Drinking Distilled. Onset, course and treatment of alcohol use disorders in the general population
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Chapter 6

Treatment seeking for alcohol use disorders: treatment gap or adequate self-selection?
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Treatment seeking for alcohol use disorders: treatment gap or adequate self-selection?
ABSTRACT

Objective
To examine whether it is harmful that subjects with an alcohol use disorder (AUD) in the general population rarely seek treatment.

Method
Subjects with a 12-month DSM-5 AUD at baseline and 3-year follow-up data (n = 154) from the Netherlands Mental Health Survey and Incidence Study-2 (NEMESIS-2) were divided in three mutually exclusive groups: AUD subjects who used (1) only general treatment for mental health or alcohol/drugs problems; (2) specialized AUD treatment; and (3) no treatment. Treatment utilization covered a 4-year period. The Composite International Diagnostic Interview 3.0 assessed AUD and other psychiatric disorders.

Results
Four-year treatment rates were: 35.4% general treatment; 10.3% AUD treatment; 54.3% no treatment. Of the three groups, AUD treatment users showed the highest baseline and/or follow-up severity on AUD characteristics, comorbid psychopathology and mental functioning. Compared to non-treatment, general treatment users more often had a 12-month emotional disorder at follow-up, but they did not differ significantly in their AUD remission rate and functioning. Moreover, follow-up functioning of non-treatment users was similar to that of people in the general population without a lifetime diagnosis of AUD and of other psychopathology.

Conclusion
Despite low treatment rates, adequate treatment selection is suggested: the most severe AUD subjects use AUD treatment and non-treatment users generally have a favorable AUD course. Yet, minorities of non-treatment and general treatment users suffered from persistent AUD and may benefit from guidance to AUD treatment. In summary, the treatment gap seems smaller than often assumed, but there is a substantial need for increased AUD treatment participation.

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Under review.
INTRODUCTION

For decades, concerns have been raised regarding the large treatment gap of alcohol use disorders (AUDs): the majority of the people who experience AUD do not enter AUD treatment (AUDTx) [1-3]. For example, two population-based surveys in the USA showed that only 8% of those with past-year AUD received AUDTx during that period [2]. These findings were recently extended by examination of the delay in treatment utilization. In the Netherlands, only 7% of those with lifetime alcohol abuse and only 37% of those with lifetime alcohol dependence eventually received AUDTx, with a median delay of 1 and 4 years after AUD onset, respectively [4]. Somewhat higher treatment rates but also longer delays are observed worldwide [5-7]. A long-term unmet need for treatment of AUDs may thus exist and improvement of treatment access has been suggested a public health priority [8-10].

However, others have questioned the magnitude of the treatment gap for AUD, because the prevalence of a disorder may not be sufficient to establish treatment need when its clinical significance and the natural course have not been determined [11-13]. Indeed, population-based research showed that AUDs, and especially alcohol abuse, are often mild and do not interfere strongly with daily activities [13-15]. Moreover, AUDs in the general population are associated with high spontaneous remission rates [16-19] and thus not all of those with an AUD diagnosis may actually need AUDTx. It is undesirable when severe AUD cases do not receive treatment, but when non-treatment (NonTx) users turn out to be mild AUD cases with a favorable course, their decision not to seek treatment may be justified and likely be cost-effective. Lastly, the treatment gap may be smaller than projected because people with AUD may receive general treatment for mental health or other addiction problems (GenTx) rather than AUDTx [2;20]. Although GenTx is not likely to focus on the AUD [21;22], it may be possible to achieve a favorable AUD outcome when any type of general treatment is received.

To guide the discussion on the treatment gap, four aspects should be considered. First, given the present context of limited resources, especially people with a severe disorder should enter AUDTx. Preferably, both severe clinical characteristics and high rates of alcohol consumption trigger AUDTx utilization, as both aspects are markers of a severe AUD course [15;16;18;23;24]. Previous research indeed showed that the first aspect, severe clinical characteristics in terms of alcohol dependence (vs. alcohol abuse) and severe impairment due to AUD, was associated with AUDTx utilization [2]. The second aspect, rate of alcohol consumption, was not yet examined in this regard and its impact on treatment utilization is therefore unknown. Second, people with AUD often receive GenTx rather than AUDTx [2]. Whether GenTx users are able to sufficiently cope with the AUD or whether the problems remain is unknown. Knowledge regarding how GenTx users are doing is lacking but this is essential to determine the magnitude of the treatment gap. Third, previous research revealed a substantial delay between AUD
onset and AUDTx entrance \[4;5;7\]. Therefore, a longitudinal perspective with regard to treatment use, thus not only past-year treatment but also treatment in the following years, is preferable to include delayed treatment seekers as well. Fourth, information on the clinical course of NonTx AUD subjects is crucial to better understand the magnitude of the treatment gap. Comparing their AUD status at follow-up with that of (different types of) treatment users is important but not sufficient: NonTx users might show a better AUD course than treatment users but may still be somewhat impaired. An additional comparison with people who never had an AUD or other psychopathology would therefore advance the interpretation of their functioning.

Data from the second Netherlands Mental Health Survey and Incidence Study (NEMESIS-2) were used to study these four aspects. Four-year treatment utilization and associated baseline and follow-up characteristics (i.e. demographics, AUD characteristics, comorbid psychiatric disorders, functioning) were investigated for three groups: GenTx, AUDTx and NonTx. Specific attention was paid to the association between alcohol intake and treatment utilization and the follow-up clinical status and functioning of NonTx users.

**METHOD**

**Study design**

NEMESIS-2 is a psychiatric epidemiological cohort study of the Dutch general population. It is based on a multistage, stratified random sampling of households, with one respondent randomly selected in each household \[25\]. The study was approved by a medical ethics committee. After having been informed about the study aims, respondents provided written informed consent.

In the first wave (T\(_0\)), performed from November 2007 to July 2009, a total of 6,646 persons aged 18-64 were interviewed (response: 65.1%). This sample was nationally representative, although younger subjects were somewhat underrepresented \[25\]. The face-to-face interviews were mainly held at the respondent’s home. All T\(_0\) respondents were approached for follow-up (T\(_1\)), three years after T\(_0\) from November 2010 to June 2012. Of this group, a total of 5,303 persons were interviewed again (response: 80.4%, with those deceased excluded). Attrition was not significantly associated with any of 12-month psychiatric disorders at baseline, after controlling for sociodemographics \[26\]. To compile the current study sample, those who met criteria for DSM-5 AUD at T\(_0\) and participated in the 3-year follow-up assessment (T\(_1\)) were selected (n = 154).

**Alcohol use disorder**

The Composite International Diagnostic Interview (CIDI) 3.0 was used at both waves to identify AUD diagnoses. The CIDI 3.0 is a fully structured, lay administered, internationally recognized interview developed by the WHO \[27\]. Even though the CIDI
3.0 was designed and validated for DSM-IV AUDs [27;28], it assesses all DSM-5 AUD criteria: 3 of the 4 DSM-IV alcohol abuse criteria (except legal problems), all 7 DSM-IV alcohol dependence criteria, and craving [29]. DSM-5 AUD is diagnosed when ≥ 2 out of these 11 criteria are present. The DSM-5 cluster criterion (≥ 2 criteria in the same 12-month period) was not included in our AUD diagnosis [15;30;31].

Treatment
The focus was on treatment during the study period. This period was 4 years: 1 year before baseline to 3-year follow-up. Treatment was present when respondents reported past-year treatment at T₀ or treatment between T₀ and T₁. Three mutually exclusive groups were distinguished: GenTx only, AUDTx; and NonTx.

First, it was examined whether respondents had received general treatment (GenTx) including at least one contact made with a professional in the general medical care or mental health care system for emotional or alcohol/drugs problems. It was assessed with the question: “In the past 12 months (T₀)/since the last interview (T₁), did you visit any of the following professionals or institutions because of emotional or alcohol or drugs problems of your own?” [13]. Included were general medical professionals (general practitioners, company doctors, social workers, home care or district nurses, physiotherapists or haptonomists, medical specialists or other professionals working the general medical care sector) and mental health services (psychiatrists, psychologists, psychotherapists, part-time or full-time psychiatric treatment).

Next, it was examined whether respondents reported AUD treatment (AUDTx) in the CIDI 3.0 AUD section. That is, as in other research (e.g. [5]), respondents were asked whether they received professional treatment or whether they talked to a medical doctor or other professional about their alcohol problems in the past 12 months (T₀)/since last interview (T₁). Then, GenTx only was coded absent for those who also reported AUDTx.

Lastly, respondents who reported neither GenTx nor AUDTx during the study period were labelled NonTx users.

Baseline and follow-up characteristics
Demographics were collected at the first wave. All other characteristics were assessed at both waves.

Demographics. Gender, age, educational level (primary, basic vocational or lower secondary education vs. higher education), partner status, employment, having enough income to live on or not.

Characteristics of AUD and drinking. All characteristics of AUD and drinking were assessed with the CIDI 3.0. Following the severity levels defined by DSM-5 [29], the number of 12-month AUD criteria were divided in categories: no disorder (0-1 criterion); mild AUD (2-3 criteria); and moderate/severe AUD (≥ 4 criteria).
Self-reported impairment due to AUD in the past 12 months was assessed with the Sheehan Disability Scale (SDS) [32]. The scale represents five disability categories (no (0); mild (1-3); moderate (4-6); severe (7-9); and very severe (10) disability) with regard to four areas of role functioning (home management; work; maintaining relationships; and social life). At least moderate impairment was present if a 4 or higher was reported in at least one area of role functioning.

Number of weekly drinks in the past 12-months was computed by multiplying answers to two questions: “In the past 12 months, how often did you usually have at least one drink – every day, nearly every day, 3-4 days a week, 1-2 days a week, 1-3 days a month, or less than once a month?” and “On the days you drank in the past 12 months, about how many drinks did you usually have per day?”. Four categories were then distinguished: abstinence or very low-risk drinking (≤ 7/14 drinks weekly for women/men); low-risk drinking (8-14/15-21 drinks weekly for women/men); medium-risk drinking (15-28/22-42 drinks weekly for women/men); and high-risk drinking (≥ 29/43 drinks weekly for women/men) [18]. Continuous variables regarding the number of weekly drinks at both waves were used to calculate the mean difference in number of weekly drinks between $T_0$ and $T_1$.

**Psychiatric disorders and functioning.** Psychiatric disorders were assessed with the CIDI 3.0. Included were 12-month emotional disorder consisting of mood disorder (major depression, dysthymia, bipolar disorder) and/or anxiety disorder (panic disorder, agoraphobia, social phobia, specific phobia, generalized anxiety disorder), and 12-month drug use disorder (drug abuse or dependence).

Functioning was assessed using two general functioning scales (ranging from 0 (poor) to 100 (good)), based on the eight SF-36 scales [33;34]: physical functioning (general health, physical health, physical functioning, and bodily pain; $\alpha = 0.78$) and mental functioning (psychological health, psychological functioning, social functioning, and vitality; $\alpha = 0.78$) [15]. Number of days lost from work or other activities in the past four weeks were measured with three questions from the WHO Disability Assessment Schedule; ‘days out of role’ [35].

**Statistical analyses**

The three groups (GenTx; AUDTx; NonTx) were compared on baseline and follow-up characteristics using multinomial regression analyses. To test for linear trends (p for trend), ordinal determinants were modeled as continuous variables. Analyses were performed using Stata version 12.1 [36]. The data were weighted to correct for differences in the response rates in different population groups at both waves and differences in the probability of respondent selection within households [26]. All analyses were adjusted for age, gender, and the time between $T_0$ and $T_1$. To account for multiple comparisons in this relatively small sample, a p-value < 0.01 was considered statistically significant.
RESULTS

Of the 154 subjects with baseline DSM-5 AUD, 19 (10.3%) received AUDTx during the study period, 50 (35.4%) received GenTx, and 85 (54.3%) did not receive any treatment (Table 6.1).

Group differences at baseline

Clinically, NonTx and GenTx users were very similar, but GenTx users were younger and more often without a partner (Table 6.1). The AUDTx group was quite different from the other two groups, including more often living without a partner, higher baseline severity on alcohol characteristics and more psychiatric disorders. More specifically, compared to NonTx use, AUDTx use was associated with higher rates of 12-month emotional disorder and 12-month drug use disorder, whereas compared to GenTx use, AUDTx use was associated with a higher rate of moderate impairment due to AUD and of 12-month emotional disorder.

Group differences at follow-up

AUD remission rates were similar for the GenTx and the NonTx users (63.9% vs. 77.9%, respectively) and much higher than the AUD remission rate for AUDTx users (28.9%) (Table 6.2).

Compared to NonTx users, GenTx users more often had a mild AUD at follow-up as well as a much higher rate of 12-month emotional disorder.

Compared to NonTx use, AUDTx use was associated with a higher number of DSM-5 AUD criteria at follow-up mainly due to the fact that moderate/severe AUD was much more frequent in AUDTx users than in NonTx users. In addition, AUDTx use was associated with significantly higher rates of 12-month emotional disorder and with worse mental and physical functioning.

Compared to GenTx use, AUDTx use was associated with a higher number of DSM-5 AUD criteria at follow-up mainly due to the fact that moderate/severe AUD was much more frequent in AUDTx users than in GenTx users. In addition, at least moderate impairment and high-risk drinking were more frequently present in AUDTx users than in GenTx users. No significant differences were observed between the two groups in psychiatric comorbidity, but mental functioning was worse in AUDTx.

How are non-treatment users getting on?

Of the three AUD groups, NonTx users had the most favorable follow-up status, but it is unclear whether their follow-up functioning is at a normal level. Therefore, a comparison with an extra reference group of non-treatment users without a lifetime AUD diagnosis and without lifetime psychiatric disorders at baseline (n = 2,747) was made. Logistic regression analyses adjusted for age, gender, and time between T₀ and T₁ revealed no significant group differences on any of the considered follow-up
### Table 6.1. Baseline characteristics associated with general treatment utilization only (GenTx; n = 50) or alcohol use disorder (AUD) treatment utilization (AUDTx; n = 19) and with non-treatment (NonTx; n = 85) during the study period (4 years) among individuals with 12-month AUD at T0.

<table>
<thead>
<tr>
<th>All a</th>
<th>GenTx a</th>
<th>AUDTx a</th>
<th>NonTx a</th>
<th>GenTx vs. NonTx b OR adj (95% CI)</th>
<th>AUDTx vs. NonTx b OR adj (95% CI)</th>
<th>AUDTx vs. GenTx b OR adj (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>100.0</td>
<td>35.4 (4.8)</td>
<td>10.3 (3.2)</td>
<td>54.3 (4.4)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sociodemographics</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Male gender (%)</td>
<td>66.6 (5.0)</td>
<td>59.9 (10.7)</td>
<td>53.5 (18.1)</td>
<td>73.4 (6.8)</td>
<td>0.58 (0.15; 2.23)</td>
<td>0.36 (0.07; 1.85)</td>
</tr>
<tr>
<td>Age (mean)</td>
<td>34.0 (1.3)</td>
<td>29.6 (1.2)</td>
<td>36.2 (5.9)</td>
<td>36.5 (1.8)</td>
<td>0.95* (0.92; 0.98)</td>
<td>1.01 (0.95; 1.08)</td>
</tr>
<tr>
<td>Low educational level (%)</td>
<td>33.2 (4.6)</td>
<td>21.8 (8.6)</td>
<td>61.0 (13.8)</td>
<td>35.3 (6.6)</td>
<td>0.41 (0.11; 1.43)</td>
<td>3.11 (0.79; 12.18)</td>
</tr>
<tr>
<td>Living without a partner (%)</td>
<td>65.6 (3.9)</td>
<td>82.5 (4.6)</td>
<td>92.7 (4.8)</td>
<td>49.5 (6.6)</td>
<td>3.71* (1.55; 8.89)</td>
<td>54.69** (6.55; 456.64)</td>
</tr>
<tr>
<td>Unemployed (%)</td>
<td>20.8 (4.2)</td>
<td>22.1 (6.4)</td>
<td>60.0 (16.8)</td>
<td>12.4 (5.1)</td>
<td>1.71 (0.43; 6.77)</td>
<td>9.10 (1.37; 60.64)</td>
</tr>
<tr>
<td>Not having enough income to live on (%)</td>
<td>14.3 (3.6)</td>
<td>24.4 (8.0)</td>
<td>12.6 (7.4)</td>
<td>8.0 (4.6)</td>
<td>2.40 (0.51; 11.34)</td>
<td>1.81 (0.19; 17.65)</td>
</tr>
<tr>
<td>Characteristics of current AUD and drinking (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate/severe AUD: ≥ 4 criteria</td>
<td>30.9 (6.2)</td>
<td>25.2 (8.7)</td>
<td>82.1 (11.8)</td>
<td>24.9 (6.7)</td>
<td>0.84 (0.33; 2.13)</td>
<td>23.57 (1.72; 323.11)</td>
</tr>
<tr>
<td>At least moderate 12-month impairment due to AUD</td>
<td>28.5 (5.4)</td>
<td>18.8 (6.5)</td>
<td>57.4 (15.0)</td>
<td>29.4 (7.4)</td>
<td>0.37 (0.13; 1.07)</td>
<td>4.79 (0.89; 25.93)</td>
</tr>
<tr>
<td>12-Month alcohol intake</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abstinence or very low-risk drinking</td>
<td>34.4 (4.9)</td>
<td>41.9 (8.7)</td>
<td>23.5 (12.8)</td>
<td>31.7 (6.7)</td>
<td>1.00 -</td>
<td>1.00 -</td>
</tr>
<tr>
<td>Low-risk drinking</td>
<td>21.4 (4.6)</td>
<td>19.5 (8.3)</td>
<td>38.7 (18.7)</td>
<td>19.4 (6.5)</td>
<td>0.64 (0.18; 2.25)</td>
<td>2.43 (0.33; 17.78)</td>
</tr>
<tr>
<td>Medium-risk drinking</td>
<td>30.0 (5.4)</td>
<td>27.2 (9.4)</td>
<td>9.7 (6.2)</td>
<td>35.8 (6.2)</td>
<td>0.53 (0.19; 1.46)</td>
<td>0.39 (0.04; 4.21)</td>
</tr>
<tr>
<td>High-risk drinking</td>
<td>14.1 (3.8)</td>
<td>11.5 (5.3)</td>
<td>28.1 (12.2)</td>
<td>13.1 (6.1)</td>
<td>0.74 (0.14; 3.79)</td>
<td>5.07 (0.57; 45.16)</td>
</tr>
<tr>
<td>P for trend</td>
<td>0.50</td>
<td>0.47</td>
<td>0.24</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.1 continues on the next page.
### Table 6.1. Baseline characteristics associated with general treatment utilization only (GenTx; n = 50) or alcohol use disorder (AUD) treatment utilization (AUDTx; n = 19) and with non-treatment (NonTx; n = 85) during the study period (4 years) among individuals with 12-month AUD at T0.

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>GenTx</th>
<th>AUDTx</th>
<th>NonTx</th>
<th>GenTx vs. NonTx</th>
<th>AUDTx vs. NonTx</th>
<th>AUDTx vs. GenTx</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR&lt;sub&gt;adj&lt;/sub&gt; (95% CI)</td>
<td>OR&lt;sub&gt;adj&lt;/sub&gt; (95% CI)</td>
<td>OR&lt;sub&gt;adj&lt;/sub&gt; (95% CI)</td>
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<td></td>
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<tr>
<td>Psychiatric comorbidity (%)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>12-Month emotional disorder</td>
<td>31.0 (4.6)</td>
<td>37.1 (7.9)</td>
<td>83.2 (8.7)</td>
<td>17.0 (5.7)</td>
<td>2.67 (0.79; 9.05)</td>
<td>21.34** (4.39; 103.75)</td>
<td>8.00* (1.91; 33.51)</td>
</tr>
<tr>
<td>12-Month drug disorder</td>
<td>10.5 (3.5)</td>
<td>13.1 (6.2)</td>
<td>37.4 (19.1)</td>
<td>3.6 (2.5)</td>
<td>3.00 (0.38; 23.49)</td>
<td>32.08* (3.77; 273.02)</td>
<td>10.71 (1.01; 113.97)</td>
</tr>
<tr>
<td>Functioning (mean)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental functioning (SF-36)</td>
<td>79.5 (1.9)</td>
<td>76.7 (3.1)</td>
<td>68.6 (2.9)</td>
<td>83.4 (2.3)</td>
<td>0.97 (0.94; 1.01)</td>
<td>0.95 (0.90; 0.99)</td>
<td>0.97 (0.94; 1.00)</td>
</tr>
<tr>
<td>Physical functioning (SF-36)</td>
<td>83.0 (1.6)</td>
<td>82.1 (2.2)</td>
<td>77.0 (6.1)</td>
<td>84.8 (2.4)</td>
<td>0.98 (0.95; 1.02)</td>
<td>0.97 (0.93; 1.00)</td>
<td>0.98 (0.95; 1.01)</td>
</tr>
<tr>
<td>Days out of role in last month</td>
<td>2.9 (0.6)</td>
<td>4.4 (1.5)</td>
<td>5.0 (1.9)</td>
<td>1.5 (0.5)</td>
<td>1.09 (1.01; 1.17)</td>
<td>1.08 (0.99; 1.17)</td>
<td>0.99 (0.94; 1.04)</td>
</tr>
</tbody>
</table>

**Note.** - Not calculated; * p < 0.01; ** p < 0.001.

* Percentages or means with the standard error between brackets.

b Odds ratios, adjusted for age, gender and time between T₀ and T₁, with 95% Confidence Intervals.

### Table 6.2. Follow-up characteristics associated with general treatment utilization only (GenTx; n = 50) or alcohol use disorder (AUD) treatment utilization (AUDTx; n = 19) and with non-treatment (NonTx; n = 85) during the study period (4 years) among individuals with 12-month AUD at T₀.

<table>
<thead>
<tr>
<th>Characteristics of current AUD and drinking</th>
<th>All</th>
<th>GenTx</th>
<th>AUDTx</th>
<th>NonTx</th>
<th>GenTx vs. NonTx</th>
<th>AUDTx vs. NonTx</th>
<th>AUDTx vs. GenTx</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR&lt;sub&gt;adj&lt;/sub&gt; (95% CI)</td>
<td>OR&lt;sub&gt;adj&lt;/sub&gt; (95% CI)</td>
<td>OR&lt;sub&gt;adj&lt;/sub&gt; (95% CI)</td>
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<tr>
<td>Number of 12-month AUD criteria (%)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>No disorder: 0-1 criterion</td>
<td>67.9 (4.2)</td>
<td>63.9 (8.1)</td>
<td>28.9 (12.2)</td>
<td>77.9 (6.6)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Mild: 2-3 criteria</td>
<td>17.7 (3.5)</td>
<td>32.8 (8.2)</td>
<td>13.0 (11.8)</td>
<td>8.8 (3.1)</td>
<td>4.16* (1.56; 11.12)</td>
<td>2.17 (0.05; 91.45)</td>
<td>0.52 (0.02; 12.48)</td>
</tr>
</tbody>
</table>

*Table 6.2 continues on the next page.*
Table 6.2. Follow-up characteristics associated with general treatment utilization only (GenTx; n = 50) or alcohol use disorder (AUD) treatment utilization (AUDTx; n = 19) and with non-treatment (NonTx; n = 85) during the study period (4 years) among individuals with 12-month AUD at T0.

<table>
<thead>
<tr>
<th></th>
<th>All a</th>
<th>GenTx a</th>
<th>AUDTx a</th>
<th>NonTx a</th>
<th>GenTx vs. NonTx b</th>
<th>OR adj (95% CI)</th>
<th>AUDTx vs. NonTx b</th>
<th>OR adj (95% CI)</th>
<th>AUDTx vs. GenTx b</th>
<th>OR adj (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate/severe: ≥ 4 criteria</td>
<td>14.3 (4.1)</td>
<td>3.3 (3.3)</td>
<td>58.1 (15.3)</td>
<td>13.3 (6.2)</td>
<td>0.09 (0.01; 0.88)</td>
<td>21.65** (6.25; 74.99)</td>
<td>230.24** (22.62; 2343.14)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>P for trend</td>
<td>0.39</td>
<td>&lt;0.001**</td>
<td>&lt;0.001**</td>
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<tr>
<td>At least moderate 12-month impairment due to AUD (%)</td>
<td>15.0 (4.0)</td>
<td>3.6 (2.3)</td>
<td>56.1 (15.0)</td>
<td>14.7 (6.3)</td>
<td>0.10 (0.01; 0.94)</td>
<td>13.80 (1.34; 141.65)</td>
<td>135.63* (4.16; 4422.28)</td>
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<td>12-Month alcohol intake (%)</td>
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<tr>
<td>Abstinence or very low-risk drinking</td>
<td>51.1 (4.9)</td>
<td>60.6 (9.1)</td>
<td>35.3 (13.3)</td>
<td>47.9 (7.0)</td>
<td>1.00 -</td>
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<tr>
<td>Low-risk drinking</td>
<td>22.2 (4.0)</td>
<td>24.7 (8.8)</td>
<td>6.6 (5.1)</td>
<td>23.6 (4.4)</td>
<td>0.61 (0.24; 1.56)</td>
<td>0.32 (0.03; 3.22)</td>
<td>0.52 (0.05; 5.86)</td>
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<td>Medium-risk drinking</td>
<td>15.3 (3.3)</td>
<td>10.6 (4.8)</td>
<td>9.3 (6.1)</td>
<td>19.4 (6.0)</td>
<td>0.33 (0.07; 1.64)</td>
<td>0.36 (0.04; 3.03)</td>
<td>1.09 (0.17; 7.10)</td>
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<td>High-risk drinking</td>
<td>11.4 (4.2)</td>
<td>4.1 (2.5)</td>
<td>48.8 (16.6)</td>
<td>9.1 (5.4)</td>
<td>0.31 (0.05; 1.82)</td>
<td>5.17 (0.84; 31.63)</td>
<td>16.53** (3.35; 81.45)</td>
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<td>P for trend</td>
<td>0.12</td>
<td>0.13</td>
<td>0.01*</td>
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<td>Mean change in number of drinks</td>
<td>-1.1 (3.4)</td>
<td>-7.1 (1.9)</td>
<td>3.8 (8.3)</td>
<td>1.9 (5.7)</td>
<td>0.97 (0.94; 1.00)</td>
<td>1.00 (0.98; 1.02)</td>
<td>1.03 (1.00; 1.07)</td>
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<td>Psychiatric comorbidity (%)</td>
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<tr>
<td>12-Month emotional disorder</td>
<td>21.5 (4.4)</td>
<td>40.2 (8.7)</td>
<td>44.8 (17.5)</td>
<td>4.9 (2.6)</td>
<td>13.82** (4.86; 39.30)</td>
<td>13.13* (2.61; 66.03)</td>
<td>0.95 (0.18; 4.92)</td>
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<td>12-Month drug disorder</td>
<td>4.2 (2.9)</td>
<td>1.9 (1.9)</td>
<td>6.3 (4.9)</td>
<td>5.2 (5.0)</td>
<td>0.24 (0.01; 5.66)</td>
<td>1.86 (0.14; 24.17)</td>
<td>7.83 (0.58; 104.90)</td>
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<td>Functioning (mean)</td>
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<td>Mental functioning (SF-36)</td>
<td>80.7 (1.0)</td>
<td>77.6 (1.9)</td>
<td>64.8 (5.0)</td>
<td>85.7 (1.3)</td>
<td>0.94 (0.88; 0.99)</td>
<td>0.90** (0.85; 0.95)</td>
<td>0.96* (0.93; 0.99)</td>
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<td>Physical functioning (SF-36)</td>
<td>83.1 (1.2)</td>
<td>82.9 (1.9)</td>
<td>73.5 (5.8)</td>
<td>85.1 (1.8)</td>
<td>0.98 (0.95; 1.01)</td>
<td>0.95* (0.91; 0.98)</td>
<td>0.96 (0.94; 0.99)</td>
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<td>Days out of role in last month</td>
<td>3.5 (0.5)</td>
<td>4.9 (1.0)</td>
<td>6.1 (1.7)</td>
<td>2.0 (0.6)</td>
<td>1.09 (1.01; 1.18)</td>
<td>1.11 (1.01; 1.22)</td>
<td>1.02 (0.96; 1.08)</td>
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Note. - Not calculated; * p < 0.01; ** p < 0.001.  
a Percentages or means with the standard error between brackets.  
b Odds ratios, adjusted for age, gender and time between T0 and T1, with 95% Confidence Intervals.
characteristics (12-month emotional disorder, 12-month drug use disorder, mental and physical functioning, days out of role in the last month). Thus, NonTx users with baseline 12-month AUD had similar follow-up functioning as subjects from the general population without AUD and without other lifetime psychopathology; suggesting quite normal follow-up functioning.

**DISCUSSION**

This longitudinal general population study adds considerably to our insight in the magnitude and severity of the so-called treatment gap in subjects with an alcohol use disorder due to (1) the assessment of a broad range of severity characteristics, including alcohol intake; (2) the comparison of NonTx users with both GenTx users and AUDTx users; (3) the investigation of a relatively long period of treatment utilization (4 years) instead of the usual one year time frame; and (4) the comparison of NonTx AUD subjects with a non-AUD control group with respect to their follow-up functioning.

The study shows that the majority (54%) of the people with AUD in the general population receives no treatment at all during a 4-year period and that only a very small proportion receives AUDTx (10%). The study confirms earlier results that AUD severity is associated with AUDTx utilization, though unexpectedly, the level of alcohol intake played a limited role. GenTx users did not portray severe AUD characteristics. This is the first study to provide detailed information on how NonTx users are getting on. In general, they have a favorable AUD course with a very high AUD remission rate (78%) and the lowest severity on other clinical characteristics as compared to the other two treatment groups. Moreover, on average, at follow-up NonTx users were functioning at a level similar to subjects from the general population without a lifetime diagnosis of AUD and of other psychiatric disorders.

**Limitations**

First, the number of subjects with DSM-5 AUD at baseline was limited, resulting in limited power of the current analyses, thus precluding the detection of smaller effects or the use of multivariable regression models. Moreover, some large odds ratios and confidence intervals were observed, probably due to the small number of subjects in the AUDTx group. Replication of these findings in multivariable context and with other population-based samples is therefore needed. Second, as in other population-based studies [4;5], our treatment rates should be interpreted with some caution, because treatment refers to at least one contact made with a professional for AUD or for mental health or alcohol/drug problems. No detailed information on treatment setting or intensity was available and therefore no conclusions regarding treatment efficacy can be drawn. Third, in prospective studies, the internal validity of findings may be affected by selective attrition [37-39]. However, in NEMESIS-2, attrition was not associated with DSM-IV mental disorders after adjusting for sociodemographic characteristics [26] and
in the present study, treatment status at baseline was not associated with attrition. Therefore, sample attrition is unlikely to have affected our findings. Last, alcohol consumption and AUD diagnosis were exclusively based on self-report, thus recall bias might be an issue. For example regarding alcohol consumption, people may have difficulties remembering the amounts and frequencies in an average week. Moreover, reports on such behavior may be influenced by social stigma. These issues may have resulted in a general underestimation of alcohol consumption in all treatment groups [40]. However, it is not clear whether there were group differences in the level of underestimation which may have subsequently biased the group comparisons.

Findings
Generally low treatment rates were observed: less than half of the people with baseline AUD received any treatment during the study period, and only one-tenth used AUDTx. Notably, GenTx utilization, and to a greater extent AUDTx utilization, were strongly associated with living without a partner, consistent with previous research [9;10]. Possibly, relatively limited social resources result in a higher treatment need and a greater probability to seek treatment. Baseline clinical characteristics of GenTx and NonTx users were quite similar, except for the (non-significantly) higher rate of comorbid psychiatric disorders in the GenTx group. Specific AUDTx was mainly associated with more AUD-related impairments and a higher co-occurrence with emotional and drug use disorders compared to the other two groups. Extending observations from previous studies [2;11], these findings support that treatment seeking, also during a longer period, is mainly associated with the severity of the AUD, AUD related impairments and the presence of comorbid psychiatric disorders. This may point to a rather adequate process in which AUDTx utilization occurs when AUD reaches a critical level and natural remission is hard to achieve [11].

Findings regarding the longitudinal outcomes further confirm that a rather adequate treatment selection process seems to have taken place and that the observed low treatment utilization rate is not necessarily an indication of a large unmet need for treatment or a large treatment gap. Of those not receiving any treatment, 78% remitted from AUD and the large majority (91%) did not drink at high-risk at follow-up. These rates were quite similar for the GenTx users, but they reported a higher rate of mild AUD and more psychiatric comorbidity at follow-up than the NonTx users. Thus, even though these two groups were rather similar at baseline, mild but persistent problems or additional psychiatric disorders may have led GenTx users to seek treatment nonetheless. Finally, people who received AUDTx had the worst status at follow-up with regard to alcohol use and AUD characteristics as well as with regard to mental functioning. These findings indicate that it is probably not cost-effective to offer treatment to all those with AUD. The large majority of both NonTx and GenTx users adequately deal with the AUD and show considerable amelioration of AUD problems. At follow-up, NonTx users even function at a similar level as people who never had an AUD or...
another psychiatric disorder. Moreover, those receiving AUDTx had the most severe and persistent problems. They are likely to perceive the highest need for care, though unfortunately, often with less than optimal outcomes [41].

Despite the finding that NonTx users generally have a favorable AUD course - with similar levels of functioning at follow-up compared to people who never had an AUD - it should be noted that an important minority of the NonTx users (22%) had a persistent AUD, and 60% of them had moderate or severe AUD at follow-up. It should be examined whether this severe subgroup would benefit from extra guidance to treatment. It may be that motivation for treatment is especially low in this group and possibly a brief and/or motivational intervention would be helpful to increase treatment entrance, as well as treatment compliance [42]. Barriers to seek treatment for alcohol problems may also include stigma associated with addiction treatment and fear of labelling [43]. E-health interventions should then be considered as these are often anonymous and therefore possibly less stigmatizing than regular treatment. Moreover, a significant subgroup of those with an AUD do not use AUDTx but only GenTx. This means that attention for alcohol problems in general treatment settings seems to be important. Specifically, although the diagnostic remission rate of 64% suggests that most of the GenTx users have a favorable AUD course, their alcohol problems should be noted so that timely interventions can be offered when the alcohol problems do not ameliorate.

Predictors of a persistent AUD course among GenTx and NonTx users were not examined in the current study, but previous population-based research showed that higher alcohol intake is associated with a poor AUD course, both in terms of persistency [18;24] and relapse [16;23;30]. As the present findings do not suggest that drinking is an important trigger for treatment utilization - no pronounced differences on baseline alcohol intake were observed between the three groups – this may point to possibilities to further improve treatment access. Possibly, positive attitudes towards drinking [44] hinder problem recognition and subsequently prevent that people feel a need for treatment, even though drinking levels and associated problems may reach a critical threshold. Primary care physicians may then be instrumental in the detection of NonTx users at risk of a severe AUD course [45]. That is, even though those individuals do not receive treatment for their mental problems, they may access primary care for physical disorders such as hypertension or diabetes, attention to alcohol intake is then desirable to increase awareness of the potential persistent problem.

Our follow-up findings also showed few significant differences in alcohol intake, with the exception of AUDTx users who were more often drinking at high-risk than GenTx users. This is in contrast to findings from the NESARC study, in which higher levels of recovery, including both diagnostic remission and abstinence or very low-risk drinking levels (< 7/14 drinks weekly for women/men) at follow-up, were observed in AUDTx users compared to NonTx users [12]. This incongruity in findings is difficult to explain, but may be due to methodological differences. NESARC only focused on 12-month treatment at baseline whereas in the present study, treatment could be present during
a 4-year period, including the 3 year prospective follow-up. Some of our AUDTx users may have just entered treatment at follow-up, thereby limiting the possibilities for a positive treatment outcome. Also, cross-national differences in treatment goals could play a role: abstinence is the dominant treatment goal in the US whereas in European countries, reduced risk drinking is more often considered a viable treatment option [46].

CONCLUSIONS

Our findings suggest that although the majority of subjects with AUD do not receive AUDTx, the problems associated with this so-called treatment gap seem limited as most NonTx and GenTx users show a favorable course of the disorder and of associated problems. The self-selection process that underlies treatment seeking and treatment utilization suggests a rational use of the limited treatment resources. However, some points for improvement could be noted. First, an important subgroup of NonTx users has a persistent course. It should be examined whether guidance to treatment would be beneficial for this group. Moreover, alcohol intake is an important marker for a severe AUD course [15;16;18;23;24] but plays a limited role in the decision to use treatment. Increased attention to level of intake in primary care may therefore be desirable to identify the subgroup of NonTx users at risk of a persistent AUD course. Lastly, monitoring of alcohol problems in GenTx settings is needed for the timely detection and treatment of persistent problems in this group.

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