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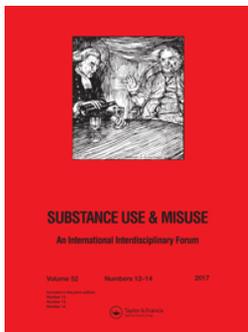
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## Identifying Risk Factors for Late-Onset (50+) Alcohol Use Disorder and Heavy Drinking: A Systematic Review

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### ABSTRACT

This systematic review seeks to expand the description and understanding of late-onset AUD and asks “Which risk factors have been reported for late-onset heavy drinking and AUD?” *Method:* Using PRISMA guidelines, a literature review and search was performed on May 19, 2015 using the following databases: MEDLINE, EMBASE, PubMed, and PsychInfo. Nine studies were included in the final review. *Results:* The search revealed that only very few studies have been conducted. Hence, the evidence is limited but suggests that stress, role/identity loss, and friends’ approval of drinking are associated with an increased risk for late-onset AUD or heavy drinking, whereas retirement, death of a spouse or a close relative does not increase the risk. *Discussion:* Inherent differences in measurements and methodologies precluded a meta-analysis. Therefore, the results presented here are descriptive in nature. Most studies base their conclusions on a certain preconception of older adults with alcohol problems, which leads to a row of circular arguments. The factors that have been measured seem to have changed over time. *Conclusion:* There has been a lack of focus on the field of late-onset AUD since the 1970s, which possibly has led to misrepresentations and preconceptions on the complex nature of late-onset AUD. There is limited evidence for any specific risk factor for late-onset AUD or heavy drinking. We suggest the adoption of a qualitative approach to uncover what is intrinsic to late-onset AUD followed by quantitative studies with more agreement on methods and definitions.

### KEYWORDS

Alcohol use disorder; systematic review; late onset; alcohol; older adults

Historically, alcohol use disorder (AUD) in old age has not been considered important or even an existing problem. In 1968, Leslie R. H. Drew wrote that: “... alcoholism tends to disappear with increasing age...” (p. 965). He reinforced this claim by citing Magnus Huss, who in 1849 concluded that: “... it is a rare exception to meet with an alcoholic who is over 60 years of age...” (Huss, 1849 in Drew, 1968). Hence, substance abuse was considered negligible in old age, and as something addicts were thought to “mature out” of after the age of 45 (Atkinson, 1990). This belief was so entrenched that until 1994 (when the DSM-IV was published), DSM-III-R asserted as a matter of fact that alcohol problems rarely begin after the age of 45 (Atkinson, Turner, Kofoed, & Tolson, 1985).

In 1974, Zimberg produced a narrative review that concluded that late-onset AUD was a “cry for help” against loneliness, depression, feelings of hopelessness, and “the stresses of ageing.” In 1978, he elaborated on his conclusions in another narrative review, in which he also included bereavement, retirement, marital stress, and

physical illness as contributors to late-onset AUD. Distinguishing between the conclusions Zimberg drew from his sources and those he drew from his own personal experience is very difficult, which makes these reviews difficult to interpret. They deserve mention, however, as they have been widely cited and have served as a reference point for later reviews.

In quasi-narrative or systematic reviews, other and later authors have backed the early conclusions of Zimberg. Still, these reviews are often based on studies with small sample sizes and which lack statistical power rather than on empirical evidence (see Atkinson, Tolson, & Turner, 1990; Blose, 1978; Fink, Hays, Moore, & Beck, 1996; Liberto & Oslin, 1995).

The narrative reviews concentrate on persistent risk factors for late-onset AUD or heavy drinking. Depression, loneliness, more free time, and “the stresses of getting older” or “reactive drinking” are identified as being among the most prevalent factors associated with late-onset AUD (Atkinson et al., 1990; Bechem, 1997;

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Blose, 1978; Fink et al., 1996; Kuerbis & Sacco, 2012; Liberto & Oslin, 1995).

However, multiple studies have since concluded that AUD is in fact present in the older adult segment of the population and that the proportion of older adults with AUD is increasing (Dharia & Slattum, 2011; Kuerbis & Sacco, 2012; Wetterling, Veltrup, John, & Driessen, 2003). Furthermore, since the number of older adults is set to increase in the coming decades, it is most likely that the number of older adults with a problematic alcohol consumption will increase (Andersen et al., 2015; Bjork, Vinther-Larsen, & Thygesen, 2006; Blazer & Wu, 2009; Hvidtfeldt, Vinther-Larsen, Bjork, Thygesen, & Grønbaek, 2006a, 2006b). The increase in heavy alcohol users among older adults is evident in a Danish study from 2006. The Danish study reported that from 1987 to 2003 the proportion of male heavy alcohol users aged 50 and above had increased from 13.2% to 20.4% (Bjork et al., 2006).

One subgroup among older adults with AUD and heavy use are those individuals who have experienced onset of alcohol problems after the age of 50 (late-onset) (see Atkinson et al., 1990; Watson et al., 1997). In a small correlational study with 60 participants, Adams and Waskel (1991b) found that as many as 11% ( $n = 7$  of 60) of all older adults with AUD had experienced a late onset (50+) of their problem. Similarly, Fink et al. (1996) found that almost 1/3 of all AUD sufferers above the age of 65 were late-onset cases. These findings have been supported more recently by Wetterling et al. (2003) in a descriptive study that found that as many as 16.8% ( $n = 45$  of 268) of their sample had developed late-onset AUD (after the age of 45). We focus on this subgroup of older adult people with late onset AUD, and not all older adult people with alcohol problems, because they are likely to have different characteristics and because this may entitle special attention when developing treatment measures (Schonfeld & Dupree, 1991; Epstein, McCrady, & Hirsch, 1997; Wetterling et al., 2003)

Moreover, we find it immensely important to focus on older adult people with late onset AUD as they constitute a substantial percentage of older adult people with alcohol problems. Improving preventive measures and interventions for this large group of individuals is likely to reduce health care spending related to alcohol treatment.

Late-onset AUD is described as a milder, more narrowly defined psychiatric problem than early or midlife onset AUD (Atkinson et al., 1990). More often than early-onset AUD, later onset abusers seem to be referred to treatment by court order (i.e., for drink driving; Atkinson et al., 1990). According to Watson et al. (1997) and Christopherson, Escher, and Bainton (1984), late-onset AUD seems to be associated with fewer

socially unacceptable symptoms than does early-onset AUD.

Wetterling et al. (2003) found that individuals with late-onset AUD are less frequently diagnosed as dependent on alcohol. They differ significantly in their preoccupation with drinking, capacity for controlling drinking behavior, desire/compulsion to drink alcohol, and their physiological withdrawal symptoms when compared to early-onset AUD. Individuals with late-onset AUD also tend to have a higher level of education, income, and life satisfaction than their early-onset counterparts, and are more stable in terms of residence (Schonfeld & Dupree, 1991; Wetterling et al., 2003). The male late-onset alcoholic may also be less attentive toward his spouse compared to early-onset alcoholic males (Epstein et al., 1997).

By surveying the available literature on the subject, the present review seeks to expand the description and understanding of the factors that have frequently been reported in the onset of AUD after the age of 50. Our explicit review question is as follows: Which factors have most often been reported as risk-factors in late-onset (50+ years) heavy drinking and AUD?

## Method

### Search strategy

The search in MEDLINE, EMBASE, PubMed, and Psych-Info was performed on May 19, 2015 by the main author while the strategy was developed in collaboration with the two co-authors and a literature-search specialist.

A thesaurus search was performed on the key terms “older adults,” “alcoholism,” “late-onset,” and “causes”/“risk factors” and synonyms (see Table 1). This search was performed in EMBASE, MEDLINE, and PsychInfo while simultaneously using Ovid. It turned up 285 articles. Removing duplicates and title scan reduced the amount to 34 articles. In the title scan, we looked for the following key-words: late-onset, older adults, late life, age of onset, onset age, aging, predictors, causes, risk factors, alcohol, alcoholism, alcohol problems, etc.

PubMed was searched separately with the same filters as described above, producing 53 relevant articles, which brought the total to 87. A further elimination of duplicates reduced the database to 76 articles for abstract scanning. This scanning was conducted by the main author.

In the abstract scan, we searched for explicit results on associations, causes, or risk factors in late-onset alcohol problems/AUD and definitions of late-onset. Six articles were excluded because of the language (French and Russian) as we did not have the resources to cover these.

**Table 1.** The search terms and their synonyms.

Search strategy				
Databases searched: EMBASE, MEDLINE, Psychinfo, PubMed				
Concept	Synonyms searched		Synonyms searched	Concepts
Elderly individuals	elderly OR aged OR aging OR old OR retired OR elder	AND	reasons OR logic OR reasoning OR sense OR causes OR element OR explanation OR matter OR motivation OR motive OR origin OR principle OR purpose OR root OR source OR account OR agency OR aim OR antecedent OR basis OR beginning OR causation OR consideration OR creator OR determinant OR doer OR end OR foundation OR genesis OR ground OR grounds OR incitement OR inducement OR instigation OR leaven OR mainspring OR maker OR object OR occasion OR producer OR spring OR stimulate OR risk factors OR protective factors OR etiology OR factors OR circumstance OR aspect OR component OR consideration OR element OR influence OR ingredient OR part OR point OR thing	Risk factors
	AND		AND	
Alcoholism	alcoholism or addiction OR drunkenness OR alcohol addiction OR alcohol dependence OR problem drinking OR substance abuse OR crapulence OR insobriety OR intoxication OR intemperance OR inebriation OR inebriety OR tipsiness OR boozing OR dipsomania OR alcohol use disorder	AND	late onset, late-onset	Late onset

45 articles were excluded, as their topic was early-onset, or older adults and alcohol in general, but not causes, risk factors, or associations for late-onset AUD. After an additional chain search based on the remaining 25 articles (adding 9 articles), and further exclusion of systematic and narrative reviews to avoid repetition and skewing (removing 9 articles), the database was reduced to 25 articles for final assessment for inclusion (see Figure 1).

### Inclusion criteria

The inclusion criteria for this review were as follows:

1. The study presented explicit data on risk factors for late-onset in the results section.
2. The study defined late-onset as no earlier than age 50.
3. The definition of heavy drinking or AUD should at least entail a self-reported experience of drinking problems. Preferably with an official diagnosis (ICD or DSM any iteration) of a drinking problem being sought.
4. If the study reported was a quantitative study, it should have more than 100 participants.
5. The articles should be written in English.

After going through the 25 articles, only nine were included in the final review. See Table 2 for a list

of the articles that were excluded and the reasons for exclusion.

## Results

### General description of included studies

As can be seen in Table A1, we included nine studies in the final review. The nine studies were based on nine different study samples, and were published between 1979 and 2013. Only two studies (Brennan & Moos, 1991, 1996) used some of the same questionnaires and inventories (LIREs, Drinking Problem Index, etc.; see Table A1) to estimate risk factors for late-onset AUD. These studies were conducted by the same authors. The studies were mainly correlational studies, two were surveys and one was a prospective study. Sample sizes varied from 216 participants and up to 2,325 participants. The studies utilized different conceptions of late-onset AUD, where two set the onset age at 50, and the rest—but one, set the onset age at 60 (the last one, at age 63).

Heavy drinking and AUD were defined very differently across the studies we included. The most explicit definition was found in Finlayson, Hurt, Davis, & Morse (1988) who used DSM-III to define AUD. The least explicit defi-

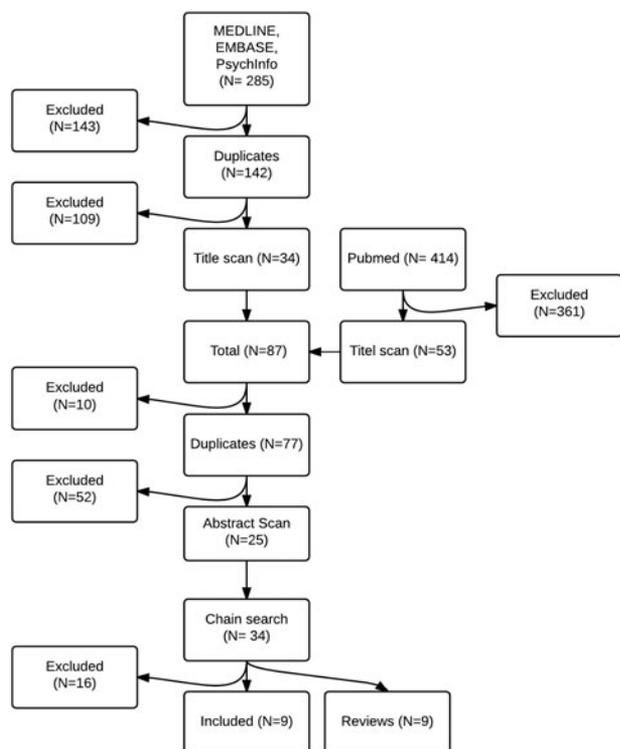


Figure 1. Search strategy.

definition was found in Jennison (1992), who defined “problem drinking” as a self-reported experience of perceived intoxication. However, the general consensus across the studies seemed to be that problematic drinking, heavy drinking, and AUD can be defined as consuming about two or more drinks a day, five or more days a week, or five or more drinks in one session a couple of times a month.

Late onset of AUD was defined as onset after the age 63 years by one study (Brennan & Moos, 1996), after the age of 60 years by four studies (Barnes, 1979; Finlayson et al., 1988; Jennison, 1992; Welte & Mirand, 1995), after the age of 50 years by two studies (Brennan & Moos, 1991; Schutte, Brennan, & Moos, 1998), and “after retirement” by one study (Ekerdt, De Labry, Glynn, & Davis, 1989).

This means that the AUD had only occurred after the onset age identified by the study—i.e., after retirement, at age 50, age 60, or age 63. This does not include those who have continued use from before the late onset cut-off point, as these are not considered late onset individuals.

The results mainly clustered around five risk factors—stress, retirement, friend approval, role loss/identity loss, and death of spouse; the results are reported in the following.

### Associations between retirement and late-onset AUD or heavy drinking

Barnes (1979) found no significant relation between unemployment and alcohol consumption in the 60 +

Table 2. Studies excluded.

Author(s)	Publication year	Reason for exclusion
Atkinson, Tolson, & Turner	1990	Did not write about associations, risk factors, or causes for late-onset AUD in their results section
Brennan & Moos	1990	Did not write about associations, risk factors, or causes for late-onset AUD in their results section
Schonfeld & Dupree	1990	Did not write about associations, risk factors, or causes for late-onset AUD in their results section
Adams & Waskel	1991a	Did not write about associations, risk factors, or causes for late-onset AUD in their results section
Adams & Waskel	1991b	Did not write about associations, risk factors, or causes for late-onset AUD in their results section
Schonfeld & Dupree	1991	Did not write about associations, risk factors, or causes for late-onset AUD in their results section
Adams & Waskel	1993	Reported no <i>p</i> -values to results on late-onset alcohol abuse.
Brennan, Moos, & Mertens	1994	Did not write about associations, risk factors, or causes for late-onset AUD in their results section
Varma et al.	1994	Definition of “late-onset” was age 25 and above
Krause	1995	Did not write about associations, risk factors, or causes for late-onset AUD in their results section
Sloan, Roache, & Johnson	2003	Was not about elderly and did not define “late-onset”
Wetterling et al.	2003	Did not write about associations, risk factors, or causes for late-onset AUD in their results section
Suliman et al.	2010	Did not write about associations, risk factors, or causes for late-onset AUD in their results section
Egorov	2010	The search result was an abstract from a conference, full article not existing
Dharia & Slattum	2011	The study was a case study of one male participant, the case study method was not described
Chen et al.	2011	Definition of “late-onset” was age 22 and above

year-olds. He found only 6% of heavy drinkers who were unemployed and 60 + year-olds. However, he found that in the age range between 50 and 59 as many as 12% of the unemployed were heavy drinkers. This tendency was even greater for males as 36% of the unemployed were heavy drinkers. Unfortunately, Barnes did not report any statistical tests and gave no *p*-values but only the percentages. However, Ekerdt et al. (1989) confirmed that there was no significant relation between late-onset AUD and retirement. Retirees had a higher level of alcohol consumption than those who remained working, but it was not statistically significant.

### Associations between role loss and late-onset AUD or heavy drinking

In 1992, Jennison concluded that “role loss” was associated with excessive drinking (see Table A1 in the

Appendix for a conspectus of what factors constituted “role loss” and *p*-values). This coincides with the review by Kuerbis and Sacco (2012), which found that roles or work identity was related to drinking behavior, suggesting that the loss of either could lead to an increase in drinking. In relation to the section on retirement and late-onset AUD, this seems contradictory. However, as has been pointed out elsewhere, it may not be the act of retiring in itself that increases the likelihood of late-onset AUD.

### **Associations between death of spouse and late-onset AUD or heavy drinking**

In a study of 200 heavy drinking participants above the age of 60, Barnes (1979) found that only 3% of those who were widowed were heavy drinkers, whereas as many as 10% of those who were still married and above age 60 were heavy drinkers. He concluded that there was no significant relation between widowhood and heavy drinking, but did not report any statistical tests and gave no values for this non-significance. However, in support of Barnes’s finding, Finlayson et al. (1988) found that of 122 early-onset drinkers (before age 60), 15 (12.3%) had experienced loss of spouse or a close relative, whereas 14 (out of 89 or 15.7%) late-onset drinkers had experienced loss of spouse or a close relative. They concluded that although late-onset drinkers in general had experienced a higher frequency of life events related to overall problem drinking, there was no significant relation in this specific subcategory. Christie, Bamber, Powell, Arrindell, and Pant (2013) confirmed the tendency that married and cohabitating individuals seem to have greater alcohol consumption than those who are divorced, single, widowed, or separated. They too, however, failed to test whether the tendency was statistically significant.

Brennan and Moos (1991) found that late-onset drinkers did not experience significantly more age-related loss (3.8%) than did non-problem drinkers at the same age (3.3%). No *p*-values were reported. Additionally, Brennan and Moos (1996) found that being unmarried was a risk factor in developing late-onset AUD.

These results are inconclusive as there is evidence for being married as both a protective and a risk factor.

### **Associations between friend approval and late-onset AUD or heavy drinking**

In a correlational study with 581 participants, Brennan and Moos (1996) found that friends’ approval of drinking in the 55–60-year-olds was associated with drinking problems in late age. Whether “friends’ approval” included friends enabling is unclear. Schutte et al. (1998) found a similar tendency in a prospective study with 1,844 participants. Late-onset was defined as age 50 and above

in Schutte et al. (1998) and a direct comparison is not possible.

### **Associations between stress and late-onset AUD or heavy drinking**

Brennan and Moos (1996) found that stress was correlated to late-onset problem drinking (spouse stressors ( $p < 0.01$ ), friend stressors ( $p < 0.01$ )). This tendency was also identified by Welte and Mirand (1995). However, their definitions of stress varied, and direct comparison of their results must be tentative.

## **Discussion**

The main conclusion of this review is that the field of late-onset AUD has been understudied since the 1970s and that this poses a risk in prejudices and misrecognition of complex problems concerning the older adults with late onset AUD. Based on the nine studies, we included we found that chronic stress, role/identity loss, and friends’ approval of drinking seem to be associated with an increased risk for late-onset AUD, whereas retirement, death of spouse or close relative is not reported to increase the risk for late-onset AUD.

### **The five risk factors**

The results of this review seem to cluster mainly around five risk factors—retirement, death of spouse, chronic stress, role/identity loss, and friend approval. These factors recall what Zimberg, in 1974 and 1978, believed to be the causes and risk factors for late-onset alcohol problems. It is not, however, transparent whether this clustering is a result of conformity or a reflection of the real world. It is an open question whether the studies are replicating the themes simply because they are researching the dimensions Zimberg originally suggested. Further, we have been unable to find any qualitative studies that have interrogated these themes. Hence, it seems that there might be a disjunction between what the researchers are researching and what is really there.

### **The preventive effort**

As mentioned in the introduction, we have found that this group of older adult people with late onset AUD constitutes a group with special characteristics and as such may need special attention when developing preventive measures. It would seem that a preventive effort needs to be guided toward chronic stress, role/identity loss, and friend’s approval of drinking. However, it is by our review, impossible to say anything about the qualitative experience of these phenomena and how a preventive effort should be qualitatively guided.

## Other reviews

Set out below are the conclusions of a series of previous reviews and narrative accounts that we compare to our own conclusions. Most of these reviews have been narrative and/or unsystematic in their approach to reviewing risk factors for late-onset AUD (Blose, 1978; Liberto & Oslin, 1995; Zimberg, 1974, 1978). The results/conclusions in these narrative accounts are the ones we have not been able to replicate fully or at all as shall be seen below. Further, the lack of systematic searches is possibly an explanation for the considerably different conclusions drawn by the different authors.

In two narrative accounts (Zimberg, 1974, 1978) offered some conclusions regarding risk factors for late-onset AUD, defining it as a “cry for help” and a reaction to the general stresses of ageing (retirement, loneliness, physical illness), and painted, without strong evidence, a picture of a rather weak older adult person with no real agency in his/her own life. We were not able to replicate these findings/conclusions.

In a narrative review based on relatively few references and no reported systematic search Blose (1978) reported that alcohol was perceived as one of the remaining pleasures in life by the older adults experiencing late onset AUD, a conclusion we have not been able to confirm.

Another narrative account (Liberto & Oslin, 1995) found that depression, sadness, loneliness, deteriorating social functions, less self-critical drinking, and more denial were associated with late-onset AUD. We were not able to confirm these findings in this review. However, they asserted that late life social stressors were also associated with late-onset AUD, which is to some extent confirmed by this review.

A review by Atkinson (1990), which had a somewhat systematic approach but no reported systematic search, found that risk factors for late-onset AUD were the having more discretionary time and money, the perception of drinking as a “medical” response to pain, and as perceiving alcohol use as enhancing social experience and relaxation. These findings were not confirmed in the present review. However, his findings on “reactive drinking” (drinking because of late life stresses) were to some extent confirmed by our review.

Lastly, it is worth mentioning Kuerbis and Sacco (2012) who conducted a very thorough systematic review on retirement as an influence on drinking patterns. As mentioned above, the conclusions they drew on role or identity loss have to some extent been supported by the present review.

Another possible explanation for the differences in our findings and the findings of other reviews may be historical. As mentioned in the introduction, the phenomenon of alcohol problems in late age was hardly recognized until 1994. The conclusions drawn in the narrative accounts

from 1974 to 1995 possibly mirror this lack of recognition. Further, within the reviews we uncovered, there has been a curious absence of a focus on women. However, it is beyond the scope of this study to offer a full analysis of historical ageism and sexism in alcohol research and late onset AUD. But, these problems underline the lack of recognition of the complexities in late onset AUD.

## Limitations and strengths of the present review

The major limitation of this review is that the studies included exhibited varying methodologies, samples, and statistical approaches. Specifically, there is no explicit, general cut-off criterion defining heavy use or AUD in terms of consumption across the studies we have reviewed. Consequently, a rather heterogenous group of “people with AUD” was included, which made it hard to interpret the findings. This is also one of the reasons why our results are contradictory at points. On the other hand, this pinpoints one of the general problems within the field: the lack of agreed definitions.

The studies included in the present review share no commonly accepted and clear definitions of heavy use. They report no exact amount of drinks per day, etc. Most of them do not even differentiate between heavy use and problematic drinking. Those studies that have defined “heavy drinking” and “problematic drinking” in relation to a particular questionnaire or statistical measure have not supplied enough information for us to access “number of drinks,” etc.

The diagnosis of AUD has changed at least twice over the past 40 years, which means that the diagnostic criteria reported on are not the same as those we use today—or the same across all the studies we have included.

We should have liked to employ firm definitions of AUD, heavy drinking, and late-onset. However, since there is no uniformity on the matter, strict definitions would have hampered this review unnecessarily. In consequence, we have settled on a continuous, dynamic, and descriptive definition to be able to compare and sum up the results of the studies we have included. This means that AUD and heavy drinking may occur interchangeably. What these conditions have in common and what was also the basis for comparison across conceptual differences is that their consequences are considered to be socially, physically, and mentally burdensome and problematic.

Our conclusions are only viable for the mostly male population of older adults. Because of the historicity mentioned in our introduction, some of the studies we included have mostly included male participants. Hence, sex difference has not been investigated in this review.

A further limitation of this review is that we were only able to include relatively old studies. Very few studies met the inclusion-criteria, and even fewer were newer than

the year 2000. However, this again illustrates the need to expand this field of research.

We excluded six articles because of language barriers, which is potentially a source of bias. However, the articles we did include do seem to agree on some key points, and it is a matter of speculation whether or not the six articles would have drawn our conclusions in any other directions.

Further, risk factors for late-onset AUD seem to constitute a rather underexplored field, and this means that the small amount of available literature/studies, lends itself badly to reviewing. Hence, the review is of an essentially descriptive nature.

The strength of the present review lies in the systematic search methods that have been employed. To our knowledge, this review is the first that seeks to gather all available research concerning the factors potentially associated with late-onset AUD.

### Implications for research

It will have emerged from this review that there is a dearth of qualitative studies on late-onset AUD. Only one supposedly qualitative case study was uncovered (Dharia & Slattum, 2011), but since the methodology used was not described in full the study was excluded. In relation to this, one overarching problem for the studies included (and those excluded as well) is the lack of agreed definitions in the field. There is agreement about the age at which late-onset is considered to begin. Beyond that, concepts like “stress” and “traumatic life events” (see Jennison, 1992; Welte & Mirand, 1995) seem inadequately defined and very differently operationalized in the studies we have reviewed. This leads to results seeming far removed from the subjects—the participants, which points up the need for further research. We suggest the adoption of a qualitative approach to capture the diversity of late-onset AUD and to understand how this differs from earlier onset AUD and other kinds of AUD. We envisage clearer definitions emerging, which in turn could realign the quantitative data with its subjects.

Some of the results of the present review seem counter-intuitive, not least the fact that death of spouse does not seem to increase the risk for late-onset AUD. We can offer no viable explanation for this result and suggest that further research be conducted in this area. We wish to find an explanation for this, as the emotional burden of having a close relative die is often plausibly seen as a cause for the onset of AUD. Again, we suggest that a qualitative approach be taken to seek explanations and to support or dispute this conclusion.

### Conclusion

We have found that research into the older adults experiencing late onset alcohol use disorder has been very

limited since the 1970s. The present systematic review illustrates that there is limited evidence for the association of any specific factors with late-onset AUD or heavy drinking. However, friend's approval and loss of role or work identity seem to be related to late-onset AUD or heavy drinking. These factors would be the first that should guide a preventive effort, but needs further qualitative investigation to constitute a viable foundation for such efforts. However, these factors have been identified in relatively old studies, and need to be investigated further. The systematic search did not reveal any qualitative studies or other attempts to uncover the experienced causes for, or experiences of late onset AUD. We suggest the adoption of a qualitative approach to uncover what is intrinsic to late-onset AUD and to better qualify a preventive effort, followed by quantitative studies with more agreement on methods and definitions in order to advance this important field of research.

### Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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## Appendix

Table A1. The included studies.

No.	Article	Type of article or study	Sample (male, female, age, etc.)	Definition of early-onset	Definition of late-onset	Definition of heavy use and/or AUD	Method	Results	Conclusions	Critique and limitations
1	Barnes, 1979	Cross-sectional, correlational study	1,041. 18–49 years: 597. 80–59 years: 138. 60+ : 200. Non-clinical.	N/A	At age 60 and upwards	Heavy Drinking: 1–2 drinks, 3 or more times a day, or 5–6 drinks at a time, a couple of times a month.	Structured interviews.	Widowed, 60 and older: 3% heavy drinkers. Married, 60 and older: 10% heavy drinkers. Non-married, 18–49 years: 42% heavy drinkers. Married, 18–49 years: 24% heavy drinkers. Unemployed, 60 and above: 6% heavy drinkers. Employed, 60 and above: 12% heavy drinkers. Unemployed males, 50–59 years: 71% heavy drinkers. Employed males, 50–59 years: 36% heavy drinkers.	No relation between heavy drinking and widowhood. Employment seems unrelated to heavy drinking above 60, but significantly related in the 50–59 year old males.	No statistical tests were reported. No power calculations were reported. Sample size was big, but sub-groups were small. "Heavy drinking" not defined.
2	Finlayson et al., 1988	Correlation study	216 (151 m/65 f). Clinical (in treatment for alcohol abuse)	Before age 60	At age 60 and upwards	DSM-III criteria for alcohol use or dependence	Minnesota Multiphasic Personality Inventory, Wechsler Adult Intelligence Scales.	Life events associated with onset or exacerbation of alcoholism: Early-onset <60 years ( $n = 122$ ) - Retirement: 15, Death of spouse or close relative: 15, Family Conflict: 9, Physical Health Problems: 7, Employment Stress: 5, Psychologic Symptoms 3, Financial Problems: 1. Late-onset 60 < ( $n = 89$ ) - Retirement: 26, Death of spouse or close relative: 14, Family Conflict: 9, Physical Health Problems: 13, Employment Stress: 5, Psychologic Symptoms 4, Financial Problems: 1.	The late-onset group reported a higher frequency of life events associated with problem drinking overall ( $p < 0.001$ ; chi-squared value = 27.55 - no significant relation between subcategories). Supports the stress-coping hypothesis.	Not clear how the "life events associated with onset of alcoholism" was measured. No power calculations were reported. Participants mainly middle and upper-middle class.

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Table A1. (Continued)

No.	Article	Type of article or study	Sample (male, female, age, etc.)	Definition of early-onset	Definition of late-onset	Definition of heavy use and/or AUD	Method	Results	Conclusions	Critique and limitations
3	Ekerdt et al., 1989	Prospective, comparative study	100 m - retirement, 316 m - remained employed. Non-clinical, community dwelling.	Before retirement	After retirement	Periodic heavy drinkers: 7 < drinks in a single day, once < in a typical month. Problems with drinking; alcohol regularly affects physical health, psychological state or social functioning.	Interviews, questionnaires.	General tendency of alcohol consumption before and after retirement: those that became retirees had a higher level of alcohol consumption than those who remained working, but not significantly ( $t = 1.30, 414 \text{ df}, p = .194$ ) at T1. At T2, when controlling for T1 and other covariates, retirement was not a significant predictor of change in alcohol consumption ( $p = .630$ ; 95% CI = .033 +/-.135).	No change in alcohol consumption was associated with retirement. Little short-term effect of retirement on alcohol consumption.	Only male participants, short timeframe in comparison to life expectancy; did not consider the variables that might cofound retirement.
4	Brennan & Moos, 1991	Comparative/correlational study.	late-onset ( $n = 229$ ), early-onset ( $n = 475$ ), non-problem drinkers ( $n = 609$ ), total ( $N = 1,313$ )	Below age 50	Age 50 and upward	Problem drinkers: 1 < drinking problems indicated (self-report) on a 17-item drinking problem index.	Drinking Problems Index, Health and Daily Living Form, Life Stressors and Social Resources Inventory (LISRES), Coping Response Inventory, Help Seeking for Drinking Problems.	Experience of age-related loss: 3.3% of non-problem drinkers; 3.8% of late-onset problem drinkers; 3.9% of early-onset problem drinkers (this difference was not significant ( $p$ -value not reported) $F$ -value: 6.49.	No relation between age-related loss and late-onset drinking problems.	The control group (non-drinkers) is not very well described. No description of how questionnaires were distributed - no bias control. Definitions of "heavy use" not clear. Use of odd-ration not explained.

5	Jennison, 1992	Population Survey	1,418 at age 60 and over. Non-clinical.	N/A	After age 60	Excessive drinking: self-report (subjective evaluation of e.g., perceived intoxication).	Drawing data from general social surveys (Canada). Cross-sectional baseline. Years 1980, 1983, and 1984.	Association between role loss and excessive drinking: Affiliation (MS 52.69, $p = 0.01$ ), Alienation (MS 2.08, $p = 0.001$ ), Physical Health (MS 42.26, $p = 0.001$ ), Employed (MS 1.87, $p = 0.001$ ), Divorce last 5 years (MS 0.12, $p = 0.01$ ), Unemployment last 5 years (MS 0.20, $p = 0.06$ ). Summary Measures: Total Losses Last Year (MS 2.10, $p = 0.001$ ), Total Losses Last 5 Years (MS 2.63, $p = 0.01$ ).	Traumatic life events and alcohol consumption are significantly related.	Because of cross-sectional data, not possible to estimate drinking before traumatic event.
6	Weite & Mirand, 1995	Survey, Correlation Study	2,325. Non-clinical.	60 and below	60 and upward	Heavy Drinking 2 < drinks a day.	Random-digit telephone survey. Structured Interviews. The Elders Life Stress Inventory, Daily Hassles Scale Health and Daily Living Manual and more.	Logistic regression predicting drinking problems and drinking symptoms after age 59 (all respondents): Current alcohol consumption: sig. level < 0.0001, WALD stat. 43. Positive direction. Problems/symptoms at age 20: sig. level 0.025, WALD stat. 5, positive direction. Problems/symptoms at age 40: sig. level 0.006, WALD stat. 8, positive direction. Chronic stress: sig. level < 0.0001, WALD stat. 17, positive direction. Sex: sig. level 0.0006, WALD stat. 12, Males score higher.	Acute stress does not have an influence on late-onset drinking. When controlled for gender, a certain influence seems to appear. Chronic stress is shown to be a significant predictor of alcohol abuse and dependence.	Self-report data, social desirability, and memory biases.

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Table A1. (Continued)

No.	Article	Type of article or study	Sample (male, female, age, etc.)	Definition of early-onset	Definition of late-onset	Definition of heavy use and/or AUD	Method	Results	Conclusions	Critique and limitations
7	Brennan & Moos, 1996	Correlational/predictive study	581. Clinical.	Abuse that began 2 years prior to initial assessment. First assessments were on participants aged 55 to 65.	Age 63 and upward	Problem drinkers: 1 < drinking problems indicated (self-report) on a 17-item drinking problem index.	Drinking Problems Index, Coping Response Inventory, Life Stressors and Social Resources Inventory (LISRES), Negative Health Events, Non-health Negative Events, Chronic Health Stressors, Friends' Approval of Drinking. One year follow-up.	Associations between personal/environmental risk and drinking problems in 55-60 year olds: being male (corr: 0.16 $p < 0.01$ ), being unmarried (corr: 0.11 $p < 0.01$ ), early-onset (corr: 0.23 $p < 0.01$ ), avoidance coping (corr: 0.06 $p = N/A$ ), negative non-health events (corr: 0.06 $p = N/A$ ), negative health events (corr: 0.03 $p = N/A$ ), chronic health stressors (corr: 0.06 $p = N/A$ ), spouse stressors (corr: 0.10 $p < 0.01$ ), friend stressors (corr: 0.13 $p < 0.01$ ), friends' approval of drinking (corr: 0.07 $p = N/A$ )	Increase in alcohol consumption was predicted by: being male, heavier baseline use, more use at 4 year follow-up, heavier reliance on avoidant coping strategies, stressors and friends' approval. Decrease in alcohol consumption was predicted by: negative health events and friend stressors for heavier drinkers.	Very long interval between follow-ups. Clinical population. Same sample as Brennan & Moos, 1991.

8	Schutte et al., 1998	Prospective study	1,844 at baseline, 687 at 7-year follow-up. 274 were non-problem drinkers at start of study.	Below age 50	At age 50 and upward	Problem drinkers: 1 < drinking problems indicated (self-report) on a 17-item drinking problem index.	Structured Interviews. Health and Daily Living Form. Life Stressors and Resources Inventory. Inventory to Diagnose Depression-Lifetime Version. ANOVA. Regression Analysis.	Logistic regression predicting late-onset drinking problems from baseline and life history predictors after controlling for gender and ethnicity: incipient problems (est. coef. 0.70, $p < 0.05$ , OR 2.01), overall frequency of alcohol consumption (est. coef. 0.13, $p < 0.05$ , OR 1.14), smoker (est. coef. 0.83, $p < 0.10$ , OR 2.29), one or more acute medical conditions complicated by alcohol consumption (est. coef. $-1.23$ , $p < 0.05$ , OR 0.29), friend's approval of drinking (est. coef. 0.25, $p < 0.01$ , OR 1.28), avoidance coping (est. coef. 0.06, $p < 0.10$ , OR 1.06), proportion of time increased alcohol consumption in response to negative affect or stress at or before age 50 (est. coef. 1.77, $p < 0.01$ , OR 5.86), spouse drank at or before age 50 (est. coef. 0.30, $p = NS$ , OR 1.35), proportion of time increased alcohol consumption in response to spouse's drinking at or before age 50 (est. coef. 0.55, $p = NS$ , OR 1.74), prolonged sad affect at or before age 50 (est. coef. 0.70, $p < 0.10$ , OR 2.02).	Significant predictors of late-onset alcohol abuse: Incipient problems, friend approval, and increased alcohol consumption in response to stressors or negative affect at or before age 50. Not significant predictors: smoking, reliance on avoidance coping strategies.	Not representative - light drinkers and abstainers not included. Very long intervals between measurements. Retrospective data.
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Table A1. (Continued)

No.	Article	Type of article or study	Sample (male, female, age, etc.)	Definition of early-onset	Definition of late-onset	Definition of heavy use and/or AUD	Method	Results	Conclusions	Critique and limitations
9	Christie et al., 2013	Retrospective study (1988–2008)	585. Clinical.	N/A	At age 50 and upward	Problem Drinkers: drinking 5 < days a week.	Structured assessment interview. No standardized measures. Daily consumption registered. Self-reported "reasons for drinking."	Reasons for drinking. Generally: to reduce tension/anxiety 22%, negative affect (anxiety, depression, boredom, life pressure) 49%, sleep problems 4%, enjoyment 11%, habit/dependency + avoiding withdrawals 22% Men: habit/dependency 23%, to reduce tension/anxiety 20%, enjoyment 7%, boredom/something to do 4%. Women: to reduce tension/anxiety 24%, lack of confidence 19%, enjoyment 14% boredom/something to do 10%.	Reasons given for drinking were primarily "negative affect."	The data collection was from a clinical tool, not a research tool. Risk of social-desirable responses because of one-to-one interviews. Self-reports. Data collected for clinical purposes = lack of objective checks for accuracy.

MS: Mean squares, N/A: Not available, Est. coef.: Estimated coefficient, OR: Odds ratio, NS: Not significant, Corr: Correlation score, CI: Confidence Interval, Df: not explained by author.