

# Alcohol Drinking as a Predictor of Elevated Blood Pressure in Croatian Youth

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## 1. Background and aim

- drinking of alcohol is one of the recognized lifestyle risk factors for elevated blood pressure (BP)

The aim of this study was to analyze alcohol drinking as a risk factor of elevated BP in school aged children.

### The Republic of Croatia

- between central and southeastern Europe
- bordering: Slovenia, Hungary, Bosnia and Herzegovina, Serbia and Montenegro
- covering the area of 56 594 km<sup>2</sup>
- consisted of 21 counties (local authority unit)
- total population about 4 284 889 (population census 2011)



World Bank list: high income country  
non OECD (GDP 2013 \$57.87 billion)

UNEMPLOYMENT RATE (%)		
Year 2011	Year 2012	Year 2013
13.5 %	15.8 %	17.3 %

Croatian Bureau of Statistics.  
Statistical Yearbook of the Republic of Croatia 2014; p. 163.

<http://www.dzs.hr/statistickii-ljetopis/2014>  
<http://www.hzjz.hr/publikacije/statisticki-ljetopis/2013>  
World Bank list of economies (January 2015),  
<http://data.worldbank.org/country/croatia>

# 1. Background and aim

## Health Indicators

## Leading causes of death

### I. Circulatory Diseases

24 232 (569.4/100 000)

### II. Neoplasms

14 012 (329.3/100 000)

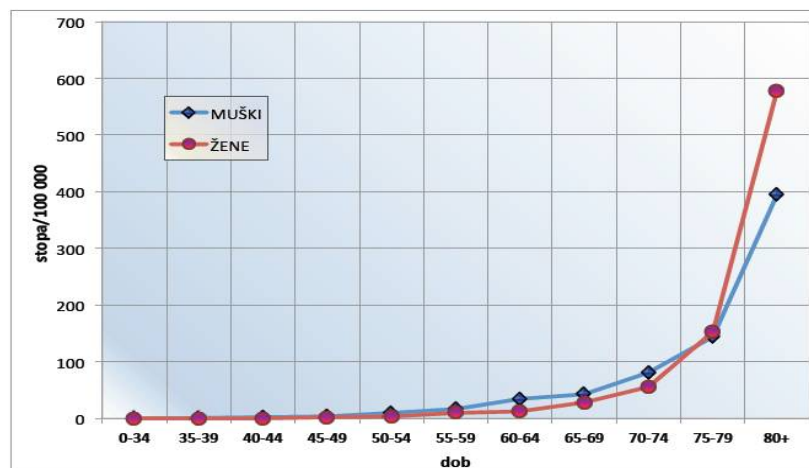
### III. Injuries and Poisonings

2 758 (64.8/100 000)

Source: <http://www.hzjz.hr/publikacije/statisticki-ljetopis/2013>

Slika 10.

*Smrtnost od hipertenzivnih bolesti po dobi i spolu u Hrvatskoj 2011. godine*



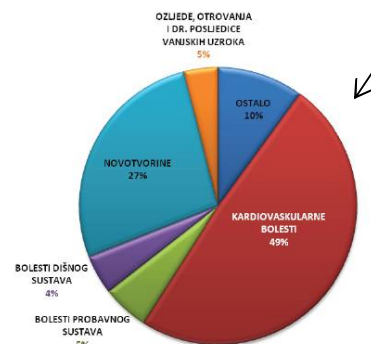
Izvor podataka za sve pokazatelje: Državni zavod za statistiku.  
Obrada podataka: Hrvatski zavod za javno zdravstvo

Croatian National Institut of Public Health.

Cardiovascular Diseases in the Republic of Croatia 2013; p. 19.

Slika 1.

*Uzroci smrti u Hrvatskoj 2011. godine*



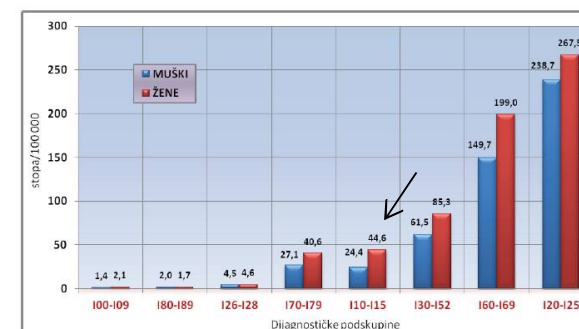
UKUPNO 51 019

Croatian National Institut of Public Health.

Cardiovascular Diseases in the Republic of Croatia 2013; p. 6.

Slika 2.

*Umrli od kardiovaskularnih bolesti prema dijagnostičkim podskupinama i spolu 2011. godine*



Croatian National Institut of Public Health.

Cardiovascular Diseases in the Republic of Croatia 2013; p. 10.

## Hypertension

Adults BP  $\geq 140$  and/or 90 mmHg (older than 18 years)

Mancia G, Fagard R, Narkiewicz K. 2013 ESH - ESC Practice Guidelines for the Management of Arterial Hypertension: ESH - ESC Task force on the management of arterial hypertension. J Hypertens 2013;31:1281-357.

**37.5%**

Jelaković B, Zeljković - Vrkić T, Pećin et al. EH-UH istraživačka skupina. Results of arterial hypertension in Croatia. Results of EH - UH study. Acta Med Croatica 2007;618:287-92.

**40.5% male and 34.9% female**

Erceg M, Kern J, Babić - Erceg A et al Regional differences in the prevalence of arterial hypertension in Croatia. Coll Antropol 2009;33Suppl 1:19-23.



## 1. Background and aim

### Age-based Pediatric Blood Pressure Reference Charts

Blood Pressure for Age, Sex and Body Height - Status Categories	
A systolic and/or diastolic BP percentile of:	Suggests that a child has:
Equal to or greater than the 95th percentile	Hypertension
90th to less than the 95th percentile	PreHypertension
BP greater than 120/80 mm Hg	PreHypertension (Elevated) *

To be accurately diagnosed with hypertension, a child must have systolic or diastolic blood pressure equal to or greater than the 95th percentile on **three separate occasions**.

National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The Fourth Report on the Diagnosis, Evaluation and Treatment of High Blood Pressure in Children and Adolescents. Pediatrics 2004;114(2):555-76.  
<https://www.bcm.edu/bodycomplab/Flashapps/BPVAgeChartpage.html>

# 1. Background and aim

## Prevalence of hypertension in school children and youth

**BP >140 and/or 90 mmHg**

School Year	Elementary Schools (1st, 5th and 8th grade)			High Schools (1st grade)			Faculties (1st year of study)			Total		
	m	f	total	m	f	total	m	f	total	m	f	total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
2000/01	615 (0,90)	363 (0,56)	978 (0,74)	422 (2,82)	178 (1,17)	600 (1,99)	No data	No data	No data	10371 (1,25)	541 (0,68)	1578 (0,97)
2001/02	516 (0,74)	314 (0,46)	830 (0,60)	419 (2,59)	171 (1,06)	590 (1,83)	41 (2,85)	17 (0,93)	58 (1,78)	976 (1,11)	502 (0,58)	1478 (0,85)
2002/03	489 (0,70)	276 (0,42)	765 (0,57)	378 (2,18)	158 (0,94)	536 (1,57)	1 (0,81)	No data	1 (0,32)	868 (1)	434 (0,53)	1302 (0,77)
2003/04	757 (1,08)	554 (0,83)	1311 (0,95)	408 (2,32)	191 (1,15)	599 (0,34)	510 (11,78)	192 (3,31)	702 (6,94)	1657 (1,82)	937 (1,05)	2612 (1,44)
2004/05	582 (0,82)	339 (0,50)	921 (0,67)	515 (2,70)	207 (1,15)	722 (1,95)	262 (6,37)	57 (0,96)	319 (3,18)	1359 (1,45)	603 (0,66)	1962 (1,06)
2005/06	597 (0,86)	346 (0,52)	943 (0,69)	523 (2,94)	192 (1,11)	715 (2,03)	No data	No data	No data	1120 (1,28)	538 (0,64)	1658 (0,97)
2006/07	532 (0,74)	349 (0,51)	881 (0,63)	484 (2,82)	149 (0,91)	633 (1,89)	227 (6,40)	59 (1,30)	286 (3,53)	1243 (1,34)	557 (0,63)	1800 (0,99)
2007/08	540 (0,79)	300 (0,47)	840 (0,63)	507 (3,02)	157 (0,98)	664 (2,02)	15 (10,00)	8 (2,09)	23 (4,32)	1062 (1,25)	465 (0,58)	1527 (0,92)
2008/09	603 (0,93)	389 (0,63)	992 (0,78)	649 (3,67)	178 (1,03)	827 (2,36)	173 (5,52)	52 (1,26)	225 (3,09)	1425 (1,67)	619 (0,74)	2044 (1,21)
...	...	...	...	...	...	...	...	...	...	...	...	...
2012/13	569 (0,71)	342 (0,4)	911 <b>(0,56)</b>	408 (2,89)	154 (1,02)	562 <b>(1,96)</b>	262 <b>(6,02)</b>	101 (2,10)	363 <b>(3,68)</b>	1239 (1,18)	597 (0,54)	1836 (0,86)

Croatian National Institut of Public Health. Croatian Health Service Yearbook (from year 2002 to 2014.)

## 2. Subjects

School aged children and youth

Representative sample of 40 elementary and 20 high schools

Average age

1<sup>st</sup> grade of elementary school

male  $7.49 \pm 0.32$  years, female  $7.51 \pm 0.30$  years

8<sup>th</sup> grade of elementary school

male  $14.48 \pm 0.32$  years, female  $14.43 \pm 0.31$  years

3<sup>rd</sup> grade of high school

male  $17.57 \pm 0.45$  year, female  $17.46 \pm 0.39$  years

### "Health survey of school children and youth" Questionnaire

▪social and demographic characteristics

▪eating habits

▪physical activity

▪habit of smoking tobacco and **alcohol drinking**

▪personal health problems and family history

▪conducted in schools

1<sup>st</sup> grade of elementary school – answered by parents

8<sup>th</sup> grade of elementary school and 3<sup>rd</sup> grade of high school

- matched subjects

Subjects	Sampling	Sample	Anthropometric measurements (coverage of sample)		Questionnaire and anthropometric measurements (coverage of sample)	
	N	N	N	%	N	%
1 <sup>st</sup> grade Elementary school	1015	996	946	94.98	926 (♀ 48.7%)	92.97
8 <sup>th</sup> grade Elementary school	1037	1021	948	92.85	948 (♀ 48.8%)	92.85
3 <sup>rd</sup> grade High school	1049	1036	931	89.87	931 (♀ 41.5%)	89.87
Total	3101	3053	2825	92.53	2805 (♀ 46.4%)	91.88



### 3. Methods

#### Anthropometric measurements

- conducted in schools
- physicians and nurses from School and Adolescent Medicine Departments
- body height (cm)
- body weight (kg)
- pulse rate (bpm)

#### BP (mmHg)

- mercury sphygmomanometer
- auscultatory method  
(accuracy of 2 mmHg)
- right upper arm
- appropriate size cuff
- resting of 10 minutes
- sitting position
- systolic BP 1<sup>st</sup> Korotkoff sound
- diastolic BP 5<sup>th</sup> Korotkoff sound

#### Data processing

##### Microsoft Excel Worksheet "BP / BMI Calculator v2013"

National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The Fourth Report on the Diagnosis, Evaluation and Treatment of High Blood Pressure in Children and Adolescents. Pediatrics 2004;114(2):555-76.

Kuczmarski RJ, Ogden CI, Guo SS i sur. 2000 CDC Growth Charts for the United States: Methods and Development. National Center for Health Statistics. Vital Health Stat 2002;11:1-190.

#### Statistical analysis

- descriptive statistics
- univariate and multiple logistic regression

The level of statistical significance of 5%

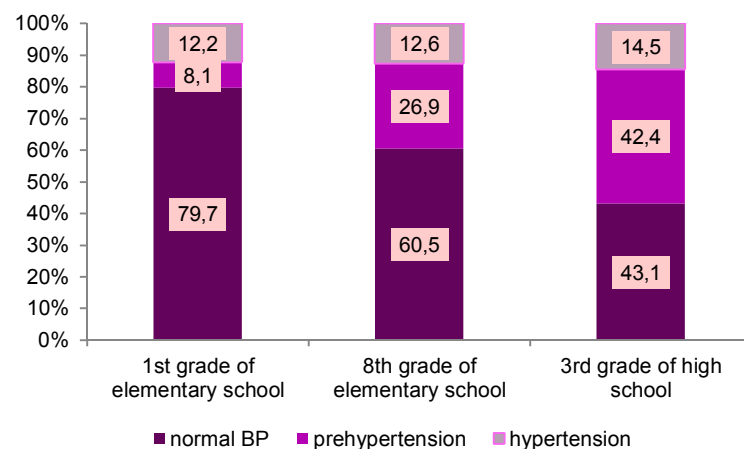
Software support STATISTICA StatSoft 10th. Inc.



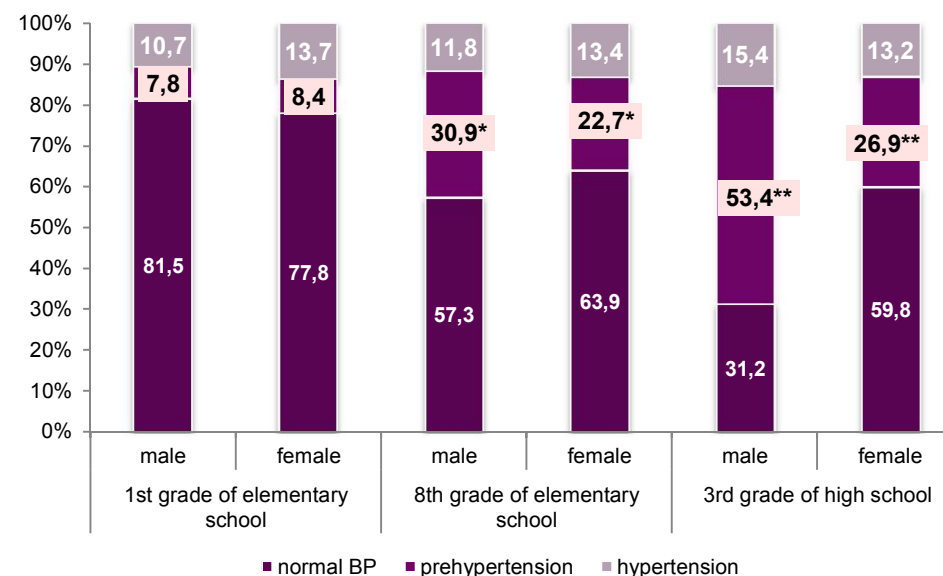
## 4. Results

### Prevalence of elevated systolic and/or diastolic BP in school children and youth

Subjects	Sex	Systolic and/or diastolic BP							
		Normal		Prehypertension		Hypertension		Total	
		N	%	N	%	N	%	N	%
1st grade of elementary school	male	387	81,5	37	7,8	51	10,7	475	100,0
	female	351	77,8	38	8,4	62	13,7	451	100,0
	total	738	79,7	75	8,1	113	12,2	926	100,0
8th grade of elementary school	male	278	57,3	150	30,9*	57	11,8	485	100,0
	female	296	63,9	105	22,7*	62	13,4	463	100,0
	total	574	60,5	255	26,9	119	12,6	948	100,0
3rd grade of high school	male	170	31,2	291	53,4**	84	15,4	545	100,0
	female	231	59,8	104	26,9**	51	13,2	386	100,0
	total	401	43,1	395	42,4	135	14,5	931	100,0



**Elevated systolic and/or diastolic BP**



1st grade of elementary school 20,3%  
(m 18,5% f 22,2%)

8th grade of elementary school 39,5%  
(m 42,7% f 36,1%)\*  
\* $\chi^2 = 4,33$  p = 0,04

3rd grade of high school 56,9%  
(m 68,8% f 40,2%)\*\*  
\*\* $\chi^2 = 15,93$ , p < 0,001

\* $\chi^2 = 8,21$ , p = 0,02  
\*\* $\chi^2 = 81,09$ , p < 0,001

## 4. Results

### Alcohol drinking in school aged children and youth

1 <sup>st</sup> grade of elementary school				
Has your child ever tried alcohol?	Normal BP		Elevated systolic and/or diastolic BP	
	Boys	Girls	Boys	Girls
Yes	54 (14%)	26 (7.4%)	12 (13.6%)	7 (7%)
No	333 (86%)	325 (92.6%)	76 (86.4%)	93 (93%)
Total	387 (100%)	351 (100%)	88 (100%)	100 (100%)

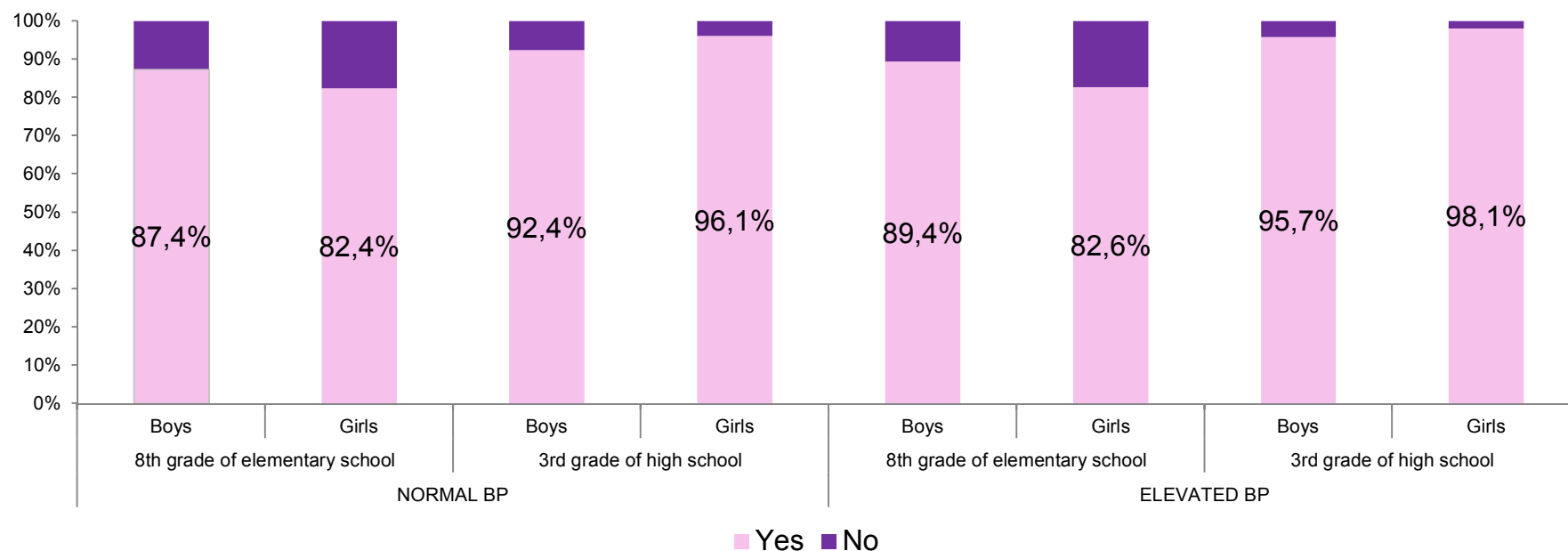
1 <sup>st</sup> grade of elementary school				
How many times has your child drank alcoholic drink with meal in last 30 days? (at least 1 glass)	Normal BP		Elevated systolic and/or diastolic BP	
	Boys	Girls	Boys	Girls
Never	384 (99.2%)	348 (99.1%)	85 (96.6%)	99 (99%)
1-2 times monthly	3 (0.8%)	2 (0.6%)	3 (3.4%)	1 (1%)
3-5- times monthly	0	1 (0.3%)	0	0
Total	387	351	88	100

## 4. Results

### Alcohol drinking in school aged children and youth

8th grade of elementary school				
Have your ever tried alcohol?	NORMAL BP		ELEVATED BP	
	Boys	Girls	Boys	Girls
Yes	243	244	185	138
No	35	52	22	29
Total	278	296	207	167

3 <sup>rd</sup> grade of high school				
Have your ever tried alcohol?	NORMAL BP		ELEVATED BP	
	Boys	Girls	Boys	Girls
Yes	157	222	359	152
No	13	9	16	3
Total	170	231	375	155



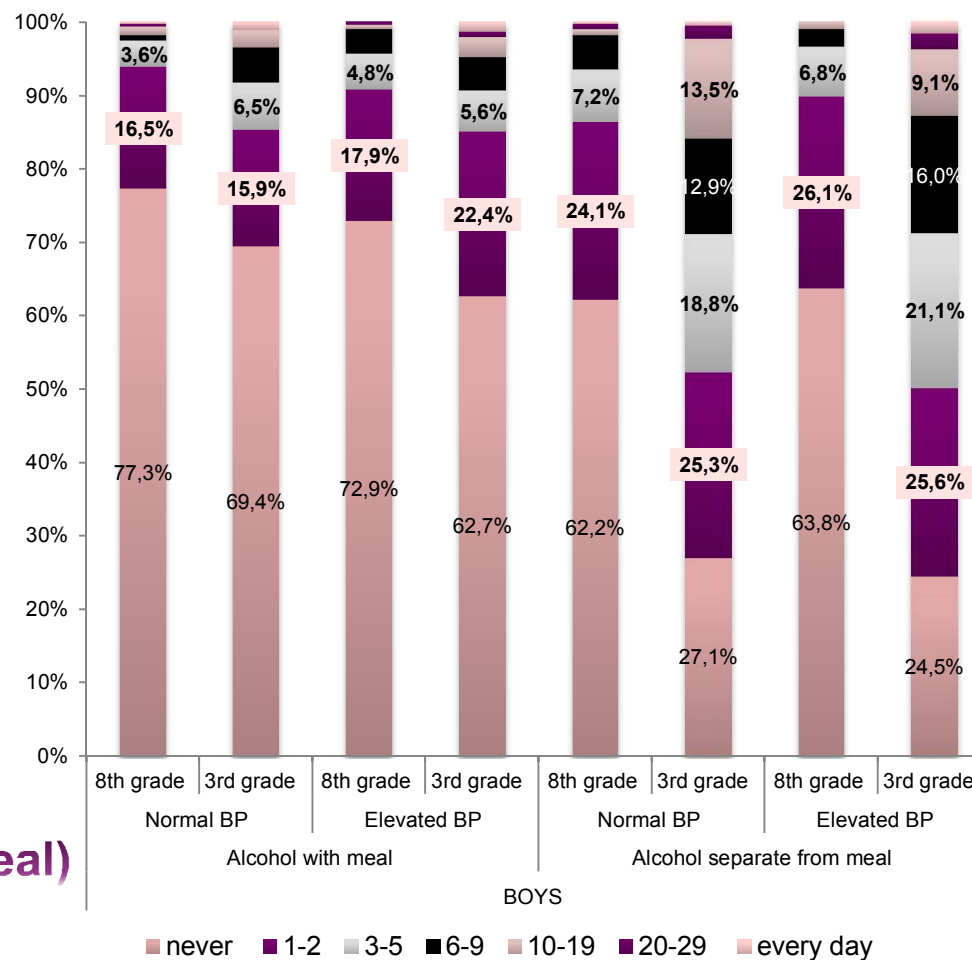
## 4. Results

### Alcohol drinking in school aged children and youth

Answers given by students

	BOYS							
	Alcohol with meal				Alcohol separate from meal			
	Normal BP		Elevated BP		Normal BP		Elevated BP	
	8th grade	3rd grade	8th grade	3rd grade	8th grade	3rd grade	8th grade	3rd grade
never	215	118	151	235	173	46	132	92
1-2	46	27	37	84	67	43	54	96
3-5	10	11	10	21	20	32	14	79
6-9	2	8	7	17	13	22	5	60
10-19	3	4	1	10	2	23	2	34
20-29	1	0	1	3	2	3	0	8
every day	1	2	0	5	1	1	0	6
Total	278	170	207	375	278	170	207	375

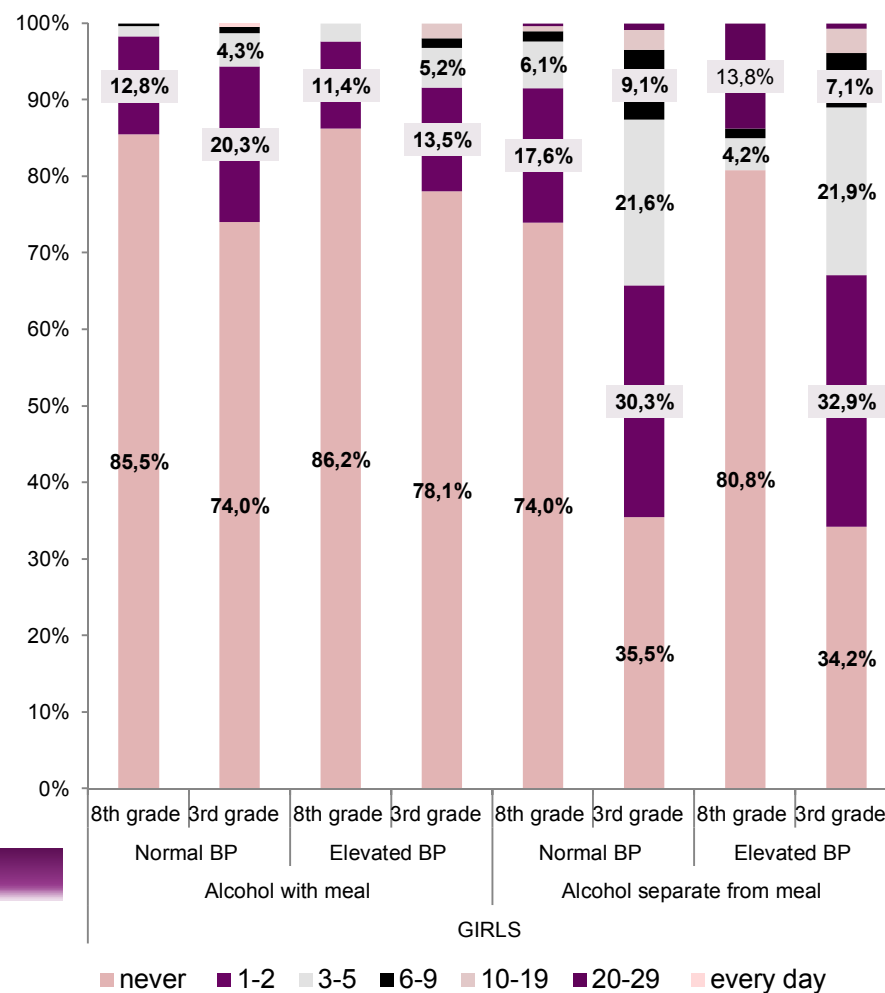
How many times have you drank alcohol with meal (separate from meal) in last 30 days?



## 4. Results

### Alcohol drinking in school aged children and youth

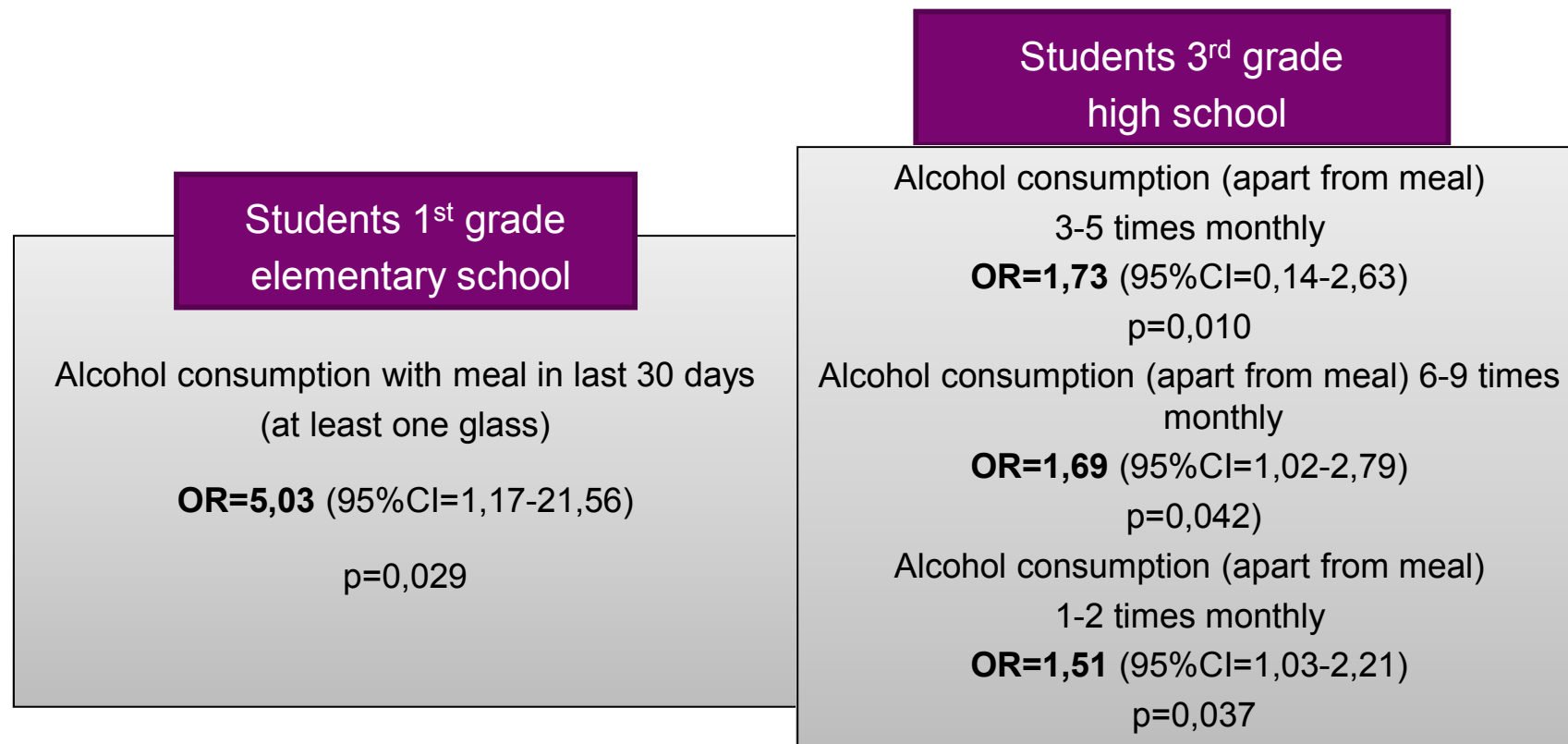
	GIRLS							
	Alcohol with meal				Alcohol separate from meal			
	Normal BP		Elevated BP		Normal BP		Elevated BP	
	8th grade	3rd grade	8th grade	3rd grade	8th grade	3rd grade	8th grade	3rd grade
never	253	171	144	121	219	82	135	53
1-2	38	47	19	21	52	70	0	51
3-5	4	10	4	8	18	50	7	34
6-9	1	2	0	2	4	21	2	11
10-19	0	0	0	3	2	6	0	5
20-29	0	0	0	0	1	2	23	1
every day	0	1	0	0	0	0	0	0
Total	296	231	167	155	296	231	167	155



## 4. Results

### Risk factors of elevated systolic BP - multiple logistic regression

- 1<sup>st</sup> graders in elementary school who drank alcohol with meal were 5 time more likely to have elevated systolic BP
- 3<sup>rd</sup> graders in high school who drank alcohol separate from meal from one to nine time monthly were about two times more likely to have elevated systolic BP, than their counterparts with normal BP





## Visit Croatia Forum

### 5. Discussion

#### Alcohol drinking

- “...18 is the legal age to drink in HR! and it's largely ignored!...”
- “...Croatia appears not to have an under age binge drinking problem currently unlike many countries in Western and Northern Europe. Being a Mediterranean country, **drinking is more a social activity and tend to start quite young. In fact people actually start drinking (mostly wine or beer) at home when they are young.** But they tend not to have a 'drink to get drunk' culture...”
- “...It is not very common to see young people being drunk in public. apart from perhaps during family or religious celebrations such as weddings etc. Alcoholism amongst the older people does exist but appears to no worst than any other European country...”
- “...One thing to note however is that Croatia has a strict ZERO drink/driving policy...”

Read more:

<http://visitcroatia.proboards.com/thread/2105/drinking-age etc#ixzz3aTkFoVFK>



## 6. Conclusion

For risk factors that result from habits acquired in childhood and adolescence such as:

- smoking
- **alcohol drinking**
- lack of exercise
- unhealthy diet

is necessary to **continuously** and **consistently** implement prevention programs for **all** school children and youth.