

Prevalence and trends of alcohol use and misuse among adolescents and young adults in the Netherlands from 1993 to 2000[☆]

Evelien A.P. Poelen^{a,*}, Ron H.J. Scholte^a, Rutger C.M.E. Engels^a,
Dorret I. Boomsma^b, Gonneke Willemsen^b

^a Behavioural Science Institute, Radboud University Nijmegen, P.O. Box 9104, 6500 HE Nijmegen, The Netherlands

^b Biological Psychology, Vrije Universiteit Amsterdam, Van der Boerhorststraat 1, 1081 BT Amsterdam, The Netherlands

Received 19 July 2004; received in revised form 16 March 2005; accepted 16 March 2005

Abstract

This study presents an overview of Dutch studies on prevalence of alcohol use and adds findings from our own study on prevalence of drinking among adolescents and young adults aged 12–30 years in the Netherlands. Data were collected as part of a longitudinal study by the Netherlands Twin Register in 1993 ($n = 3885$), 1995 ($n = 4814$), 1997 ($n = 3772$) and 2000 ($n = 4090$). Measures included lifetime alcohol use, frequency of drinking, quantity of drinking, lifetime drunkenness, frequency of drunkenness and problem drinking. The main findings are: (a) alcohol use increased with age until the age of 25, after which it decreased; (b) males exceeded females on all aspects of alcohol use, with exception of the youngest age group and lifetime alcohol use; (c) time trends indicated an increase in frequency and quantity of drinking among 12–15-year-old adolescents during the 1990s; and moreover, (d) 21–25-year-old females drank more frequently, consumed more drinks a week, had more experience with lifetime drunkenness and were drunk more often in 2000 than in 1993. Among 21–25-year-old males, an increase of drunkenness and problem drinking was displayed during the 1990s.

© 2005 Elsevier Ireland Ltd. All rights reserved.

Keywords: Alcohol; Prevalence; Trends; Adolescents; Young adults

1. Introduction

In most western societies, adolescents experiment with alcohol and alcohol use becomes a ‘normal’ phenomenon during adolescence. The majority of the adolescents develop a drinking pattern that is socially acceptable, but a small group of adolescents use alcohol more frequently and is exposed to the accompanying risks of heavy drinking (e.g. Bauman and Phongsavan, 1999; Van Laar et al., 2002). Alcohol is among the most commonly used substances in many western societies including the Netherlands, but a complete overview in English of prevalence and trends concerning various aspects of drinking among young people in the Netherlands is not

available. Previous studies on drinking among young people are described in Dutch reports. The aim of the present study was to give an overview of existing studies on alcohol use of Dutch adolescents and young adults and add findings from our study on adolescents and young adults to this overview.

First, the Dutch situation regarding alcohol use in adolescents is described briefly. In the Netherlands, it is illegal to sell light alcoholic beverages (for example, beer and wine) to people under the age of 16. This limit is 18 years for strong alcoholic beverages (liquor). Despite these strict criteria, it is not difficult for under-aged adolescents to obtain alcoholic beverages. Bieleman et al. (2002) showed that among 13–15-year olds who ordered a light alcoholic beverage in catering establishments, 98% obtained this drink. Of the 14 and 15-year olds, 73% successfully purchased strong alcoholic beverages in a liquor store. Among 16 and 17-year olds, who wanted to order or buy strong alcoholic beverages in catering establishments and liquor stores, 98% and 85%, respectively, actually obtained these beverages.

[☆] Supplementary information for this article can be found by accessing the online version of this paper at <http://dx.doi.org> by entering doi:10.1016/j.drugalcddep.2005.03.020. Please see Appendix A for more information.

* Corresponding author. Tel.: +31 24 361 57 67; fax: +31 24 361 27 76.

E-mail address: e.poelen@pwo.ru.nl (E.A.P. Poelen).

During the 1990s, several changes have taken place that may have altered adolescent and young adult alcohol consumption. First, alcopops, consisting of soft drinks with a small amount of alcohol, were introduced and bottled mixed drinks became easily available. Alcopops and bottled mixed drinks are easy to drink and have a sweet and pleasant taste that tends to conceal the taste of alcohol. Recent studies in the Netherlands show that alcopops and mixed drinks are among the most popular alcoholic beverages among students in secondary education (De Zwart et al., 2000; Ter Bogt et al., 2002). Other European studies by Roberts et al. (1999) and Romanus (2000) reported that alcopops account for the increase of alcohol consumption among 13–16-year olds. Furthermore, in the Netherlands, the 1990s was a period of welfare. Figures of Centraal Bureau voor de Statistiek Central Bureau of Statistics (2001) (CBS) and Nationaal Instituut voor Budgetvoorlichting, National Institution for Budget Information (2002) (NIBUD) show an increase in income among adolescents and young adults during this period, providing them with more opportunities to go to pubs and discos, which is likely to have resulted in an increase in alcohol consumption. Data of research performed between 1994 and 2002 show that adolescents between 12 and 18 years of age and particularly adolescents between 16 and 18 years of age increased their expenses on alcohol. In fact, alcohol is the most important expense for Dutch adolescent males and the second most important expense for Dutch adolescent females (CBS, 2001; NIBUD, 2002).

Two studies systematically collected data on adolescent alcohol use in the Netherlands between 1992 and 2001 (De Zwart et al., 2000; Ter Bogt et al., 2002). The European School Survey Project on Alcohol and Other Drugs (ESPAD) collects data on alcohol use in European Countries including the Netherlands, in 15 and 16-year olds (Hibell et al., 2000). One other study on alcohol use among Dutch aged 12 and older (Abraham et al., 2002) did not differentiate between males and females. Findings of the last two studies have not been included in the present paper because of the restricted age range and the pooling of data from males and females. The study by De Zwart et al. (2000) is a large prevalence study on smoking, drinking, drug use and gambling among students from 12 to 20 years of age by the Trimbos Institute and Ter Bogt et al. (2002) present data from the Dutch part of the Health Behaviour in School-aged Children (HBSC) study on substance use. These studies show that prevalence rates of lifetime alcohol use, lifetime drunkenness and quantity of drinking increase with age and are higher among males than among females. De Zwart et al. (2000) conclude that alcohol use among adolescents has not changed in the period 1992–1999. Figures show that about 60% of 12–13-year-old males and about 50% of 12–13-year-old females have used alcohol at least once; by the age of 18, this percentage rises to about 90% for males and females. About 20% of 12–13-year-old males and 15% of females have been drunk at least once; for 16–17-year olds, this was about 70% for males and about 60% for females. Prevalence rates on quantity of drink-

ing show that about 80% of 12–13-year-old males and 90% of females drank one to four drinks on the last occasion they drank. At the age of 18, about 65% of males and about 35% of females drank more than four drinks on the last occasion they drank.

In our own study, we describe alcohol use during adolescence and during the transition into young adulthood (age 12–30 years). The focus of this paper is on prevalence and trends of young people's alcohol use in the Netherlands. This study adds to existing knowledge on alcohol use for several reasons. First, the studies by De Zwart et al. (2000) and Ter Bogt et al. (2002) focused on students in secondary education. However, it may be useful to examine drinking after secondary education because, in general, problems with alcohol consumption start during this period of life. Second, in our study, a larger variety of alcohol measures than in existing Dutch studies were used: lifetime alcohol use, frequency of drinking, quantity of drinking, lifetime drunkenness, frequency of drunkenness and problem drinking. In addition, we examined age and gender differences. Until the age of 17, the prevalence of drinking increases, in particular between 12 and 15 years (De Zwart et al., 2000; Kuipers et al., 1997; Sutherland and Sheperd, 2001; Ter Bogt et al., 2002; Van Laar et al., 2002; Young et al., 2002). Prevalence rates of alcohol consumption show significant higher rates for males than for females in earlier Dutch studies (De Zwart et al., 2000; Kuipers et al., 1997; Ter Bogt et al., 2002; Van Laar et al., 2002) and in studies conducted in other western countries (Gross, 1993; Sutherland and Sheperd, 2001; Wilsnack et al., 2000; Young et al., 2002). However, recent figures from the United Kingdom show an increase in binge drinking by adolescent and young adult females (Plant et al., 2004; Plant and Plant, 2001). We want to investigate whether we see an increase in prevalences for different aspects of drinking behavior with age, whether the sex difference is becoming smaller and whether we can find time trends in drinking among Dutch adolescents and young adults during the 1990s.

2. Method

2.1. Procedure and participants

Data reported in this study are part of an ongoing longitudinal survey study by the Netherlands Twin Register. From 1991 onwards, families with twins have been questioned about lifestyle, personality and psychopathology roughly every 2 years. Twins were asked to participate in each wave (1991, 1993, 1995, 1997 and 2000), parents only in 1991, 1993 and 1995, and siblings only in 1995, 1997 and 2000. Some individuals participated once, while others participated several times. General information about sample and data collection is described in detail in Boomsma et al. (2002).

For this study, we used the 1993, 1995, 1997 and 2000 data of twins and siblings, as in these waves, alcohol use was measured by identical instruments. Despite the longitudinal character of the data, we only focused on prevalence

and trends of alcohol use. Developmental patterns in alcohol use will be examined in future studies. From these four measurement waves, we selected participants between 12 and 30 years of age. Participants included in one wave and aged over 30 in the following wave were excluded from further analyses. Participants were grouped in four age categories, the first category contained participants aged 12–15 years. At this age, adolescents are experimenting with alcohol and develop drinking patterns, however, they are not allowed to drink alcohol legally. At age 12, most Dutch adolescents are entering secondary education. In the second age category, 16–20-year olds were included. In the Netherlands, as of the age of 16, adolescents legally are allowed to drink alcoholic beverages. Moreover, young people are still of school age until the age of 17, only a 10% minority of our participants do not attend any kind of education. The third age category consists of 21–25-year olds. At this age, 49% of the males and 45% of the females still go to school/college while others have started a professional career. In the fourth age category (26–30 years), most of our participants are working (89% of the males and 95% of the females).

The sample consisted of 3885 adolescents and young adults in 1993 (all twins), 4814 in 1995 (70.8% twins and 29.2% siblings), 3772 in 1997 (71.5% twins and 28.5% siblings) and 4090 in 2000 (80.1% twins and 19.9% siblings). In 1993, the mean age of the participants was 17.8 (S.D. 3.1) with an age range from 12 to 27 years. The sample contained 55.4% females and 44.6% males. In 1995, the mean age of the participants was 20.3 (S.D. 3.7) with an age range from 12 to 30 years. The sample contained 54.2% females and 45.8% males. In 1997, the participants were on average 22.2 (S.D. 4.1) years old with an age range from 12 to 30 years. The sample included 58.3% females and 41.7% males. In 2000, the mean age of the participants was 24.3 (S.D. 3.9) ranging from 12 to 30 years. The sample included 63.6% females and 36.4% males. In the current study, 11.7% of the participants took part at all four measurements, 17.3% filled out three questionnaires, 28.4% filled out two questionnaires and 42.7% filled out one questionnaire. It should be noted that not all participants were invited to fill out a questionnaire at each measurement wave and we excluded participants aged over 30 in a subsequent wave from analyses. Still non-response or attrition may bias the findings of our study. However, results by Vink et al. (2004) suggest that our data on alcohol use are relatively unbiased.

Educational levels of fathers of the twins and siblings in our sample show that 18.3% completed primary education, 33.8% completed lower general education or vocational education, 23.4% followed intermediate vocational education or intermediate and higher general education and 24.4% finished higher vocational education or university.

2.2. Measures

To analyze drinking among adolescents and young adults, information about lifetime alcohol use, frequency of drink-

ing, quantity of drinking, lifetime drunkenness, frequency of drunkenness and problem drinking (problem drinking was not assessed in 1993) was selected from the questionnaires from all four waves. *Lifetime alcohol use* was measured by the question: "Have you ever used alcohol?" The question had three response categories: (1) "no", (2) "a few times" and (3) "yes", which were summarized into two response categories: (1) "no" (original category 1) and (2) "yes" (original category 2 and 3).

Participants were asked to report their *frequency of drinking* by the question: "How often do you drink alcohol?" The question had eight response categories: (1) "I do not drink alcohol", (2) "once a year or less", (3) "a few times a year", (4) "about once a month", (5) "a few times a month", (6) "once a week", (7) "a few times a week" and (8) "daily". Because of low frequencies in some categories, this item was summarized as a 4-point scale: (1) "seldom or never" (original items 1 and 2), (2) "a few times a year" (original items 3 and 4), (3) "a few times a month" (original items 5 and 6) and (4) "a few times a week" (original items 7 and 8).

In order to measure *quantity of drinking*, participants were asked: "How many drinks do you drink on average per week (including the weekend)?" This question had seven response categories: (1) "less than 1 drink a week", (2) "1–2 drinks a week", (3) "3–5 drinks a week", (4) "6–10 drinks a week", (5) "11–20 drinks a week", (6) "21–40 drinks a week" and (7) "over 40 drinks a week", and was summarized as a 4-point scale: (1) "less than 1 drink a week" (original item 1), (2) "1–5 drinks a week" (original items 2 and 3), (3) "6–20 drinks a week" (original items 4 and 5) and (4) "over 20 drinks a week" (original items 6 and 7).

Participants were asked to report *lifetime drunkenness* by the question: "Have you ever been drunk?" The question had three response categories: (1) "no", (2) "once in my life" and (3) "yes, more than once", and was dichotomized into: (1) "no" (original item 1) and (2) "yes" (original items 2 and 3).

Frequency of drunkenness was measured by the question: "How often do you get drunk?" Responses were on a 6-point scale (1) "never", (2) "once a year or less", (3) "three or four times a year", (4) "about once in 2 months", (5) "about once or twice a month" and (6) "once a week or more". Because of the low frequencies in some categories, this item was transformed into a 4-point scale: (1) "never" (original item 1), (2) "once a year or less" (original item 2), (3) "a few times a year" (original items 3 and 4) and (4) "a few times a month" (original items 5 and 6).

Problem drinking was assessed by the CAGE scale for drinking problems (Ewing, 1984). The CAGE questionnaire derives its name from the acronym of four questions: "Have you ever felt you ought to *cut* down on your drinking?", "Have people *annoyed* you by criticizing your drinking?", "Have you ever felt bad or *guilty* about your drinking?" and "Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover?" (*eye opener*). Responses were either: (1) "yes" and (2) "no". Two or more

positive answers suggest that the existence of alcohol-related problems is likely (Ewing, 1984).

2.3. Data analyses

Prevalence rates for lifetime alcohol use, frequency of drinking, quantity of drinking, lifetime drunkenness, frequency of drunkenness and problem drinking were computed using SPSS 11.5.1 for Windows. Chi-square analyses were used to test these rates for age and gender differences and time trends. In addition, standardized residuals were used to examine data patterns that contribute to the significant Chi-square test. We examined time trends by testing age groups in 1993 and 2000 for changes in drinking behavior. Since problem drinking was measured as of 1995, we tested age groups in 1995 and 2000 for changes in problem drinking. Given the multiple tests performed, we set our level of significance at $p < 0.01$.

The inclusion of multiple individuals from the same family in this study could cause problems because scores of participants are not statistically independent. To deal with this problem, we repeated our analyses with a sample in which only one sibling (the firstborn twin) from each family was included. Results of these analyses showed same patterns, although Chi-squares values were lower.

3. Results

Table 1 presents prevalence rates of lifetime alcohol use for each age group and gender. The majority of the adolescents and young adults had used alcohol at least once. Within each wave, lifetime alcohol use sharply increased with age, showing significant differences between all age groups for both males and females. In 1993, significantly more 12–15-year-old males than females had used alcohol at least once. No significant differences for gender were found for other age categories and at other waves. Regarding time trends, lifetime alcohol use did not significantly change from 1993 to 2000.

Due to the range of the age categories, participants could be in the same age category at two waves. To examine effects of this overlap of participants, analyses were repeated on the age categories: 12–13, 14–15, 16–17, 18–19, 20–21, 22–23, 24–26, 27–28 and 29–30. These analyses showed similar results as those performed on the broader age ranges.

Table 2 shows prevalence rates of frequency of drinking for each age group and gender. With increasing age, participants drank alcohol more frequently, as indicated by significant differences between all age groups for both males and females within all four waves. Except for 12–15-year olds in 1995 and 1997, males drank significantly more frequently than females. Moreover, between waves, significant changes in frequency of drinking were found for 12–15-year-old males and females, for 16–20-year-old males and for 21–25-year-old females. These analyses showed that adolescents and young adults in these age categories drank more frequently in 2000 than in 1993.

Prevalence rates of quantity of drinking for each age group and gender are displayed in Table 3. Within each wave, adolescents and young adults drank significantly more when they grew older, but quantity of drinking showed a decrease after the age of 25. Gender differences revealed that, except for 12–15-year olds in 1993, 1997 and 2000, males drank significantly more than females. Furthermore, over time, significant changes in quantity of drinking were found for 12–15-year-old males, for 16–20-year-old females and for 21–25-year-old females. Time trends showed that adolescents and young adults drank more in 2000 than in 1993.

Table 4 presents the prevalence rates for lifetime drunkenness for each age group and gender. A considerable part of the adolescents and young adults did not have any experience with drunkenness. However, within each wave, the percentage of participants who had been drunk at least once significantly increased with age. Except for 12–15-year olds, significantly more males than females had been drunk at least once. In addition, between waves, significant changes in frequency of lifetime drunkenness were found for 21–25-year-old females. This time trend showed that more females in

Table 1
Prevalence of lifetime alcohol use by age and gender in Dutch adolescents and young adults (%)

| | Male | | | | Female | | | |
|----------------|--------------|-------------|-------------|-------------|--------------|--------------|--------------|-------------|
| | 12–15 | 16–20 | 21–25 | 26–30 | 12–15 | 16–20 | 21–25 | 26–30 |
| 1993, <i>n</i> | 557 68.6* | 855 94.7 | 308 97.7 | – – | 673 60.3* | 1037 94.3 | 424 96.7 | 3 100.0 |
| 1995, <i>n</i> | 293 67.6 | 976 93.9 | 763 96.9 | 155 98.7 | 343 68.2 | 1127 92.3 | 963 95.0 | 163 95.1 |
| 1997, <i>n</i> | 91 70.3 | 553 96.9 | 618 97.6 | 299 98.3 | 93 60.2 | 763 96.6 | 899 98.1 | 434 98.2 |
| 2000, <i>n</i> | 43 88.4 | 282 96.1 | 627 96.8 | 530 98.1 | 69 85.5 | 475 95.4 | 1094 97.9 | 953 98.1 |

Note: Symbol (*) indicates significant gender differences (Chi-square tests $p < 0.01$). Chi-square for this difference is (1, $n = 1230$) = 9.02, $p = 0.00$. Chi-squares for age differences ranged from $\chi^2(3, n = 1482) = 13.61, p = 0.00$ to $\chi^2(3, n = 2187) = 267.30, p = 0.00$ for males and $\chi^2(3, n = 2591) = 45.11, p = 0.00$ to $\chi^2(3, n = 2137) = 415.97, p = 0.00$ for females.

Table 2

Prevalence of frequency of drinking by age and gender in Dutch adolescents and young adults (%)

| | Male | | | | Female | | | |
|---------------------|-------|-------|-------|-------|--------|-------|-------|-------|
| | 12–15 | 16–20 | 21–25 | 26–30 | 12–15 | 16–20 | 21–25 | 26–30 |
| 1993, <i>n</i> | 550 | 854 | 308 | – | 676 | 1038 | 422 | 3 |
| Seldom or never | 50.5* | 11.8* | 7.5* | – | 61.7* | 16.1* | 13.7* | 0.0 |
| A few times a year | 33.1* | 17.4* | 12.3* | – | 27.5* | 31.5* | 32.0* | 66.7 |
| A few times a month | 14.2* | 37.4* | 30.2* | – | 9.8* | 38.9* | 38.6* | 0.0 |
| A few times a week | 2.2* | 33.4* | 50.0* | – | 1.0* | 13.5* | 15.6* | 33.3 |
| 1995, <i>n</i> | 292 | 975 | 767 | 155 | 342 | 1127 | 960 | 163 |
| Seldom or never | 42.1 | 10.9* | 7.7* | 3.9* | 44.4 | 15.0* | 13.5* | 12.9* |
| A few times a year | 31.5 | 14.7* | 11.9* | 11.6* | 35.1 | 29.3* | 28.9* | 35.0* |
| A few times a month | 20.2 | 35.0* | 28.2* | 29.7* | 17.3 | 43.2* | 37.7* | 30.7* |
| A few times a week | 6.2 | 39.5* | 52.3* | 54.8* | 3.2 | 12.5* | 19.9* | 21.5* |
| 1997, <i>n</i> | 84 | 555 | 618 | 298 | 89 | 763 | 898 | 433 |
| Seldom or never | 51.2 | 6.5* | 6.1* | 7.0* | 53.9 | 9.0* | 10.2* | 13.9* |
| A few times a year | 32.1 | 12.1* | 7.8* | 11.1* | 24.7 | 27.9* | 27.7* | 28.4* |
| A few times a month | 14.3 | 41.3* | 27.5* | 32.9* | 20.2 | 48.1* | 42.2* | 37.6* |
| A few times a week | 2.4 | 40.2* | 58.6* | 49.0* | 1.1 | 14.9* | 19.6* | 20.1* |
| 2000, <i>n</i> | 43 | 282 | 627 | 529 | 69 | 475 | 1093 | 953 |
| Seldom or never | 16.3* | 6.4* | 7.2* | 4.5* | 27.5* | 10.7* | 9.9* | 14.4* |
| A few times a year | 27.9* | 7.1* | 8.3* | 9.1* | 40.6* | 22.3* | 24.7* | 27.6* |
| A few times a month | 41.9* | 35.1* | 24.1* | 27.4* | 31.9* | 42.7* | 39.3* | 32.4* |
| A few times a week | 14.0* | 51.4* | 60.4* | 59.0* | 0.0* | 24.2* | 26.1* | 25.6* |

Note: Symbol (*) indicates significant gender differences (Chi-square tests $p < 0.01$). Chi-squares for gender differences ranged from $\chi^2(3, n = 112) = 13.00, p = 0.01$ to $\chi^2(3, n = 1516) = 260.75, p = 0.00$. Chi-squares for age differences ranged from $\chi^2(9, n = 1481) = 57.64, p = 0.00$ to $\chi^2(6, n = 1712) = 573.80, p = 0.00$ for males and from $\chi^2(9, n = 2590) = 63.23, p = 0.00$ to $\chi^2(9, n = 2139) = 549.87, p = 0.00$ for females. Between 1993 and 2000, significant differences were found for 12–15-year-old males ($\chi^2[3, n = 597] = 17.59, p = 0.00$) and females ($\chi^2[3, n = 749] = 17.29, p = 0.00$), for 16–20-year-old males ($\chi^2[3, n = 1137] = 12.39, p = 0.01$) and 21–25-year-old females ($\chi^2[3, n = 1520] = 17.22, p = 0.00$) = 17.29, $p = 0.00$).

Table 3

Prevalence of quantity of drinking by age and gender in Dutch adolescents and young adults (%)

| | Male | | | | Female | | | |
|--------------------|-------|-------|-------|-------|--------|-------|-------|-------|
| | 12–15 | 16–20 | 21–25 | 26–30 | 12–15 | 16–20 | 21–25 | 26–30 |
| 1993, <i>n</i> | 544 | 847 | 305 | – | 677 | 1027 | 415 | 3 |
| <1 drink a week | 90.3 | 32.7* | 22.3* | – | 94.2 | 55.7* | 54.2* | 66.7 |
| 1–5 drinks a week | 8.5 | 28.5* | 25.2* | – | 5.3 | 30.7* | 31.8* | 0.0 |
| 6–20 drinks a week | 1.3 | 32.0* | 41.3* | – | 0.4 | 12.6* | 13.5* | 33.3 |
| >20 drinks a week | 0.0 | 6.8* | 11.1* | – | 0.0 | 1.1* | 0.5* | 0.0 |
| 1995, <i>n</i> | 291 | 973 | 765 | 154 | 341 | 1125 | 958 | 162 |
| <1 drink a week | 79.0* | 29.5* | 22.0* | 20.1* | 86.2* | 53.2* | 51.5* | 54.9* |
| 1–5 drinks a week | 15.8* | 27.7* | 25.8* | 38.3* | 12.9* | 32.8* | 31.9* | 35.2* |
| 6–20 drinks a week | 5.2* | 35.0* | 39.5* | 35.7* | 0.9* | 13.2* | 15.8* | 8.6* |
| >20 drinks a week | 0.0* | 7.7* | 12.8* | 5.8* | 0.0* | 0.8* | 0.8* | 1.2* |
| 1997, <i>n</i> | 74 | 551 | 606 | 292 | 70 | 739 | 870 | 414 |
| <1 drink a week | 86.5 | 23.8* | 14.7* | 21.2* | 77.1 | 41.9* | 42.5* | 51.0* |
| 1–5 drinks a week | 10.8 | 28.7* | 24.8* | 34.9* | 20.0 | 40.3* | 37.7* | 36.2* |
| 6–20 drinks a week | 2.7 | 38.7* | 43.7* | 36.6* | 1.4 | 16.5* | 18.5* | 12.1* |
| >20 drinks a week | 0.0 | 8.9* | 16.8* | 7.2* | 1.4 | 1.2* | 1.3* | 0.7* |
| 2000, <i>n</i> | 41 | 280 | 620 | 523 | 63 | 455 | 1067 | 920 |
| <1 drink a week | 53.7 | 17.5* | 17.1* | 15.5* | 68.3 | 34.3* | 42.0* | 48.3* |
| 1–5 drinks a week | 39.0 | 25.4* | 23.4* | 27.9* | 22.2 | 38.0* | 33.1* | 34.9* |
| 6–20 drinks a week | 7.3 | 47.1* | 43.9* | 45.5* | 9.5 | 25.9* | 23.9* | 16.2* |
| >20 drinks a week | 0.0 | 10.0* | 15.6* | 11.1* | 0.0 | 1.8* | 1.0* | 0.7* |

Note: Symbol (*) indicates significant gender differences (Chi-square tests $p < 0.01$). With Chi-squares between $\chi^2(2, n = 632) = 11.98, p = 0.00$ and $\chi^2(3, n = 1476) = 299.34, p = 0.00$. Chi-square tests for age differences ranged from $\chi^2(9, n = 1464) = 62.45, p = 0.00$ to $\chi^2(6, n = 1696) = 571.78, p = 0.00$ for males and from $\chi^2(9, n = 2093) = 47.04, p = 0.00$ to $\chi^2(9, n = 2122) = 327.21, p = 0.00$ for females. Between 1993 and 2000, significant differences were found for 12–15-year-old males ($\chi^2[3, n = 592] = 23.56, p = 0.00$), for 16–20-year-old females ($\chi^2[3, n = 1492] = 25.66, p = 0.00$) and for 21–25-year-old females ($\chi^2[3, n = 1499] = 25.57, p = 0.00$).

Table 4
Prevalence of lifetime drunkenness by age and gender in Dutch adolescents and young adults (%)

| | Male | | | | Female | | | |
|----------------|-------------|--------------|--------------|--------------|-------------|---------------|---------------|--------------|
| | 12–15 | 16–20 | 21–25 | 26–30 | 12–15 | 16–20 | 21–25 | 26–30 |
| 1993, <i>n</i> | 535 9.9 | 842 61.8* | 304 80.3* | – – | 644 8.7 | 1030 40.8* | 420 50.2* | 3 66.7 |
| 1995, <i>n</i> | 290 18.3 | 976 62.4* | 764 77.7* | 155 83.2* | 340 12.1 | 1125 42.1* | 962 52.4* | 163 58.3* |
| 1997, <i>n</i> | 83 16.9 | 557 68.8* | 617 84.9* | 298 81.5* | 87 11.5 | 760 53.6* | 897 63.4* | 433 65.8* |
| 2000, <i>n</i> | 41 22.0 | 282 75.2* | 620 86.6* | 525 87.6* | 64 28.1 | 465 60.0* | 1082 69.9* | 942 67.9* |

Note: Symbol (*) indicates significant gender differences (Chi-square tests $p < 0.01$). With Chi-squares between $\chi^2(1, n = 747) = 17.95, p = 0.00$ and $\chi^2(1, n = 1726) = 118.30, p = 0.00$. Chi-squares for age differences ranged from $\chi^2(3, n = 1468) = 134.06, p = 0.00$ to $\chi^2(2, n = 1681) = 501.01, p = 0.00$ for males and from $\chi^2(3, n = 2553) = 57.33, p = 0.00$ to $\chi^2(3, n = 2097) = 258.77, p = 0.00$ for females. Between 1993 and 2000, significant differences were found for 21–25-year-old females ($\chi^2[1, n = 1507] = 18.71, p = 0.00$).

this age category had been drunk at least once in 2000 than in 1993.

The prevalence rates for frequency of drunkenness for each age group and gender are shown in Table 5. Within each wave, frequency of drunkenness significantly increased with age until participants were 25; after the age of 25, frequency of drunkenness decreased. Except for 12–15-year olds, males had been drunk significantly more often than females. In addition, between waves, significant changes in frequency of drunkenness were found for 16–20-year-old males and

21–25-year-old males and females. Time trends showed that adolescents and young adults had been drunk more often in 2000 than in 1993.

Finally, problem drinking was examined. Table 6 reveals that irrespective of age and gender, a vast majority of the adolescents and young adults were not problem drinkers, based on their CAGE scores. Within each wave, the frequency of problem drinkers increased significantly with age for males in 1995 and in 1997, this frequency decreased after the age of 25. Except for 12–15-year olds, significantly more males

Table 5
Prevalence of frequency of drunkenness by age and gender in Dutch adolescents and young adults (%)

| | Male | | | | Female | | | |
|---------------------|-------|-------|-------|-------|--------|-------|-------|-------|
| | 12–15 | 16–20 | 21–25 | 26–30 | 12–15 | 16–20 | 21–25 | 26–30 |
| 1993, <i>n</i> | 533 | 827 | 301 | – | 646 | 1013 | 409 | 3 |
| Never | 90.4 | 38.9* | 19.9* | – | 91.0 | 60.2* | 51.1* | 33.3 |
| Once a year or less | 6.8 | 34.0* | 47.2* | – | 7.7 | 30.5* | 40.6* | 33.3 |
| A few times a year | 2.4 | 21.2* | 23.6* | – | 1.1 | 8.4* | 7.8* | 33.3 |
| A few times a month | 0.4 | 5.9* | 9.3* | – | 0.2 | 0.9* | 0.5* | 0.0 |
| 1995, <i>n</i> | 290 | 960 | 752 | 152 | 340 | 1103 | 948 | 160 |
| Never | 81.7 | 38.2* | 22.6* | 17.1* | 87.9 | 59.0* | 48.3* | 42.5* |
| Once a year or less | 12.4 | 33.4* | 42.2* | 53.3* | 9.1 | 30.6* | 42.1* | 50.0* |
| A few times a year | 5.5 | 22.5* | 27.0* | 25.0* | 2.6 | 9.1* | 8.9* | 6.3* |
| A few times a month | 0.3 | 5.8* | 8.2* | 4.6* | 0.3 | 1.3* | 0.7* | 1.3* |
| 1997, <i>n</i> | 79 | 486 | 546 | 266 | 81 | 617 | 726 | 309 |
| Never | 87.3 | 35.8* | 17.0* | 20.7* | 95.1 | 57.2* | 45.2* | 47.9* |
| Once a year or less | 7.6 | 15.2* | 24.7* | 32.3* | 0.0 | 16.0* | 22.9* | 33.3* |
| A few times a year | 5.1 | 35.0* | 42.9* | 39.8* | 3.7 | 23.7* | 27.5* | 17.5* |
| A few times a month | 0.0 | 14.0* | 15.4* | 7.1* | 1.2 | 3.1* | 4.4* | 1.3* |
| 2000, <i>n</i> | 41 | 279 | 620 | 525 | 64 | 465 | 1082 | 940 |
| Never | 82.9 | 49.1* | 38.7* | 44.6* | 81.3 | 62.6* | 64.0* | 75.3* |
| Once a year or less | 12.2 | 18.6* | 18.9* | 20.6* | 14.1 | 19.4* | 17.2* | 14.0* |
| A few times a year | 4.9 | 24.0* | 31.3* | 26.1* | 4.7 | 16.8* | 16.2* | 9.7* |
| A few times a month | 0.0 | 8.2* | 11.1* | 8.8* | 0.0 | 1.3* | 2.7* | 1.0* |

Note: Symbol (*) indicates significant gender differences (Chi-square tests $p < 0.01$). With Chi-squares between $\chi^2(3, n = 744) = 31.87, p = 0.00$ and $\chi^2(3, n = 1700) = 214.91, p = 0.00$. Chi-squares for age differences ranged from $\chi^2(9, n = 1465) = 40.36, p = 0.00$ to $\chi^2(6, n = 1661) = 500.60, p = 0.00$ for males and from $\chi^2(9, n = 2551) = 53.48, p = 0.00$ to $\chi^2(9, n = 2071) = 249.21, p = 0.00$ for females. Between 1993 and 2000, significant differences were found for 16–20-year-old males ($\chi^2[3, n = 1123] = 11.28, p = 0.01$) and for 21–25-year-old males ($\chi^2[3, n = 925] = 39.76, p = 0.00$) and females ($\chi^2[3, n = 1501] = 40.38, p = 0.00$).

Table 6
Prevalence of problem drinking age and gender in Dutch adolescents and young adults (%)

| | Male | | | | Female | | | |
|-----------------|------------------|--------------------|---------------------|---------------------|--------|------------------|------------------|------------------|
| | 12–15 | 16–20 | 21–25 | 26–30 | 12–15 | 16–20 | 21–25 | 26–30 |
| 1995, <i>n</i> | 283 | 958 | 754 | 154 | 327 | 1114 | 946 | 158 |
| Problem drinker | 1.1 ^a | 7.0 ^{*,a} | 10.1 ^{*,a} | 12.3 ^{*,a} | 1.8 | 2.2 [*] | 3.8 [*] | 3.8 [*] |
| 1997, <i>n</i> | 79 | 552 | 615 | 295 | 81 | 759 | 890 | 428 |
| Problem drinker | 0.0 [*] | 7.8 ^{*,a} | 14.0 ^{*,a} | 10.2 ^{*,a} | 0.0 | 3.0 [*] | 4.5 [*] | 4.9 [*] |
| 2000, <i>n</i> | 40 | 280 | 619 | 526 | 59 | 461 | 1072 | 930 |
| Problem drinker | 2.5 | 15.7 [*] | 16.0 [*] | 14.6 [*] | 1.7 | 4.8 [*] | 5.3 [*] | 4.8 [*] |

Note: Symbol (*) indicates significant gender differences (Chi-square tests $p < 0.01$). With Chi-squares between $\chi^2(1, n = 723) = 7.38, p = 0.01$ and $\chi^2(1, n = 1691) = 54.41, p = 0.00$; a indicates significant age differences (Chi-square tests $p < 0.01$). Chi-square in 1995 $\chi^2[3, n = 2149] = 28.97, p = 0.00$ and in 1997 ($\chi^2[3, n = 1541] = 21.84, p = 0.00$). Between 1995 and 2000, significant differences were found for 21–25-year-old males ($\chi^2[1, n = 859] = 10.10, p = 0.00$).

than females were problem drinkers. Furthermore, in 2000, the prevalence of problem drinking among 21–25-year-old males increased compared to 1995.

Additional Chi-square analyses were carried out to examine whether students and working participants differed in their drinking in 1993 and 1995. For males, these analyses showed only significant differences for lifetime alcohol use in 1995; students had higher lifetime alcohol use than working participants. However, for females, we showed that compared to working participants, students had higher lifetime alcohol use in 1995, higher frequency of drinking and higher quantity of drinking in both waves, higher lifetime drunkenness, frequency of drunkenness and problem drinking in 1995.

To examine differences in alcohol use between twins and singletons, univariate analyses of variance were conducted. These analyses did not show consistent differences between twins and singletons.

4. Discussion

The current study aimed at describing alcohol use among adolescents and young adults in the Netherlands. Our study showed that a substantial part of Dutch adolescents and young adults were exposed to alcohol use at early age, but rates of regular drinking and drunkenness were considerably lower in the Netherlands. A minority of the Dutch adolescents and young adults were excessive drinkers but excessive drinking was virtually absent among 12–15-year olds. These figures are consistent with findings for similar age categories from studies by De Zwart et al. (2000) and Ter Bogt et al. (2002).

Regarding time trends, it was striking to find that 12–15-year-old males and females drank more frequently and consumed more drinks a week in 2000 than in 1993. A possible explanation for this increase in alcohol use might be the increased popularity of alcopops among this age group. Young people who are not used to drinking alcohol probably prefer the sweet taste of these mixed drinks too, for example, beer or wine. This was in line with other studies in Europe by Roberts et al. (1999) and Romanus (2000). In addition, 21–25-year-old females drank more frequently, consumed more drinks

a week, had more experience with lifetime drunkenness and were drunk more often in 2000 than in 1993. Because this age category consists, for a large part, of students and students in general consume more alcohol than other adolescents and young adults (Van Laar et al., 2002), the increase in alcohol use during the 1990s might be explained by the increase in female students in this time period (CBS, 2004). In 2000, 21–25-year-old males were drunk more often than in 1993 and were more often a problem drinker, according to the CAGE scale, than in 1995. An explanation for this increase in alcohol use over time is still unclear. Time trends in drinking were only found for 12–15-year-old males and females and 21–25-year-old males and females; overall alcohol consumption did not change substantially during the 1990s. This was in line with findings from De Zwart et al. (2000) and Ter Bogt et al. (2002).

The present study revealed that prevalence rates for lifetime alcohol use, frequency of drinking, quantity of drinking, lifetime drunkenness, frequency of drunkenness and problem drinking increased with age until the age of 25, after which the prevalence of these behaviors decreased. As our additional analyses indicated this decrease could, at least for females and partly for males, be explained by the fact that the majority of participants over 25 years of age finished their studies and started working. The decrease of alcohol use after the age of 25 might be caused by changes in social roles, particularly by women. For example, findings from a study by Hajema and Knibbe (1998) showed that acquisition of a partner role and a parental role was associated with a decrease in drinking.

This study showed that male adolescents and young adults reported a higher alcohol use (except lifetime alcohol use) than females at all ages except in the age category of 12–15 years. These findings are in line with reports of the Substance Abuse and Mental Health Services Administration (SAMHSA, 2001, 2002) and Young et al. (2002) who found no gender differences for alcohol use for 12–15-year olds. It is possible that girls, who are usually ahead of boys in puberty, experiment with drinking at an earlier age, which may counteract the fact that boys drink more. A possible explanation for gender differences in alcohol use after the age of 15 could be the biological difference in sensitivity to alcohol

effects (Ely et al., 1999; Frezza et al., 1990; Wilsnack et al., 2000). Compared to males, females are generally more sensitive to alcohol effects and hence they can drink less to obtain the same effects. In addition, gender differences in alcohol consumption might be explained by socio-cultural factors. In western societies, a greater tolerance exists towards male drinking than towards female drinking (Carman and Holmgren, 1986; Wilsnack et al., 2000). Males may drink more than females because drinking can be seen as a demonstration of masculinity. In contrast, females may drink less because drinking does not fit with expectations of females' traditional domestic roles and public behavior.

In the current study, we used the CAGE questionnaire to assess problem drinking. Previous studies on the validity of the CAGE questionnaire among adolescents pointed out that the CAGE items are not sensitive to problem drinking among adolescents (Chung et al., 2000; Knight et al., 2003; O'Hare and Tran, 1997). A low sensitivity indicates a risk for false negatives. Accordingly, our figures on problem drinking might underestimate the actual number of participants who experience alcohol-related problems.

It should be noted that in the current study, we presented data from a special sample of adolescents and young adults, namely twins and their siblings. Nevertheless, the findings seem to be generalizable to singletons. When comparing twins and singletons in the present study, no consistent differences were found.

In summary, in the Netherlands, adolescent and young adult alcohol use showed clear age and gender effects. Drinking increased with age until the age of 25, after which it decreased. Males exceeded females on all aspects of drinking, with exception of the youngest age group and for lifetime alcohol use. Time trends indicated an increase in frequency and quantity of drinking among 12–15-year-old adolescents during the 1990s. Moreover, 21–25-year-old females drank more frequently, consumed more drinks a week, had more experience with lifetime drunkenness and were drunk more often in 2000 than in 1993. Among 21–25-year-old males, an increase of drunkenness and problem drinking was displayed during the 1990s.

Acknowledgments

This work was supported by the Netherlands Organization of Scientific Research (NWO 016-005-029, NWO 900-562-137, NWO 575-25-006, NWO 985-10-002 and NWO-MW 904-61-193).

Appendix A. Supplementary data

Supplementary data associated with this article are presented in a Table that can be found in the online version of this paper at <http://dx.doi.org> by entering 10.1016/j.drugalcdep.2005.03.020.

References

- Abraham, M.D., Kaal, H.L., Cohen, P.D.A., 2002. Licit and Illicit Drug Use in the Netherlands 2001. Mets, Amsterdam.
- Bauman, A., Phongsavan, P., 1999. Epidemiology of substance use in adolescence: prevalence, trends and policy implications. *Drug Alcohol Depend.* 55, 187–207.
- Bieleman, B., Jetzes, M., Kruize, F., 2002. Alcoholverstreking aan Jongeren: Naleving Leeftijdsgrenzen 16 en 18 Jaar uit de Drank-en Horecawet: Metingen 1999 en 2001 [Alcohol Supply to Youths: Observance of Age Restrictions 16 and 18 Years from the Alcohol- and Catering Law: Measures 1999 and 2001]. Intraval, Groningen/Rotterdam.
- Boomsma, D.I., Vink, J.M., Van Beijsterveldt, T.C.E.M., De Geus, E.J.C., Beem, A.L., Mulder, E.J.C.M., Derks, E.M., Riese, H., Willemsen, G.A.H.M., Bartels, M., Van den Berg, M., Kupper, N.H.M., Polderman, T.J.C., Posthuma, D., Rietveld, M.J.H., Stubbe, J.H., Knol, L.I., Stroet, T., Van Baal, G.C.M., 2002. Netherlands Twin Register: a focus on longitudinal research. *Twin Res.* 5, 401–406.
- Carman, R.S., Holmgren, C., 1986. Gender differences in the relationship of drinking motivations and outcomes. *J. Psychol.* 120, 375–378.
- CBS, 2001. Jeugd 2001: Cijfers en Feiten [Youth 2001: Figures and Facts]. Centraal Bureau voor de Statistiek, Voorburg.
- CBS, 2004. www.cbs.nl/nl/cijfers/statline.
- Chung, T., Colby, S.M., Barnett, N.P., Rohsenow, D.J., Spirito, A., Monti, P.M., 2000. Screening adolescents for problem drinking: performance of brief screens against DSM-IV alcohol diagnosis. *J. Stud. Alcohol* 61, 579–587.
- De Zwart, W.M., Monshouwer, K., Smit, F., 2000. Jeugd en Riskant Gedrag. Kerngegevens 1999. Roken, Drinken, Drugsgebruik en Gokken onder Scholieren vanaf Tien Jaar [Youth and Risky Behavior. Key Data 1999. Smoking, Drinking, Drug Use, and Gambling among Scholars Aged Ten Years and Older]. Trimbo-instituut, Utrecht.
- Ely, M., Hardy, R., Longford, N.T., Wadsworth, M.E., 1999. Gender differences in the relationship between alcohol consumption and drink problems are largely accounted for by body water. *Alcohol Alcohol.* 34, 894–902.
- Ewing, J.A., 1984. Detecting alcoholism. The CAGE questionnaire. *JAMA* 252, 1905–1907.
- Frezza, M., Di-Padova, C., Pozzato, G., Terpin, M., Baraona, E., Lieber, C.S., 1990. High blood alcohol levels in women: the role of decreased gastric alcohol dehydrogenase activity and first-pass metabolism. *N. Engl. J. Med.* 322, 95–99.
- Gross, W.C., 1993. Gender and age differences in college students' alcohol consumption. *Psychol. Rep.* 72, 211–216.
- Hajema, K.J., Knibbe, R.A., 1998. Changes in social roles as predictors of changes in drinking behaviour. *Addiction* 93, 1717–1727.
- Hibell, B., Andersson, B., Ahlström, S., Balakireva, O., Bjarnason, T., Kokkevi, A., Morgan, M., 2000. The 1999 ESPAD Report: Alcohol and Other Drug Use Among Students in 30 European Countries. The Swedish Council for Information on Alcohol and other Drugs, Stockholm.
- Knight, J.R., Sherritt, L., Harris, S.K., Gates, E.C., Chang, G., 2003. Validity of brief alcohol screening tests among adolescents: a comparison of the AUDIT, POSIT, CAGE, and CRAFFT. *Alcohol. Clin. Exp. Res.* 27, 67–73.
- Kuipers, S.B.M., Stam, H., De Zwart, W.M., 1997. Jeugd en Riskant Gedrag 1996. Roken, Drinken, Drugsgebruik en Gokken onder Scholieren vanaf Tien Jaar [Youth and Risky Behavior 1996. Smoking, Drinking, Drug Use, and Gambling among Scholars Aged Ten Years and Older]. Trimbo-instituut, Utrecht.
- NIBUD, 2002. Nationaal Scholierenonderzoek 2001/2002 [National Students Research 2001/2002], from www.NIBUD.nl.
- O'Hare, T., Tran, T.V., 1997. Predicting problem drinking in college students: gender differences and the CAGE questionnaire. *Addict. Behav.* 22, 13–21.

- Plant, M.A., Miller, P., Plant, M.L., 2004. Trends in drinking and other “risky” behaviours among 15 and 16 year olds in the United Kingdom (1995–2003). Paper presented at the Kettil Bruun Society for Social and Epidemiological Research on Alcohol, Helsinki, Finland.
- Plant, M.L., Plant, M.A., 2001. Heavy drinking by young British women gives cause for concern. *BMJ* 323, 1183.
- Roberts, C., Blakey, V., Tudor Smith, C., 1999. The impact of ‘alcopops’ on regular drinking by young people in Wales. *Drug Educ. Prev. Policy* 6, 7–15.
- Romanus, G., 2000. Alcopops in Sweden—a supply side initiative. *Addiction* 95 (Suppl. 4), S609–S619.
- SAMHSA, 2001. <http://oas.samhsa.gov/nhsda/2k1nhsda/PDF/ch3.pdf>.
- SAMHSA, 2002. <http://oas.samhsa.gov/nhsda/2k2nsduh/2k2SoFW.pdf>.
- Sutherland, I., Sheperd, J.P., 2001. The prevalence of alcohol, cigarette and illicit drug use in a stratified sample of English adolescents. *Addiction* 96, 637–640.
- Ter Bogt, T., Van Dorsselaer, S., Vollebergh, W., 2002. Roken, Drinken en Blowen door Nederlandse Scholieren (11 t/m 17 jaar) 2001: Kerngegevens Middelengebruik uit het Nederlands HBSC-onderzoek [Smoking, Drinking, and Smoking Dope among Dutch Scholars (11–17 year) 2001: Key Data Substance Use from the Dutch HBSC-study]. Trimbos-instituut, Utrecht.
- Van Laar, M.W., Cruts, A.A.N., Rigter, H.G.M., Verdurmen, J.E.E., Meijer, R.F., Van Ooyen, M.M.J., 2002. Nationale Drugmonitor: Jaarbericht 2002 [National Drugmonitor: Annual Report 2002], Trimbos-instituut, Utrecht.
- Vink, J.M., Willemsen, G., Stubbe, J.H., Middeldorp, C.M., Ligthart, R.S., Baas, K.D., Dirkzwager, H., De Geus, E., Boomsma, D.I., 2004. Estimating non-response bias in family studies: application to mental health and lifestyle. *Eur. J. Epidemiol.* 19, 623–630.
- Wilsnack, R.W., Volgelant, N.D., Wilsnack, S.C., Harris, T.R., 2000. Gender differences in alcohol consumption and adverse drinking consequences: cross-cultural patterns. *Addiction* 95, 251–265.
- Young, S.E., Corley, R.P., Stallings, M.C., Rhee, S.H., Crowley, T.J., Hewitt, J.K., 2002. Substance use, abuse and dependence in adolescence: prevalence, symptom profiles and correlates. *Drug Alcohol Depend.* 68, 309–322.