribed ones. Also in the women, the number of nonprescribed medicines increased by the number of the prescribed ones (slope 0.09; R^2 = 0.53). Associations were found between the use of prescribed medicines and perceived poor or moderate physical condition, trials with illegal drugs and frequent visits to a physician in the last 12 months. The use of nonprescribed medicines was associated with education level and binge drinking (Table 5-6; Study IV Table 3). In addition, in the bivariate analyses, use of prescribed medicines was associated with higher age, and use of nonprescribed medicines with obtaining nonprescribed medicines from parents, peers or other people.

5.2 Prevalence and determinants of self-medication (I–IV)

5.2.1 Male conscripts (I–III)

Three quarters (74%) of the male respondents claimed self-medication for at least one of the given indications in February (I), and 65% in July (II,III) 1999 (Table 5-7, Fig. 5-1; Study II, Table 2). The most frequently reported indications were headache (47% of the all respondents in February and 39% in July), symptoms of common cold (49% and 33%), other aches (26% and 23%) and cough (37% and 19%). Self-medication was also more frequently used for skin troubles or yeast, stomach aches or constipation in February than in July. Self-medication with stimulants such as caffeine tablets was reported by 12% in February and by 8% in July, and self-medication for sleeplessness or anxiety by 7% and 1%, respectively. In January, 24% of the men had used vitamins, while 20% in April.

Table 5-4. Sample description of the female conscripts in April 1999 (N = 177) (IV). Use of prescribed and nonprescribed medicines (%) in the 2 weeks preceding the mailed questionnaire study.

	Use of prescribed medicines			Use of nonprescribed medicines		
	N	%	*p*-value[1]	N	%	*p*-value[1]
All	177	43.5		177	31.1	
No answer	0			0		
Age (years)			0.075			0.184
17–19	43	34.9		43	37.2	
20–22	76	52.6		76	35.5	
23 or older	43	34.9		43	20.9	
No answer						
Military county			0.623			0.203
Southern	31	35.5		31	45.2	
Western	61	49.2		61	31.1	
Eastern	49	40.8		49	24.5	
Northern	33	42.4		33	24.2	
No answer						
Military entry cohort			0.282			0.720
July 1998	84	39.3		84	29.8	
January 1999	93	47.3		93	32.3	
No answer						
Civilian area of residence			0.19			0.484
Helsinki capital area	26	50.0		26	38.5	
Town (>100.000 inhab.)	25	60.0		25	40.0	
Town (20.000-100.000 inhab.)	62	41.9		62	25.8	
Small town (<20.000 inhab.) or rural area	64	35.9		64	29.7	
No answer						
Educational level			0.376			0.066
Comprehensive or vocational school, college or other	53	50.9		53	18.9	
Matricualtion examination	102	39.2		102	36.3	
University studies	21	42.9		21	38.1	
No answer						
Marital status			0.961			0.475
Single	113	43.4		113	29.2	
Boyfriend, engaged, married or other	64	43.8		64	34.4	
No answer						

[1] χ^2-test between the variable levels

Table 5-5. Use of medicines in the 2 weeks preceding the study among the female conscripts in April 1999 (N = 177) (IV).

	N		%	
All medicines				
Used	107		60.5	
1 medicine		*49*		*27.7*
2 medicines		*39*		*22.0*
3 or more medicines		*19*		*10.7*
No use	70		39.6	
No answer	0			
Use of nonprescribed medicines				
Used	55		31.1	
1 medicine		*36*		*20.3*
2 medicines		*15*		*8.5*
3 or more medicines		*4*		*2.3*
No use	122		68.9	
No answer	0			
Use of prescribed medicines				
Used	77		43.5	
1 medicine		*46*		*26.0*
2 medicines		*22*		*12.4*
3 or more medicines		*9*		*5.1*
No use	100		56.5	
No answer	0			

Table 5-6. Multivariate analysis. Summary of predictors (p<0.05) of the use of prescribed and nonprescribed medicines among the female conscripts in the last 2 weeks (IV, Table 3).

	Prescribed medicines	Nonprescribed medicines
Poor or moderate physical condition	+	–
Tried illegal drugs[1]	+	–
Frequent physician visits[2]	+	–
Frequent intensive alcohol intake	–	+
Self-medication often provided by parents, peers or others	–	+

[1] during lifetime
[2] in the last 12 months

Among the male conscripts in July 1999 (II,III), overall self-medication was associated with the respondent's predisposing (brigade) and health behavior variables (attending first aid education, visits to a pharmacy, and frequent physician visits before the military service) (Table 5-8). Along with predisposing and health behavior variables, self-medication for pain or common cold symptoms or self-medication with stimulants were associated with need variables such as perceived health and occurrence of pain. Bivariate analyses suggested an association between caffeine tablets and other stimulant use and psychological symptoms such as sleep disorders, depression and anxiety, but these associations did not remain in the multivariate analyses. Neither the bivariate association between self-medication for pain or common cold symptoms and major life events and social restrictions caused by physical or mental problems remained when the effect of other background variables was taken into account. According to the multivariate analysis, the use of vitamins was associated with father's education level, frequent pharmacy and physician visits, being hospital inpatient, active exercising and experiments with illegal drugs.

5.2.2 Female conscripts (IV)

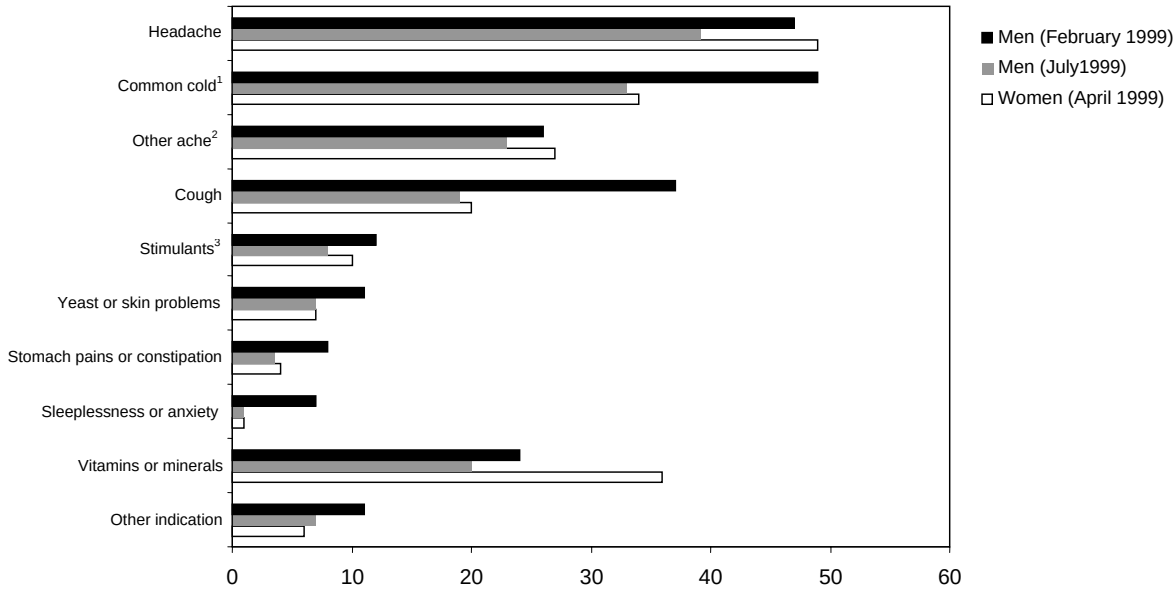
Of the female conscripts, 79% had used self-medication for suggested indications in April 1999 (IV). Self-medication was most often reported for different aches (67%); for headache it was claimed by 49%, for symptoms of common cold by 34%, and for other aches by 27% (Fig. 5-1). Stimulative self-medication was claimed by 10%, and self-medication for sleeplessness or anxiety by 1% of the respondents.

Table 5-7. Sample description of the male conscripts in July 1999 (N = 857) (II,III). Use of self-medication (%) in the 2 weeks preceding the mailed questionnaire study.

	N	%	*p*-value[1]
Age (years)			0.2284
17–18	40	63.2	
19–21	767	64.8	
22–28	40	78.4	
No answer	10		
Brigade			<0.001
Northern I (Sodankylä)	99	46.9	
Northern II (Kajaani)	98	77.9	
Southern I (Helsinki)	76	84.9	
Southern II (Hattula)	96	66.7	
Southern III (Kirkkonummi)	100	70.4	
Eastern I (Valkeala)	94	53.2	
Eastern II (Kontiolahti)	102	63.9	
Western I (Keuruu)	96	57.6	
Western II (Säkylä)	94	70.7	
No answer	2		
Civilian area of residence			0.035
Helsinki capital area	141	70.8	
Town (>100.000 inhabit.)	111	63.6	
Town (20.000-100.000 inhab.)	196	69.1	
Town (<20.000 inhab.)	146	62.4	
Rural area	256	62.6	
No answer	7		
Marital status			0.030
Single	716	63.6	
Girlfriend, engaged or married	123	75.8	
Divorced, widow or other	15	60.0	
No answer	3		
Educational level			0.053
Comprehensive school	74	60.6	
Vocational school	278	61.0	
College	74	75.0	
Matriculation examination	393	67.9	
University studies	30	51.7	
No answer	8		

[1] χ^2-test between the variable levels

Figure 5-1. Self-medication (%) in the 2 weeks preceding the study among male conscripts in February 1999 (N = 3725) (I) in July 1999 (N = 857) (II,III), and in female conscripts in April 1999 (N = 177) (IV).



[1] Cold, fever or sore throat
[2] Muscle pain, joint pain or toothache
[3] Caffeine tablets or other stimulants

Table 5-8. Multivariate analysis. Summary of predictors (p<0.05) of self-medication among the male conscripts in the last 2 weeks (II, Table 3; III, Table 2).

	Overall self-medication medication	Pain and common cold symptoms	Caffeine tablets or other stimulants	Vitamins
Predisposing variables				
Brigade	+	+	+	–
Higher education	–	+[3]	–	–
Father's higher education	–		+	+
Need variables				
Good/excellent self-perceived health status	–	+	–	–
Considerable or severe physical pains	–	+	+	–
Health behavior variables				
Attending first aid education[1]	+		–	–
Frequent pharmacy visits[1]	+	+	–	+
Frequent physician visits[1]	+	+	–	+
Hospital inpatient1	–	–	–	+
Frequent tv warcher[1]	–	+	–	–
Active exercising[1]	–	–	–	+
Tried illegal drugs[1,2]	–	–	+	+

[1] before military service
[2] during lifetime
[3] highest prevalence with midlevel education

5.2.3 Use of OTC analgesics among male and female conscripts (I,IV)

In February 1999 (I), 63% of the men consripts reported use of nonprescribed analgesics in the last 2 weeks. Of all the men, 15% had used these medicines daily or almost daily, 24% at least a couple times times a week, and 24% few time a week (Linden *et al*. 2000). During the service, they most frequently used ibuprofen preparations; other products with a different active ingredient (aspirin, paracetamol, ketoprofen, and combined products) were used by 15–22% of all the respondents. Products of one therapeutic group had used 27%, from two groups 18% and from three or more groups 19%. Fifteen percent of the men had concomitantly used nonprescribed and prescribed medications for the same purpose. Among the female conscripts in April 1999 (IV), 71% had used these preparations. Of the females 7% had used nonprescribed analgesics daily or almost daily, and 64% a couple of times or few times a week (Linden *et al*. 2001). Ibuprofen products had been taken by 60%, and medicines from other groups by 8–20%. Users of medicines of one threrapeutic group comprised 39%,

of two groups 16%, and from three or more groups 16%. Of the male and female respondents (I,IV), approximately 9% recalled that they had used OTC analgesics before the military service.

For the male and female conscripts (II,IV), headache was the most important indication for use of ibuprofen products (58% and 53% of the users of the products of this category, respectively), for aspirin products (72% and 80%), and for ketoprofen products (54% and 44%). In addition, in women, headache was often (41%) the most important purpose to the use of paracetamol medicines. In men, major indication for use of aspirin products was common cold symptoms (17%), while headache for use of combined products (19%). A third (35%) of the women using ketoprofen products claimed muscle, joint or toothache as the main purpose of this medicine use. All the women who reported the use of combined products had used them for common cold symptoms.

5.3 Origin of medicines (I,IV)

Among both male and female conscripts, most respondents using prescribed medicines had received these medicines from FDF health care (88% of men and 82% of women) (I, Fig. 3). In contrast, 73% of the male users of nonprescribed medicines had acquired these medicines from civilian sources, and 67% of the female conscripts nonprescribed medicine users. The female conscripts had acquired both prescribed and nonprescribed medicines in the last 2 weeks less frequently from both the FDF health care and civilian sources concomitantly.

In most cases, the male and female conscripts commonly acquired their self-medication (self-medication provided by the FDF health care was excluded) by self-purchase from a pharmacy (I,II,IV). Among men, this way was reported as the most important one by 38% and in July by 60%, and among women by 68% in April 1999. As the most frequent way to obtain these medicines from parents was reported by 38% of the men in February and 25% in July.

5.4 Drug information campaign for conscripts (V)

5.4.1 "Drug information for conscripts" -campaign (V)

A novel multi-partner campaign on drug information to Finnish conscripts was conducted in the winter of 1999. The aim of the campaign was to increase the conscripts' knowledge of medicine use, in particular of their effects on an individual's awareness and functioning as well as on risks of concomitant medicine use, alcohol and illegal drugs. The project was a collaborative project of the Association of Finnish Pharmacies (AFP) and private pharmacies, the Finnish Defence Forces (FDF; Health Care Division of Defence Staff, and Military Pharmacy) and the Soldiers' Home Association. Parallel to the campaign, a medicine study (I,V) was conducted.

The campaign concept, material and recruitment of private proprietary and other pharmacists as lecturers was planned by the AFP and FDF. The slogan of the campaign was "Harmless tablets do not exist!" The FDF allocated the needed resources and informed the pre-selected garrisons of the campaign. Before launching the campaign, a theme day for the key persons of the campaign of different partners was held to educate the study protocol and for informal discussions. Although the lecturers were provided with uniform study protocol and material, they were encouraged to modify their presentations to meet with local needs and different circumstances. However, special attention was paid to the uniform conduction of the study part of the campaign. The local military and medical officers conducting the study in practice were separately profoundly instructed about the study protocol by the Health Care Division of the Defence Staff.

5.4.2 Conscripts' perceived knowledge of medicines and the attitudes towards a drug information campaign (V)

Of the responding men, 81% reported that they had a sufficient knowledge of medicine use in general before the drug information campaign (Study V, Fig. 2). Of the effects of the mixed use of alcohol and medicines, 89% perceived that they had enough information, whereas 71% had enough information of possible effects of medicines on awareness of functioning. Three-quarters (73%) of the respondents found the drug information campaign beneficial; the campaign lecture provided new information to 48% of the men on use of medicines in general, and 43% received new information about effects on awareness and functioning. The correct answer to the question about the campaign contents was given by 78%.

Conscripts with self-perceived insufficient prior-to-campaign knowledge of the use of medicines reported more frequently that they received new information on these issues (OR = 3.5; 95%CI 2.9–4.2). These individuals also found the campaign more

frequently beneficial (OR = 1.9; 95%CI 1.5–2.4). Further, if receiving new information was reported, it was also evaluated as beneficial (OR = 6.7; 95%CI 5.6–8.1).

According to the multivariate analyses (Study V, Tables 2A and 2B), self-perceived knowledge of sufficient medicine use was associated with recent non-use of prescribed medicines, a higher military fitness category A, and having no inpatient days in the past 6 months. Finding the campaign beneficial was associated with a nonurban civilian living area, lower education, recent non-use of prescribed medicines, independent purchases of OTC medicines in a pharmacy, vitamin and mineral use, exercising as well as using no snuff and not using self-medication for sleeplessness or anxiety.

6 DISCUSSION

6.1 Samples and methods

Adolescents and young adults often reply less frequently to questionnaires than older individuals (Ryan *et al.* 2001). In the present studies among the male conscripts (I-III,V), the high response rate of 95% or more was contributed by conducting the studies as part of a compulsory daily program of military service and using questioning techniques that the respondents were already used to during their conscription time. The response rate, 68% of the women in study (IV), was seen as acceptable for the analysis because it was a postal questionnaire without a reminder (Jesson and Pocock 2001). The study on the female conscripts (IV) consisted of 177 responses that represented 68% of all the women on duty in April 1999.

In the studies I and IV, the sample of 3725 male respondents from eight brigades represented approximately 19% of all the male conscripts performing military service in February 1999. However, the sample comprised responses from only the largest brigades with no special training and was, thus, not strictly representative of the whole cohort of Finnish male conscripts. The sampling of the studies II and III (N = 857 from nine brigades) was based on the study sampling commonly used in the FDF studies. The data for the studies I and V were based on a separate medication study conducted in February 1999 (V), while the data for the studies II and III were drawn from the more general health behavior study in the beginning of basic military training in July 1999. The medicine questionnaires for studies I and V were conducted immediately after the campaign events of the "Drug Information for Conscripts" -campaign (V).

The total anonymity of the questionnaires was emphasized in all the studies (I-V). The bias caused by the military environment is difficult to estimate. On the other hand, it has been shown that, under civilian circumstances, adolescents reliably report sensitive issues such as sexual behavior in questionnaire studies (Shew *et al*. 1997).

Classification of medicines may be prone to some misreporting; some medicines, such as herbal medicines and oral contraceptives, may not be recognized as medicines and parts of the reported products may not be medicines (Tobi *et al.* 2003). It is widely known that people underreport their use of OTC medicines, especially of herbal or natural products (Hensrud *et al.* 1999; Glintborg *et al.* 2004; Rieger *et al.* 2004). The present analysis made a difference between prescribed and nonprescribed medicines, *i.e.*, those obtained on the basis of a visit to a physician or not, that likely came with more reliable results than the respondent's own decisions of the status of his or her medicine as an OTC or a prescription-only medicine. Part of the reported nonprescribed medicines, however, may constitute medicines prescribed for other indications or for other individuals. The definition of a preparation may have caused

discrepancy, in particular in reporting the use of "vitamins or nutritional supplements" (III) (Pattersson *et al*. 1998).

Most of the independent variables used in the studies I-V have been employed in the FDF studies for several years. The set of the independent variables in the FDF basic health behavior survey questionnaire made it possible to apply Andersen's *et al*. (Andersen 1968 and 1995) theoretical health care utilization model in studies II and III. This model is widely used in studies of medicine use (*e.g*., Bush and Osterweis 1978; Fillenbaum *et al.* 1993; Hanlon *et al.* 1996; Antonov and Isacson 1998; Kamal *et al.* 2003). It was useful in analyzing self-medication, because it was originally developed for predicting use of health care services and illustrates the importance of need as well as predisposing, enabling and health behavior factors (Andersen 1995; Antonov and Isacson 1998). Although a single question on the respondent's own opinion on his or her health is suggested to be of limited importance in evaluating chronic and occasional medicine use, it is suggested to be one of the most predictive variables in the curative use of medicines (Idler *et al*. 1990; Andersen 1995; Furu and Thelle 2001).

In all the studies (I-V), the conscripts not attending the survey were not reached afterwards. The conscripts absent from the study events, for example because of sickness or duty, may differ in their medicine use from those on duty. On the other hand, this study design probably increased the confidentiality in sensitive questions.

The recall time of 2 weeks is widely used in pharmacoepidemiological studies (*e.g*., Furu *et al.* 1997; Antonov and Isacson 1998; Yearbook of Health and Medical Care 1999; Stoelben *et al*. 2000). Although it also may seen a long time to recall very occasional medicine use, infrequent medicine use may be detected within it (Rahkonen *et al*. 1987; Klaukka and Martikainen 2003). In evaluation of morbidity on the basis of the of medicines, the frequency and duration of medicines should be taken into account (Furu and Thelle 2001).

In general, self-reported medicine use is often revealed to underestimate medicine use (Kehoe *et al*. 1994; West *et al*. 1995; Norell *et al.* 1998; Hensrud *et al.* 1999). The closed question on medicine use in the questionnaire probably results in underreporting of medicine use compared to questions with indications or open questions for the names of medicines used or to personal interviews (Lam *et al*. 1994; West *et al*. 1995; Klungel *et al*. 2000). Consistently, the prevalence of medicine use from self-reports and medical records strongly depends on the therapeutic groups of medicines (Furu and Thelle 2001; Norell *et al.* 1998; Klungel *et al*. 2000). In the personal interviews, for example, illustrating brands of pharmaceuticals or checking individuals' medicine packages or prescriptions would have increased the validity of the study (Kimmel *et al.* 2003).

In cross-sectional studies, conclusions as to the causality between dependent and independent variables cannot usually be drawn with confidence. Longitudinal studies,

for example on the military entry cohorts, should be employed to study causality between background variables and medicine use.

6.2 Prevalence of use of medicines (I-V)

6.2.1 Prevalence of overall use of prescribed and nonprescribed medicines among male and female conscripts (I,IV)

Finnish male and female conscripts frequently used medicines. Of the male conscripts, over two-thirds (71%) reported medicine use in the last 2 weeks of January 1999 (I), while 61% of the female conscripts used medicines in April 1999 (IV). On the average, all the men had used 1.6 and all the females 0.9 medicines, respectively.

In contrast to several studies in the civilian populations of adolescents and young adults (*e.g.,* Dengler and Roberts 1996; Eggen 1997; Arinen *et al.* 1998; Stakes 1998-2005; Paulose-Ram *et al.* 2003), the conscripts more frequently used prescribed medicines. In January 1999, 60% of the males had used prescribed and 42% nonprescribed medicines (I). Of the females in April 1999, 44% had used prescribed and 31% nonprescribed medicines (IV).

The literature provides examples of common medicine use even in civilian populations of adolescents and young adults (Rudolf *et al*. 1993; Dengler and Roberts 1996; Chambers *et al*. 1997; Warner *et al*. 2002). The magnitude of the prevalence of overall medicine use among male conscripts in January 1999 (I) was at a higher or at the same level, and among the female conscripts in April 1999 (IV) at the same or moderately lower level, than reported among their civilian counterparts. In Western countries, the prevalence of 25–85% of medicine use by young men during the past 1–2 weeks is reported (Rahkonen *et al.* 1987; Dengler and Roberts 1996; Eggen 1997; Furu 1997; Del Rio *et al.* 1997; Arinen *et al.* 1998; Yearbook of Health and Medical Care 1999; Kaufman *et al.* 2002; Tobi *et al.* 2003). Of Finnish 15–24-year-old civilian men, for example, 42% had used medicines during a week in spring 1999 (Helakorpi *et al*. 1999). Further, 75% of 15–24-year-old women had used medicines during 2 weeks, including 31% who had used contraceptive pills (Helakorpi *et al*. 1999). Within a 30-day recall time, approximately 55% of Finnish 15–18-year-old men and 82% of women reported medicine use in 1998-2003 (Stakes 1998-2005).

In Finland, adults used 2.8 prescribed medicines on the average per user (Arinen *et al.* 1998), while in the USA, the average number was 3.0 for prescribed and 2.2 for OTC medicines in the last month (NCPIE 2002).

The comparisons with previous civilian studies are challenging, due to differences in the study design and methodology (*e.g*., questioning technique, recall period). Further, comparisons between our studies among men in January 1999 (I) and

July 1999 (II) as well as among women in April 1999 (IV) and some female responses as part of study I in January 1999 are not completely comparable, owing to differences in the sample populations and study questions. The sex of the female responses in the studies I and IV could not be confirmed due to the self-completed questionnaire, and therefore, they were excluded from the study.

The prevalence of overall medicine use among both male and female conscripts in the present studies can be regarded as high because it represents medicine use by basically healthy young adults who have recently been qualified to do their common military service (Salmi and Lehesjoki 1996; Parkkola 1999; Sahi 2005). Furthermore, during military service, all the health care, including medicines, is provided by the FDF and is totally free of charge to the conscripts (Koskenvuo 1996).

The easy access to the health care, in particular to a physician, may contribute to the frequent use of prescribed medicines. OTC medicines may also be prescribed more often by a physician than under usual civilian circumstances.

Military service may cause physical, psychological and social stress (Svarstad 1983; Koskenvuo 1996; Norheim *et al.* 2002) that may be based on the military training itself or on the physically and socially challenging life situation typical for the time period from adolescence to young adulthood (Ross and Woodward 1994; Koskenvuo 1996). Medicine use may be a coping strategy with which an individual tries to adjust himself or herself to a stressful situation, or to enhance performance (Svarstad 1983; Kristensen 1991; Bédard *et al.* 1997; Stolelben *et al.* 2000; Warner *et al.* 2002; Holstein *et al.* 2004; Charlton 2005). For women, military service may cause stronger physical stress due to their physical and anatomical characteristics and equal military service to both sexes (Ross and Woodward 1994; Sipinen *et al.* 1996). In addition, women conscripts doing voluntary military service are often more committed to the military service than men, which may contribute to the greater use of medical services and medicines not only for treating symptoms but also for enhancing performance (Määttä 1999).

The overall prevalence of medicine use may also be affected by the season when the studies were conducted (Del Rio *et al.* 1987; Eagles 2003; Itterman *et al.* 2003). For example, in February and April, the climate in Finland is favorable for upper respiratory tract infections (Rahkonen *et al.* 1987). Also the differences in the lighting conditions many have affected the use of medicines (Hansen *et al.* 1998; Rosen *et al.* 2002).

Among the males in February 1999 (I), 50% of the prescribed medicine users had taken nonprescribed medicines during 2 weeks, and as few as 15% of all the medicine users took solely nonprescribed medicines, which is in accordance with the magnitude of overall and exclusive OTC medicine use in the whole civilian German male population (Beitz *et al.* 2004). Further, the number of nonprescribed medicines used increased with the number of the prescribed ones. These finding do not support substitution for prescribed medicines by nonprescribed ones.

Most of the prescribed medicines were obtained from the FDF health care, while most of the nonprescribed medicines were acquired from civilian sources. Among the males using prescribed medicines in February 1999 (I), 89% received these medicines from the FDF, and 73% of the users of nonprescribed medicines acquired those medicines from civilian sources. Among the females in April 1999, the corresponding figures were 82% and 67% (IV). Self-purchase in a pharmacy and obtaining medicines from parents were the most common ways to acquire nonprescribed medicines from the civilian sources for both men and women (I,II,IV). In comparison to a bit younger civilian individuals, the conscripts seem to acquire their medicines more independently; for 86% of high school students, self-medication is provided by their parents, and 23% purchase them from a pharmacy (Hämeen-Anttila *et al.* 2005). Interestingly, these medicine sources were similarly used by the male conscripts in July 1999 (II) and in the female conscripts in April 1999 (IV), but parents were a more frequent source for the males in February 1999 (I). Although comparisons cannot be drawn directly for the different samples, this difference may be associated with different seasons or differences in the health behaviors of these military entry cohorts.

Contacts with a physician or other health professional may contribute to more appropriate medicine use. Frequent acquaintance and use of medicines from civilian sources may increase the risk of medicine related problems, and can be seen as economically inappropriate from the viewpoint of an individual conscript.

The overall prevalence of medicine use among male conscripts in January (I,V) was higher than among women in April 1999 (IV). Due to major differences in the time of a study and study design, comparisons between these studies are not possible. The literature provides plenty of evidence that women use both prescribed and nonprescribed medicines more frequently than men, and that the difference often decreases with age (Rabin 1972; Vener *et al*. 1982; Johnson and Pope 1983; Leibowitz 1989; Benrimoj and Chua 1990; Eggen 1993; Eggen 1997; Furu *et al*. 1997; Antonov and Arinen *et al*. 1998; Fe Caces *et al*. 1998; Jaqueir *et al*. 1998; Al-Windi *et al*. 2000; Figueiras *et al*. 2000; Helakorpi *et al*. 2002; Kaufman *et al*. 2002; Roe *et al*. 2002, Itterman *et al*. 2003; Paulose-Ram *et al.* 2003; Tobi *et al*. 2003). In Finland, for example, women have reported to use typically 1.2 to 1.8 -fold more medicines than men (Klaukka 1988 and 1989; Helakorpi *et al.* 1991; Arinen *et al.* 1998; Klaukka 2005). A similar ratio was also reported in a Norwegian study; in the age group of 20–29 years women's medicine use was 1.7-fold (Furu *et al*. 1997). In Rahkonen's *et al*. (1987) study, among 12–18-year-old Finns, the difference was 1.5-fold. The gender difference is present even at the early teenage (Eggen 1993; Dengler and Roberts 1996; Roe *et al*. 2002; Tobi *et al*. 2003). Compared to boys, girls of 11–15 years take medicines more frequently, *e.g*., for headache, stomach aches, and for dysmenorrhoea and gynecological infections (Klaukka and Rajaniemi 1997; Hansen *et al*. 2003; Currie *et al*. 2000).

The more prevalent use of medicines among women has been based on biological, psychological and social factors (Svarstad *et al*. 1987; Benrimoj and Chua 1990; Klaukka *et al*. 1990; Grabenstein *et al*. 1995; Unruh 1996; Sayer and Britt 1997; Tuinstra *et al*. 1998; Bardbury 2003; Neutel 2005). Basic reasons for this phenomenon comprise likely higher prevalence of ailments and symptoms found in women or reported by them and their better knowledge of and higher willingness to use health care services as well as greater interest in health issues in general (Verbrugge and Ascione 1987; Hansen 1989; Wool and Barsky 1994; Unruh 1996; Settertobulte and Kolip 1997; Figueiras *et al*. 2000; Roe *et al*. 2002). For example, the physiological mechanism of pain experience may differ between women and men (Bradbury 2003) Women use medicines more frequently for stress or other psychological symptoms than men (Krupka *et al*. 1978; Vener *et al*. 1982; Benrimoj and Chua 1990; Cabrita *et al*. 2004). Women are also more likely to receive a prescription for common ailments than men (Verbrugge 1996); this difference has remained after adjusting for potentially confounding factors associated with physicians, patients and morbidity (Sayer and Britt 1997). Men may be more often ignorant of their symptoms and they may more often use non-medical ways such as alcohol or exercising to alleviate the symptoms (Dean 1984; Pirkkola 2000; Itterman *et al*. 2003; Wazaify *et al.* 2005). Men have more often adopted a more critical attitude to professional health care, in accordance with the fact that they are often socially more isolated than women (Stoller 1988; Benrimoj and Chua 1990). Further, use of solely self-medication is more common among men while women more frequently use self-medication and prescribed medicines concomitantly (Beitz *et al*. 2004).

Although women report and treat their symptoms more frequently, the gender difference persists when general morbidity and use of health care services have been taken into account, (Gordon *et al*. 1993; Furu *et al*. 1997; Figueiras *et al*. 2000). Nor the presence of gynecological symptoms such as dysmenorrhoea may explain the difference in the use of analgesic alone (Eggen 1993 and 1997). On the other hand, a few studies suggest that if all the medicines clearly related to gender (*e.g*., hormone preparations, dysmenorrhoea medication) are taken into account, there would be only minor differences in the use of medicines between the genders (Svarstad *et al*. 1987; Eggen 1996). In the adolescents, the gender difference vanish when the subject's opinion of symptom severity, satisfaction with previous medical consultation and tendency to be concerned about one's health were taken into account (Settertobulte and Kolip 1997). At least to some extent the gender difference may be based on the learned social roles (Bush and Osterweis 1978); use of medicines is probably socially more acceptable among women than men (Rahkonen *et al*. 1987, Figueiras *et al*. 2000).

Of the female conscripts (IV), 59% reported use of contraceptive pills. This is in accordance with the prevalence reported among the Finnish civilian women of this age (Kosunen *et al.* 1999), but lower prevalences are also reported (Helakorpi *et al*. 1999;

Yearbook of Health and Medical Care 1999; Roe *et al*. 2002). The present prevalence should, however, be interpreted cautiously because the use of contraceptive pills was asked as an option for contraception in general, not for the last 2 weeks.

6.2.2 Prevalence of self-medication among male and female conscripts (II–IV)

During 2 weeks, 65% of the male conscripts reported self-medication for the suggested common indications in February 1999 (II). Correspondingly, 79% of the female conscripts had self-medicated in April 1999 (IV). On the basis of Nordic population surveys, these overall prevalences were higher than in most of the studies on the corresponding civilian populations (Rahkonen *et al*. 1987; Furu *et al.* 1997; Helakorpi *et al*. 1999; Yearbook of Health and Medical Care 1999; Al-Windi *et al.* 2000; Hämeen-Anttila *et al.* 2005).

The present findings on the use of nonprescribed analgesics suggest that the male and female conscripts used these medicines more commonly than corresponding individuals under civilian circumstances (Chambers *et al*. 1997; Helakorpi *et al*. 1999; Sihvo *et al.* 2000; Stoelben *et al*. 2000; Paulose-Ram *et al*. 2003). The conscripts most frequently used self-medication for pain or for common cold symptoms (54% of the responding males [I] and 67% of the females [IV]). Including all the indications, 63% of the men and 71% of the women used nonprescribed analgesics. Frequent use (daily or at least a couple of times a week) of nonprescribed analgesics was reported by 39% of the male and 21% of the female conscripts. These figures include the proportion of daily or almost daily users of 15% and 7%, respectively. For the comparison, of Finnish 17–year-old students, 41% reported self-medication for headache (Hämeen-Anttila *et al.* 2005). In accordance, Hansen *et al*. (2003) reported that 37% of 15-year-old boys and 53% of girls used medicines for headache. During a 2-week recall time, approximately 20–55 of civilian adolescents and young adults are reported to use nonprescribed analgesics (Jaquier *et al*. 1991; Antonov and Isacson 1998; Socialstyrelsen 1999; Thomson and Poulton 2002). Of US young men, 65% (79% of women) used OTC analgesics during a month (Paulose-Ram *et al*. 2003). In specific groups such as in US adolescent football players, as many as 75% had taken pain killers in the last 3 months (Warner *et al*. 2002). Further, approximately 10% of Finnish adolescents and young adults reported frequent (daily or a few times a week) use of OTC analgesics under civilian circumstances (Turunen *et al.* 2005) which is in accordance with our present finding that 11% of the male conscripts recently enrolled (I) recalled that they had used OTC analgesics with a frequency of at least once a week before the service. Concomitant use of prescribed and nonprescribed analgesics was reported by 1-2% of the civilian adolescents and young adults (Turunen *et al*. 2005) while 15% of the male conscripts (I) had used nonprescribed analgesics and prescribed medicines at the same

time. Concurrent use of nonprescribed and prescribed may set the medicine users at the risk of overdosing or unintended interactions (Sihvo *et al.* 2000; Kaufman *et al.* 2002; National Angency for Medicines 2005; Wazaify *et al.* 2005b)

Among the male and female conscripts who reported use of OTC analgesics (I,IV), ibuprofen products were most commonly used, which is in accordance with the prominent position of ibuprofen preparations in the Finnish market of OTC analgesics (Ahonen and Kaija 1996; Finnish Statistics on Medicines 2001; Marttila-Lehto *et al*. 2004; Voipio 2005) and earlier finding among Finnish 15–18-year-old students Hämeen-Anttila *et al.* 2005). Among the conscripts, headache was the most common indication for nonprescribed analgesic use. In particular, ibuprofen and aspirin products were often used for this indication. The common use of aspirin products may be explained by their cheaper price, if acquired from civilian pharmacies. Women conscripts used more often ketoprofen products for muscle or joint aches or other aches, and probably also for dysmenorrhoea. Finnish combined analgesic OTC products are indicated for common cold symptoms, and they were probably used for this purpose in both male and female conscripts.

According to a Finnish study by Ahonen and Kaija (1996), of purchasers of OTC analgesics (Ahonen and Kaija 1996), 74% were women. Half (52%) of the women and men purchaising medicines bought them for immediate use. In most cases (37% of the purchases), the active ingredient of the product was ibuprofen, in 16% paracetamol, in 16% aspirin, in 13% ketoprofen, and in 13% of cases a combined preparation. The prominence of ibuprofen and paracetamol products was also present in the purchasers of OTC analgesics (Marttila-Lehto *et al.* 2004). Also Finnish 14–18-year-old students used commonly ibuprofen preparations; for headache, 73% chose an ibuprofen product while a paracetamol product was chosen by 24% and a ketoprofen product by 3% of the respondents (Hämeen-Anttila *et al.* 2005). In the USA, men more frequently use aspirin and paracetamol products whereas women prefer paracetamol preparations (Paulose-Ram *et al.* 2003). In Canada, young women prefer paracetamol and ibuprofen products for dysmenorrhoea (Campbell and McGrath 1997).

Self-medication for skin and stomach problems by the conscripts was as frequent or even less frequent as by civilian adolescents and young adults (Rahkonen *et al*. 1987; Stakes 1998-2005; Helakorpi *et al*. 1999; Yearbook of Health and Medical Care 1999; Hämeen-Anttila *et al.* 2005). However, the civilian studies show very fluctuating results on the medicine use for these indications.

Approximately 10% of the male and female conscripts claimed self-medication with caffeine tablets or other stimulants. In addition to caffeine tables, a wide variety of products (*e.g*., herbal and natural products) was likely reported in this group (Charlton 2005). Lower prevalences were reported for self-medication for sleeplessness or anxiety. Among Finnish and Swedish civilians aged 15–24 years, only insignificant use of sleeping medicines is reported (Helakorpi *et al*. 1999; Yearbook of Health and

Medical Care 1999). On the other hand, of Finnish university students, 6% reported recent use of caffeine tablets (Kunttu 1997), and 8% of Portuguese students had taken psychoactive medicines in the last 2 weeks (Cabrita *et al.* 2004), and 4% of Norwegian 15–16-year-olds during a month (Skurtveit *et al.* 2005). Prevalent use of caffeine tablets such as any psychoactive self-medication may indicate inappropriate medication use as well as the medical problems behind it (Farkas 1979; Dinges *et al*. 1997; Hughes and Hale 1998; Suomela and Henriksson 2001; Barlow 2005). These may constitute risks for individual conscripts and a safe conscription environment.

In January 1999, 20% of male conscripts had taken vitamins or minerals (III), and 36% of female conscripts in April (IV) during 2 weeks. These prevalences are of the same magnitude as in the corresponding civilian populations (Helakorpi *et al*. 1999; Yearbook of Health and Medical Care 1999; Allen *et al*. 2000; Nilsson *et al*. 2001; Beitz *et al*. 2002; Sichert-Hellert and Kersting 2004). The Finnish school survey (Stakes 1998-2005) revealed that 38% of 15–18-year-old men and 52% of women used vitamin or mineral products when medication use was recalled for a month. In the present studies on the conscripts (III,IV), the contents of nonprescribed vitamin use was not investigated, but it may also include inappropriate or potentially harmful medicine use (Arsenault and Kennedy 1999; Kim and Keen 1999; Neuhouser *et al.* 1999; DesJardins 2002).

The overall prevalence of self-medication, suggested on the basis of questions on the specific indications (II,IV) or brand names of OTC analgesics (I,IV) was clearly higher than on the basis of direct questions of nonprescribed medicine use (I,IV). This observation is in accordance with the current literature (Aromaa *et al*. 1986; Hensrud *et al*. 1999; Klungel *et al*. 2000), and suggests that the prevalences of nonprescribed medicine use on the basis of direct questions (42% among males [I], 31% among females [IV]) would be underestimates of real medicine consumption.

6.3 Determinants of use of medicines (I–IV)

Contrary to the use of prescribed medicines, in nonprescribed medicine use, the choice of medication and the possible alteration of its dosing are often done by an individual taking medicine. On the basis of this fundamental difference in these medication processes, there are major differences in the determinants of these processes (Rabin 1972; Bush and Osterweis 1978; Hedvall 1988; Raisch 1990; van der Geest *et al*. 1996; Antonov and Isacson 1998; Shortell *et al*. 1998). In addition, there are different treatment paths for curative and preventive self-medication, and, for example, vitamins may be used for prevention or treatment of illnesses (Hedvall 1988; Lam *et al*. 1994; McCaleb and Edgil 1994; Collin and Laurier 2000).

Male and female conscripts' overall use of prescribed and nonprescribed medicines was associated with the respondents' sociodemographic and health behavior variables in studies I and IV, in which need variables were not included. In studies II and III, self-medication for specific indications of the male conscripts was associated with the respondents' predisposing, need and health behavior variables. However, overall self-medication was associated only with predisposing (brigade) and health behavior variables (such as attending first aid education, frequent pharmacy and physician visits), but not with need variables. This may be understood on the basis of the general nature of self-medication, which can be used both for curative and preventive purposes (Hedvall 1988; Segall 1990; Neuhouser *et al*. 1999; Collin and Laurier 2000).

6.3.1 Predisposing (sociodemographic) variables

Age

Of the predisposing variables, age and gender are often shown to be the most important predictors for medicine use (Bush and Osterweis 1978; Antonov and Isacson 1998). Medicine use clearly increases with age since early adolescence (Klaukka *et al.* 1990; Eggen 1996; Jaquier *et al.* 1998; Arinen *et al.* 1998; Kaufman *et al.* 2002; Roe *et al*. 2002; Hansen *et al.* 2003). There is inconsistency in the findings of the effect of age on vitamin use; in a US study, use was shown to increase with age (Svarstad 1983), but in a Finnish study this trend was not detected (Klaukka *et al.* 1985).

In the present studies, the overall prevalence of use prescribed medicines increased with the male conscripts' age (I). The more common use of prescribed medicines by men over 19-years-old may be associated with their more common medical needs or with susceptibility to use medicines or health care services. Among the female conscripts, this association did not remain in the multivariate analysis (IV).

Living area

According to the multivariate analyses on the male conscripts, the use of prescribed and nonprescribed medicines was most common in the southern and western brigades and least frequent in the most northern one (I). Further, overall self-medication as well as self-medication for pain and for common cold symptoms and with caffeine tablets was most frequently reported in the southern and western brigades and in a single northern one (II,III). Among the female conscripts, medicine use was not affected by the brigade.

The effect of a brigade may be based on situational factors such as the present morbidity in the study brigades. However, this observation is also in accordance with the population adjusted statistics of the Social Insurance Institution showing more prevalent medicine use in the North and less frequent use on the Åland Islands than on the continent (Lahnajärvi *et al.* 1997; Finnish Statistics on Medicines 2001). In the

literature, the living area is often associated with the prevalence of medicine use. For example, different regions of a country or the urbanization level of the individual's living area are found to be associated with self-medication (Rabin 1972; Benrimoj and Chua 1990; Ryan *et al*. 2001; Finnish Statistics on Medicines 2001). Use of prescribed and nonprescribed medicines is often more common in urban environments (Eggen 1997; Del Rio *et al*. 1997; Figueiras *et al*. 2000). In Germany, the use of OTC medicines was more common in individuals in the area of earlier West-Germany than in those from earlier East-Germany and in larger towns (Uehleke and Steinhoff 2002; Beitz *et al*. 2004). Especially in the early 1980s, the use of vitamins was most frequent in urban populations (Klaukka *et al*. 1985). The male conscripts' vitamin use was not associated with a brigade (III).

Variation in the use of medicines may reflect differences in the lifestyle in regions with different urbanization level (Dean 1989; Smith 1989; Karvonen *et al.* 1999; Figueiras *et al.* 2000; Dwyer *et al.* 2001). In addition, medicine use might also be associated with local accesability of pharmaceutical services and following experience and consumption of medicines. Although the pharmacy density per an inhabitant is quite constant in all regions of Finland, the geographical density of pharmacies (pharmacy outlets/1000 km^2) is much lower in the North than in other areas of Finland (National Agency for Medicines 2004).

Education and socioeconomic status

In our studies of overall medicine use (I,IV), the use of prescribed medicines was not associated with a respondent's education level. On the contrary, the use of nonprescribed medicines was more frequent among the female conscripts with higher education (IV), but not among the men (I). Male conscripts' self-medication for pain or common cold symptoms was most prevalent among those with midlevel education (II).

In the literature, there is a discrepancy in the findings of the effect of education as well as income level and socioeconomic status on medicine use. Studies on these associations are challenging due to strong interrelationships between these and other socio- and demographic factors (Johnson and Pope 1983; Klaukka and Martikainen 2003). Some studies have suggested that education has a stronger predictive value for health in general than income or occupation (Rahkonen *et al*. 1995; West *et al*. 1997; Henricson *et al.* 1998; Tuinstra *et al*. 1998). Among the female conscripts (IV), those with a higher education level reported more frequently the use of nonprescribed medicines which in accordance with the observations in civilian populations (Benrimoj and Chua 1990; Arinen *et al.* 1998; Itterman *et al.* 2003; Beitz *et al*. 2004).

Along with brigade and the occurrence of considerable or severe physical pains, the father's higher education level predicted the use of stimulants such as caffeine tablets (II). Father's education level was also associated with the use of vitamins (III). The effect of the father's education level on these medication patterns, and lack of the

effects of the respondent's own or his mother's education level, may demonstrate medication habits learned from home, or possibly the socioeconomic status of the family (Bush and Iannotti 1988; Rahkonen and Hemminki 1988; Kim and Keen 1999; Holstein *et al.* 2004). The present association is also in accordance with an earlier finding that 63% of Finnish 14–18-year-old men see their father as a source of medication information while only 34% recognize that source (Hämeen-Anttila el al. 2005). Interestingly, the mother's education level did no predict any category of self-medication, although the role of mothers is suggested to affect the patterns of medication use of other family members (Maiman *et al.* 1986; Portner 1991; Menacker *et al.* 1999). Approximately 90% of Finnish adolescent men and women name their mother as a source of medication information (Hämeen-Anttila *et al.* 2005).

Persons with higher education probably have more knowledge of medicines and health care, and they may have more self-confidence in resolving minor health problems by themselves (Figueiras *et al.* 2000). They commonly have a more positive attitude to medicines, but, on the other hand, some of them have a very critical view of them or even find them dangerous (Isacson and Bingefors 2002). Positive attitudes and expectations towards self-medication predict self-medication and satisfaction with medicine use (Johnson and Pope 1983; Benrimoj and Chua 1990; Chinburapa and Larson 1990; Ho *et al.* 1997; Schafheutle *et al.* 2001). The involvement with the choice of OTC medicines is suggested to be weaker among individuals with higher education or incomes that may be understood by lower perceived risk of this decision due to the certainty provided by a better economic situation, knowledge of health issues and experience of independent decision-making in general (Gore *et al.* 1994).

Both in the lowest and highest education groups, self-medication may reflect a critical attitude towards physicians and other health care providers as well as rejecting the role of a patient (Leibowitz 1989). In accordance, self-medication is often seen to be more common among individuals with higher education (Johnson and Pope 1983; Fleming *et al.* 1984; Leibowitz 1989; van der Meer *et al.* 1996; Figueiras *et al.* 2000; Itterman *et al.* 2003; Beitz *et al.* 2004), and vitamin use is most prevalent among individuals with higher education (Jylhä 1994; Klaukka *et al.* 1985). Education is also shown to increases positive attitudes to the medication changes by a pharmacist (Bradley *et al.* 1998).

Use of prescribed medicine is less frequent in men with mid-level education when their health is taken into account, but there was no association between education and use prescribed or nonprescribed medicines in women (Nielsen *et al.* 2003). A low education level is associated with the use of OTC and prescribed analgesics (Turunen *et al.* 2005) as well as of strong analgesics (Eggen 1996)

Literature provides fluctuating examples of an association between overalluse of medicines and socioeconomic status in the adolescence. Accroding to Holstein *et al.* (2000), adolescents' use of medicines increases with decreasing socioeconomic status of

the family. In the studies by Rylance *et al*. (1988) and Perquin *et al*. (2000) this association was not detected, and even reverse results exist (Maiman *et al*. 1986). Among 14–21-year-old adolescents, Tobi *et al*. (2001 and 2003) found no association between socioeconomic status and use of prescribed medicines was present. Among the men, however, a higher socioeconomic level was related to the more common use of OTC medicines (Tobi *et al.* 2001 and 2003), which is in accordance with other reports (Tobi ym 2003; West 1997; Rahkonen *et al.* 1987; Rahkonen *et al.* 1995; Jaquier *et al.* 1998; Tuinstra *et al.* 1998). Staples and Bravander (2002) have reported that adherence to medication used in the treatment of a chronic illness is higher in adolescents with socioeconomic status.

Health problems are often more prevalent in lower social groups and this is in turn proposed to explain at least part of the more common use of medicines in these groups (Rabin 1972; van der Meer *et al.* 1996; Del Rio *et al.* 1997; Berntsson *et al*. 2001; Nielsen *et al.* 2003). The often found bimodal distribution of medicine use by income may reflect different objectives of medicine use; in the segments with low income people may try avoid the extra expenses caused by consulting health care while in the high income segments self-medication can be seen as a safe and feasible way to treat ailments instead of using time for visits to health care, and on the other hand, it may reflect their proneness to react more sensitively to minor symptoms (Verbrugge and Ascione 1987; Leibowitz 1989; Vuckovic and Nichter 1997; Lumme-Sandt 2002). There might also be more trust in the expertise and authority of the professional health care providers among persons with lower incomes (Figueiras *et al.* 2000). In the USA and in France in the late 1960s, prescription medication use was clearly most prevalent in the lowest and highest income categories (Rabin 1972). Further, a higher income level predicted more prevalent self-medication (Johnson and Pope 1983; Benrimoj and Chua 1990; Northcott and Bachynsky 1993). In Finland, use of prescribed medicines is seen to be inversely related to the income level (Klaukka 2005). The most positive attitude to medicines is found in individuals with a mid-level income (Isacson and Bingefors 2002).

Use of medicines is also found to be associated with an individual's occupation. Although the effects of age, gender and health status were adjusted, retired persons used regular medications and frequently analgesics more often (Nielsen *et al.* 2002; Turunen *et al.* 2005). People who live alone or are divorced use more self-medication than others (Segall 1990; Figueiras *et al.* 2000; Beitz *et al.* 2004). Several differences in the habits of medicine use have been linked with race and ethnic background (Bush and Osterweis 1978; Fillenbaum *et al.* 1993; Lieue *et al.* 1993; Smith *et al.* 1999; Holstein *et al.* 2005).

In our study on self-medication (II), overall self-medication was not associated with a male conscript's education level, but self-medication for pain or common cold symptoms was most prevalent among the conscripts with a mid-level education. Among the female conscripts (IV), nonprescribed medicines were more often used by the

respondents with higher education. Under civilian circumstances, higher socioeconomic status in men, but not in women, is associated with use of OTC analgesics (Antonov and Isacson 1998).

6.3.2 Need variables

Need variables are often the most important predictors for the use of medicines or other health care services (Rabin 1972; Fillenbaum *et al*. 1974; Bush and Osterweis 1978; Fleming *et al*. 1984; Verbrugge 1989; Eggen 1993; Andersen 1995; Furu *et al*. 1997; Antonov and Isacson 1998; Andersson *et al*. 1999; Turunen *et al.* 2005). Need is based on an individual's subjective perception of illness or its symptoms or a health care professional's diagnosis.

The use of medicines is a very common means of treating ailments. Thus, as expected, poor perceived health is often associated with medicine use and/or consulting health professionals (Fleming *et al*. 1984; Furu 1997; Verbrugge and Ascione 1987; Benrimoj and Chua 1990; Antonov and Isacson 1996; Bédard *et al*. 1997; Lau *et al.* 2000). For example, self-evaluated health status often predicts the use of nonprescribed medicines (Johson and Rope 1983; Benrimoj and Chua 1990; Itterman *et al*. 2003). According to Itterman *et al*. (2003), objectively measured poorer physical or mental health was associated with more common self-medication. On the hand, individuals with the best objective measured health may also actively treat their symptoms, which can be understood on the basis of their probably more health-oriented lifestyle or their more sensitive way of reacting to the symptoms (Verbrugge and Ascione 1987; Dean 1989). Acute moderate symptoms were most actively treated by the individuals with the best and poorest health (Verbrugge and Ascione 1987). In Sweden, self-medication was associated with poor physical condition, but not with poor perceived health in general. Among men, poor perceived health increased consumption of both prescribed and nonprescribed analgesics, among women only of prescribed ones (Antonov and Isacson 1998).

Parallel to older population groups, among adolescents, need factors associated with health status are strong predictors for the use of prescribed and nonprescribed medicines (Stoelben *et al*. 2000; Tobi *et al*. 2003). For example, in Finnish 12–18-year-olds, use of medicines was associated with low perceived health, chronic illnesses and number of symptoms (Rahkonen *et al*. 1987). According to Dengler and Roberts (1996), a chronic illness clearly predicted the use of prescribed medication in the adolescents. Further, self-medication was predicted by poor self-reported health, accidents in the last 6 months, depression symptoms, and among young women a chronic illness. In a Swiss study among the adolescents (Stoller 1998), self-medication was associated with the occurrence of symptoms such as headache, airway symptoms, and sleeplessness as well

as with social behaviors, *e.g.*, experiments with illegal drugs or social problems in the family.

Among the female conscripts (IV), poor or moderate health status was slightly associated with the more prevalent use of prescribed medicines that could be understood on the basis of medical needs treated with prescribed medication. In the study on the overall medicine use among male conscripts (I), need variables such as pain level or perceived health were not included as background variables. On the contrary, among the male conscripts (II), the occurrence of pain predicted self-medication for pain and common cold symptoms and self-medication with caffeine tablets. The latter association may indicate, for example, sleeping disorders that may indicate health problems that may set an individual, for example, at risk of accident (Horne and Reyner 1995; Härmä and Sallinen 2000). Interestingly, self-medication for pain and for common cold symptoms was more prevalent among the conscripts with better perceived health-status.

Lack of need variables in the predictive model for vitamin use (III) is in accordance with common observations that these products are mostly used for enhancing health and preventing illness, not for treating symptoms (Thomsen 1987; Collin and Laurier 2002; Nilsson *et al*. 2001; Pommier *et al*. 2002). Vitamin use is also often suggested to be part a health-oriented lifestyle (Klaukka 1999; Dwyer *et al.* 2001) and is supported by the present study finding that is was associated with active exercising.

Psychological stress often increases the use of health care services (Svarstad 1983; Greene *et al*. 1985) and it may cause or contribute to morbidity and somatic symptoms that, in turn, may cause more distress. The present multivariate analyses on the self-medication of male conscripts (II,III) did not show associations with background variables indicating psychological or social problems. However, the bivariate analyses suggested that men using caffeine tablets or other stimulants as self-medication had more often self-reported psychological symptoms (such as sleep disorders, depression or anxiety), whereas those with self-medication for pain or common cold symptoms had had more often major life events and more often reported social restrictions than other conscripts. These observations and the association between occurrence of pain and the use of caffeine tablets or other stimulants suggest possible risks in these conscripts' self-medication.

Medicine use is a means with which an individual can try to manage with psychological symptoms (Dean 1989; Ahonen *et al*. 1991; Ledoux *et al*. 1994; Stoller 1988; Charlton 2005). Psychological or social problems, such as feeling that one is not able to manage with normal life or being unsatisfied with life in general, are associated with use of medicines, in particular with psychotropic ones (Takala 1993; Furu *et al*. 1997; Barlow 2005). Work related stress, for example, is shown to increase medicine use in general (Gordon *et al*. 1986; Vinet *et al*. 1989; Kristensen 1991; Pelfrene *et al*. 2004), and it is suggested that OTC analgesics might be used for psychological

symptoms such as stress (Ahonen *et al*. 1991; Abbott and Fraser 1998; Mitka 2004; Charlton 2005). Turunen *et al*. (2005) have recently found that frequent use of analgesics is associated with low mood. Along with work or study-related distress, difficulties with family increase overall use of medicines, and in particular, use of psychotropic medicines (Lapeyre-Mestre 1999; Cabrita *et al*. 2004). Stress increases use of OTC analagesics in men and women and of OTC antacids in men (Svarstad 1983). Psychological stress is associated with self-medication even though the effects of sociodemographic factors, attitude factors and health status are taken into account (Svarstad 1983). According to a Finnish study (Turunen *et al.* 2005), low mood is associated with use of prescribed and nonprescribed analgesics. Among all OTC medicine users, the prevalence of aches, and with psychological symptoms such as feelings of depression, irritability or anxiety is higher than among others (Al-Windi *et al*. 2000; Itterman *et al*. 2003). Use of analgesics, antacids and laxatives is more prevalent among individuals with increased stress, recent major life events, or psychological symptoms such as anxiety, depression, or sleeplessness (Cummings *et al*. 1974; Svarstad 1983). The possible association, for example, between laxative use and stress may partly be understood as the neurophysiological effects of stress on the gastro-intestinal system (Martinez-Augustin *et al*. 2000).

Among adolescents, social stress is shown to be associated with frequent use of medicines (Stoelben *et al*. 2000). Among girls of the age of 12–18 year, problems in school increase medication use (Rahkonen *et al*. 1987). Further, among men of this age, medication use is least prevalent among those who had already finished school, and most prevalent among those in high school. In a 8-year longitudinal study in 19–27-year-old adolescents, the use of nonprescribed psychoactive preparations predicted latter use of prescribed ones (Fe Caces 1998). According to a Finnish study on young males (Rintanen 2000), frequent use of medicine was probably associated with potential educational problems at the early stage of adulthood. Among students, sleeping disorders are associated with minor psychiatric disorders and with prevalent use of analgesics (von Korff *et al*. 1988; Ahonen *et al*. 1991; Antonov and Isacson 1996; Hidalgo and Caumo 2002).

Although potential associations between psychological or social problems and self-medication – in particular self-medication with caffeine tablets or other stimulants, or self-medication for pain or for common cold symptoms probably mostly comprising OTC analgesic use – were not confirmed in multivariate analyses on the conscripts, the associations between potential psychological or social stressors and medicine use in the bivariate analyses underline the importance of dicusssions on medine use and drug information in the conscripts' health care.

6.3.3 Health behavior variables

Supplementary and concomitant medicine use

Self-medication may substitute for consulting a physician or using prescribed medicines (Bush and Rabin 1976; Benrimoj and Chua 1990; Stuart and Grana 1995; Eggen 1997; Furu *et al*. 1997; McIsaac *et al*. 1998; Stoller 1998). Literature shows considerable discrepancies in the associations between nonprescribed medicine use and prescribed medicine use or utilizing other health care services (*e.g.*, Rabin and Bush 1974; Bush and Rabin 1976; Bush and Osterweis 1978; Dean 1984; Palo Stoller 1988 Benrimoj and Chua 1990; Northcott and Bachynsky 1993; Campbell and Roland 1996). For example, in Norway, use of nonprescribed medicines was associated with less frequent physician visits and following less frequent use of prescribed medicines (Verbrugge and Ascione 1987). On the other hand, frequent visits to a physician were associated with less frequent use of OTC pain killers in a Finnish rural population (Ahonen *et al*. 1991). In a recent Swedish study, frequent physician visits were associated with use of both prescribed and nonprescribed analgesics in men but not in women (Antonov and Isacson 1998).

In the study on the male conscripts' overall use of prescribed and nonprescribed medicines (I), the recent concomitant use of prescribed and nonprescribed medicines was associated among men. This and the increasing number of the used nonprescribed medicines by the number of the used prescribed ones would suggest that use of nonprescribed and prescribed medicines would be supplementary. More frequent nonprescribed analgesic use before military service among the medicine users can be explained by medical troubles that continue during the conscription or by habitual use. Medical needs likely also explain the more common prescribed medicine use in the male conscripts in the lower fitness category B and ones with frequent visits to a physician before the military service.

Life-style and health behavior variables

Parallel to effects of sociodemographic factors on medication use, the effects of life style and health behavior factors are often complicated due to many interactions. However, life-style factors such as exercising or self-care practices or previous use of health care services may also be important predictors for medicine use. For example, preventive medicine use, such as vitamin use, is widely associated with a healthy life-style (Collin *et al*. 2000; Dwyer *et al*. 2001; Nilsson *et al*. 2001). Positive health activities, as well as many harmful health behaviors, often accumulate in the same individuals (Dean 1989; Furu *et al*. 1997; Glied and Pine 2002). For example, high alcohol intake is associated with high medicine consumption in men, and outdoor activities with lower use of medicines in both sexes (Furu *et al*. 1997).

As expected, frequent physician visits, probably indicating medical problems, predicted prescribed medicine use, and frequent pharmacy visits nonprescribed medicine use in general among the male conscripts (I). Further among the men, both frequent physician and pharmacy visits were associated with overall self-medication, self-medication for pain and common cold symptoms (II). This is in accordance with an earlier finding that civilian individuals' use of analgesics is associated with visits to a physician (Ahonen *et al*. 1991; Eggen 1996; Antonov and Isacson 1998). Among the male conscripts, physician and pharmacy visits were also associated with use of vitamins, which may reflect medical needs or susceptibility to use these services. In the female conscripts (IV), the use of prescribed medicines was associated with drug experiments during their life-time, frequent visits to a physician, and possibly, to poor or moderate self-perceived health status. Further, frequent intensive alcohol intake was associated with use of nonprescribed medicines. These associations were likely at least to some extent based on medical troubles or risky health behaviors among these individuals (Viner and Macfarlane 2005).

Exercising and going in sports are often associated with less frequent medication use (Jylhä *et al*. 1994; Furu *et al*. 1997); for instance, in civilian men active exercising is associated with low use of analgesics (Eggen 1993). On the other hand, among adolescents, going in sports is associated with more common use of medicines (Rahkonen *et al*. 1987). Overweight is associated with use of prescribed medicines and analgesics (Hemminki *et al*. 1989; Antonov and Isacson 1998). Of the effect of smoking, controversial findings exist (Eggen 1993; Furu *et al*. 1997). For example, smoking is shown to be associated with women's use of prescribed and nonprescribed medicines (Antonov and Isacson 1998). Among men, smoking is reported to predict use of psychotropic medicines (Skurtveit *et al.* 2005). In a Finnish study among adolescents with a chronic disease, adolescents with health-oriented lifestyle, such as regular exercising, less smoking and alcohol consumption, had higher compliance to their medications (Kyngäs 2000). In an earlier US study (Krupka *et al*. 1987), use of OTC analgesics was associated with alcohol consumption, smoking, and use of illegal drugs. Use of alcohol may partly be associated with pain, and thus be one kind of "self-medication" substituting therapeutic alternatives. For example, frequent intensive alcohol intake was associated with use of medicines in men, but not in women (Furu *et al*. 1997). In Finnish adolescent women of the age of 12–18-year-old, use of alcohol and smoking were associated with medication use (Rahkonen *et al*. 1987) that may partly be in accordance with an earlier observation (Rimpelä *et al*. 1980) that health of adolescents who smoke or use alcohol is often poorer than the average. Use of illegal drugs is often shown to be associated with off-label use prescribed psychoactive prescribed medicines and anabolic steroids (*e.g.,* Poulin 2001; Nilsson *et al.* 2005).

Health behavior variables predicting stimulant and vitamin use may illustrate those men's lifestyle in general (II,III). According to the multivariate analyses, for

example, attending first aid education was associated with overall self-medication, and active exercising with vitamin use. Frequent television watching among the users of self-medications for pain or common cold symptoms (II) may be in association with those individuals' less healthier lifestyle or poorer health status (Straus *et al.* 2001; Hancox *et al.* 2004; Van de Bulck *et al.* 2005). Both the use of caffeine tablets or other nonprescribed stimulants (II) and of vitamins (III) were associated with illegal drug use during lifetime. Also among the female conscripts (IV), experiments with illegal drugs were associated with prescribed medicine use. These observations may reflect those conscripts' interest in illegal and legal drugs and medicines in general. Further, according to the bivariate analyses, vitamin use was more common among the men who were from urban civilian living area, used snuff, brushed their teeth frequently and who reported social restrictions caused by physical or mental health problems (III).

6.4 Perceived knowledge of medicine use and attitudes towards drug information campaign in male conscripts (V)

Most people have a positive attitude to prescription-only and OTC medicines and find them useful (Busson *et al*. 1986; Cady *et al*. 1989; Bardley *et al*. 1998; Lumme-Sandt 2002; Isacson and Bingefors 2002; PAGB 2005). Most medicine users also have a positive attitude towards drug information (Culbertson *et al*. 1988; Airaksinen *et al*. 1993; Cordina *et al*. 1998; Erickson *et al*. 1998; Åström *et al*. 2000; Katajavuori *et al.* 2002; Stergachis *et al*. 2002). In Finland (Airaksinen *et al*. 1993), approximately two-thirds of pharmacy customers would like to have drug information without request, and approximately a third with a request. Of all medicine users, 60% would like to receive more drug information than provided. In accordance, two-thirds of the US users of prescribed medicines were interested in receiving drug information (Erickson *et al*. 1998). Only 15% of the US medicine users who had not received drug information saw it unnecessary (NCPIE 2002). Despite of the positive attitude towards drug information, however, medicine purchasers seldom ask independently for further information about their medicines (Busson and Dunn 1986; Portner 1991; Taylor 1994; Hassell *et al*. 1998; Katajavuori *et al*. 2002). For example, only 6% of Finnish users of prescribed medicines ask independently for further information in a pharmacy (Airaksinen *et al*. 1998). The spontaneous questions on medicine use are often crucial for successful management of the therapy (Snellman *et al*. 1998).

Drug information is most often given to women and older individuals (Sleath *et al*. 2001). Men are shown to receive less frequently drug information from a pharmacy than women (Pesonen *et al*. 2003). Further, older men seldom ask for further information about their medicines (Airaksinen *et al*. 1993). Women are also more influenced by drug information provided by a pharmacist; for example, advice regarding

a choice of an OTC medicine in a pharmacy has a stronger effect among women than men (Cordina *et al*. 1998). Also earlier experience with medicine and occurrence of adverse effects increase patients' interest in drug information (May 1986; Laaksonen *et al*. 2002). Further, higher education and socioeconomic level contribute receiving of drug information (Åström *et al*. 2000). In Finland (Talvia *et al*. 2002), however, the effect of education level was not found. The convenience, expense, and time consumed to need to find drug information score in the choice of drug information source (Portner and Smith 1994; Gray *et al*. 2002).

At a physician's office, 60% of patients report to have used their medicines against instructions (Sleath *et al*. 2000). The most typical reasons for the improper medicine use are: medication was finished, it was forgotten to take, and uncertainty with dosing or with the use in general. Regarding OTC medicines, the most prevalent problems in the medication use are uncertainty with the indication (34% of all customers with detected problems with OTC medications), poor outcome of the treatment (20%), and for 5–9% contradictions as well as overuse or abuse of the medicine. In the US, 70% of the respondents sometimes use OTC medicine in higher doses than instructed (NCPIE 2002). Further, only a third (34%) of the users of OTC medicines pay attention to the active ingredient of the preparation, a half (51%) read the instructions and only a fifth (21%) the warnings in the package insert when first time purchasing the preparation. Of the US Army dental patients, only 51% were able or willing to report the names of prescribed medicines they had used in the last 6 month, and as few as 45% of them were able to recall the dosing of those medicines (Stahl and Kerns 2002).

Poor knowledge of medicine use may be based on patients' low basic knowledge on health issues, their few earlier experiences with medicines and lack of interest in drug information (Airaksinen *et al*. 1994; Hayes 1994; Kjellgren *et al*. 1998; Ward *et al*. 2000; Sleath *et al*. 2001; Hughes *et al*. 2002; Katajavuori 2002; Bjerrum and Foged 2003; Koo *et al*. 2003) Drug information may also be delivered in an inadequate way; it may be delivered insufficiently or too excessively, it may contain too professional terms, and the communication skills of the health professional may also be limited (Kjellgren *et al*. 1998; Peremans *et al*. 2000; Elwyn *et al*. 2003; Stevenson 2003; Calnan and Sanford 2004).

The "Medication information for conscripts" campaign in January 1999 (V) was well accepted by the conscripts. The results suggest that the male conscripts were interested in drug information and find it useful; almost three-quarters (73%) of the participants found it useful. Half of the men reported receiving new general information of medicine use; of the possible effects of medicines on awareness or functioning, 71% had received new information, and 89% of the risks of concomitant use of medicines and alcohol. These results are supported by an earlier finding that adolescents and young adults are interested in medicine information in general, and in particular, young

men in the effects of mixed use of alcohol and medicines (Howard *et al*. 1999; Ackard *et al*. 2001; Conard *et al.* 2002; Dundee *et al*. 2003). The conscripts who saw that they did not have enough general information of medicine use before the campaign most frequently evaluated it useful. In accordance, the individuals receiving new information from the campaign judged it most commonly useful.

The general knowledge of medicine use seemed to be limited among the male conscripts. Although over 80% perceived they have enough information of these issues before the campaign, even approximately 70–90% of the conscripts reported that they received new information of the short campaign event on the basics of medicine use, and approximately 25% gave a wrong answer on the post-campaign question regarding the practical implication of the red warning triangle at the medicine package. These results suggest that the objective knowledge of medicine and their proper use in the young men is limited which is in accordance with the literature (Zerr 1982; Bush *et al.* 1999; Stoelben *et al.* 2000).

The men who used prescribed medicines during the last 2 weeks found the campaign less frequently beneficial. This may be based on their previous experience and drug information of the medicines they have used (Stoelben *et al.* 2000). Alternatively, this may indicate those individuals lower interest in drug information or health issues in general (Griffith *et al.* 1999; Pommier *et al.* 2002). Instead, limited knowledge of medicine use before the campaign was associated with the respondent's lower fitness category B, previous inpatient days, and recent self-medication. Recent use of prescribed medicines was not associated with sufficient pre-campaign knowledge of medicine use. These observations address the need to aim drug information at the individuals using medicines, in particular prescribed ones.

As expected, drug information campaign was more frequently found beneficial by the individuals with health behaviors likely indicating a more health-oriented lifestyle. The behaviors included active exercising, vitamin use, visits to a pharmacy for self-medication, less frequent use of snuff, prescription medicines or self-medication for insomnia or anxiety. The campaign was also perceived less frequently beneficial among the men from urban areas and with the lowest education level. These associations may reflect differencies in the attitudes towards drug information or in lifestyle of individuals from different living environments (Culbertson *et al.* 1988; Karvonen *et al*. 1999; Sleath *et al*. 2001; Talvia *et al.* 2002; Pesonen *et al.* 2003;).

Despite the prevalent positive attitude towards the drug information campaign and receiving new information, the clinical effectiveness of the small interventions of this kind is often very limited (Zerr 1982; Bettinghaus 1986; Coons *et al.* 1989; Nutbeam 1993; Orme and Starkey 1999; Richmond *et al.* 1999; Brown *et al.* 2000; Grilli *et al.* 2001).

The findings in the present study address the importance of including the basic package of drug information in the health education aimed at conscripts, and above all,

the importance of the appropriate drug information in contacts between conscripts and heath care professionals.

7. CONCLUSIONS

On the basis of the results of the present study, the following conclusions can be drawn:

- Use of prescribed and nonprescribed medicines was prevalent among Finnish male and female conscripts. Of the male conscripts, 71% had used medicines during 2 weeks in February 1999, and 61% of the female conscripts in April 1999.
- Conscripts used prescribed medicines more frequently than nonprescribed ones. In February 1999, 60% of the male conscripts used prescribed medicines and 42% nonprescribed ones. Of all males, 15% used solely nonprescribed medicines. Of the female conscripts, 44% used prescribed medicines and 31% nonprescribed ones during 2 weeks in April 1999.
- Of the male conscripts, 65% reported self-medication for the suggested indications during 2 weeks in July 1999 including the use of vitamins or minerals by 20%. Most of the self-medication was for pain or common cold symptoms (54% of all respondents) or cough. In April 1999, 79% of the female conscripts reported self-medication and during 2 weeks. Use of caffeine tablets or other stimulants was claimed by approximately 9% of the male and female conscripts.
- OTC analgesics were used by 63% of male conscripts in February 1999 and by 71% of women conscripts in April 1999. At least a couple times a week these medicines were used by 39% and 28%, respectively. Ibuprofen products dominated the use of OTC analgesics.
- The type of the study questions strongly affected the prevalence of medicine use detected (*i.e.*, open questions vs. questions with suggested indications or with medicine brand names). This suggests that the prevalence of nonprescribed medicine use examined with direct questions would present an underestimate of real nonprescribed medicine use.
- Comparisons with civilian medicine use studies suggest that overall medicine use and self-medication, in particular the use of OTC analgesics, in the male and female conscripts was at least as prevalent as in their civilian counterparts.
- Among the male conscripts, overall use of prescribed and nonprescribed medicines was associated with the respondent's brigade and variables related to recent medicine use and other health behavior. Among the female conscripts, use of prescribed medicines was associated with the respondent’s perceived health, frequent physician visits and experiments wit illegal drugs. Nonprescribed medicine use was associated with education level and binge drinking.
- Overall self-medication and self-medication for specific indications in the males was associated with the respondent's predisposing and health behavior variables. Contrary to the self-medication for pain or common cold symptoms or self-

medication with caffeine tablets or other stimulants, the overall self-medication or the use of vitamins or minerals was not associated with need variables such as occurrence of pain or self-perceived health. Associations between risky health behaviors and medicine use suggest potential health risks or may reflect psychological or social problems among few conscripts.

- Prescribed medicines were mostly obtained from the health care of the Finnish Defence Forces while most of nonprescribed medicines were acquired from civilian sources.
- Independent self-medication was mostly acquired from civilian pharmacies or it was provided by parents.
- In general, the conscripts had a positive attitude towards drug information. Most of them reported sufficient self-evaluated knowledge of medicines. However, a short lecture on the basic drug information provided new and useful information for most of the conscripts. The attitudes to drug information were affected by the respondent's previous medicine use and sociodemographic factors.
- The results of the study underline the importance of medical and pharmaceutical services as well as sufficient drug information to conscripts.

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APPENDIX I

List of the dependent and independent variables in the studies I-V.

Study	Dependent variables	Independent variables
I	1 Use[a] of 1.1 Prescribed medicines from the FDF health care; 1.2 Prescribed medicines from civilian sources; 1.3 Nonprescribed medicines from the FDF health care; 1.4 Nonpresciebd medicines from civilian sources 2 Overall medicine use[a] (yes, if any of 1a-d reported) 3 Use[a] of 3.1 Prescribed medicines (yes, if 1.1 or 1.2 reported); 3.2 Nonprescribed medicines (yes, if 1.3 or 1.4 reported) 4 Use[a] of 4.1 Medicines from the FDF health care (yes, if 1.1 or 1.3 reported); 4.2 Medicines from civilian sources (yes, if 1.2 or 1.4 reported) 5 Use[a] of OTC analgesics: 5.1 The following active ingredients (asked with brand names): *ibuprofen,* *aspirin,* *paracetamol,* *ketoprofen products,* *combined products,* *other analgesics.* 5.2 The main indication these OTC medicine with the following options: *headache,* *muscle or joint pain,* *symptoms of common cold,* *other aches,* *other purpose,* *not used.* 5.3 Frequency of the use of the most used OTC analgesic	Respondent's: 1 Sociodemographic background variables: *brigade,* *age,* *civilian living area,* *education level,* *military fitness category* 2 Health behavior variables: *recent concomitant use of prescribed and nonprescribed medicines,* *frequent OTC analgesic use before military service,* *smoking,* *snuff use,* *binge drinking,* *exercising,* *use of civilian health service before military services (visits to a physician, nurse, dentist, hospital emergency department, pharmacy, physiotherapy)*

	6 Use[a] of self-medication (yes, if reported use of medicines obtained without a visit to a physician on at least one of the following indications: *headache,* *symptoms pf common cold (flu, fever or sore throat),* *other ache (muscle, joint or toothache),* *cough,* *skin troubles or yeast,* *sleeplessness or anxiety,* *self-medication with stimulants (e.g., caffeine tablets),* *stomach ache or constipation,* *use of vitamins or minerals,* *for other indication.*	
II	1 Use[a] of self-medication: see study I (dependent variable 6)	Respondent's: 1 Predisposing variables: *age,* *marital status,* *education level,* *father's education level,* *mother's education level,* *childhood family relations (number of parents),* *unemployment history,* *military fitness category,* *brigade,* *civilian living area* 2 Need variables: *self-estimated health status,* *sleep disorders,* *depression,* *major life events in the last 12 months,* *subjective opinion of own ability to complete military service,* *social limitations caused by a respondent's physical or mental health,* *effect of physical health problems on working efficiency or completing everyday tasks,* *effect of mental health problems on working efficiency or completing everyday tasks* 3 Health behavior variables: *smoking,* *binge drinking,* *snuff use,* *own experience with illegal drugs,* *frequet tooth brushing,* *exercising,* *body mass index (kg/m^2, length and weight inquired),* *obtaining first aid education before military service,* *frequent TV watching,* *number of sex partners during lifetime,* *frequent use of health service before military services (visits to a physician, nurse, dentist, hospital emergency department, pharmacy, physiotherapy) in the last 6 months*
III	Use[a] of vitamins or minerals	See study II

IV	1 Use[a] of medicines: see study I (dependent variables 1-4) 2 Use[a] of self-medication: see study II (dependent variable 2) 3 Use[a] of OTC analgesics: see study I (dependent variable 5)	Respondent's: 1 Sociodemographic background variables: *age,* *civilian living area,* *education level,* *marital status,* *military command,* *military entry cohort* 2 Health status and health behavior variables: *self-estimated physical health status and mental health status, body mass index (kg/m^2, length and weight inquired),* *finding military service mentally stressful,* *satisfaction with civilian social contacts,* *smoking,* *frequent use of mild and strong alcoholic beverages,* *frequent bindge drinking,* *knows a user of illegal drugs,* *own experience with illegal drugs,* *frequent use of health services before military service (visits to a physician, nurse, dentist, hospital emergency department, pharmacy, physiotherapy) in the last 12 months*
V	1 Self-perceived sufficient knowledge of medicine use prior to the drug information campaign (yes/no) 2 Received new information of the use of medicines from the drug information campaign (yes/no) 3 Found the drug information campaign as beneficial (yes/no)	See Study I

[a] In the last 2 weeks (14 days)

ORIGINAL PUBLICATIONS

I Linden K, Jormanainen V, Kennedy LA, Pietilä K (2003) Prevalence and predictors of the medicine use in males during common military service in Finland. J Soc Adm Pharm 20: 172-81 and 259.

II Linden K, Jormanainen V, Swigonski NL, Pietilä K (2005) Self-medication among Finnish young men in the beginning of common military service. Pharmacoepidemiol Drug Saf 14: 193-201.

III Linden K, Jormanainen V, Pietilä K (2004) Varusmiespalvelusta aloittavien miesten vitamiinien käyttö. Sosiaalilääk Aikak 41: 118-27. [In Finnish, English summary: Use of vitamins among Finnish male conscripts. J Soc Med 41: 127.]

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