Measurement of Lifetime Alcohol Intake: Utility of a Self-administered Questionnaire

I. H. M. Friesema1,2, M. Y. Veenstra3, P. J. Zwietering2,4, J. A. Knottnerus2,4, H. F. L. Garretsen3,5, and P. H. H. M. Lemmens1,2

1 Department of Health Care Studies, Section of Medical Sociology, University of Maastricht, Maastricht, the Netherlands.  
2 Care and Public Health Research Institute, University of Maastricht, Maastricht, the Netherlands.  
3 Addiction Research Institute, Erasmus University Rotterdam, Rotterdam, the Netherlands.  
4 Department of General Practice, University of Maastricht, Maastricht, the Netherlands.  
5 Faculty of Social and Behavioral Sciences, Tilburg University, Tilburg, the Netherlands.

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Prior epidemiologic research revealing cardioprotective effects of alcohol intake has systematically neglected lifetime exposure to alcohol, which may cause serious bias in conclusions regarding drinking and heart disease risk. Departing from use of an earlier interview schedule, the authors of the present 1996–2001 cohort study developed a self-administered Lifetime Drinking History questionnaire (LDH-q). A total of 16,211 Dutch men and women older than age 45 years participated by completing the baseline questionnaire. A random sample of 3,255 men and women was used to determine the reliability and validity of the LDH-q. Test-retest reliability was assessed by means of the intraclass correlation coefficient and kappa scores. Correlations between lifetime and current intake scores were used to assess discriminant and convergent validity. Both reliability and validity appeared to be reasonably high compared with results obtained by using interview formats to measure lifetime alcohol intake. Reliability of the LDH-q was higher for men than for women, probably because of the more frequent and regular drinking of men. Indices of validity were similar for men (0.75) and women (0.70). Results show that the LDH-q can be a useful instrument in large-scale cohort studies.

alcohol drinking; cohort studies; data collection; questionnaires; reproducibility of results

Abbreviations: ICC, intraclass correlation coefficient; LDH-q, Lifetime Drinking History questionnaire; QF, quantity-frequency index of alcohol intake per week; QF-last-year, quantity-frequency index of alcohol intake in the last year, measured at baseline.

Epidemiologic research on the relation between alcohol intake and coronary heart disease has led to the generally accepted idea that moderate intake of alcohol is beneficial to health (1–6). Coronary heart disease does not occur suddenly but is a preliminary outcome of an atherosclerotic process. This process may start early in life: Visible lipid deposits have been found in adolescents and even in children (7–11). Clinical studies suggest that the cardioprotective effects of alcohol may be generated by certain lipoproteins, decreased platelet function, and increased fibrinolysis (12). Of these effects of alcohol, some seem to be immediate or short term, such as blood platelet aggregation. In such instances, there is no need to consider lifetime exposure because it would explain little of the variation in risk. Because most population studies measure alcohol intake by means of self-reports with short reference periods (13), it should not come as a surprise that results from these studies often confirm these immediate, short-term beneficial effects. However, for other outcomes, such as arterial lipid formation or high blood pressure, exposure to alcohol throughout life may affect risk. When, for example, the natural course of atherosclerosis is considered, an additive or cumulative effect of lifetime alcohol exposure is conceivable, necessitating measurement of lifetime intake. Unfortunately, measuring alcohol intake, especially earlier in life, is not straightforward.

A general problem in measuring alcohol intake is the absence of a “gold standard.” Self-reports are the simplest method but are prone to response bias. However, other, more objective techniques such as use of biomarkers of alcohol intake do not seem more valid than self-reports when the
reference period is stretched over some time (14–16). Since accuracy of recall of an autobiographic event is affected by the elapsed time since the event occurred (next to saliency of the event and its frequency of occurrence), extending the reference period to a lifetime probably will affect the accuracy of such self-reports (17). Research into the quality of self-reports for lifetime intake is scarce, however. To our knowledge, only one study is available in which self-reported drinking (actual intake in the last week) was directly compared with recall of intake during that period 18 years later (18). Paradoxically, intake recalled 18 years later was, on average, found to be higher than when intake was assessed immediately after the drinking occurred. However, current intake was not related to the size of the discrepancy in reports, suggesting absence of differential bias in the self-reports after 18 years.

Results on the stability of self-reports of lifetime drinking from three studies in which an interview schedule was used showed moderate-to-high correlations ranging from 0.73 to 0.94 for total lifetime intake (19–21). However, in large cohort studies, interviewing all participants is often not feasible, and one has to resort to a self-administered questionnaire format. Despite the potential cost of an increased number of missing values and inconsistencies often attributed to a lower perception of threat when self-administered questionnaires are used (22), self-administered questionnaire formats yield similar or even better results than personal interviews when alcohol intake is measured (22–24).

In the present 1996–2001 study, the quality of the self-administered format of the Lifetime Drinking History questionnaire (LDH-q) was tested in a large cohort study, the Lifestyle and Health Study (in Dutch, abbreviated as the LEGO study). The LDH-q was developed in an earlier pilot study (25) on the basis of an interview schedule (26), since no self-administered questionnaire about lifetime drinking was available. In the present study, test-retest reliability of the LDH-q was estimated. The construct validity of the LDH-q was tested by comparing it with two measures of current drinking, assuming that scores for corresponding drinking periods should show a high correlation. It was further presumed that the further back in time the intake for which the subject was reporting occurred, the lower its correlation with current intake.

MATERIALS AND METHODS

Population

The LDH-q was developed primarily for measuring lifetime exposure to alcohol in a large prospective cohort study. The data in this article were derived from the Dutch Lifestyle and Health Study, which started in 1996. The study cohort was composed of men and women born between 1925 and 1951 and registered at 34 participating general practices. Coverage of the general population by patient registration in primary practices is high in the Netherlands. In the period 1995–1997, an estimated 78–86 percent of all men and women aged 45 years or older visited their general practitioner at least once in a 1-year period (27). The primary practices were drawn from two regions of the Netherlands, southeastern and western, because of differences in past drinking patterns. Historically, the southeastern region, compared with the western region, is characterized by a low alcohol abstinence rate among men but a relatively high abstinence rate among women and by a higher intake among men versus a relatively lower intake among women (28, 29).

Participation of practices was sought with the help of municipal health authorities and through the network of practices of the Department of General Practice of the University of Maastricht (30). No particular criteria were used in selection other than number of patients and availability of medical information. The study design, in which only anonymous data were used, was approved by the review committee of the Registration Network Family Practices. Informed consent was obtained by using a letter explaining the questionnaire.

After patients with terminal disease, patients with severe dementia, mentally disabled patients, and institutionalized patients were excluded, 31,348 persons were presented with a baseline questionnaire. Those who refused to participate (18.7 percent) could indicate so by returning a blank questionnaire. These persons were then removed from the cohort. To all other nonrespondents (35.3 percent), a second baseline questionnaire was sent out in 1997. From these respondents (n = 1,803), no retest data were available. Of the 14,408 baseline-1996 respondents, 77.2 percent responded to the follow-up questionnaire with the retest. Preliminary data did not reveal differences in age or sex between respondents and nonrespondents.

From the 16,211 persons constituting the cohort, a random sample of 3,255 was drawn. For this sample, questionnaires were processed and data were made available for analysis.

Alcohol intake

Alcohol intake was measured by using three methods: the LDH-q; a quantity-frequency index of intake in the last year, measured at baseline (QF-last-year); and the weekly recall. For the latter, actual intake in the past week was reported.

The self-administration format of the LDH-q is based on the interview schedule of the Lifetime Drinking History (19), which was in turn an adaptation of a format suggested by Rohan (31). The interview schedule of the Lifetime Drinking History provides quantitative data on patterns of alcohol intake starting from onset of regular drinking and was intended primarily to assess the drinking history of heavy drinkers. The major alteration made to the LDH-q was in the format of the drinking periods. In the interview schedule of the Lifetime Drinking History, drinking periods are not fixed but “floating”; the respondent defines the different drinking periods in his or her life. These periods are demarcated by changes in drinking behavior, which the respondent qualifies as large. However, such a free format is too complicated to use in a self-administered questionnaire context, so the drinking periods in the LDH-q were presented as fixed. Nevertheless, comparison of a free format and the floating format of the Cognitive Lifetime Drinking History interview did not lead to differences in results (21). In the pilot study, the LDH-q was compared with the interview schedule of the Lifetime Drinking History in a sample of 45.
male social drinkers (25). The test-retest correlation was about 0.70, a figure easily affected by a few outliers caused by routing errors. The conclusion was that, after some major (routing) adjustments, the LDH-q could yield a reliability profile similar to the one for the interview schedule of the Lifetime Drinking History.

For the present study, the LDH-q was conducted twice in the spring, 1 year apart. The LDH-q was part of the baseline questionnaire. The 1997 follow-up questionnaire was slightly shorter; the main indices of drinking were retained but questions about reasons for discontinuing drinking were omitted. The LDH-q starts off with a question about age (in years) at onset of drinking, defined as consuming the “first, full glass” of alcohol. Then, respondents are asked about their usual frequency of drinking (eight options ranging from “every day” to “never”) and their usual quantity per occasion (in glasses) during each age period. Five drinking periods were defined: youth (aged 12–18 years), young adult (aged 19–27 years), adult (aged 28–45 years), middle age (aged 46–60 years), and elderly (aged ≥61 years) (25). Usual quantity and usual frequency, converted to fit a weekly frequency, were multiplied to form an index of usual intake for each drinking period. Cumulated index scores for the drinking periods were added to produce an estimate of total lifetime intake. Additional questions in the original version inquiring about variability, that is, the frequency of binge drinking, type of beverage (beer, wine, spirits), drinking context, and attempts to quit, were omitted from the retest version.

Additional drinking indicators in both the test and retest versions of the LDH-q were QF-last-year and a measure of actual drinking during the last week (weekly recall). Both indices measured alcohol intake separately for beer, wine, and spirits.

Analysis

Test-retest reliability was assessed by calculating the kappa measure for a binary variable or the single-score intra-class correlation coefficient (ICC) for one-way models (32). The ICC is closely related to the kappa measure and, under some conditions, is a special case of weighted kappa (33). An advantage of the ICC is correction for possible systematic variation between two measurements or methods in addition to application of only the variation between subjects and the random variation in the Pearson’s correlation coefficient (34). ICCs were calculated for frequency, quantity, and total weekly intake for each drinking period and for lifetime intake. The indices were examined for influential cases by using Cook’s distance. ICC changes of more than 0.10 for one or two cases were considered influential, and those cases were excluded temporarily.

Construct validity was determined by comparing the LDH-q with the QF-last-year and the weekly recall, all measured in the baseline questionnaire. The five drinking periods were also compared with each other. The rationale behind these tests is that the association between intake scores for different drinking periods should be weaker the further apart in time they are. If reporting bias is large, it would be reflected in equally high correlations between reported intake over periods even far apart in time. Construct validity was determined for alcohol intake per week by using Spearman’s correlation coefficient because the variables used probably do not follow a normal distribution. Furthermore, if there is a normal distribution, Spearman’s $\rho$ will be equal to Pearson’s correlation coefficient (35).

Finally, an aspect of face validity was investigated by comparing trends in the cohort with those in the Dutch population at large over the period 1950–1995. Mean alcohol intake in the cohort (in liters of pure alcohol per year) for the years 1950, 1955, and so on up to 1995 was calculated for comparison with per-capita intake for these years in the Netherlands. Drinks were converted to liters of pure alcohol, assuming that one glass contains 12.5 ml of pure alcohol. Data for all cohort members were used in the calculation, with those for members not (yet) drinking set to zero. When per-capita intake was calculated (based on sales data), data for Dutch inhabitants of all ages were included in the denominator (36).

RESULTS

Baseline data were available for 1,608 men and 1,647 women, of whom 1,427 men and 1,450 women had responded in 1996. About half of the respondents were aged 44–54 years. The distribution over the five 5-year age categories was equal to the distribution of these groups in the Netherlands (37).

Drinking behavior

Table 1 shows that, compared with older men, younger men started drinking earlier in life ($p < 0.01$) and tended to report consuming more drinks per week during each life period, which was significant for reports of drinking by young adults, adults, and elderly men. A similar pattern was found for women (table 2), with significant trends in reports about age at onset for young adults, adults, and middle-aged women. When tables 1 and 2 are compared, it becomes obvious that, for each life period, men reported consuming at least twice as many drinks per week as women did, and they started drinking about 2 years earlier. Both men and women reported consuming more drinks per week according to the weekly recalls than to the QF-last-year, except for men aged 60–64 years. However, this finding was statistically significant for men aged 44–59 years only. The gender differences were consistent across the age range in the sample. The expected differences between the two regions were found for men only. For women, no significant differences or inverse differences in drinking pattern were found.

Test-retest reliability

Baseline and follow-up data were available for 1,074 men and 1,085 women. However, 31 men and 87 women were excluded from the study because of incomplete alcohol intake data for either year; six men and seven women did not complete the alcohol questions for both years. The LDH-q specifically asks the respondent if he or she has been a life-long abstainer. Of the women, 6.0 percent, compared with
1.2 percent of the men, indicated on both questionnaires that they had never drunk any alcohol. Answers about lifelong abstention were inconsistent more often among women (8.1 percent) than among men (1.5 percent). The kappa measure of agreement for this question was 0.61 for men and 0.55 for women. Combining this specific question with information from subsequent questions on alcohol intake revealed a conflict for another six men and 37 women who seemed to be “ever” drinkers. In all, when information from both questionnaires was used, 15 men (1.4 percent) and 74 women (7.4 percent) could be considered lifelong abstainers on both occasions. These 89 persons were excluded from the remaining test-retest analyses, leaving 1,028 men and 924 women.

Table 3 shows the ICCs for the LDH-q. The ICC for age at onset was low, especially for men (0.21). In some instances, current age instead of age at onset was given. Correction was made by combining age at onset with information on drinking during the first drinking period, increasing the ICCs to 0.60 for men and 0.61 for women.

The ICCs for the drinking indices during different drinking periods ranged from 0.44 to 0.88 for men but were somewhat lower for women (range, 0.42–0.88). This finding especially concerned the ICCs for quantity per occasion; they ranged from 0.68 to 0.77 for men and from 0.50 to 0.62 for women. The ICCs for reports about the “youth” period were, in general, the lowest. Finally, the ICCs for mean lifetime intake were 0.75 for men and 0.70 for women. ICC values were calculated separately for the different 5-year age categories. There did not seem to be a trend with age, although the ICCs seemed the lowest for the oldest men. In another analysis (results not shown), beer preference among

### TABLE 1. Age at onset of alcohol intake and mean number of glasses consumed per week per drinking period in relation to age at baseline for male drinkers in the Netherlands, 1996–2001

<table>
<thead>
<tr>
<th>Alcohol intake</th>
<th>Age at onset (years)</th>
<th>No. of men</th>
<th>44–49</th>
<th>50–54</th>
<th>55–59</th>
<th>60–64</th>
<th>65–71</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean</td>
<td>SD*</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Drinking period</td>
<td>Youth</td>
<td>1,496</td>
<td>16.4</td>
<td>2.7</td>
<td>16.7</td>
<td>2.8</td>
<td>17.1</td>
</tr>
<tr>
<td></td>
<td>Young adult</td>
<td>1,010</td>
<td>6.9</td>
<td>10.1</td>
<td>6.7</td>
<td>15.4</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>1,334</td>
<td>14.6</td>
<td>15.4</td>
<td>13.0</td>
<td>15.9</td>
<td>10.1</td>
</tr>
<tr>
<td></td>
<td>Middle age</td>
<td>1,354</td>
<td>14.8</td>
<td>16.4</td>
<td>12.5</td>
<td>14.6</td>
<td>12.3</td>
</tr>
<tr>
<td></td>
<td>Elderly</td>
<td>347</td>
<td>13.1</td>
<td>12.9</td>
<td>12.5</td>
<td>14.0</td>
<td>12.6</td>
</tr>
<tr>
<td>Mean lifetime intake</td>
<td>1,503</td>
<td>13.2</td>
<td>13.6</td>
<td>11.8</td>
<td>12.3</td>
<td>10.8</td>
<td>12.0</td>
</tr>
<tr>
<td>QF-last-year*</td>
<td>1,110</td>
<td>14.9</td>
<td>15.7</td>
<td>14.1</td>
<td>14.1</td>
<td>12.8</td>
<td>13.1</td>
</tr>
<tr>
<td>Weekly recall</td>
<td>1,032</td>
<td>16.7</td>
<td>13.5</td>
<td>16.8</td>
<td>13.8</td>
<td>14.4</td>
<td>11.8</td>
</tr>
</tbody>
</table>

* SD, standard deviation; QF-last-year, quantity-frequency index of alcohol intake in the last year, measured at baseline.

Table 2 shows the ICCs for the LDH-q. The ICC for age at onset was low, especially for men (0.21). In some instances, current age instead of age at onset was given. Correction was made by combining age at onset with information on drinking during the first drinking period, increasing the ICCs to 0.60 for men and 0.61 for women.

The ICCs for the drinking indices during different drinking periods ranged from 0.44 to 0.88 for men but were somewhat lower for women (range, 0.42–0.88). This finding especially concerned the ICCs for quantity per occasion; they ranged from 0.68 to 0.77 for men and from 0.50 to 0.62 for women. The ICCs for reports about the “youth” period were, in general, the lowest. Finally, the ICCs for mean lifetime intake were 0.75 for men and 0.70 for women. ICC values were calculated separately for the different 5-year age categories. There did not seem to be a trend with age, although the ICCs seemed the lowest for the oldest men. In another analysis (results not shown), beer preference among

### TABLE 2. Age at onset of alcohol intake and mean number of glasses consumed per week per drinking period in relation to age at baseline for female drinkers in the Netherlands, 1996–2001

<table>
<thead>
<tr>
<th>Alcohol intake</th>
<th>Age at onset (years)</th>
<th>No. of women</th>
<th>44–49</th>
<th>50–54</th>
<th>55–59</th>
<th>60–64</th>
<th>65–71</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean</td>
<td>SD*</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Drinking period</td>
<td>Youth</td>
<td>1,275</td>
<td>18.2</td>
<td>3.6</td>
<td>18.8</td>
<td>3.9</td>
<td>20.4</td>
</tr>
<tr>
<td></td>
<td>Young adult</td>
<td>1,020</td>
<td>2.0</td>
<td>6.1</td>
<td>1.3</td>
<td>1.8</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>1,087</td>
<td>3.3</td>
<td>4.2</td>
<td>3.0</td>
<td>3.8</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>Middle age</td>
<td>1,076</td>
<td>5.6</td>
<td>7.5</td>
<td>5.1</td>
<td>7.8</td>
<td>4.1</td>
</tr>
<tr>
<td></td>
<td>Elderly</td>
<td>270</td>
<td>6.0</td>
<td>6.0</td>
<td>5.6</td>
<td>7.1</td>
<td>5.7</td>
</tr>
<tr>
<td>Mean lifetime intake</td>
<td>1,297</td>
<td>4.5</td>
<td>5.7</td>
<td>4.2</td>
<td>5.6</td>
<td>3.9</td>
<td>5.9</td>
</tr>
<tr>
<td>QF-last-year*</td>
<td>925</td>
<td>8.3</td>
<td>13.7</td>
<td>6.7</td>
<td>8.0</td>
<td>7.1</td>
<td>9.2</td>
</tr>
<tr>
<td>Weekly recall</td>
<td>765</td>
<td>9.0</td>
<td>8.1</td>
<td>8.9</td>
<td>8.7</td>
<td>8.3</td>
<td>7.2</td>
</tr>
</tbody>
</table>

* SD, standard deviation; QF-last-year, quantity-frequency index of alcohol intake in the last year, measured at baseline.
men and wine preference among women did not lead to any relevant differences in reliability outcomes for either category.

**Construct validity**

The Spearman’s correlation coefficient between both measurements of current intake was 0.83 for men and 0.81 for women. Table 4 shows the correlations between both indices of current intake and the intake estimates for the different drinking periods. The correlations between QF-last-year and quantity-frequency index of alcohol intake per week (QF) indices for different drinking periods were somewhat higher than those between the weekly recall and period-specific QF measures. The greater the interval between current intake and the LDH-q drinking period, the lower the correlation. In particular, intake estimates for youth and young adulthood were poorly correlated with self-reports of current drinking. From adulthood on, correlations with current intake indices increased. Self-reports over periods overlapping with current intake, that is, “middle age” for persons no older than age 60 years and “elderly” for persons aged 61 years or older, showed the highest correlations. The correlations between current intake and mean lifetime intake were between 0.63 and 0.78.

In table 5, the results of the comparison of the five drinking periods are shown. Two trends became apparent. First, correlations were lower between reports of drinking the further apart in time the reports were made. For example, the correlation between reports over the last period (elderly) and drinking during youth was as low as 0.07 for men. The correlations increased to 0.25, 0.56, and 0.80 for periods approaching current age (last row of table 5). Second, as age increased, the correlation between two adjacent, contiguous life periods increased. For example, the correlations on the diagonal in table 5 increased from 0.60 to 0.80 for men and from 0.54 to 0.88 for women.

**Per-capita intake**

Figure 1 compares per-capita intake in the Netherlands (36) with mean intake in the cohort during the same years. The averages, in liters of alcohol consumed per capita, in the Dutch population and the cohort were similar, and they increased equally through the years. The same trends were
DISCUSSION

The present study investigated the stability and validity of self-reports of lifetime drinking behavior in a self-administered questionnaire (the LDH-q). Correlation coefficients were used as indicators for test-retest reliability of self-reports of intake collected 1 year apart. Stability of self-reported lifetime intake was found to be reasonable: 0.75 for men and 0.70 for women. As expected, reliability of self-reported intake decreased as the reference period became further back in time, with the lowest ICCs of about 0.50 for intake during youth (12–18 years of age).

In the present study, men on average claimed to have started drinking about 2 years before women did and drank about twice as much as women. Both younger men and women tended to report a greater alcohol intake than the elderly during the same drinking period. This finding is consistent with the trend in per-capita intake in the Netherlands, which increased substantially from 2.1 liters of pure alcohol in 1955 to 9.4 liters in 1979 (36). Although comparable trends were found for mean alcohol intake and per-capita intake, the composition of the populations differs. The cohort was a fixed population aging as time passed, whereas the age of the Dutch population was reasonably stable. On the other hand, differences in alcohol intake between age categories were small relative to the period effects, and all age categories showed a similar trend in intake between the 1950s and the 1990s (29). Such an increase in overall intake over the years could affect self-reports of alcohol intake, as was found by Simpura and Poikolainen (18). They reported a tendency by respondents to overestimate their intake of 18 years ago, suggesting a period effect caused by the large increase in per-capita intake in Finland during that period. Whether overestimation occurred in the present study could not be examined. However, if there was overestimation due to an increase in overall intake, one would not expect the trends in intake estimates for both populations to be so similar.

### TABLE 4. Spearman’s correlation coefficients between current and past alcohol intake of study participants in the Netherlands, 1996–2001

<table>
<thead>
<tr>
<th>Past alcohol intake</th>
<th>Current alcohol intake</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td></td>
<td>QF-last-year*</td>
<td>Weekly recall</td>
</tr>
<tr>
<td></td>
<td>No. r</td>
<td>No. r</td>
</tr>
<tr>
<td>QF* youth</td>
<td>743 0.20</td>
<td>696 0.20</td>
</tr>
<tr>
<td>QF young adults</td>
<td>990 0.37</td>
<td>922 0.35</td>
</tr>
<tr>
<td>QF adults</td>
<td>1,012 0.67</td>
<td>940 0.62</td>
</tr>
<tr>
<td>QF middle age</td>
<td>748 0.87</td>
<td>700 0.78</td>
</tr>
<tr>
<td>&lt;60 years†</td>
<td>299 0.72</td>
<td>274 0.70</td>
</tr>
<tr>
<td>≥61 years†</td>
<td>321 0.87</td>
<td>292 0.81</td>
</tr>
<tr>
<td>QF elderly</td>
<td>1,102 0.66</td>
<td>1,024 0.63</td>
</tr>
</tbody>
</table>

* QF-last-year, quantity-frequency index of alcohol intake in the last year, measured at baseline; QF, quantity-frequency index of alcohol intake per week.
† Age at baseline.

### TABLE 5. Spearman’s correlation coefficients between average weekly alcohol intake estimates for five different drinking periods in the Netherlands, 1996–2001

<table>
<thead>
<tr>
<th>Drinking period</th>
<th>Youth</th>
<th>Young adults</th>
<th>Adults</th>
<th>Middle age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Young adults</td>
<td>0.60</td>
<td>0.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults</td>
<td>0.40</td>
<td>0.37</td>
<td>0.66</td>
<td>0.71</td>
</tr>
<tr>
<td>Middle age</td>
<td>0.24</td>
<td>0.28</td>
<td>0.43</td>
<td>0.49</td>
</tr>
<tr>
<td>Elderly</td>
<td>0.07</td>
<td>0.23</td>
<td>0.25</td>
<td>0.33</td>
</tr>
</tbody>
</table>
The reliability of reports of lifetime drinking behavior seemed slightly higher for men than for women. A possible reason might be the drinking pattern, which is less frequent and less regular among women (38), increasing the difficulty in remembering their intake. A similar memory effect may be present for reporting alcohol intake during youth because it concerns the distant past and is characterized by an irregular drinking pattern (39). Low test-retest correlations for intake during youth found in the present study were reported earlier for women (40) and veterans (20).

The LDH-q yielded low estimates of lifelong abstention. Only 1.2 percent of men and 6.0 percent of women could be identified as lifelong teetotals. In earlier Dutch surveys, estimates of nondrinking usually were about 10 percent for men and 25 percent for women (27, 29, 41), as was also found in the QF-last-year in the present study (13.0 percent for men and 27.6 percent for women). This information could indicate that using nondrinking rates collected during normal drinking inquiries as indicators of lifelong abstention rates causes these rates to be overestimated.

The low correlation for age at onset may have been partly due to problems some people had in understanding the question correctly; some filled in their current age. When this problem occurred, it was corrected by taking the youngest age for the first drinking period. Doing so provided a noticeable increase in the test-retest correlation for men (from 0.21 to 0.60) and a small increase for women (from 0.52 to 0.61). The revised correlation for women was comparable to reliability estimates for age at onset with a test-retest interval of 5 years in an interview assessing lifetime drinking history (40). To prevent misunderstandings in the future, one could tie the question about age at onset closer to the drinking periods.

The ICCs for the frequency questions were lower than those for the open-ended quantity questions and the quantity-frequency weekly intakes. Here, a disadvantage of the ICC could have played a role. In general, the ICC tended to be higher the larger the variation was between subjects (34). Restriction of the variation, as was the case for the frequency question, will lower the ICC. However, the ICCs for mean lifetime intake in this study (0.75 for men and 0.70 for women) were comparable to results for the LDH interview formats, ranging from 0.70 to 0.93 (19–21).

The finding that correlations decreased with an increase in the interval between self-reports on drinking during two drinking periods and with an increase in the interval between drinking period and current intake indicates reasonable construct validity. However, recall of early drinking periods was comparatively poor in this study, which could have interfered with estimation of construct validity. The high correlations between current intake and reports for the most recent drinking period fell within the range of test-retest figures for normal current intake tests (15). There seemed to be no difference between men and women regarding this validity aspect.

The correlations between the summary measures for the most recent LDH-q drinking period and over the past year were higher than those between the weekly recall method and the LDH-q. Explanations for this difference may be the similar format of the QF methods and the fact that weekly recall is more sensitive to temporal fluctuations. One could argue that the moderately high correlation between current drinking estimates and lifetime intake estimates (between 0.66 and 0.78; table 4) would make use of the latter redundant. In an earlier study (25), computer simulations indeed showed that a J-shaped risk curve between a lifetime intake measure and some outcome could not be reproduced if the correlation between this measure and a current intake measure fell below 0.60. Values of more than 0.60 would not alter the finding reported in many epidemiologic studies of a J-shaped risk curve. However, a correlation of 0.70, although comparatively high, still leaves much variation unexplained ($R^2 \leq 0.49$). In addition, one should not ignore the possibility that the value of the correlations between lifetime and current intakes may well vary by drinking habits and over time.

Until the current study, data on lifetime alcohol intake were all collected by means of interviews. In large-scale population studies, interviews are not feasible, and self-administration is an alternative. A drawback of using a self-administrated questionnaire is the lack of control over the response situation, and lack of guidance, should a respondent fail to understand a question or a routing indication. A large number of respondents who did not complete particular sections of the questionnaire could point to high cognitive complexity. However, only six men and seven women did not complete the LDH-q on both occasions.

In conclusion, test-retest reliability of the LDH-q was within the range normally found for self-report measures of drinking. Construct validity checks, such as decreased correlations with increased time lag, seem to indicate that response effects remained within limits. Finally, the LDH-q yielded results comparable to those for interview measures.
of lifetime drinking. For studies in which the effects of alcohol are cumulative rather than substitutive, assessment of lifetime exposure is necessary. In such cases, the LDH-q seems a suitable measure.

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