



**Inese Gobina**

**Chronic pain and  
associated factors  
in adolescents**

Summary of doctoral thesis  
Speciality – Public health and epidemiology

Scientific supervisor:  
Dr. med., Assoc. Prof. Anita Villerusa

Rīga, 2010



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**Approved reviewers:**

Dr. Med. Prof. Inara Logina (Riga Stradins University)

Dr. Med. Valdis Folkmanis (University of Latvia)

Dr. Med., Prof. Jurate Klumbiene (Lithuanian University of Health Sciences)



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Secretary of the Doctoral Board:

Dr habil. med., Prof. Līga Aberberga - Augškalne

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## **1. Introduction**

Chronic pain is one of the most frequent somatic health complaints of the adult population. The costs associated with its diagnosis and treatment are significant.<sup>1</sup> Comparatively little is known about chronic pain and associated risk factors in the adolescent population.

In its essence pain is a distinctly subjective phenomenon. Thus, the most valuable information in assessing pain (localization, duration, intensity, influence on daily activities etc.) in epidemiological studies, also among adolescent population, is that gained from the individual. In pain research subjective individual information can be considered the „golden standard”.<sup>2,3,4</sup>

The International Association of the Study of Pain (IASP) defines pain as „an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage”.<sup>5,6</sup> In this definition, which is widely used in pain research, attention is given towards subjective experience of pain regardless of its primary causes. Especially in the studies in general population, the case definition of chronic pain doesn't describe clinical diagnosis. Chronic pain is characterized by the heterogeneity in etiology and manifestation of symptoms; thereby, the chronic pain itself is a health problem and central focus of research.

Most studies on chronic pain include individuals who have sought their doctor's or pediatrician's advice. But this type of selection principle is not representative within the general adolescent population. The individuals in clinical settings may differ regarding several research parameters, for example, general health condition.<sup>7,8,9</sup> Research results show that in most cases adolescents do not seek medical attention in cases of chronic pain. However, health care utilization continues to be high for those adolescents seeking medical help because of chronic pain.<sup>10,11,12</sup>

Complaints of localized chronic pain are one of the most weekly health complaints among adolescents. Existing epidemiological research shows that on average of 20% – 50% of the adolescent population complains of some sort of chronic pain.<sup>12,13,14,15</sup> The results are subject to variations due to pain case definition as well as differences in research methods.

Existing European studies reveal an increase in the prevalence of chronic pain among adolescents over the last 20 years.<sup>16,17,18</sup> Chronic pain also at such a young age has a negative effect on quality of life and daily functioning.<sup>9,19,20,21</sup> Moreover, the

cohort studies suggest that complaints about chronic pain in childhood and adolescence result not only in the risk of chronic pain but also can lead to other chronic health disorders later in adulthood.<sup>8,22</sup>

There has been no research in Latvia on the prevalence of chronic pain and associated factors among adolescents. The information available from international studies on factors associated with chronic pain in adolescents is fairly limited and often contradictory, making mutual comparison difficult. The main research issue raised in this thesis is determining the prevalence of chronic headache, stomach ache and back pain among adolescents based on gender and analyzing the association of chronic pain with other health indicators and certain lifestyle and psychosocial factors.

## **2. Aim, Objectives and Hypotheses**

**Aim:** to study the prevalence of chronic headache, stomachache and backache and associated health, lifestyle and psychosocial factors in Latvian adolescents.

### **Objectives:**

1. To determine the prevalence of chronic headache, stomach ache and back pain in adolescents from 1994 – 2006.
2. To study the association between chronic pain and other indicators of adolescent health.
3. To determine the association between chronic pain and factors characteristic of adolescent lifestyle.
4. To study the association between chronic pain and psychosocial factors in the family and at school.
5. To assess the independent effect of health, lifestyle and psychosocial factors on chronic headache, stomach ache and back pain in adolescents adjusting by age and other health complaints in multiple logistic regression analysis.

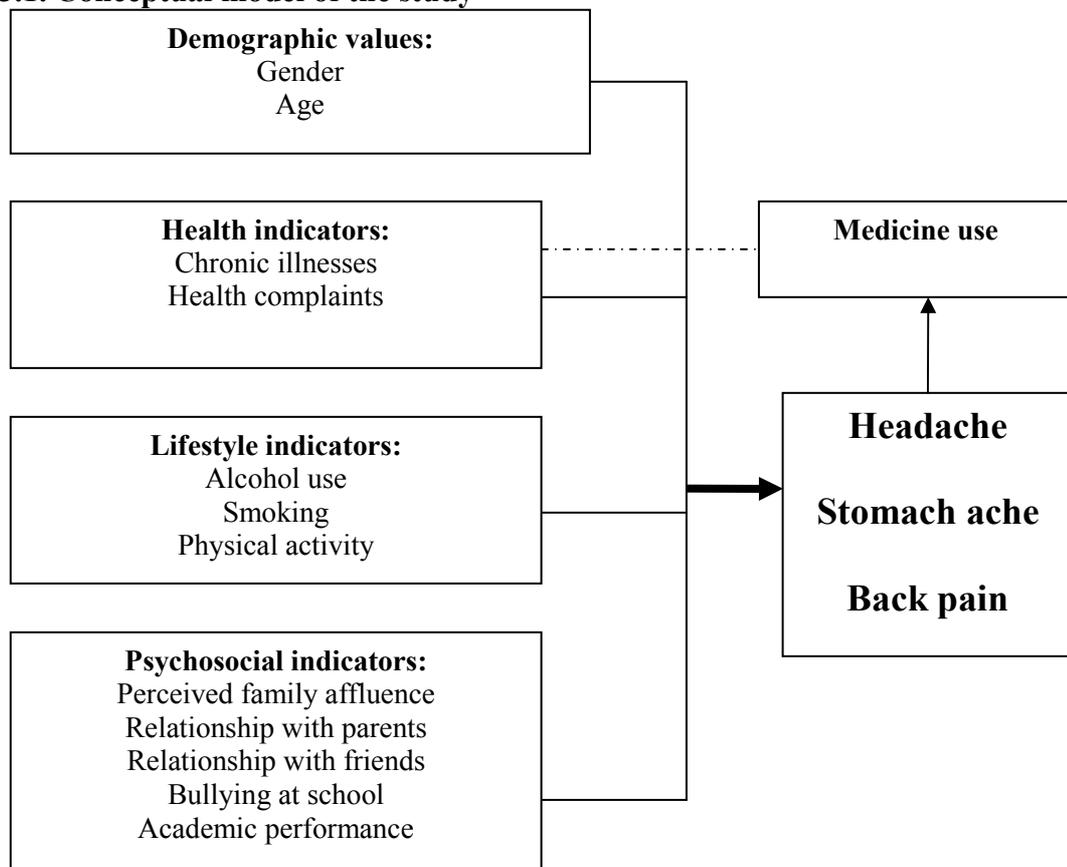
### **Hypotheses:**

- Chronic pain is related to adolescent lifestyle and psychosocial factors.
- The effect of factors associated with chronic pain differs among boys and girls.

### 3. Conceptual Model

The theoretical framework of this doctoral thesis is based on bio-psycho-social model of pain. According to this model, each individual's complaints of and reaction to pain is determined by a complex interaction of biological, psychological and social factors. Fig.3.1. shows the conceptual model of the study presented in the doctoral thesis.

**Fig. 3.1. Conceptual model of the study**



The main variable of interest in the study is chronic pain – headache, stomach ache and back pain. In this study chronic pain in adolescents is defined as pain that recurs at least once per week over a six-month period.

The associated factors of chronic pain studied in this study can be divided in three broad categories: (1) health, (2) lifestyle and (3) psychosocial. Age and gender were taken into account in statistical analysis as significant determinants for both

chronic pain and associated factors. In the statistical analysis the chronic pain is selected as the dependent variable with the only exception being the case of the association with medicine in which the chronic pain was chosen as the independent variable.

It should be noted that the study design used in the data analysis is a cross-sectional; hence it is not possible to prove the true direction of the associations and causality. The choice of independent or dependent study variables is based on the aim of the study, theoretical considerations as well as the results of other research studies. The true direction of associations notwithstanding, the measures of association between chronic pain and studied factors remains quantitatively unchanged.

#### ***4. Novelty and Practical Application***

This doctoral thesis presents the first study of the prevalence of chronic pain and associated factors among adolescents in Latvia. The data collected in the surveys of Health Behavior Study in School-aged Children (HBSC) in Latvia from 1994 – 2006 provides the basis for assessment of distribution trends of chronic pain among adolescents over a longer period of time.

An important advantage of this study is the considerable number of respondents (n = 15319) representing Latvian adolescents ages 11, 13 and 15. This number of respondents ensures sufficient statistical power for a stratified data analysis and testing for a statistical interaction, allowing a separate analysis of chronic pain factors in boys and girls as well as assessment of differences in age groups.

A multiple logistic regression analysis is used to assess the influence of factors associated with chronic pain. Logistic regression analysis allows the assessment of each factor (health, lifestyle, psychosocial) independent of other factors such as age and other health complaints. Such analysis of factors associated with chronic pain in different adolescent gender and age groups using appropriate statistical methods have not previously been carried out in Latvia and have been comparatively little studied as part of other international epidemiological studies.

The information gained by this study might have practical clinical application especially as part of primary health care in dealing with chronic pain problems in adolescents using a bio-psychosocial approach. The findings suggest the information

on adolescent psychosocial and lifestyle factors could be useful and important not only in diagnosing chronic pain, especially procuring anamnesis, but also in choosing the best and most effective chronic pain therapy for adolescents.

For the first time the problem of chronic pain among adolescents in Latvia is presented to public health professionals. The identification of factors associated with chronic pain in a representative sampling of adolescents in Latvia by using appropriate statistical methods ensures evidence-based information enabling the development of further public health programs that address the chronic pain issue in promoting health in adolescents.

## ***5. Structure of the Doctoral Thesis***

The doctoral thesis is written in Latvian. It consists of nine sections: the introduction, an overview of the literature, materials and methods, results, discussion, conclusions, scientific novelty and recommendations, the bibliography and addenda. The work consists of 200 pages and includes 63 tables and 15 figures; 266 sources are referred to in the doctoral thesis.

## ***6. Materials and Methods***

The data collected in the surveys of Health Behavior Study in School-aged Children in Latvia from 1994 – 2006 was used as the basis for the research. The Health Behavior in School-aged Children Study (HBSC) is an international school-based survey supported by the World Health Organization and includes 41 participant countries ([www.hbsc.org](http://www.hbsc.org)). Latvia joined the HBSC project in 1990/1991. The Principal Investigator of HBSC in Latvia from 1990 – 2000 was Prof. Ieva Ranka (Medical Academy of Latvia/Riga Stradins University) but from 2001 the Principal Investigator is Dr. Iveta Pudule (The Centre of Health Economics).

The study methods are standardized for all HBSC participant countries. The study design of HBSC is cross-sectional. The survey is carried out every 4 years. The target audience consists of general education students aged 11, 13 and 15. The standardized questionnaire prepared by the international scientific work group is used

as the method of measurement in this study. The HBSC surveys in Latvia were administered by specially trained personnel and ensured student anonymity and the right to refuse to answer the questionnaire. The time allotted for filling out the questionnaire was one classroom hour.

The surveys of HBSC Latvia were conducted with the support of the Ministry of Health, the Ministry of Science and Education and WHO Country Office in Latvia.

### *Sampling*

The data gained from four HBSC Latvia surveys conducted from 1994 – 2006 were used in the analysis. A representative selection of participants was achieved by using the multilevel cluster sampling with probability proportional to size selecting schools and classes at random from the Ministry of Science and Education school registry. The initial sampling included only general education schools, excluding schools for children with special needs and those whose teaching language is not Latvian or Russian. Classes were selected at random, one from each class group. The total number of adolescents studied from all the surveys conducted from 1994 – 2006 is 15319 (Table 6.1).

*Table 6.1. The number of respondents and response rate per HBSC surveys in Latvia*

<b>Survey year</b>	<b>Number of respondents</b>	<b>Response rate</b>
1993/1994	3818	92%
1997/1998	3775	94%
2001/2002	3481	80%
2005/2006	4245	82%

In further tables and figures the short form of the survey year is used showing only the last period of academic year.

### *Measurements*

In this study the association between chronic pain and the following factors was determined: 1) other health indicators such as other health complaints, chronic illnesses, medicine use; 2) specific lifestyle factors such as smoking, alcohol use, vigorous physical activity; 3) psychosocial factors such as perceived family affluence, relationship with family members and friends, bullying, academic achievement and academic stress.

The main variables revealed by results analysis are headache, stomach ache and back pain. **Frequency of pain** was assessed based on health complaints over the last six months on a five point scale – „*almost every day*”, „*more than once a week*”, „*almost every week*”, „*almost every month*”, and „*seldom or never*”. The proportion of students not answering based on type of pain is between 1% and 1.7% (Addendum 1). Those respondents who complained of pain at least once a week over the last six months fit the definition of chronic pain used in this study.

Other health indicators considered as possibly associated with chronic pain in adolescents included other health complaints, chronic illness and use of medication. **Health complaints** were measured with HBSC Symptom Check List and included the frequency of irritability or bad temper, anxiety, difficulty falling asleep, and dizziness over the last six months, with the respondents commenting on each complaint separately. The same answer categories were used as for pains. The frequency of health complaints was dichotomized for the purpose of data analysis as in the case of pain – adolescents having health complaints weekly or rarely/never.

In order to determine the prevalence of **chronic illnesses**, the respondents were asked to respond with a „yes” or „no” based only on a doctor’s diagnosis of chronic illness. The relationship between chronic pain and chronic illness was analyzed using 2006 survey results (n = 4245) since the question of chronic illnesses was not included in the other surveys. **Use of medication** among adolescents was determined by asking about use of medication over the last month for a) headache, b) stomach ache, c) anxiety, and d) difficulty falling asleep by answering „yes” or „no”. The relationship between chronic pain and use of medication was analyzed using 1994, 1998 and 2006 survey results (n = 11838).

Considering the comparability of the items in the questionnaire of the HBSC surveys in Latvia from 1994 – 2006 (n = 15319), the lifestyle factors selected for assessment as related to chronic pain were smoking, alcohol use and vigorous physical activity. Students who **smoke** or **use alcohol** (beer and/or wine and/or spirits) every day or at least once a week were analyzed. Sufficient **vigorous physical activity** was defined as participating at least 2 – 3 times per week at least one hour per week in the physical activities that produce sweat and hard breathing. [26]

Considering the comparability of the used questions in the HBSC surveys in Latvia from 1994 – 2006 (n = 15319), the following psychosocial factors were selected for data analysis: the student’s subjective assessment of his family’s

affluence, communication with friends and parents, and school associated factors such as academic achievement, academic stress and bullying. The **perceived family's affluence** was used to define the socioeconomic condition of adolescents. Adolescents were asked about how well-off their families are with answer categories: “*very well-off*”, “*quite well-off*”, “*average*”, “*not so well-off*” and “*not at all well-off*”. The data analysis with combining the first and last two answer categories resulted in three groups of respondents rating their family's affluence level as (1) high, (2) middle, and (3) low.

In order to measure the **family and friends communication**, the respondents were asked to evaluate how easy it is to discuss various bothering problems with their mother, father, same gender friends or friends of the opposite gender on a five point scale: „*very easy*”, „*easy*”, „*difficult*”, „*very difficult*”, and „*don't have or see this person*”. To assess the association between chronic pain and difficulties to communicate, the respondents answering „*don't have or see this person*” were omitted from the analysis (no father – 13.3%. no mother – 2.7%. no friends of the opposite gender – 16.4%. no friends of the same gender – 7.2%). For purposes of data analysis the responses were divided in two categories where the communication with parents or friends was very easy/easy or difficult/very difficult.

The adolescents were also asked how they felt their teachers evaluate their **academic success** compared with that of their classmates with these possible answers: „*very good*”, „*good*”, and „*average*”, „*below average*”. The respondents were also asked to rate their **academic stress** with the question about how pressured do they felt by the schoolwork with the following answers: „*none*”, „*a little*”, „*some*”, „*a lot*”; the first two response categories were combined in the data analysis.

In order to assess the prevalence of **bullying** in schools, the respondents were asked two questions about the last couple of months: „*how often have you been bullied at school?*” and „*how often have you taken part in bullying other student(s) at school?*” Possible answers: „*this has not happened*”, „*once or twice*”, „*2 – 3 times a month*”, „*about once a week*”, „*several times a week*”. Data analysis included only those students responding to both questions. Considering the answers given, the respondents were grouped in four categories: „*have not been bullied and have not bullied*” (*neutrals*), „*have only been bullied*” (*victims*), „*have only bullied others*” (*bullies*), „*have bullied others and been bullied*” (*bullies/victims*). Based on validation studies, frequency of bullying from „*2 – 3 times a month*” was considered

the control group in order to classify the respondents in one of three bullying categories (victims, bullies, victims/bullies). [27]

### *Statistical analysis*

The  $\chi^2$  test was used to compare the subgroups for data analysis in 2x2 tables. The percentage differences were tested to compare three or more independent groups. Confidence Interval Analysis software (CIA 2.1.2.) was used to determine the confidence interval of percentage differences. Linear regression was used to assess the chronic pain prevalence trends from 1994 – 2006. In order to determine the association between analyzed types of chronic pain and also mutual association among other health complaints, log-linear analysis was used which is applicable to multi-way frequency tables.

Given the fact that the selection of respondents was done not based on individual cases but on the cluster sampling of schools and classes from the state school registry, it was necessary to assess the possible influence of the selection method. This was done with statistics software MLwiN 2.11, computing the *Intraclass Correlation Coefficient – ICC* in order to assess the degree of chronic pain variation in the classes. The ICC for headache, stomach ache and back pain varied from 0.01 – 0.026, thus indicating that the cluster selection method has no significant effect on the results of the study. For this reason multiple logistic regression analysis was used to analyze the results using a single level (student) model in statistical software SPSS 16.0.

The association between specific factors and chronic pain is expressed in the form of an odds ratio – OR, which shows the odds of chronic pain in adolescents based on comparison of factors with the adolescents in reference group (pain seldom or never). If the OR is greater than 1 the odds of chronic pain related to the specific factor is greater than in the reference group, but if the OR is less than 1, chronic pain based on this factor is less than in the reference group. The statistical differences of regression coefficients between multiple answer categories of independent variables except the reference category were tested with  $\chi^2$  test in the statistical software MLwiN 2.12. In order to evaluate the effect of each specific factor on chronic pain independently from other factors such as age, adjustment was used. The significance of the change in relationship between various factors after controlling for other

variables was assessed given that regression coefficient changes of greater than 10% were chosen a cutoff for an important change in the estimate.

Considering that a total of four HBSC Latvia surveys from 1994 – 2006 were used in the data analysis, a survey year-adjusted results in logistic regression are shown in the results section. There were no significant differences of ORs in the crude models of logistic regression compared with survey year-adjusted models. In the summary of this thesis most of the logistic regression results are already age adjusted, because in the most cases the OR estimates were similar to results prior to adjustment, with the changes of ORs all under 10%. The one exception is the case of the association between chronic pain with smoking and alcohol use where significant changes of ORs after the adjustment by age were observed, and this is also shown in results section of the summary.

Since the prevalence of chronic pain as well as other health and lifestyle indicators differs significantly among gender groups, a separate data analysis was implemented for boys and girls. Multiplicative statistical interaction between gender and the independent variables of interest was evaluated, thus testing statistical significance of the heterogeneity of OR between boys and girls. Multiplicative interaction also between other studied independent variables was assessed by evaluating the possibilities to adjust the variables in the logistic regression models. Statistically significant differences of ORs between boys and girls are entered in **bold** in the logistic regression results tables. The results shown in *italics* indicate the statistically significant multiplicative interaction found in the logistic regression models between age and independent variable; statistically significant differences found between age groups are discussed more detailed in the text.

A significance level of 0.05 was selected for all the statistical tests. The confidence interval (CI) for estimated results was set to 95%.

## 7. Results

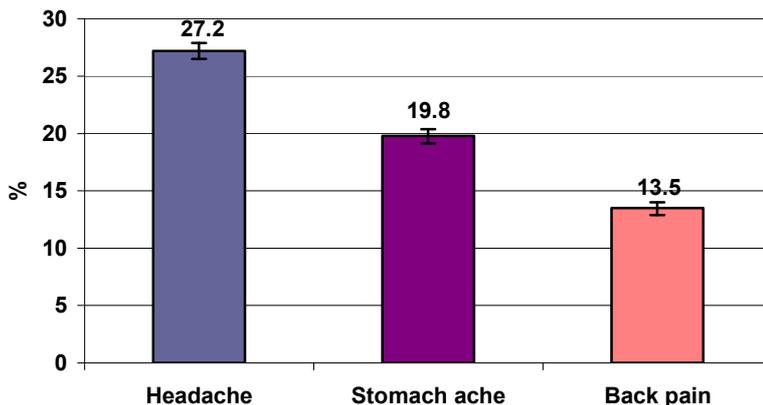
### 7.1. Prevalence of chronic pain in adolescents and changes from 1994 – 2006

#### 7.1.1. Prevalence of chronic pain

A total of 40.5% adolescents (n = 15319) reported complaints of chronic headache and/or stomach ache and/or back pain; i.e. – recurrent pain that occurred at least once a week over the last six months. *All further results refer to the above definition of chronic pain.*

Complaints of chronic headache were most common, followed by chronic stomach ache and back pain (Figure 7.1.1.1).

Figure 7.1.1.1. Prevalence of chronic pain among adolescents (%)



In all cases of chronic pain the proportion of girls was greater than that of boys ( $p < 0.001$ ). The greatest gender differences were in the case of headache – the proportion of girls complaining of chronic headache was greater by 15% (95%CI= 13.7 – 16.4) than that of boys. The smallest, but statistically valid differences were observed in the case of back pain; the proportion of girls with chronic back pain was greater by 3.4% (95%CI= 2.3 – 4.5) as compared with boys (Table 7.1.1.1).

Table 7.1.1.1. Prevalence of chronic pain by age in boys and girls (%)

Gender	Chronic pain	Age groups			Total	
		11 years	13 years	15 years	%	95% CI
<b>Boys</b>						
	Headache	20.6	19.3	17.2	<b>19.1</b>	18.2 – 20.0
	Stomach ache	16.4	13.4	10.8	<b>13.6</b>	12.9 – 14.5
	Back pain	9.0	11.4	14.9	<b>11.6</b>	10.9 – 12.4
<b>Girls</b>						
	Headache	29.7	31.9	39.9	<b>34.1</b>	33.1 – 35.1
	Stomach ache	26.2	25.4	23.2	<b>25.0</b>	24.1 – 25.9
	Back pain	11.0	13.5	19.9	<b>15.0</b>	14.3 – 15.8

The proportion of boys complaining of chronic headache slightly decreased with age but a statistically significant proportional decrease of 3.4% (95%CI=1.1 – 5.7) can be observed only in 15-year-old boys compared with 11-year-olds. The prevalence of chronic headache significantly increased in girls at age 15; it was 10.2% (95%CI=7.7 – 12.7) greater than in 11-year-old girls. There were no statistically significant differences in the prevalence of chronic headache between ages 11 and 13 for both genders.

As age increased, the prevalence of chronic stomach ache gradually decreased in both genders, however, the decrease was steeper for boys. The proportion of 15-year-old boys suffering from chronic stomach ache was 5.6% (95%CI=3.6 – 7.6) less than at age 11, but for girls – 3% (95%CI=0.7 – 5.3) less.

Overall, the prevalence trends of chronic headache ( $p<0.001$ ) and stomach ache ( $p<0.01$ ) in age groups among boys and girls were found to be significantly different; the multiplicative statistical interaction between age and gender in logistic regression in these cases was found.

The statistically significant ( $p<0.001$ ) increase of the prevalence of chronic back pain in increasing age groups was about the same for both boys and girls.

### 7.1.2. Combination of chronic pain

Table 7.1.2.1 shows the estimated prevalence of combinations of chronic headache, stomach ache and back pain of those adolescents responding about all three types of pain. In all 15.9% (95%CI=15.3 – 16.5) of adolescents complained of combinations of several types of chronic pain. The total prevalence of multiple chronic pain was 10.5% (95%CI=9.8 – 11.3) for boys and 20.4% (95%CI=19.5 – 21.3) for girls ( $p<0.001$ ).

*Table 7.1.2.1. Proportional distribution of adolescents complaining of chronic pain at one or multiple sites (%)*

<b>Chronic pain</b>	<b>n</b>	<b>%</b>	<b>95% TI</b>
No pains	8934	59.5	58.7 – 60.2
Only headache	1934	12.9	12.3 – 13.4
Only stomachache	1030	6.9	6.5 – 7.3
Only back pain	742	4.9	4.6 – 5.3
<b>Headache + stomach ache</b>	1105	<b>7.4</b>	6.9 – 7.8
<b>Headache + back pain</b>	445	<b>3.0</b>	2.7 – 3.2
<b>Back pain + stomach ache</b>	227	<b>1.5</b>	1.3 – 1.7
<b>Headache + stomach ache + back pain</b>	608	<b>4.0</b>	3.7 – 4.4
Total	15025	100	
Missing	294		
Total	15319		

Combined chronic headache and stomach ache was the most widespread as noted by 7.4% of adolescents. The other combinations were less common, but the combination of all three types of chronic pain was relatively more prevalent – 4%.

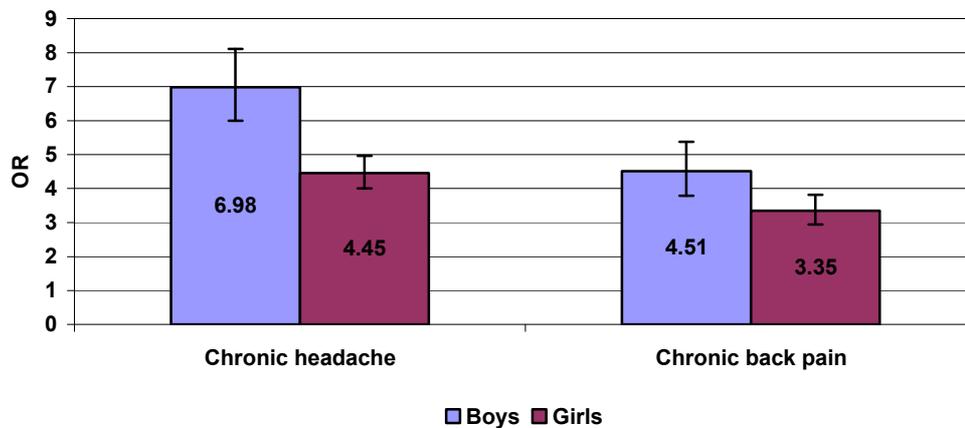
The association between all three types of chronic pain was tested in a log-linear analysis. The three-way effects were not statistically significant ( $\chi^2 = 0.89$ ;  $p=0.35$ ), but a two-way effects were found to be significant ( $p<0.001$ ). This means that there was a statistically significant association between any two of the pain types, but the combination of pain types didn't depend on the remaining variable – the third pain type. For example, chronic headache was associated with chronic stomach ache, but this association was not dependent on chronic back pain. Chronic headache, in turn, was associated with back pain independent of stomach ache.

The odds of other chronic pain increased significantly by logistic regression in those cases in which one of the pain types is stomach ache. For example, the odds of chronic headache in adolescents with stomach ache increased by seven times, but

adolescents with stomach ache were four times more likely to complain also of chronic back pain. It should be noted, however, that these results reflect the inter-association of chronic pain types and it is not possible within this study, because of the study design, to determine which of the pain types is primary.

In logistic regression, testing the multiplicative interaction of each specific pain type based on gender in combination with other pain types, the interaction effect was statistically significant on almost all pain type combinations. The only exception was the combination of headache and back pain. Figure 7.1.2.1 shows the odds of occurrence of chronic headache and back pain for boys and girls complaining also of stomach ache. In the case of existing chronic stomach ache, for boys the odds of both chronic headache ( $p < 0.001$ ) and back pain ( $p < 0.05$ ) were greater than for girls. For example, the odds also of chronic headache in boys suffering already from chronic stomach ache increased by a factor of seven, but for girls – a factor of four.

*Figure 7.1.2.1. The odds<sup>1</sup> of chronic headache and back pain in boys and girls with chronic stomach ache*



<sup>1</sup>Adjusted by age and survey year  
Reference group (OR=1): complaints of pain – rarely/never

In cases of existing chronic back pain, the odds of reporting the chronic headache also were slightly greater for boys (OR=3.84; 95%CI=3.27 – 4.51) than for girls (OR=3.23; 95%CI=2.84 – 3.67) but the differences of ORs between genders in this case were not statistically significant. No statistically significant differences were observed when combinations of chronic pain were compared separately for boys and girls based on age.

### 7.1.3. Chronic pain prevalence trends from 1994 to 2006

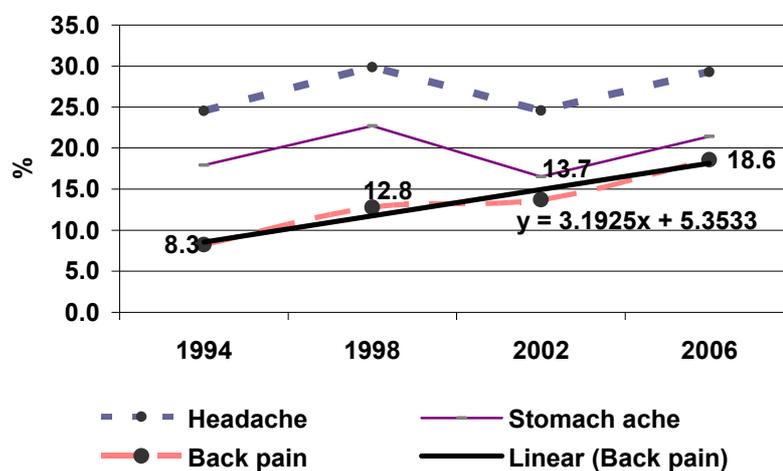
The prevalence trends of analyzed types of chronic pain were assessed as part of the data analysis using a linear regression and taking into consideration the HBSC Latvia survey results from 1994 – 2006. Table 7.1.3.1 shows changes in prevalence of chronic pain types during the survey years along with the percentage change and confidence intervals as obtained by linear regression.

*Table 7.1.3.1. Prevalence of chronic pain during survey years (%)*

	1994	1998	2002	2006	% changes; 95%CI
<b>Headache</b>	24.5	29.9	24.6	29.3	+0.9% (-5.4; + 7.2)
<b>Stomach ache</b>	17.9	22.7	16.5	21.4	+0.4% (- 6.3; + 7.2)
<b>Back pain</b>	8.3	12.8	13.7	18.6	+3.2% (+0.9; + 5.5)

During the period from 1994 to 2006 the prevalence of chronic back pain had increased on average by 3.2% ( $p < 0.05$ ) each survey year. The total prevalence of chronic back pain had increased from 8.3% in 1994 to 18.6% in 2004 (Figure 7.1.3.1).

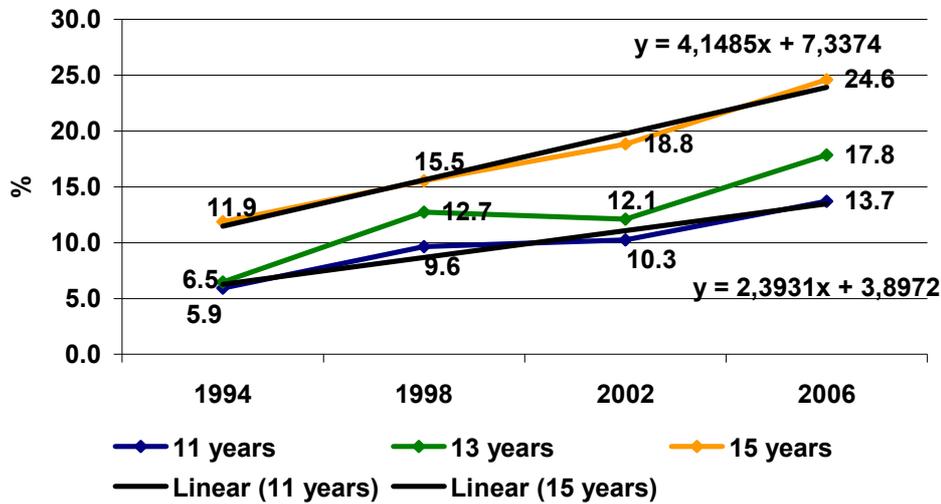
*Figure 7.1.3.1. Changes in prevalence of chronic pain from 1994 to 2006 (%)*



Assessing the changes in prevalence of chronic back pain by age, the proportion of adolescents complaining of chronic back pain from 1994 to 2006 had increased in 11-year-olds ( $p < 0.05$ ) and 15-year-olds ( $p < 0.01$ ) (Figure 7.1.3.2). Comparing the year 1994 with 2006, the prevalence of chronic back pain among 15-

year-olds had increased by 12.7% (95%CI=9.8 – 15.6) and by 7.8% among 11-year-olds (95%CI=5.5 – 10.0).

Figure 7.1.3.2. Prevalence of chronic back pain from 1994 to 2006 by age (%)



In gender groups the prevalence of chronic back pain had significantly increased from 14.5% in 1994 to 28.7% in 2006 ( $p < 0.05$ ) among 15-year-old girls while in boys the significant increase was among 11-year-olds from 5.1% in 1994 to 12.7% in 2006 ( $p < 0.01$ ).

Among 11-year-old boys also a slight linearly increasing trend of the prevalence of chronic headache was observed ( $p < 0.05$ ). In this age group prevalence of chronic headache had increased on average by 1.4% in each survey year from 18.6% in 1994 to 23.0% in 2006 ( $p < 0.05$ ).

Considering the differences in prevalence of chronic pain among boys and girls and given the multiplicative interaction between age and gender on the odds of chronic headache and stomachache shown by logistic regression, subsequent results regarding factors associated with chronic pain were analyzed separately for boys and girls.

## 7.2. Chronic pain and other health complaints

Based on the HBSC surveys in Latvia of 1994 – 2006 (n = 15319) the prevalence of other adolescent health complaints such as *irritability or bad temper, anxiety, difficulty falling asleep and dizziness* was estimated. Only those health complaints occurring at least once a week over the last past sixth months were studied and defined as *weekly*.

The proportion of adolescents suffering from one of the other health complaints besides pain was 66.3% (95%CI=65.5 – 67.1). The most common complaint among adolescents was irritability or bad temper (52.7%), but the least common complaint – dizziness (13.7%) (Table 7.2.1). Just as chronic pain, all the other health complaints were more prevalent among girls than boys (p<0.001).

*Table 7.2.1. Prevalence of weekly health complaints among boys and girls (%)*

	<b>Boys</b>	<b>Girls</b>	<b>Total</b>	
<b>Health complaints at least once a week</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>95%CI</b>
Irritability of bad temper	44.6	59.6	<b>52.7</b>	51.9 – 53.3
Nervousness	30.2	44.0	<b>37.7</b>	36.9 – 38.5
Difficulties falling asleep	21.7	28.2	<b>25.2</b>	24.5 – 25.9
Dizziness	10.1	16.7	<b>13.7</b>	13.1 – 14.2

Adolescents who had other weekly health complaints also reported more chronic pain than those adolescents with health complaints occurring more seldom. In all cases the percentage differences were statistically significant (p<0.001). For example, a total of 41.6% adolescents with weekly anxiety also complained of chronic headache while among adolescents with anxiety occurring more seldom, respectively, only 18.6% (Table 7.2.2).

Table 7.2.2. Prevalence of chronic pain as related to other health complaints (%)

	Headache		Stomach ache		Back pain	
	%	95%CI	%	95%CI	%	95%CI
<b>Irritability or bad temper</b>						
Weekly	<b>37.7</b>	36.7 – 38.8	<b>27.7</b>	26.7 – 28.7	<b>18.7</b>	17.8 – 19.6
Rarely/never	<b>15.5</b>	14.7 – 16.3	<b>11.0</b>	10.3 – 11.7	<b>7.7</b>	7.1 – 8.3
<b>Nervousness</b>						
Weekly	<b>41.6</b>	40.3 – 42.9	<b>30.6</b>	29.4 – 31.8	<b>21.8</b>	20.7 – 22.9
Rarely/never	<b>18.6</b>	17.8 – 19.4	<b>13.2</b>	12.5 – 13.9	<b>8.5</b>	7.9 – 9.1
<b>Difficulties getting asleep</b>						
Weekly	<b>43.7</b>	42.1 – 45.2	<b>32.0</b>	30.5 – 33.5	<b>21.8</b>	20.5 – 23.1
Rarely/never	<b>21.7</b>	20.9 – 22.4	<b>15.6</b>	15.0 – 16.3	<b>10.7</b>	10.1 – 11.2
<b>Dizziness</b>						
Weekly	<b>61.1</b>	58.9 – 63.1	<b>45.9</b>	43.7 – 48.0	<b>30.9</b>	28.9 – 32.9
Rarely/never	<b>21.9</b>	21.2 – 22.6	<b>15.6</b>	15.0 – 16.3	<b>10.7</b>	10.2 – 11.2

Table 7.2.3 shows the odds of chronic pain as related to other health complaints among boys and girls adjusted by survey year and age. In the case of weekly health complaints, the odds of all chronic pain significantly increased ( $p < 0.001$ ). These findings indicate that in general chronic health complaints among adolescents are closely interrelated. It must be noted, since the cross-sectional study design precludes an analysis of causation, it is not possible to identify the true direction of the association.

Table 7.2.3. The odds<sup>1</sup> of chronic pain as related to other weekly health complaints

Health complaints at least weekly	Chronic pain					
	Headache		Stomach ache		Back pain	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Boys</b>						
Irritability of bad temper	3.03***	2.66 – 3.45	3.04***	2.62 – 3.53	2.92***	2.49 – 3.43
Nervousness	3.19***	2.81 – 3.66	<b>3.31***</b>	2.86 – 3.83	2.93***	2.51 – 3.41
Difficulties falling asleep	<b>3.11***</b>	2.72 – 3.55	<b>2.99***</b>	2.58 – 3.47	<b>2.73***</b>	2.33 – 3.21
Dizziness	5.06***	4.28 – 5.97	4.51***	3.78 – 5.39	<b>4.18***</b>	3.46 – 5.04
<b>Girls</b>						
Irritability of bad temper	3.08***	2.77 – 3.42	2.96***	2.63 – 3.33	2.34***	2.03 – 2.70
Nervousness	2.68***	2.44 – 2.95	<b>2.61***</b>	2.34 – 2.90	2.65***	2.32 – 3.02
Difficulties falling asleep	<b>2.49***</b>	2.25 – 2.76	<b>2.20***</b>	1.98 – 2.45	<b>2.13***</b>	1.87 – 2.43
Dizziness	5.27***	4.64 – 5.99	4.08***	3.61 – 4.62	<b>3.38***</b>	2.93 – 3.89

<sup>1</sup> Adjusted by age and study year

Reference category – health complaints rarely/never

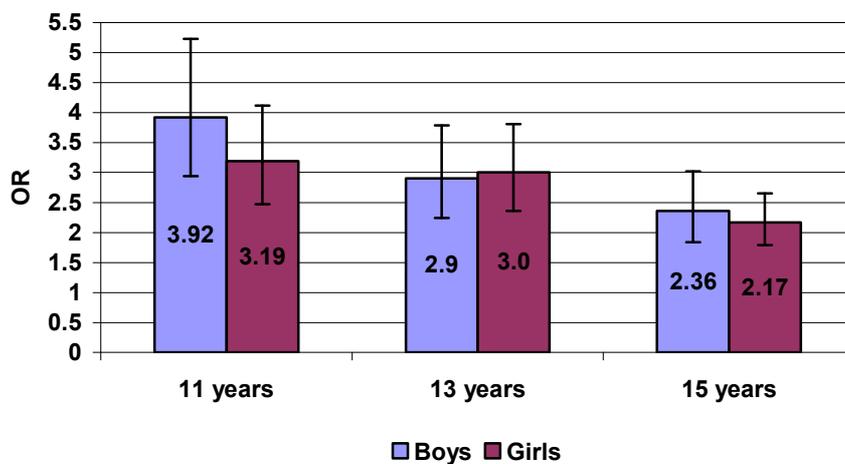
\* $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ ; NS – not significant

The odds of chronic pain in association with other health complaints for boys were in more cases greater than that for girls. The significantly greater odds of chronic

stomach ache as related to anxiety ( $p < 0.05$ ) and chronic back pain as related to dizziness ( $p < 0.05$ ) were found in boys as compared with girls. The odds of all chronic pain types as related to difficulty falling asleep were also significantly greater for boys than that for girls ( $p < 0.001$ ) (see Table 7.2.3 in bold). For example, for boys finding it difficult to fall asleep at least once a week the odds of all types of chronic pain increased by a factor of three, but for girls the odds of all types of chronic pain in this case increased by a factor of two ( $p < 0.001$ ).

Logistic regression was used to test the multiplicative interaction of age and other health complaints in relation to chronic pain, noting possible statistically significant differences by age. In all cases in which a statistically significant multiplicative interaction between age and other health complaints was found (see Table 7.2.3 in *italics*), respondents in the 11-year-old group were significantly more likely to report chronic pain than adolescents in the other two age groups. For example, as for boys ( $\chi^2(2) = 6.87$ ;  $p < 0.05$ ) as for girls ( $\chi^2(2) = 7.34$ ;  $p < 0.05$ ) the odds of chronic back pain related to weekly nervousness significantly differed among studied age groups. If there were differences among 11 and 13-year-old girls (OR ~ 3), then among 15-year-old girls the odds of chronic back pain significantly decreased (OR ~ 2) ( $p < 0.05$ ). However, as age increased for boys, the odds that they would suffer from chronic back pain related to nervousness gradually decreased in all age groups from 4 to 2 ( $p < 0.05$ ) (Figure 7.2.1).

Figure 7.2.1. The odds<sup>1</sup> of **chronic back pain** in adolescents with weekly complaints of nervousness by age



<sup>1</sup> Adjusted by study year  
Reference category – complaints of nervousness rarely/never

In order to assess the association between chronic pain and each of the health complaints independently from other health complaints, a mutual adjustment of analyzed health complaints was done in logistic regression. By gradually adjusting the health complaints, the odds of chronic pain as related to each specific health complaint decreased for both genders (see Tables 7.2.3 and 7.2.4).

Table 7.2.4. The odds<sup>1</sup> of chronic pain as related to *mutually adjusted* other health complaints

<i>Health complaints at least weekly</i>	<i>Chronic pain</i>					
	<i>Headache</i>		<i>Stomach ache</i>		<i>Back pain</i>	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Boys</b>						
Irritability of bad temper	1.96***	1.69 – 2.26	1.89***	1.60 – 2.24	1.91***	1.60 – 2.29
Nervousness	1.83***	1.58 – 2.11	1.93***	1.63 – 2.27	1.73***	1.45 – 2.06
Difficulties falling asleep	1.90***	1.65 – 2.20	1.83***	1.56 – 2.16	1.69***	1.42 – 2.02
Dizziness	3.56***	2.81 – 4.00	2.89***	2.39 – 3.49	2.76***	2.26 – 3.37
<b>Girls</b>						
Irritability of bad temper	2.00***	1.78 – 2.25	1.95***	1.71 – 2.22	1.44***	1.22 – 1.69
Nervousness	1.61***	1.44 – 1.80	1.60***	1.42 – 1.81	1.82***	1.57 – 2.12
Difficulties falling asleep	1.64***	1.47 – 1.83	1.45***	1.28 – 1.63	1.45***	1.26 – 1.66
Dizziness	3.98***	3.49 – 4.54	3.07***	2.70 – 3.49	2.54***	2.19 – 2.95

<sup>1</sup> Adjusted by age and study year

Reference category – health complaints rarely/never

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

The decrease of the odds of chronic pain as related to mutually adjusted other health complaints can be explained by the close association among the health complaints. Log-linear regression analysis showed that a four-way effect ( $\chi^2(1) = 3.91$ ;  $p<0.05$ ) among the health complaints as well as a three-way ( $\chi^2(4) = 51.2$ ;  $p<0.001$ ) and two-way effects ( $\chi^2(6) = 6934.74$ ;  $p<0.001$ ) were found to be statistically significant.

Although after the mutual adjustment of the health complaints, the effect of each health complaint on chronic pain decreased, the odds of chronic pain as related to each specific health complaint remained significantly greater for adolescents with weekly health complaints than for those who had complaints occurring more seldom.

### 7.3. Chronic pain in adolescents with chronic illness

Given that the question of prevalence of chronic illness among adolescents was addressed only in the 2006 survey of HBSC Latvia, it is only these data (n = 4245) that were analyzed in this results section. Adolescents were asked to answer if they had any long-term illness, disability or medical condition (like arthritis, allergy, asthma, diabetes etc.) that had been diagnosed only by a doctor.

Overall 17.2% of adolescents (95%CI=16.1 – 18.4) reported having a chronic illness diagnosed by a doctor. The proportion of girls (19.9%) suffering from chronic illness was 5.6% greater (95%CI=3.3 – 7.8) than among boys (14.3%). A comparison of age groups showed no differences in prevalence of chronic illness among 11-year-old boys and girls. The prevalence increased among girls with age from 14.9% at age 11 to 24.2% at age 15 (p<0.001).

Table 7.3.1 shows the prevalence of chronic pain in adolescents with diagnosed chronic illness and in those without chronic illness.

*Table 7.3.1. Prevalence of chronic pain as related to chronic illness (%)*

	Headache		Stomach ache		Back pain	
	%	95%CI	%	95%CI	%	95%CI
<b>Chronic illness</b>						
Yes	<b>41.1</b>	37.6 – 44.7	<b>34.6</b>	31.2 – 38.2	<b>28.3</b>	25.1 – 31.6
No	<b>26.9</b>	25.4 – 28.3	<b>18.7</b>	17.4 – 20.0	<b>16.6</b>	15.4 – 17.8

Compared with respondents without chronic illnesses, those adolescents with a chronic illness constituted a greater proportion in all three pain types (p<0.001).

Table 7.3.2 shows unadjusted (model I) and adjusted (model II) OR of chronic pain as related to chronic illness in boys and girls. Both boys and girls suffering from chronic illness had statistically significant greater odds (about a factor of 2) of suffering from chronic pain than did adolescents without chronic illness. There were no statistically significant gender differences.

Table 7.3.2. Unadjusted (model I) and adjusted (model II) OR of chronic pain as related to chronic illness

Chronic illness	Chronic pain					
	Headache		Headache		Headache	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Model I</b>						
Boys	1.82***	1.39 – 2.39	2.31***	1.72 – 3.11	1.48*	1.09 – 2.02
Girls	1.80***	1.46 – 2.23	2.13***	1.71 – 2.65	2.27***	1.80 – 2.87
<b>Model II</b>						
Boys	1.83***	1.39 – 2.41	2.36***	1.75 – 3.18	1.50*	1.09 – 2.05
Girls	1.70***	1.37 – 2.10	2.15***	1.72 – 2.69	2.13***	1.68 – 2.70

<sup>1</sup> Adjusted by age and study year

Reference category – no chronic illness

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

Adolescents suffering from chronic illness also complained more about weekly irritability/bad temper, anxiety, difficulty falling asleep and dizziness (p<0.001). It was determined by logistic regression how much chronic illness affected chronic pain in adolescents independent of the other health complaints. By gradually adjusting chronic illness with the other weekly health complaints, it was found that there was a steady decrease in the odds of chronic pain in the case of chronic illness (Table 7.3.3). The association between each health complaint and chronic pain significantly changed upon mutual adjustment by the other health complaints, not chronic illness. The final results of adjustment showed that the odds of chronic pain for both genders in the association with chronic illnesses have significantly decreased after the adjustment by other health complaints (see Tables 7.3.2 and 7.3.3). Thus, the association between chronic illness and chronic pain was also affected by the prevalence of other health complaints among adolescents with chronic illness.

Table 7.3.3. The odds of chronic pain as related to chronic illness by adjustment by other health complaints

	Headache		Stomach ache		Back pain	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Boys</b>						
<b>Chronic illness</b>	1.30NS	0.96 – 1.77	1.70***	1.23 – 2.36	1.05NS	0.75 – 1.48
<b>Health complaints at least once a week</b>						
Irritability of bad temper	1.94***	1.50 – 2.51	1.61**	1.19 – 2.18	1.74***	1.30 – 2.32
Nervousness	1.65***	1.28 – 2.13	1.93***	1.44 – 2.59	1.53**	1.15 – 2.02
Difficulties falling asleep	1.95***	1.48 – 2.55	1.80***	1.33 – 2.43	1.98***	1.48 – 2.65
Dizziness	3.61***	2.68 – 4.86	2.85***	2.06 – 3.92	2.63***	1.92 – 3.61
<b>Girls</b>						
<b>Chronic illness</b>	1.28*	1.01 – 1.62	1.73***	1.36 – 2.21	1.76***	1.37 – 2.26
<b>Health complaints at least once a week</b>						
Irritability of bad temper	1.98***	1.56 – 2.51	1.94***	1.49 – 2.51	1.38*	1.04 – 1.83
Nervousness	1.72***	1.39 – 2.13	1.74***	1.39 – 2.21	1.85***	1.44 – 2.38
Difficulties falling asleep	1.53***	1.22 – 1.90	1.63***	1.30 – 2.05	1.18NS	0.92 – 1.51
Dizziness	3.87***	3.01 – 4.99	3.08***	2.41 – 3.93	2.65***	2.05 – 3.42

<sup>1</sup> Adjusted by age

Reference categories: health complaints – rarely/never; no chronic illness

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

However, upon the adjustment by other health complaints, the odds of chronic stomach ache related to chronic illness remained to increase by a factor of 2 for both genders, but for girls the odds of chronic back were also two times higher compared with girls not suffering from a chronic illness.

#### 7.4. Chronic pain and use of medication

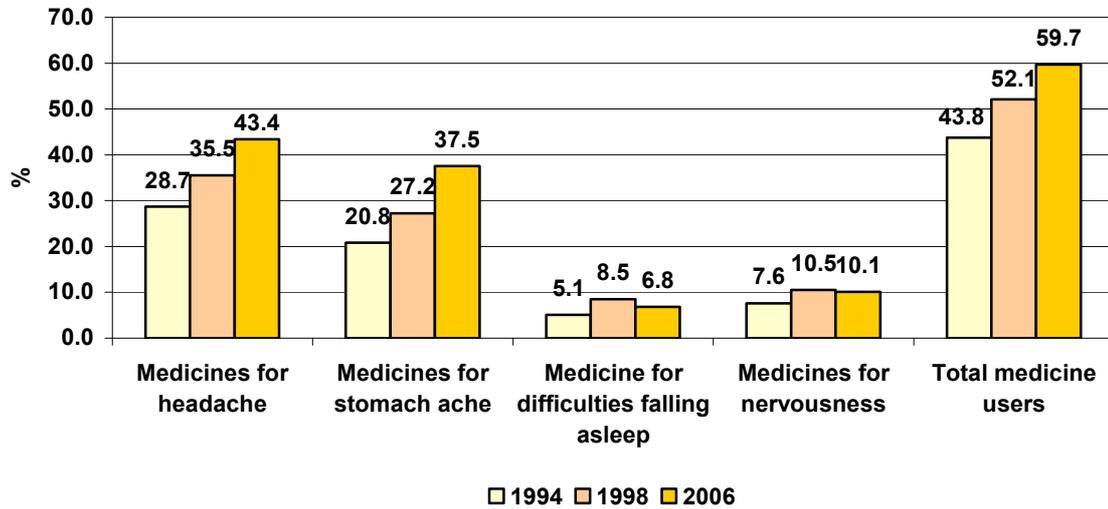
Data from HBSC Latvia surveys conducted in 1994, 1998 and 2006 was analyzed in this section (n = 11838), because these surveys all addressed the issue of use of medication for headache, stomach ache, difficulty falling asleep and anxiety.

On average of 52% of adolescents (95%CI=51.1 – 53.0) had used at least one kind of medication for headache, stomach ache, difficulty falling asleep or anxiety in the past month. In general girls used medications more than boys do (p<0.001), but there was no statistically significant gender difference in the use of medication for difficulty falling asleep.

The proportion of adolescents using medications had increased significantly by 15.9% (95%CI=13.7 – 18.0) from 1994 (43.8%) to 2006 (59.7%). This can be

explained by more widespread use of medication for headache and stomach ache ( $p<0.001$ ) (Figure 7.4.1).

Figure 7.4.1. Proportion of adolescents among medication users in the survey years (%)



The use of medications was much greater among adolescents with chronic pain than among adolescents without pain ( $p<0.001$ ). In Table 7.4.1 the association between medicine use and chronic pain is presented with OR from results by logistic regression after the adjustment by survey year and age.

In the case of adolescents suffering from chronic headache and stomach ache, the odds of corresponding medicine use were more than three times greater than among adolescents without these chronic pains ( $p<0.001$ ). In the case of back pain, also the odds of medicine use for headache and stomach ache increased. In the case of all three pain types, also the odds of medicine use for difficulty falling asleep and anxiety on average doubled ( $p<0.001$ ).

The association between chronic pain and non-corresponding medication use can be explained by the previously found combinations of chronic pain and strong association of the chronic pain with other health complaints.

Table 7.4.1. The odds<sup>1</sup> of medication use as related to chronic pain

<i>Chronic pain</i>	Medicines for headache		Medicines for stomach ache		Medicines for difficulties falling asleep		Medicines for nervousness	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
<b>Boys</b>								
Headache	3.49***	3.03 – 4.03	1.75***	1.50 – 2.05	1.84***	1.44 – 2.34	2.36***	1.90 – 2.93
Stomach ache	<i>1.81***</i>	1.54 – 2.13	<b>3.85***</b>	3.26 – 4.55	1.95***	1.50 – 2.53	1.98***	1.56 – 2.51
Back pain	1.53***	1.28 – 1.83	<i>1.46***</i>	1.21 – 1.77	1.98***	1.47 – 2.67	1.80***	1.37 – 2.38
<b>Girls</b>								
Headache	3.70***	3.31 – 4.13	<i>1.38***</i>	1.24 – 1.54	1.75***	1.43 – 2.15	1.86***	1.58 – 2.20
Stomach ache	1.79***	1.59 – 2.01	<b>3.12***</b>	2.77 – 3.51	1.61***	1.30 – 1.99	1.73***	1.45 – 2.05
Back pain	1.35***	1.17 – 1.56	1.18*	1.02 – 1.37	<i>1.91***</i>	1.49 – 2.46	1.46***	1.18 – 1.81

<sup>1</sup> Adjusted by age and survey year

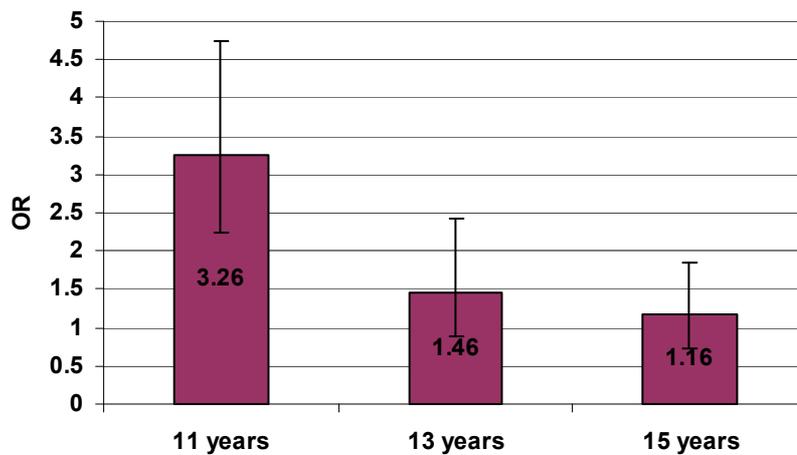
Reference category: complaints of pain – rarely/never

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

The odds of medicine use for stomach ache in the case of chronic stomach ache were significantly higher among boys than girls (p<0.05) (see Table 7.4.1 in **bold**). Boys suffering from chronic stomach ache were four times more likely to use medication for stomach ache than boys with stomach ache occurring more seldom compared with the difference of two times among girls.

A multiplicative interaction between age and pain was observed in several cases of medication use (see Table 7.4.1 in *italics*); in all of these cases 11-year-olds with chronic pain were more likely to use medication than 13- and 15-year-olds. For example, the odds of medicine use for difficulties falling asleep among girls with chronic back pain among 11-year-olds increased by a factor of 3 but in the oldest age groups the association significantly decreased.

Figure 7.4.2. The odds<sup>1</sup> of medicine use for difficulties falling asleep among girls with chronic back pain by age



<sup>1</sup> Adjusted by survey year

Reference category: back pain – rarely/never

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

## 7.5. Chronic pain and adolescent lifestyle

Based on data gained in the 1994 – 2006 HBSC Latvia, the association between chronic pain and certain lifestyle factors among adolescents was studied. These factors include smoking, alcohol use and vigorous physical activity.

### 7.5.1. Chronic pain and smoking

In general, 15.2% of boys (95%CI=14.3 – 16.0) and 9% of girls (95%CI=8.4 – 9.7) smoked regularly – at least once a week or every day. The proportion of regular smokers among boys was higher than girls in all age groups (p<0.001). The prevalence of smoking had increased with increasing age (p<0.001). If a total of 2.3% of boys (95%CI=1.8 – 2.9) smoked regularly at age 11, then by age 15 the proportion increased to 31.9% (95%CI=29.9 – 33.9). The corresponding proportion among girls was 0.7% (95%CI=0.4 – 1.0) at age 11 and 18.8% (95%CI=17.4 – 20.2) at age 15. Comparing the survey years, a trend in the total increase of female smokers was observed, however, statistically significant increase was only in girls aged 15 from 13.3% in 1994 to 22.7% in 2006 (p<0.05).

The regular smokers complained of all three types of chronic pain more than adolescents had never or seldom smoked ( $p<0.05$ ). The most difference between both groups was observed in the case of chronic back pain – regular smokers complained of chronic back pain 1.7 times more than non-smokers and adolescents who had seldom smoked (Table 7.5.1.1).

Table 7.5.1.1. Prevalence of chronic pain as related to smoking (%)

	Headache		Stomach ache		Back pain	
	%	95%CI	%	95%CI	%	95%CI
<b>Smoking</b>						
At least once a week	<b>30.5</b>	28.4 – 32.7	<b>24.8</b>	22.8 – 26.8	<b>21.5</b>	19.6 – 23.4
Seldom/never	<b>26.7</b>	26.0 – 27.5	<b>19.1</b>	18.4 – 19.8	<b>12.4</b>	11.8 – 13.0

Logistic regression results showed that regular smoking increased the most the odds of chronic back pain for both boys and girls and also the odds of stomach ache for girls (Table 7.5.2.1). The odds of chronic back pain as related to regular smoking increased by 2 times compared with adolescents who had never or seldom smoked ( $p<0.001$ ); but for girls regular smoking increased the odds of chronic stomach ache also by 2 times ( $p<0.001$ ).

Table 7.5.1.2. The odds<sup>1</sup> of chronic pain as related to smoking

Smoking	Chronic pain					
	Headache		Stomach ache		Back pain	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>at least once a week</b>						
<b>Model I</b>						
Boys	1.15NS	0.98 – 1.35	1.28**	1.07 – 1.54	2.04***	1.70 – 2.43
Girls	1.58***	1.35 – 1.84	1.83***	1.56 – 2.15	1.97***	1.64 – 2.36
<b>Model II</b>						
Boys	1.31**	1.10 – 1.56	1.68***	1.38 – 2.05	1.78***	1.47 – 2.17
Girls	1.34***	1.14 – 1.57	2.08***	1.76 – 2.47	1.55***	1.28 – 1.87

<sup>1</sup> Adjusted by survey year in model I

<sup>2</sup> Adjusted by survey year and age in model II

Reference category: smoking – seldom/never

\* $p<0.05$ ; \*\*  $p<0.01$ ; \*\*\*  $p<0.001$ ; NS – not significant

Adjustment by age (model II) revealed significant changes in the odds of smoking related chronic pain in both genders compared to results adjusted only by survey year (model I) (Table 7.5.1.2). The effect of regular smoking on chronic pain decreased after adjustment by age. However, the odds of chronic headache increased in boys but the odds of chronic stomach ache increased in both boys and girls, which

can be explained by the opposite trends observed in the prevalence of smoking and chronic pain in age subgroups. As adolescent age increased, the prevalence of chronic stomach ache had decreased in both genders, but the prevalence of chronic headache decreased in boys only. However, as the age increased, also the prevalence of smoking had increased for both genders. Thus, the independent effect of smoking on the chronic pain before age-adjustment was lower.

Compared with adolescents who had never or seldom smoked, regular smokers significantly more reported the prevalence of weekly complaints of irritability/bad temper, anxiety, difficulty falling asleep and dizziness ( $p < 0.001$ ). In order to determine how much regular smoking was associated with chronic pain regardless of other health complaints, the adjustment by these complaints was done in logistic regression, thus allowing an assessment of the independent effect of smoking on chronic pain (Table 7.5.1.3).

*Table 7.5.1.3. The odds<sup>1</sup> of chronic pain in association with smoking adjusted by other health complaints*

<b>Smoking</b> <i>at least once a week</i>	<b>Chronic pain</b>					
	<b>Headache</b>		<b>Stomach ache</b>		<b>Back pain</b>	
	OR	95%CI	OR	95%CI	OR	95%CI
Boys	0.97NS	0.80 – 1.18	1.29*	1.04 – 1.59	1.42***	1.15 – 1.74
Girls	1.02NS	0.86 – 1.22	1.74***	1.45 – 2.09	1.27*	1.04 – 1.55

<sup>1</sup> Adjusted by age and survey year and other health complaints (irritability/bad temper, anxiety, difficulty falling asleep and dizziness)

Reference category: smoking – seldom/never

\* $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ ; NS – not significant

After the adjustment by other health complaints, the association between smoking and chronic pain had decreased by 22% – 24% in both genders and in the case of chronic headache statistical significance had disappeared. However, regardless of other health complaints, a rather significant association remained between regular smoking and chronic stomach ache in girls (OR=1.74;  $p < 0.001$ ) and back pain in boys (OR=1.42;  $p < 0.001$ ) with a decrease in the odds of 16% and 18%, respectively.

## 7.5.2. Chronic pain and alcohol use

The data analyzed in this thesis refer to alcohol use (beer and/or wine and/or spirits) at least once a week. A total of 10.8% (95%CI=10.2 – 11.7) of boys and 5.4% (95%CI=4.9 – 5.9) of girls had used alcohol at least once a week ( $p<0.001$ ). The proportion of boys in all age groups was on average twice as big as the proportion of girls. The prevalence of weekly alcohol use significantly had increased for both genders as they get older ( $p<0.001$ ).

During the period from 1994 to 2006 there was an increasing trend of weekly alcohol use among girls. However, significantly weekly alcohol use had increased only in 13-year-old girls from 1.7% in 1994 to 5% in 2006 ( $p<0.05$ ).

Adolescents who had used alcohol at least once a week reported more chronic pain than adolescents who had never or seldom used alcohol ( $p<0.001$ ) (Table 7.5.2.1). The relatively most difference was observed in the case of chronic back pain.

*Table 7.5.2.1. Prevalence of chronic pain as related to alcohol use (%)*

	<b>Headache</b>		<b>Stomach ache</b>		<b>Back pain</b>	
	%	95%CI	%	95%CI	%	95%CI
<b>Alcohol use</b>						
At least once a week	<b>33.4</b>	30.8 – 36.2	<b>23.4</b>	21.0 – 25.9	<b>22.1</b>	19.7 – 24.6
Seldom/never	<b>26.7</b>	25.9 – 27.4	<b>19.5</b>	18.8 – 20.1	<b>12.7</b>	12.2 – 13.3

Logistic regression showed that before the adjustment by age (model I) the girls who had used alcohol at least once a week were about twice as likely to report chronic pain as girls who had never or seldom used alcohol ( $p<0.001$ ). The odds of chronic pain were also higher in boys who had used alcohol weekly and the strongest association was observed between alcohol use and chronic back pain (Table 7.5.2.2).

Table 7.5.2.2. The odds<sup>1</sup> of chronic pain as related to alcohol use

<i>Alcohol at least once a week</i>	<i>Chronic pain</i>					
	<b>Headache</b>		<b>Stomach ache</b>		<b>Back pain</b>	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Model I</b>						
Boys	1.42***	1.19 – 1.70	1.24*	1.01 – 1.53	1.95***	1.60 – 2.39
Girls	1.87***	1.54 – 2.27	1.69***	1.37 – 2.06	2.06***	1.65 – 2.58
<b>Model II</b>						
Boys	1.59***	1.32 – 1.93	1.55**	1.24 – 1.93	1.75***	1.41 – 2.16
Girls	1.62***	1.32 – 1.97	1.79***	1.45 – 2.21	1.65***	1.31 – 2.08

<sup>1</sup> Adjusted by survey year in model I

<sup>2</sup> Adjusted by survey year and age in model II

Reference category: alcohol use – seldom/never

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

The age-adjusted results (model II) showed significant changes in the odds of chronic pain as related to alcohol use. The independent effect of alcohol use on chronic back pain decreased adjusting by age, but it remained significant nevertheless. The age-adjusted odds of chronic stomach ache increased for both boys and girls with weekly alcohol use, but the odds of chronic headache increased only for boys. As in the case of smoking, this can be explained by the opposite trends of the prevalence of alcohol use and chronic pain among age subgroups. Taking into account the logistic regression results, the age is a significant factor in assessing the association between chronic pain and smoking/alcohol use.

Compared with adolescents who had never or seldom used alcohol, adolescents who had used alcohol at least once a week not only were more likely to complain of chronic pain, but also more likely reported the other health complaints analyzed before (p<0.001). The adjustment by these complaints (irritability/bad temper, anxiety, difficulty falling asleep and dizziness) was done in logistic regression in order to assess the independent effect of alcohol use on chronic pain (Table 7.5.2.3).

Table 7.5.2.3. The odds<sup>1</sup> of chronic pain in association with alcohol use adjusted by other health complaints

<i>Alcohol use</i>	<i>Chronic pain</i>					
	<i>Headache</i>		<i>Stomach ache</i>		<i>Back pain</i>	
	<i>at least once a week</i>	OR	95%CI	OR	95%CI	OR
Boys	1.24*	1.01 – 1.53	1.17NS	0.92 – 1.48	1.38**	1.10 – 1.73
Girls	1.22NS	0.98 – 1.51	1.41**	1.13 – 1.77	1.31*	1.03 – 1.67

<sup>1</sup> Adjusted by age and survey year and other health complaints (irritability/bad temper, anxiety, difficulty falling asleep and dizziness)

Reference category: smoking – seldom/never

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

By comparing the results in the Table 7.5.2.2 with the Table 7.5.2.3, the association between alcohol use and chronic pain had significantly decreased for both genders after the adjustment by other health complaints. The odds of chronic pain had decreased from 21% – 24% and in some cases the association ceased to be statistically significant.

It can be concluded that the independent effect of both alcohol use and smoking on chronic pain decreases subject to other health complaints. For this reason the greater prevalence of chronic pain in adolescents who regularly smoke and use alcohol can largely be explained also by the greater prevalence of other weekly health complaints in this group.

### 7.5.3. Chronic pain and vigorous physical activity

The level on vigorous physical activity in about 58.3% (95%CI=57.2 – 59.5) of boys and 36.2% (95%CI=35.1 – 37.2) of girls was considered sufficient, i.e. at least 2 – 3 times per week for a total of one or more hours per week. The proportion of boys who had a sufficient level of vigorous physical activity gradually had increased with age (p<0.001), but there were no statistically significant differences by age among girls. Comparing the results of the HBSC surveys in Latvia from 1994 to 2006, there was an increase in the proportion of 11-year-old girls who had a sufficient level of physical activity from 27.4% to 51.0 % (p<0.01).

Logistic regression analysis of the association between chronic pain and vigorous physical activity showed similar results in the estimates of ORs before (model I) and after (model II) adjustment by age (Table 7.5.3.1). There was no association between chronic pain and vigorous physical activity in girls. In general the

odds of chronic pain in boys with a sufficient level of vigorous physical activity were somewhat less than for physically inactive boys, but a statistically significant difference was only in the case of chronic headache – by 0.8 times ( $p<0.05$ ).

Table 7.5.3.1. The odds<sup>1</sup> of chronic pain associated with level of vigorous physical activity

<i>Sufficient vigorous physical activity</i>	<i>Chronic pain</i>					
	<i>Headache</i>		<i>Stomach ache</i>		<i>Back pain</i>	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Model I</b>						
Boys	0.82**	0.73 – 0.93	0.89NS	0.77 – 1.02	0.90NS	0.77 – 1.05
Girls	0.98NS	0.89 – 1.08	1.03NS	0.93 – 1.15	1.00NS	0.87 – 1.13
<b>Model II</b>						
Boys	0.84**	0.74 – 0.95	0.90NS	0.78 – 1.04	0.88NS	0.75 – 1.02
Girls	0.98NS	0.89 – 1.09	1.04NS	0.94 – 1.16	1.01NS	0.88 – 1.15

<sup>1</sup> Adjusted by survey year in model I

<sup>2</sup> Adjusted by survey year and age in model II

Reference category: vigorous physical activity – insufficient

\* $p<0.05$ ; \*\*  $p<0.01$ ; \*\*\*  $p<0.001$ ; NS – not significant

After the adjustment by previously analyzed other weekly health complaints, there were no significant changes in the estimates of ORs showing the association between chronic pain and vigorous physical activity in the Table 7.5.3.1.

## 7.6. Chronic pain and subjective socio-economic status

According to the results of HBSC Latvia from 1994 to 2006, on average of 57.3% (95%CI=56.5 – 58.1) of adolescents had perceived their family affluence to be high. About 34.2% (95%CI=33.4 – 34.9) of adolescents considered their family's level of affluence as middle and 8.5% (95%CI=8.1 – 9.0) – as low. A total of 10% (95%CI=9.4 – 10.7) of girls and 6.8% (95%CI=6.2 – 7.4) of boys reported their family's level of affluence to be low; these gender differences were statistically valid ( $p<0.001$ ). The proportion of adolescents who considered their family's level of affluence to be low also increased with age increase ( $p<0.001$ ). The increase in boys was 3.8% (95%CI=2.3 – 5.4) from 5.2% at age 11 to 9% at age 15, but among girls the increase was greater by 8.4% (95%CI=6.8 – 10.0), respectively from 5.9% at age 11 to 14.3% at age 15.

As the family's level of affluence had decreased, statistically both boys and girls showed a greater proportion of chronic pain ( $p<0.001$ ) (Table 7.6.1). The strongest association is in the case of chronic headache. The prevalence of chronic

headache among adolescents who considered their family's affluence as low exceeded that of adolescents who rated their family's affluence as high by 14.4% (95%CI=11.6 – 17.3).

Table 7.6.1. Prevalence of chronic pain as related to assessment of family's level of affluence

	Headache		Stomach ache		Back pain	
	%	95%CI	%	95%CI	%	95%CI
<b>Family affluence</b>						
High	<b>23.2</b>	22.3 – 24.1	<b>17.6</b>	16.8 – 18.5	<b>11.6</b>	10.9 – 12.3
Middle	<b>31.3</b>	30.0 – 32.6	<b>21.6</b>	20.5 – 22.8	<b>15.0</b>	14.1 – 16.0
Low	<b>37.6</b>	35.0 – 40.3	<b>26.7</b>	24.4 – 29.2	<b>19.9</b>	17.8 – 22.2

As the level of affluence in the family declined both boys and girls had statistically greater odds of experiencing chronic pain (Table 7.6.2). For both genders if the family affluence level was perceived as low, the odds of chronic pain types nearly doubled ( $p < 0.001$ ).

Table 7.6.2. The odds<sup>1</sup> of chronic pain as related to assessment of family's level of affluence

Family affluence	Chronic pain					
	Headache		Stomach ache		Back pain	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Boys</b>						
Middle	1.45***	1.27 – 1.66	1.34***	1.14 – 1.56	1.27**	1.07 – 1.50
Low	1.75***	1.38 – 2.21	1.78***	1.37 – 2.30	1.89***	1.44 – 2.48
<b>Girls</b>						
Middle	1.43***	1.29 – 1.59	1.30***	1.16 – 1.46	1.38***	1.20 – 1.58
Low	1.92***	1.64 – 2.26	1.75***	1.48 – 2.08	1.99***	1.62 – 2.43

<sup>1</sup> Adjusted by age and survey year

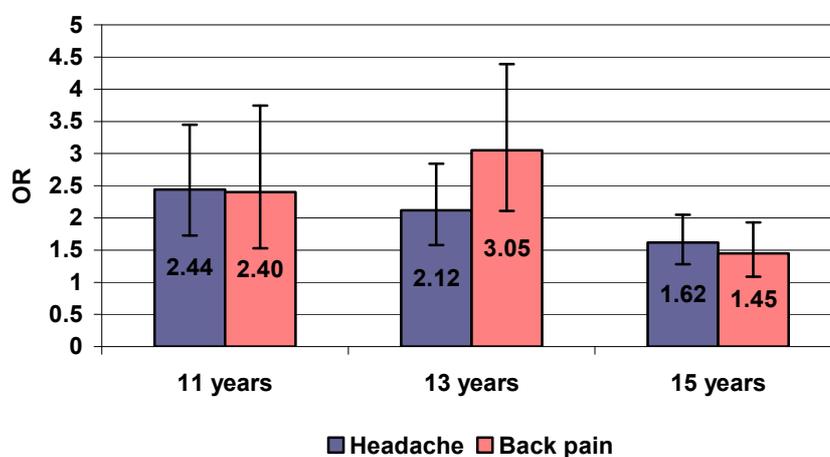
Reference category: high family affluence

\* $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ ; NS – not significant

The odds to report all types of chronic pain were statistically greater among girls with low family affluence compared with those who considered their family's level of affluence as middle. The difference of odds for headache among boys with middle or low family affluence were not statistically valid, but the odds of chronic stomach ache ( $\chi^2(1) = 4.29$ ;  $p < 0.05$ ) and back pain ( $\chi^2(1) = 7.49$ ;  $p < 0.01$ ) were statistically greater for boys with low family affluence than for those who considered their family's level of affluence as middle.

In the case of girls suffering from chronic headache ( $\chi^2(4) = 9.54$ ;  $p < 0.05$ ) and back pain ( $\chi^2(4) = 13.32$ ;  $p < 0.01$ ), a multiplicative interrelationship between age and family affluence assessment was found to exist (see Table 7.6.2 in *italics*). The odds of chronic headache and back pain among girls who considered their family's level of affluence to be middle or low, were the lowest among 15-year-olds than in the two younger groups. In the Figure 7.6.1 the differences between odds of chronic headache and back pain among the age groups are shown for girls with perceived family affluence as low.

Figure 7.6.1. The odds<sup>1</sup> of **chronic back pain and headache** among **girls with perceived family affluence as low by age**



<sup>1</sup> Adjusted by survey year  
Reference category: high family affluence  
\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

To be compared with high and middle levels of family affluence, among adolescents with a lower level of family affluence the prevalence of other health complaints was the highest; these were irritability/bad temper, anxiety, difficulty falling asleep and dizziness ( $p < 0.001$ ).

In the logistic regression the odds of chronic pain after the adjustment by other health complaints in the case of low family affluence ratings decreased from 23% – 30% (see Tables 7.6.2 and 7.6.3).

Table 7.6.3. The odds<sup>1</sup> of chronic pain as related to assessment of family's level of affluence adjusted by other health complaints

Family affluence	Chronic pain					
	Headache		Stomach ache		Back pain	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Boys</b>						
Middle	1.33***	1.15 – 1.54	1.21*	1.03 – 1.43	1.13NS	0.95 – 1.35
Low	1.27NS	0.99 – 1.63	1.29NS	0.98 – 1.70	1.38*	1.04 – 1.85
<b>Girls</b>						
Middle	1.27***	1.14 – 1.43	1.14*	1.01 – 1.28	1.22**	1.05 – 1.41
Low	1.47***	1.24 – 1.75	1.34**	1.11 – 1.61	1.54***	1.25 – 1.90

<sup>1</sup> Adjusted by age and survey year and other health complaints (irritability/bad temper, anxiety, difficulty falling asleep and dizziness)

Reference category: high family affluence

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

Thereby, the greater prevalence of chronic pain among adolescents who considered their family's affluence as low could be partly explained by the greater prevalence of other weekly health complaints. However, independently from other health complaints, in most cases the association between chronic pain and assessment of family affluence level remained statistically valid, and for girls the association between chronic pain and a low affluence level remained stronger.

## 7.7. Chronic pain and adolescent communication with parents and friends

In order to assess adolescent relationships with parents and friends, the respondents were asked to rate how easily they can talk about bothering problems with their mother, father, same-gender friends and opposite-gender friends. In the text this issue is referred to as *communication problems with parents and friends*.

### 7.7.1. Chronic pain and adolescent relationships with their parents

Based on the results of HBSC surveys conducted from 1994 to 2006 in Latvia, on average of 13.3% (n = 1929) adolescents noted that they didn't have a father and 2.7% (n = 398) reported they didn't have a mother or that they had no contact with

them. These respondents were not included in the assessment of communication problems with parents.

A total of 18.8% (95%CI=18.2 – 19.4) of adolescents reported to be difficult or very difficult to talk about bothering problems to their mother and 38.1% (95%CI=37.3 – 39.0) – to their father. The proportion of girls having communication difficulties with both parents was greater than the proportion of boys, but the greatest differences appeared in communication with the father. The proportion of girls (47.2%) finding it difficult to communicate with their father exceeded that of boys (27.8%) by 19.4% (95%CI=17.7-21.1) (p<0.001). In the case of both genders communication difficulties with parents were twice more prevalent at age 15 than in the youngest age group (p<0.001).

The prevalence of chronic pain was greater among adolescents who found it difficult to communicate with their parents than among those who didn't (p<0.001) (Table 7.7.1.1). The greatest differences in both groups were observed in communication with the father; chronic pain was 1.5 times more prevalent among those adolescents finding it difficult to communicate with their father.

*Table 7.7.1.1. Prevalence of chronic pain among adolescents who find it very easy/easy or difficult/very difficult to discuss bothering problems with their parents (%)*

	<b>Headache</b>		<b>Stomach ache</b>		<b>Back pain</b>	
	<b>%</b>	<b>95%CI</b>	<b>%</b>	<b>95%CI</b>	<b>%</b>	<b>95%CI</b>
<b>Communication with mother</b>						
Difficult/very difficult	<b>33.2</b>	31.5 – 35.0	<b>23.4</b>	21.8 – 25.0	<b>18.5</b>	17.1 – 20.0
Very easy/easy	<b>25.6</b>	24.8 – 26.4	<b>18.8</b>	18.1 – 19.5	<b>12.2</b>	11.6 – 12.8
<b>Communication with father</b>						
Difficult/very difficult	<b>33.2</b>	31.9 – 34.6	<b>24.7</b>	23.5 – 25.9	<b>16.6</b>	15.6 – 17.7
Very easy/easy	<b>22.7</b>	21.7– 23.6	<b>16.2</b>	15.4 – 17.1	<b>11.2</b>	10.5 – 11.9

Logistic regression results showed that in general the odds of chronic pain increased by 1.5 times among adolescents having communication difficulties compared with adolescents who didn't find it difficult to communicate with their parents (Table 7.7.1.2). For the most part, the odds of chronic pain in association with communication difficulties with parents among boys were higher than girls; but these gender differences were not found to be statistically valid.

Table 7.7.1.2. The odds<sup>1</sup> of chronic pain as related to communication difficulties with parents

<i>Communication with parents</i>	<i>Chronic pain</i>					
	<b>Headache</b>		<b>Stomach ache</b>		<b>Back pain</b>	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Difficulties in communication with mother</b>						
Boys	1.59***	1.36 – 1.86	1.42***	1.18 – 1.70	1.63***	1.35 – 1.96
Girls	1.27***	1.12 – 1.42	1.30***	1.14 – 1.48	1.42***	1.23 – 1.65
<b>Difficulties in communication with father</b>						
Boys	1.68***	1.45 – 1.93	1.46***	1.24 – 1.72	1.54***	1.29 – 1.83
Girls	1.32***	1.19 – 1.47	1.62***	1.44 – 1.82	1.39***	1.21 – 1.61

<sup>1</sup> Adjusted by age and survey year

Reference category: communication with parents – very easy/easy

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

Among the adolescents who found it difficult or very difficult to communicate with their parents the prevalence of other weekly health complaints (irritability/bad temper, anxiety, difficulty falling asleep and dizziness) was higher than among those without communication difficulties (p<0.001). In the logistic regression it was determined to what degree the association between chronic pain and communication difficulties could be explained independent of other health complaints.

By comparing the results in the Table 7.7.1.2 with the Table 7.7.1.3, after the adjustment by other health complaints, the odds of chronic pain among adolescents with communication difficulties with parents decreased by 12% – 22%, in many cases losing statistical validity (Table 7.7.1.3). The statistically strongest association (OR = 1.42) for girls remained between chronic stomach ache and communication difficulties with their father.

Table 7.7.1.3. The odds<sup>1</sup> of chronic pain as related to communication difficulties with parents adjusted by other health complaints

<i>Communication with parents</i>	<i>Chronic pain</i>					
	<b>Headache</b>		<b>Stomach ache</b>		<b>Back pain</b>	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Difficulties in communication with mother</b>						
Boys	1.28**	1.08 – 1.51	1.14NS	0.94 – 1.38	1.33**	1.09 – 1.61
Girls	1.02NS	0.89 – 1.16	1.08NS	0.94 – 1.23	1.21*	1.03 – 1.41
<b>Difficulties in communication with father</b>						
Boys	1.34***	1.15 – 1.57	1.14NS	0.95 – 1.36	1.22*	1.02 – 1.47
Girls	1.10NS	0.98 – 1.24	1.42***	1.25 – 1.61	1.21*	1.04 – 1.40

<sup>1</sup> Adjusted by age and survey year and other health complaints (irritability/bad temper, anxiety, difficulty falling asleep and dizziness)

Reference category: communication with parents – very easy/easy

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

Thus, a greater prevalence of other health complaints largely explains the association between chronic pain and communication difficulties with parents which again indicates the strong interconnectedness between pain and other health complaints and also strong association between all chronic health complaints and family communication during adolescence.

## 7.7.2. Chronic pain and adolescent relationships with friends

Based on the 1994 – 2006 HBSC surveys in Latvia, on average of 7.2% (n = 1009) adolescents reported they did not have any same-gender and 16.4% (n = 2282) – opposite gender friends. These respondents were not included in assessment of communication difficulties with friends.

In all 19.5% (95%CI=18.8 – 20.2) of adolescents reported it was difficult or very difficult to discuss bothering problems with their same-gender and 48.5% (95%CI=47.6 – 49.4) – opposite-gender friends. There were no differences in communication with same-gender friends, but the proportion (53.4%) of girls finding it difficult to communicate with opposite-gender friends exceeded that of boys (42.6%) by 10.8% (95%CI=9.0 – 12.6). Communication difficulties decreased for both genders with the age increase. However, the proportion of adolescents finding it difficult to communicate with opposite-gender friends decreased more – for boys from

48.4% at age 11 to 36.5% at age 15; for girls from 66.3% at age 11 to 41.5% at age 15 (p<0.001).

The difference of the prevalence of chronic pain among adolescents as related to communication difficulty with friends in most cases was not statistically significant. Adolescents who did have problems communicating with their same-gender friends had a slightly greater prevalence for chronic stomach ache than adolescents with no communication difficulties (p<0.05). Proportions of adolescents with chronic headache and back pain was slightly higher among those who found it difficult to communicate with opposite-gender friends than those who didn't (p<0.01). Although statistically valid, the percentage differences just mentioned were negligible – on average of 2% (Table 7.7.2.1).

*Table 7.7.2.1. Prevalence of chronic pain among adolescents finding it difficult /very difficult or easy/very easy to discuss bothering problems with their friends*

	<b>Headache</b>		<b>Stomach ache</b>		<b>Back pain</b>	
	<b>%</b>	<b>95%CI</b>	<b>%</b>	<b>95%CI</b>	<b>%</b>	<b>95%CI</b>
<b>Communication with same-gender friends</b>						
Difficult/very difficult	<b>28.9</b>	27.1 – 30.7	<b>21.3</b>	19.7 – 22.9	<b>13.7</b>	12.4 – 15.1
Very easy/easy	<b>27.0</b>	26.2 – 27.9	<b>19.5</b>	18.8 – 20.3	<b>13.4</b>	12.7 – 14.0
<b>Communication with opposite-gender friends</b>						
Difficult/very difficult	<b>28.8</b>	27.6 – 30.0	<b>20.5</b>	19.5 – 21.6	<b>14.8</b>	13.9 – 15.7
Very easy/easy	<b>26.4</b>	25.3 – 27.6	<b>19.6</b>	18.6 – 20.6	<b>12.8</b>	12.0 – 13.7

Logistic regression analysis showed that the odds of chronic pain as related to communication difficulties with friends indicators were for the most part not statistically significant (Table 7.7.2.2). As a result of communications difficulties, the odds of chronic headache and stomach ache increased by a factor of 1.24 – 1.33 in boys. Girls who found it difficult to communicate with friends of the opposite gender seemed to be 0.8 times less likely to report chronic back pain as compared with those girls who didn't have this difficulty. Although the latter was not statistically valid, the odds of chronic pain for girls with communications problems with friends actually decreased rather than increased.

Table 7.7.2.2. The odds<sup>1</sup> of chronic pain as related to communication difficulties with friends

<i>Communication with friends</i>	<i>Chronic pain</i>					
	<b>Headache</b>		<b>Stomach ache</b>		<b>Back pain</b>	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Difficulties in communication with same-gender friends</b>						
Boys	1.24**	1.05 – 1.45	1.33**	1.11 – 1.60	1.17NS	0.96 – 1.43
Girls	1.08NS	0.95 – 1.23	1.00NS	0.87 – 1.15	0.99NS	0.83 – 1.17
<b>Difficulties in communication with opposite-gender friends</b>						
Boys	1.17*	1.01 – 1.35	0.98NS	0.83 – 1.15	1.03NS	0.86 – 1.23
Girls	1.04NS	0.93 – 1.16	0.93NS	0.83 – 1.04	0.87*	0.75 – 1.00

<sup>1</sup> Adjusted by age and survey year

Reference category: communication with friends– very easy/easy

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

There were statistically significant differences of the odds of chronic stomach ache in boys finding it difficult to communicate with same-gender friends in studied age groups ( $\chi^2(2)=7.20$ ;  $p<0.05$ ). Boys had the highest odds of chronic stomach ache (OR=1.73; 95%CI=1.32 – 2.27) as related to difficulties in communicating with same-gender friends at age 11, but at age 13 (OR=0.96; 95%CI=0.69 – 1.33) and at age 15 (OR=1.30; 95%CI=0.89 – 1.88) the association was weaker and no longer statistically valid.

Girls had statistically significant differences of the odds of back pain by age as related to communicating with friends of the opposite gender ( $\chi^2(2) = 7.45$ ;  $p<0.05$ ). At age 11 girls who found it difficult to communicate with opposite-gender friends were 1.26 times (95%CI=0.91 – 1.74) more likely to report chronic back pain, but this was not statistically significant. At age 13 (OR=0.77; 95%CI=0.59 – 1.01) and at the age of 15 (OR=0.80; 95%CI=0.65 – 0.98) the odds of chronic back pain inversely remained below 1, but only the last case was statistically valid.

Thus, lower odds of back pain, mentioned already before, among girls with communication problems with opposite-gender friends were statistically valid only at 15-year old girls. To some extent it could be explained by the age differences on forming interrelationship and communication with opposite-sex friend throughout the period of adolescence for girls. However, there is a need for evidenced-based information, firstly, testing the construct validity of this measurement among different age and gender groups within the adolescent period.

After adjustment by logistic regression for other health complaints (irritability/bad temper, anxiety, difficulty falling asleep and dizziness), the odds of chronic pain practically didn't change among girls and decreased somewhat among boys, but these changes were not substantial (see Tables 7.7.2.2 and 7.7.2.3). Such results could be explained by the fact there were no differences in the prevalence of these health complaints between different adolescent groups depending on communication difficulties with friends.

*Table 7.7.2.3. The odds<sup>1</sup> of chronic pain as related to communication difficulties with friends adjusted by other health complaints*

<i>Communication with friends</i>	<b>Chronic pain</b>					
	<b>Headache</b>		<b>Stomach ache</b>		<b>Back pain</b>	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Difficulties in communication with same-gender friends</b>						
Boys	1.12NS	0.94 – 1.33	1.22*	1.01 – 1.47	1.06NS	0.86 – 1.31
Girls	1.03NS	0.90 – 1.18	0.95NS	0.82 – 1.10	0.93NS	0.78 – 1.11
<b>Difficulties in communication with opposite-gender friends</b>						
Boys	1.08NS	0.93 – 1.26	0.88NS	0.74 – 1.05	0.90NS	0.75 – 1.09
Girls	1.03NS	0.92 – 1.16	0.91NS	0.80 – 1.03	0.85*	0.74 – 0.99

<sup>1</sup> Adjusted by age and survey year and other health complaints (irritability/bad temper, anxiety, difficulty falling asleep and dizziness)

Reference category: communication with friends – very easy/easy

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

Reviewing the logistic regression results (see Tables 7.7.1.2 and 7.7.2.2), it could be concluded that the presence of chronic pain among adolescents was much more strongly associated with communication difficulties with parents than friends.

## 7.8. Chronic pain and academic performance

In the HBSC study the academic success of adolescents was evaluated by analyzing the respondents' answer to this question: *"In your opinion, what does your teacher(s) think about your school performance compared to your classmates?"* Further this concept is referred to as **academic success**. Thereby, the self-evaluated relative academic success is measured in this study. The role of self-image in academic success might be as much as important as objective academic achievement, especially, in terms of subjective health.

A total of 5.7% (95%CI=5.3 – 6.1) of the respondents reported their academic success was very good compared with classmates' average, while 5.3% (95%CI=5.0 – 5.7) considered their academic success below the average. The proportion of girls who evaluate themselves as very good exceeded that of the boys by 2.9% (95%CI=2.2 – 3.7) while the proportion of girls who assessed their academic success below the average level of their classmates was 4.1% (95%CI=3.4 – 4.8) lower than that of the boys ( $p > 0.001$ ).

The proportion of girls who evaluated their academic success as very good had increased from 1994 to 2006 from 3.8% in 1994 to 11.4% in 2006 ( $p < 0.05$ ).

As adolescent age increased, the self-evaluated academic success as very good for both genders slightly decreased. A total of 5.8% of the boys at age 11 reported their academic success as very good, but at age 15 this proportion decreased by one half ( $p < 0.001$ ). The opposite tends to be true for those adolescents who considered their academic success below the average level of their classmates. The proportion of girls in this category was somewhat larger ( $\approx 4\%$ ) at age 15 than at 11 (2%), but for boys the difference was greater. At age 15, the proportion of boys (10.1%) considering their academic success below the average level of their classmates was 6.3% greater (95%CI=4.8 – 7.8) than at age 11 (4.4%) ( $p < 0.001$ ).

The greatest proportion of adolescents with chronic pain was among those adolescents who evaluated their academic success below the average level of their classmates. The prevalence of chronic headache and back pain was slightly higher among those adolescents with very good academic success compared to those with self-assessed good academic success (Table 7.8.1).

Table 7.8.1. Prevalence of chronic pain as related to academic success (%)

	Headache		Stomach ache		Back pain	
	%	95%CI	%	95%CI	%	95%CI
<b>Academic success</b>						
Very good	<b>29.2</b>	26.3 – 32.3	<b>19.9</b>	17.3 – 22.7	<b>15.0</b>	12.7 – 17.5
Good	<b>24.8</b>	23.8 – 25.9	<b>17.8</b>	16.9 – 18.8	<b>12.0</b>	11.2 – 12.9
Average	<b>28.1</b>	27.1 – 29.1	<b>20.8</b>	19.9 – 21.8	<b>13.5</b>	12.8 – 14.4
Below average	<b>35.0</b>	31.7 – 38.3	<b>24.8</b>	22.0 – 28.0	<b>21.6</b>	18.9 – 24.7

Table 7.8.2 shows the logistic regression analysis results as related to the association between chronic pain and self-evaluated academic success separately for boys and girls after adjustment by survey year and age. Adolescents with self-assessed good academic success were selected as the reference category since this group of respondents was the largest and had the lowest proportion of adolescents reporting the chronic pain.

The highest odds of chronic pain existed for girls who considered their academic success below the average level of their classmates; the odds of chronic pain were twice as great as for girls with self-rated good academic success ( $p < 0.001$ ). The odds of chronic pain for boys who evaluated their academic success below the average level of their classmates increased by 1.6 – 1.8 times compared to boys with good academic success. However, the odds of chronic stomachache increased by 1.6 times also for those boys with self-assessed very good academic success ( $p < 0.01$ ).

Table 7.8.2. The odds<sup>1</sup> of chronic pain as related to academic success

Academic success	Chronic pain					
	Headache		Stomach ache		Back pain	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Boys</b>						
Very good	1.25NS	0.91 – 1.70	<b>1.61**</b>	1.16 – 2.25	0.89NS	0.58 – 1.34
Average	1.34***	1.17 – 1.54	<b>1.27**</b>	1.09 – 1.50	1.10NS	0.93 – 1.31
Below average	<b>1.80***</b>	1.42 – 2.27	<b>1.64**</b>	1.25 – 2.15	1.69***	1.29 – 2.21
<b>Girls</b>						
Very good	1.18NS	0.98 – 1.42	<b>0.92NS</b>	0.74 – 1.15	1.29*	1.01 – 1.64
Average	1.32***	1.19 – 1.46	<b>1.49***</b>	1.34 – 1.67	1.26***	1.10 – 1.44
Below average	<b>2.54***</b>	1.98 – 3.26	<b>2.41***</b>	1.87 – 3.12	2.31***	1.74 – 3.07

<sup>1</sup> Adjusted by age and survey year

Reference category: good academic success

\* $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ ; NS – not significant

There were no statistically significant differences in the odds of chronic stomach ache in boys as related to different self-evaluated levels of academic success (very good, average or below average), but in the case of girls, statistically valid

differences appeared between the all levels of academic success ( $p < 0.001$ ). For example, the odds of stomach ache in girls were significantly lower in the group with self-assessed average academic success than in the group with academic success below the average level of their classmates.

Both boys ( $p < 0.01$ ) and girls ( $p < 0.001$ ) with the academic success below the average level of their classmates were more prone to chronic headache and back pain than students with very good or average academic success. The differences between the odds of chronic back pain and headache in students who evaluate their academic performance as average or very good were statistically invalid for both genders.

The likelihood that girls who evaluated their academic success below the average level of their classmates would suffer from chronic headache was statistically greater than it was for boys ( $\chi^2(3) = 8.05$ ;  $p < 0.05$ ) (see Table 7.8.2 in **bold**). Moreover, girls also were more prone to have chronic stomach ache than boys were, both those with self-evaluated average or below the average academic success ( $\chi^2(3) = 20.2$ ;  $p < 0.001$ ). Thus, the odds that girls would suffer from chronic headache and stomach ache exceeded that of boys as their academic success level decreased. However, if there was no association between chronic stomach ache and very good academic success for girls, then academically very successful boys showed a statistically valid greater likelihood of reporting chronic stomach ache.

In general the prevalence of other health complaints (irritability/bad temper, anxiety, difficulty falling asleep and dizziness) was much greater in those adolescents who considered their academic success below the average level of their classmates ( $p < 0.001$ ). However, no differences appeared when to compare students who were academically good or very good.

In order to determine how much chronic pain was associated with academic success independent of other health complaints, academic self-evaluation was adjusted by other health complaints (Table 7.8.3).

Table 7.8.3. The odds<sup>1</sup> of chronic pain as related to academic success adjusted by other health complaints

<i>Academic success</i>	<i>Chronic pain</i>					
	<i>Headache</i>		<i>Stomach ache</i>		<i>Back pain</i>	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Boys</b>						
Very good	1.30NS	0.92 – 1.82	1.74**	1.22 – 2.49	0.91NS	0.59 – 1.40
Average	1.28***	1.11 – 1.49	1.18*	1.01 – 1.40	1.02NS	0.85 – 1.22
Below average	1.51***	1.17 – 1.95	1.33NS	0.99 – 1.77	1.42**	1.07 – 1.89
<b>Girls</b>						
Very good	1.16NS	0.95 – 1.43	0.87NS	0.69 – 1.10	1.25NS	0.98 – 1.61
Average	1.15**	1.04 – 1.29	1.34***	1.20 – 1.51	1.12NS	0.97 – 1.29
Below average	1.66***	1.27 – 2.19	1.61***	1.22 – 2.12	1.57**	1.16 – 2.11

<sup>1</sup> Adjusted by age and survey year and other health complaints (irritability/bad temper, anxiety, difficulty falling asleep and dizziness)

Reference category: good academic success

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

The odds of chronic pain as related to an academic success rating of lower than average significantly decreased by 16% – 19% in boys and 32% – 35% in girls after the adjustment by other health complaints. Thus, weekly health complaints by adolescents who evaluate their academic success below the average level of their classmates to some extent explain the association with greater odds of chronic pain. Still, the odds of chronic stomach ache increased almost twice for boys who considered themselves academically very good compared with those boys with self-evaluated good academic success.

As part of the HBSC survey adolescents were asked how much pressured they felt by the schoolwork, further referred to as **academic stress**. Most of the respondents (71.1%; 95%CI=70.4 – 71.8) felt very little or no academic stress. A total of 23.2% (95%CI=22.6 – 23.9) of respondents felt some stress and 5.7% (95%CI=5.3 – 6.1) – a lot of stress by the schoolwork.

The proportion of boys and girls who reported a lot of academic stress was similar. In the case of those adolescents reporting some academic stress, the proportion of girls (25.2%) was 4.3% (95%CI=3.0 – 5.7) greater than that of boys (20.9%). The level of academic stress increased for both genders with age (p<0.001).

The students with self-assessed a lot of academic stress were twice as likely to suffer from chronic pain as those students with no academic stress (p<0.001) (Table 7.8.4).

Table 7.8.4. Prevalence of chronic pain as related to academic stress (%)

	Headache		Stomach ache		Back pain	
	%	95%CI	%	95%CI	%	95%CI
<b>Academic stress</b>						
Not at all/a little	<b>23.3</b>	22.5 – 24.1	<b>17.5</b>	16.8 – 18.3	<b>11.4</b>	10.8 – 12.0
Some	<b>35.3</b>	33.7 – 36.9	<b>24.6</b>	23.2 – 26.0	<b>17.4</b>	16.2 – 18.7
A lot	<b>42.9</b>	39.6 – 46.3	<b>27.9</b>	25.0 – 31.0	<b>23.5</b>	20.8 – 26.5

The results in logistic regression adjusting by survey year and age showed that the odds of chronic pain increased on average by two times for those adolescents who reported a lot of academic stress compared to the reference group – adolescents with very little or no academic stress. The gender differences of odds for chronic pain for adolescents as related to academic stress were not statistically significant.

Table 7.8.5. The odds<sup>1</sup> of chronic pain as related to academic stress

Academic stress	Chronic pain					
	Headache		Stomach ache		Back pain	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Boys</b>						
Some	1.96***	1.70 – 2.26	1.67***	1.42 – 1.97	1.63***	1.36 – 1.94
A lot	2.39***	1.88 – 3.04	2.00***	1.52 – 2.64	2.03***	1.53 – 2.70
<b>Girls</b>						
Some	1.65***	1.48 – 1.84	1.56***	1.39 – 1.75	1.53***	1.33 – 1.76
A lot	2.40***	1.99 – 2.90	1.82***	1.48 – 2.22	2.30***	1.85 – 2.88

<sup>1</sup> Adjusted by age and survey year

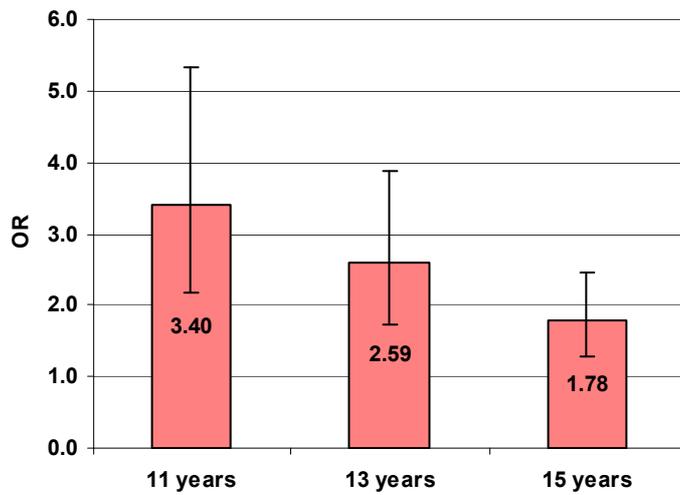
Reference category: academic stress – not at all/a little

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

In boys there were no significant differences of odds for chronic pain between those with some academic stress compared to those with a lot of academic stress. In girls the odds of chronic headache ( $\chi^2(1) = 13.49$ ;  $p < 0.001$ ) and back pain ( $\chi^2(1) = 11.76$ ;  $p < 0.001$ ) as related to self-reported levels of some or a lot of academic stress were significantly different. As the level of academic stress among girls increased, the odds of mentioned chronic pain also increased.

There were statistically significant differences of odds for chronic back pain among age groups in girls with a lot of academic stress ( $\chi^2(4) = 6.74$ ;  $p < 0.05$ ). Among the girls with a lot of academic stress the odds of back pain in 11 year-olds were twice as great as the odds in 15 year-olds (Figure 7.8.1).

Figure. 7.8.1. The odds<sup>1</sup> of **chronic back pain** among **girls with a lot of academic stress** by age



<sup>1</sup>Adjusted by survey year  
Reference category: academic stress – not at all/a little

Adolescents who assessed their academic success below the average level of their classmates felt some stress 1.6 times more often and a lot of stress three times more often than respondents with self-evaluated good academic success ( $p < 0.001$ ). It is possible that the association between self-evaluated academic success and chronic pain is related to a greater level of academic stress. Therefore the mutual adjustment of academic success and academic stress was studied in logistic regression in order to determine the independent effect of these factors on chronic pain (Table 7.8.6).

Table 7.8.6. The odds<sup>1</sup> of chronic pain as related to *mutually adjusted* academic success and academic stress

<i>Academic success and stress</i>	<i>Chronic pain</i>					
	<i>Headache</i>		<i>Stomach ache</i>		<i>Back pain</i>	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Boys</b>						
Very good academic success	1.25NS	0.91 – 1.71	1.69**	1.21 – 2.36	0.90NS	0.59 – 1.37
Average academic success	1.25***	1.09 – 1.44	1.22*	1.03 – 1.43	1.05NS	0.88 – 1.25
Below average academic success	1.50***	1.18 – 1.90	1.42**	1.08 – 1.88	1.46**	1.11 – 1.93
Some academic stress	1.92***	1.66 – 2.22	1.64***	1.39 – 1.94	1.59***	1.34 – 1.90
A lot of academic stress	2.25***	1.76 – 2.87	1.88***	1.42 – 2.50	1.93***	1.45 – 2.57
<b>Girls</b>						
Very good academic success	1.20NS	0.99 – 1.45	0.93NS	0.74 – 1.15	1.30*	1.02 – 1.65
Average academic success	1.26***	1.14 – 1.40	1.44***	1.29 – 1.61	1.21**	1.05 – 1.39
Below average academic success	2.28***	1.77 – 2.94	2.22***	1.71 – 2.87	2.01***	1.51 – 2.69
Some academic stress	1.59***	1.43 – 1.78	1.48***	1.32 – 1.67	1.47***	1.27 – 1.70
A lot of academic stress	2.26***	1.87 – 2.74	1.68***	1.37 – 2.06	2.17***	1.73 – 2.72
Very good academic success	1.25NS	0.91 – 1.71	1.69**	1.21 – 2.36	0.90NS	0.59 – 1.37

<sup>1</sup> Adjusted by age and survey year

Reference category: good academic success and academic stress – not at all/a little

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

After the mutual adjustment of academic success and academic stress the greatest decrease in the odds of chronic pain (10% –14%) in both girls and boys was associated with a below average academic success level. Thus, the association between a low level of academic success and chronic pain in adolescents can partly be explained by the subjective level of academic stress. However, independent of academic stress, an academic success rating below that of their classmates resulted on average in a 1.5 times greater odds of chronic pain in boys and up to two times in girls.

The independent effect of academic stress as related to chronic pain was comparatively greater than academic success in boys. However, independent of academic stress, the odds of chronic stomach ache associated with very good academic success in boys still remained increasing almost by two times compared to boys with good academic success.

The level of academic stress, especially in girls, explained less variation in chronic pain as related to academic success than it was with other health complaints (see Tables 7.8.3 and 7.8.6). This could be explained by the fact that the other health complaints studied before (irritability/bad temper, anxiety, difficulty falling asleep and dizziness) result from a much broader range of psycho-emotional feelings that are not associated with only academics.

## 7.9. Chronic pain and bullying at school

The prevalence of bullying in schools was determined by asking the respondents how often they have been bullied in the last few months and how often they had bullied others. Taking into consideration the answers to both questions, the students were classified in four groups: „*have not been bullied nor have bullied others*” (neutrals), „*have only been bullied*” (victims), „*have only bullied others*” (bullies), „*have been bullied and have bullied others*” (bullies/victims).

In general, about the same proportion of adolescents had only bullied others – 12.8% (95%CI=12.3 – 13.3) as had only been bullied – 14.9% (95%CI=14.3 – 15.4). The lowest proportion of adolescents – 9.1% (95%CI=8.6 – 9.6) was in the group of bullies/victims.

Table 7.9.1 shows the prevalence of bullying by gender and age. The proportion of boys who had only bullied others was almost twice as great as the proportion of girls ( $p<0.001$ ). There was no statistically valid gender difference in the group of victims. Among the adolescents who had both been bullied and bullied others, the proportion of boys was 3.1% (95%CI=2.2 – 4.1) greater than that of girls ( $p<0.001$ ).

*Table 7.9.1. Prevalence of bullying at school among boys and girls by age (%)*

Gender	Bullying groups	Age groups			Total	
		11 years	13 years	15 years	%	95% CI
<b>Boys</b>						
	Bullies	10.3	18.3	22.1	<b>16.5</b>	15.7 – 17.4
	Victims	19.1	16.7	9.4	<b>15.4</b>	14.6 – 16.2
	Bullies/victims	9.7	12.8	9.7	<b>10.8</b>	10.1 – 11.5
<b>Girls</b>						
	Bullies	5.7	10.9	12.1	<b>9.6</b>	9.0 – 10.3
	Victims	18.5	15.5	9.6	<b>14.4</b>	13.7 – 15.2
	Bullies/victims	7.5	9.1	6.6	<b>7.7</b>	7.1 – 8.2

The proportion of bullies doubled as adolescents age increased, both boys and girls ( $p<0.001$ ). By contrast, the proportion of victims, both boys and girls, was cut in half ( $p<0.001$ ). The proportion of adolescents in the bully/victim group at age 11 and 15 was almost unchanged, but at age 13 compared with age 11 it increased by 3.1% (95%CI=1.3 – 4.9) for boys and 1.7% (95%CI=0.1 – 3.2) for girls (Table 7.9.1).

Compared to the adolescents who had neither been bullied nor had bullied others (neutrals), the chronic pain was most prevalent among victims and bullies/victims (Table 7.9.2).

*Table 7.9.2. Prevalence of chronic pain as related to bullying at school (%)*

	Headache		Stomach ache		Back pain	
	%	95%CI	%	95%CI	%	95%CI
<b>Bullying groups</b>						
Neutrals	<b>25.4</b>	24.6 – 26.3	<b>17.6</b>	16.8 – 18.4	<b>12.0</b>	11.4 – 12.7
Bullies	<b>25.9</b>	24.0 – 27.9	<b>19.6</b>	17.9 – 21.4	<b>14.9</b>	13.4 – 16.6
Victims	<b>31.6</b>	29.7 – 33.5	<b>25.7</b>	23.9 – 27.6	<b>15.8</b>	14.4 – 17.4
Bullies/victims	<b>33.6</b>	31.1 – 36.1	<b>25.3</b>	23.0 – 27.6	<b>16.9</b>	15.0 – 19.0

Table 7.9.3 shows the odds of chronic pain as related to bullying at school after adjustment by survey year and age. The reference category (OR=1) is adolescents who had neither been bullied nor have bullied others (neutrals).

In the case of both genders, the bully/victim group showed a twice as much likelihood of chronic pain than the neutral group. Statistically significant differences were observed for girls as related to the odds of chronic headache ( $\chi^2(1) = 5.58$ ;  $p < 0.05$ ) and back pain ( $\chi^2(1) = 4.22$ ;  $p < 0.05$ ) between the bullies and the bullies/victim group; the odds of the latter was somewhat greater.

Among boys the differences in the odds of chronic pain among the various bullying groups were greater. Among victims the odds for chronic headache ( $\chi^2(1) = 16.98$ ;  $p < 0.001$ ) and stomach ache ( $\chi^2(1) = 14.80$ ;  $p < 0.001$ ) was on average by 1.5 times greater than among bullies. Similar differences were observed comparing the bullies with the bullies/victims as related to chronic headache ( $\chi^2(1) = 9.76$ ;  $p < 0.001$ ) and stomach ache ( $\chi^2(1) = 12.21$ ;  $p < 0.001$ ). Among boys statistically valid differences in the odds of chronic back pain were only between the bullies and the bullies/victim ( $\chi^2(1) = 4.92$ ;  $p < 0.05$ ).

Thus, there were no statistically significant differences in the odds of chronic pain between victims and bullies/victims among neither boys nor girls.

Table 7.9.3. The odds<sup>1</sup> of chronic pain as related to bullying at school

<i>Bullying at school</i>	<i>Chronic pain</i>					
	<b>Headache</b>		<b>Stomach ache</b>		<b>Back pain</b>	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Boys</b>						
Bullies	1.07NS	0.89 – 1.28	<b>1.16NS</b>	0.94 – 1.43	1.28*	1.04 – 1.58
Victims	<b>1.67***</b>	1.42 – 1.97	<b>1.86***</b>	1.54 – 2.23	<b>1.63***</b>	1.32 – 2.01
Bullies/victims	<b>1.78***</b>	1.47 – 2.13	<b>1.84***</b>	1.49 – 2.28	<b>1.75***</b>	1.38 – 2.21
<b>Girls</b>						
Bullies	1.24**	1.06 – 1.45	<b>1.49***</b>	1.26 – 1.76	1.24*	1.01 – 1.52
Victims	<b>1.37***</b>	1.20 – 1.56	<b>1.59***</b>	1.38 – 1.83	<b>1.58***</b>	1.33 – 1.88
Bullies/victims	<b>1.62***</b>	1.36 – 1.92	<b>1.67***</b>	1.39 – 2.01	<b>1.66***</b>	1.33 – 2.08

<sup>1</sup> Adjusted by age and survey year

Reference category: neutrals

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

Among adolescents in the victim group, the odds of chronic headache was greater for boys than for girls ( $\chi^2(3) = 12.19$ ;  $p < 0.01$ ), but among the bullies, the odds of chronic stomach ache was greater for girls than it was for boys ( $\chi^2(3) = 9.49$ ;  $p < 0.01$ ) (see Table 7.9.3 in **bold**).

With respect to the prevalence of other health complaints (irritability/bad temper, anxiety, difficulty falling asleep and dizziness) among adolescents in all three groups indicating the involvement in bullying, it was statistically greater than among adolescents in the neutral group ( $p < 0.001$ ).

Table 7.9.4 shows that after adjustment by other health complaints, the odds of chronic pain as related to bullying decreased significantly, especially in the bully/victim group (by 29% – 32% for boys and 23% – 25% for girls). This is explained by the highest prevalence of other health complaints in the bullies/victims group.

Table 7.9.4. The odds<sup>1</sup> of chronic pain as related to bullying at school adjusted by other health complaints

<i>Bullying at school</i>	<i>Chronic pain</i>					
	<i>Headache</i>		<i>Stomach ache</i>		<i>Back pain</i>	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Boys</b>						
Bullies	0.92NS	0.76 – 1.11	1.01NS	0.82 – 1.26	1.12NS	0.90 – 1.40
Victims	1.34**	1.12 – 1.60	1.51***	1.24 – 1.84	1.30*	1.04 – 1.62
Bullies/victims	1.25*	1.02 – 1.53	1.30*	1.04 – 1.63	1.19NS	0.93 – 1.53
<b>Girls</b>						
Bullies	1.05NS	0.88 – 1.24	1.30**	1.08 – 1.55	1.06NS	0.86 – 1.32
Victims	1.06NS	0.91 – 1.22	1.27**	1.09 – 1.47	1.27**	1.06 – 1.53
Bullies/victims	1.22*	1.01 – 1.47	1.28**	1.05 – 1.55	1.28*	1.02 – 1.62

<sup>1</sup> Adjusted by age and survey year and other health complaints (irritability/bad temper, anxiety, difficulty falling asleep and dizziness)

Reference category: neutrals

\*p<0.05; \*\* p<0.01; \*\*\* p<0.001; NS – not significant

Thus, the association between bullying and chronic pain is to a certain extent explained by the high prevalence of other health complaints among those adolescents involved in bullying at school. These results again confirm the strong association between chronic pain and other health complaints.

## **8. Conclusions**

1. 40% of adolescents have chronic pain (headache and/or back pain and/or stomach ache); 16% of adolescents report multiple chronic pain.
2. From 1994 to 2006 the prevalence of chronic back pain among adolescents has statistically increased in Latvia from 8% to 18%.
3. Chronic pain is experienced more often by adolescents suffering from chronic illness or other health complaints.
4. Adolescents with chronic pain not only use twice as much pain medication than adolescents without chronic pain, but also use more medications for difficulty falling asleep and anxiety.
5. The odds of chronic pain increases for adolescents who smoke and use alcohol.
6. The prevalence of chronic pain is higher among those adolescents with low perceived family affluence as well as communication difficulties with parents.
7. A low academic success but high level of academic stress as well as bullying at school all increases the odds of chronic pain in adolescents.
8. Not only does the prevalence of chronic pain differ between boys and girls by age, but often the strength of association between chronic pain and studied factors does too.
9. To a certain extent the association between chronic pain and other health-related, lifestyle and psychosocial factors can be explained by a greater prevalence of other health complaints among adolescents with chronic pain. This confirms the strong association between studied factors and chronic health complaints in general and also the existence of psychosomatic mechanisms in the development of chronic pain among adolescents supported by quantitative evidence.

## 9. Recommendations

1. Use of gender stratified analysis is recommended for epidemiological studies on chronic pain in adolescents.
2. Both in research and clinical practice, it is important and useful to obtain additional information about other health indicators, adolescent lifestyle and psychosocial factors when studying chronic pain and its possible causes in adolescents.
3. It is crucial to initiate the issue of chronic pain in public health programs addressing adolescent health in the frame of biopsychosocial approach.

## 10. Publications and reports

The results of the thesis „Chronic Pain and Associated Factors in Adolescents” were presented at the joint meeting of the RSU Department of Public Health and Epidemiology and the Public Health Association of Latvia on May 13, 2010.

### List of publications

- 1) Gobina I., Välimaa R., Tynjälä J., Villberg J., Villerusa A., Iannotti R.J., Godeau E. et al. The Medicine use and corresponding subjective health complaints among adolescents, a cross-national survey // *Pharmacoepidemiology and Drug Safety*, 2011; 19: DOI: 10.1002/pds.2102
- 2) Gobiņa I., Pudule I., Villeruša A. Medikamentu lietošana un sūdzības par galvassāpēm un vēdera sāpēm pusaudžiem Latvijā/Medicine use for headache and stomach ach among adolescents in Latvia // *Zinātniskie raksti 2009/Collection of Scientific Papers 2009*. – Riga: Riga Stradins University, 2010. – Pp. 295. – 303.
- 3) Holstein B.E., Currie C., Boyce W., Damsgaard M.T., Gobina I., Kőköneyi G., Hetland J. et al. Socio-economic inequality in multiple health complaints among adolescents: international comparative study in 37 countries // *International Journal of Public Health*, 2009; 54: S1–S11.
- 4) Gobiņa I., Villeruša A., Pudule I., Kalniņa I. Skolēnu veselības paradumu pētījums Latvijā 1990. – 2005./Health Behaviour Study in School-aged Children in Latvia from 1990 to 2005 // *Akadēmiskā Dzīve*. Riga: University of Latvia, 2009; 46: 42.–50.
- 5) Gobina I., Zaborskis A., Pudule I., Kalnins I., Villerusa A. Bullying and subjective health among adolescents at schools in Latvia and Lithuania // *International Journal of Public Health*, 2008; 53: 272–276.

- 6) Gobina I., Villerusa A., Pudule I., Barengo N.C. Subjective Health Complaints among Adolescents in Latvia during 1994 – 2006 // Collection of Scientific Papers 2007. Research articles in medicine & pharmacy. – Riga: Riga Stradins University, 2008. – Pp. 84–89.
- 7) Villeruša A., Gobiņa I. Latvijas jauniešu veselība demogrāfiskās situācijas kontekstā/ Youth's health in the context of demographic situation in Latvia/ Stratēģiskās analīzes komisija. Zinātniski pētnieciskie raksti/ Scientific Proceedings of the Commission of Strategic Analysis, 4(15). Riga: Zinātne, 2007. – Pp. 179 – 196.
- 8) Gobiņa I., Villeruša A., Pudule I. Ļirgāšanās un skolēnu veselība Latvijā/Bullying and Health among School-aged Children in Latvia // Zinātniskie raksti 2006/ Collection of Scientific Papers 2006 – Riga: Riga Stradins University, 2017. – Pp. 171 – 176.

### **Thesis and Conference Presentations**

- 1) Gobiņa I., Pudule I., Villeruša A. Medikamentu lietošana starp pusaudžiem, kuriem ir sūdzības par biežām sāpēm/Medicine use among adolescents with recurrent chronic pain // 2010. gada Zinātniskā konference. Tēzes /Thesis of Scientific Conference of Riga Stradins University/, – Rīga: Rīgas Stradiņa universitāte, 2010. – Pp. 65.
- 2) Gobiņa I., Pudule I., Villeruša A. Medikamentu lietošanas izplatība pusaudžiem laikā no 1994. – 2006. gadam/Medicine use among adolescents from 1994 to 2006 in Latvia // 2009. gada Zinātniskā konference. Tēzes /Thesis of Scientific Conference of Riga Stradins University/ – Rīga: Rīgas Stradiņa universitāte, 2009. – Pp. 63.
- 3) Gobiņa I., Pudule I., Villeruša A. Hronisko slimību un atkārtotu sāpju prevalence skolēniem pusaudžu vecumā / Chronic illness and chronic pain among adolescents // 2008. gada Zinātniskā konference. Tēzes /Thesis of Scientific Conference of Riga Stradins University/ – Rīga: Rīgas Stradiņa universitāte, 2008. – Pp.73.
- 4) Gobina I., Villerusa A., Barengo N., Pudule I. Gender differences of multiple subjective health complaints among adolescents in Latvia during 1994 – 2006 // European Journal of Public Health, Vol. 17, Suppl. 2, 2007: 170. (15th European Public Health Conference 2007)
- 5) Gobiņa I., Villeruša A., Barengo N., Pudule I. Veselības sūdzību prevalence un raksturojums skolēniem pusaudžu vecumā laikā no 1994. līdz 2006. gadam/ Subjective health complaints among adolescents from 1994 – 2006 // 2007. gada Zinātniskās konference. Tēzes /Thesis of Scientific Conference of Riga Stradins University/ – Rīga: Rīgas Stradiņa universitāte, 2007. – Pp.70.
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- 7) Gobiņa I., Villeruša A., Pudule I. Veselības pašvērtējumu noteicošie veselības indikatori skolas vecuma bērniem Latvijā / Health indicators of self-perceived health among school-aged children // 2006. gada Zinātniskā konference. Tēzes /Thesis of Scientific Conference of Riga Stradins University/ – Rīga: Rīgas Stradiņa universitāte, 2006. – Pp.77.

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