

On emerging need for data on alcohol consumption at the regional level

Sanna Roos, Statistics and Research Åland, sanna.roos@asub.ax

Abstract

The main theme of the paper refers to the challenge of generating reliable data and statistics on alcohol consumption at the regional level. The need for regional estimations is emerging as alcohol policies aim at targeting consumption in different subgroups of the local population, such as among youth and elderly. Since the 1970s, estimation of total alcohol consumption in population studies have largely been rooted in the theory of the total consumption model (TCM). At the same time, studies on alcohol consumption at the regional level have dominantly been dependent on survey methods, which are known to be challenged, for instance, by the growing non-response rates. Furthermore, local and contextual factors need to be evaluated when designing and building data collection aiming at serving the needs of regional alcohol policy formation. In Åland, the easy access to duty-free alcohol contributes to the total alcohol consumption at the local level, at the same time as the lack of statistics on alcohol purchases made by the tourists severely hampers the estimation of alcohol consumption in the local population. Thus, innovative ways are needed in collecting and quantifying data and statistics on alcohol consumption in local populations. This is highly important, in particular, in those Nordic regions which might be facing specific challenges due to the unique contexts. Recommendations for supplementary methodologies and actions are presented.

Keywords: total consumption model (TCM), alcohol policy, surveys, Åland

1. Introduction

A descending trend in alcohol consumption has been noted in the Nordic countries when estimated with alcohol consumption at the national level (Hellman & Kettunen 2017). This is good news especially in the context of the total consumption model (TCM), which has been a central theory in the alcohol epidemiology literature since the 1970s (see e.g. Rossow 2019). In TCM, the amount of alcohol consumed in population is linked to the level of alcohol-related harm. Since the total consumption of alcohol is expected to determine the amount of alcohol-related problems in population, the consumption level should be a key target of preventive alcohol policy

(see, e.g. Sulkunen & Warsell, 2012). As such, TCM has contributed to Nordic policies that tackle public health issues by following up on the total alcohol consumption level of the population (Bruun 1975; Tigerstedt 1999).

According to research, alcohol accounts for a substantial amount of harm in form of diseases, accidents, and psychiatric diagnoses (see, e.g. Norström & Ramstedt 2005). Several population studies have, indeed, demonstrated a statistically significant relationship between per capita consumption of alcohol and mortality, for instance, from liver cirrhosis and other alcohol-related diseases (Norström & Ramstedt 2005). A subsequent association between consumption and health issues has relatively recently been detected between mean levels of gambling and those who participate in excessive or problem gambling (Rossow 2019). That is, a positive association between population gambling mean and prevalence of excessive or problem gambling has been found with both cross-sectional and longitudinal data. Thus, the availability of alcohol or gambling seems to be linked to related problem behaviors in the population.

Although widely accepted in the Nordic countries, TCM may not always be the most suitable approach when targeting alcohol consumption in local populations (Pryce et al. 2020). For instance, contextual factors of local populations may need to be considered and evaluated within the estimation procedure, as they might significantly influence the assessment outcome at the regional level. In Åland, duty-free alcohol is sold on most ferries operating from nearby regions, such as mainland Finland, Sweden, and Estonia, to the main island. The easy access to duty-free alcohol has in previous studies been estimated to contribute about 30 per cent of the alcohol consumed by the population in Åland (Karlsson 1999). In addition, there is a severe lack of official statistics on the amount of alcohol being purchased by the numerous tourists in the region. The contribution of tourists to the registered alcohol consumption in Åland has, so far, been estimated within the framework of studies conducted by Statistics and Research Åland (ÅSUB) aimed at measuring the overall consumption of goods and services by tourists (see e.g. Statistics and Research Åland 2019). In the following, we will present a review of the studies and methods that have been used for estimating alcohol consumption in population of Åland since

1980. The review will help us understand the challenges of both estimations and interpretation of the results at the regional level.

2. Review of alcohol consumption surveys in Åland

Seven population studies on alcohol consumption have so far been conducted in Åland (1980, 1995, 2002, 2005, 2011, 2016 and 2021) with each of these surveys being based on randomised samples. In the studies from 1980 to 2005, total amount of alcohol consumed in the region was calculated from the average quantities and frequencies reported by respondents (Jordas & Lilja 2002; Karlsson 1995; Lilja & Jordas 2006; Pettersson 1982). A summary method on the average amount of alcohol typically consumed by the respondent (quantity-frequency-index, QF) was then calculated separately for each participant in the study (for more on the measure, see Sobell & Sobell 2003). As such, the estimation procedure was expected to cover both registered and unregistered alcohol consumption, that is, both the registered sale of alcohol, as well as alcohol that is imported, smuggled, or home brewed by the local population. In the formula for calculating the total amount of alcohol consumed by a respondent, the beverage type and subsequent volume percentage of alcohol was accounted for. The following alcohol contents (volume percentages) were applied in the formula: medium strong beer 4.48, strong beer 5.50, wine 14.50 and spirits 40.00 (Karlsson 1995).

In 2002, the estimation formula for the QF index was adjusted, such that the volume percentage of alcohol was set to 5.00 percent for beer, 15.00 for wine and 40.00 percent for spirits. The annual consumption based on the self-reported QF was estimated to be 5 litres of pure alcohol per individual in Åland in 1980. Since then, the annual self-reported consumption has been estimated to be around 7–8 litres per individual. Due to the adjustments, the comparability of the results for total alcohol consumption may be reduced over time. In *Table 1*, we report the percentage of the respondents consuming alcohol at least once a week in the studies conducted in Åland.

Table 1. Percentage (%) of respondents aged 18–65 years consuming alcohol at least once a week by type of beverage and estimation year

Year	Beer etc.	Wine	Spirits
1980	33	7	12
1995	40	15	10
2001	40	.	8
2005	40	30	8
2011	37	30	11
2016	32	26	7
2021	36	28	7

A gradually declining response rate is a severe challenge in studies based on survey methods, since a low participation rate may undermine the representativeness of the randomized samples. In the first population study on alcohol consumption in Åland (1980), the response rate was 67 per cent, consisting of 559 randomly selected individuals. In 1995 and 2001, the response rates were somewhat lower, 63 and 65 per cent, representing a total of 501 and 678 respective respondents. The highest participation rate so far, 70 per cent, was observed in the alcohol consumption survey of 2005 involving a total of 423 participants. Since 2005, the participation rate has gradually been declining. The average response rate was down to 64 per cent in the survey of 2011 and 58 per cent in 2016, with both studies covering 651 respondents. In the survey of 2021, the participation rate was the lowest so far, 53 per cent, consisting of 637 respondents.

In addition to the declining response rate, the outcome of the estimation procedure is likely to be undermined by other methodological limitations. For instance, different surveys may target different age groups in the population, which hinders the process of detecting and evaluating trends in alcohol consumption over time. Furthermore, the targeted age group may not be sufficiently representative to reliably estimate alcohol consumption in the whole population. In Åland, the 1980 survey was aimed at the population aged 20–59 years, excluding consumers aged 18–19 years and respondents aged 60 years and older. Since then, the targeted age group of the alcohol consumption surveys has been expanded, and covered the population aged 18–79 years in 2016 and 2021.

The weaknesses of the survey method do not emerge solely from the possible lack of representativeness of the data. In addition, the nature of the survey questions concerning individuals' alcohol consumption may pose a risk of bias. Underreported

alcohol consumption, human memory error, and a relatively high non-participation rate among heavy drinkers have been detected as common challenges in alcohol surveys (Nugawela et. al 2016; Sobell & Sobell 1995; Sobell & Sobell 2003; WHO 2021). Furthermore, if alcohol consumption is measured by quantities and frequencies that are typical for the respondent, seasonal variation in drinking behaviours may remain undetected. Overall, self-reported estimates of alcohol consumption based on the QF method are expected to cover only 30–50 per cent of the actual total consumption (for more on challenges in self-reports, see, e.g., Boman et. al 2006; Del Boca & Darkes 2003; Karlsson, 1995). The QF method has been noted to provide less accurate estimates of alcohol consumption than, for instance, diaries on drinking behaviours (Hogan, Patteson & Cox 2020; WHO 2021).

Because of the methodological limitations of alcohol consumption surveys, two additional methods for estimating total amount alcohol consumed in Åland were presented in the 2011 study. In one of the additional methods, the registered alcohol consumption was estimated to cover about 80 per cent of the total alcohol consumption, to which an estimation of unregistered alcohol consumption was added. The other additional method relied on the statistics on registered alcohol consumption, from which the average amount of consumption by tourists was subtracted. The estimations of unregistered alcohol consumption in the form of duty-free alcohol purchases, home brewing of alcohol, smuggling, purchasing of alcohol in other countries (to take home), as well as alcohol purchased online were then added to the estimation procedure. This estimation procedure has since then been utilized in alcohol consumption studies in Åland.

3. Assessing the quality of the survey questions related to alcohol consumption

Several attempts have been made to improve the quality of the survey questions concerning drinking occasions and thresholds in the alcohol consumption surveys in Åland. In the 1980 and 1995 surveys, the respondents were asked to report their average number of drinking occasions. In the 2002 and 2005 surveys, the timeframe was further specified to cover the alcohol consumption of the respondent during the past 30 days. Since 2011, the reference period for alcohol consumption has been

specified as the past twelve months, thus covering the eventual seasonal variation in consumption among respondents. Improvements have also been made in the thresholds of the individuals' alcohol consumption. In the 1980 and 1995 studies, the quantity thresholds for beer and wine were defined as bottles (0.33 and 0.75 litres respectively). After that, several options and visual support were added to the thresholds. In the 2021 survey, one alcohol portion of beer was visualized with a bottle (0.33 litres), one alcohol portion of wine with a glass (12.0 centilitres for wine and 8.0 centilitres for strong wine), and one alcohol portion of spirits with a glass of "schnapps" (4.0 centilitres).

In contrast to the questions on drinking occasions and thresholds, some of the survey questions have proved not to need improvement or adjustment. The gender differences in alcohol consumption, for instance, are recommended to be confirmed during the analysis, rather than being presumed in the context of the survey questions. A single set of quantity thresholds for both men and women should be applied, rather than building assumptions on gender differences in hazardous or harmful alcohol consumption into the survey questions (Sobell & Sobell 1995). In the alcohol consumption surveys in Åland, a single set of quantity has been the dominant approach. In addition, no presumptions have been made on the eventual gender differences concerning binge-drinking or on the quantity of alcohol leading to intoxication. Binge-drinking has been specified as the number of episodes during the last 30 days in which the respondent has consumed more alcohol than 24 centilitres of spirit, six cans of beer, or a bottle of wine (consisting of alcohol maximum 22 volume percentage). The results have indicated that, in addition to gender, respondents' age and education level are associated with binge-drinking.

When conducting alcohol consumption surveys in Åland, actions have been taken to overcome the methodological concerns related to the declining response rate. For instance, repeated reminders have been sent to the survey respondents.

Furthermore, non-responses have been corrected by weighting the survey data prior to the analyses. Despite these improvements, the quality of the assessment methodology could be further improved. The surveys should preferably combine measures of drinking patterns over time as well as measures of heavy drinking days or situation-specific drinking (Single & Wortley 1994; Stockwell et al. 2002; Wyllie et

al. 1994). Eventual discrepancies in the estimated alcohol consumption levels (for a literature review, see e.g. Midanik 1982) could be avoided if the QF method was replaced or adjusted by refined questions on contexts (Armor & Polich 1982; Göransson & Hanson 1994; Nugawela et. al 2016). For instance, the lack of questions on blood alcohol content, such as duration of drinking occasions or body mass index, are likely to undermine the effective use of data based on the QF method. However, the QF method should not form the sole basis for the estimation of total alcohol consumption in the population (WHO 2021). Rather, questions concerning quantities and frequencies of alcohol consumption should be used for comparative purposes (Sobell & Sobell 1995). *Table 2* shows a selection of alcohol-related survey questions that allow for comparison over time.

Table 2. A selection of survey questions on alcohol in the studies of 1995, 2005, 2011, 2016 and 2021

	Survey question	1995	2005	2011	2016	2021
Background	Gender	x	x	x	x	x
	Year of birth	x	x	x	x	x
	Region living in (in Åland)	x	x	x	x	x
	Marital status		x	x	x	x
	Main occupation			x	x	x
	Education		x	x	x	x
	Number of people/children in the household			x	x	x
	Self-estimated health				x	x
Alcohol	Times/amounts drinking beer, cider etc.	x	x	x	x	x
	Times/amounts drinking wine	x	x	x	x	x
	Times/amounts drinking strong wine			x	x	x
	Times/amounts drinking spirits	x	x	x	x	x
	Binge-drinking	x	x	x	x	x
	Age when first drank alcohol				x	x
Alcohol purchases	Times of purchase in ferries/flights to Åland			x	x	x
	Times/amounts of beer, cider etc.	x	x	x	x	x
	Times/amounts of wine		x	x	x	x
	Times/amounts of spirits	x	x	x	x	x
Risk belief	Daily drinking of spirits (8 cl)		x	x	x	x
	Daily drinking of spirits (24 cl)		x	x	x	x
Attitudes	It's okay for minors to taste alcohol			x	x	x
	It's okay for adults to serve alcohol to minors			x	x	x
	Minors who are served alcohol at home learn to handle alcohol better than minors drinking on the sly			x	x	x
	It's okay that adults drink alcohol in the presence of minors				x	x
	It's okay that adults are drunk in the presence of minors			x	x	x
	It's okay that adults drink alcohol in the presence of minors if a sober adult looks after the children			x	x	x
	The attitudes of the parents concerning youth's alcohol drinking has significance for the drinking of the teenagers			x	x	x

4. Measuring alcohol consumption for policy formation

Alcohol policy that aims at affecting the demand for alcoholic beverages in a population is supported by the underlying assumptions of TCM related to the expectations of the amount of alcohol consumed in population being linked to the level of alcohol-related harm. In Åland, there has been a growing need for regional statistics and data on alcohol consumption to be used for the regional alcohol policy. The 1980 alcohol consumption survey (Pettersson 1982) was financed by the local association for sobriety (Ålands Nyketerhetsförbund), aiming to spread knowledge on alcohol consumption among the local authorities and the public. The drinking habits of the population were primarily measured and analysed at the group level with the focus on gender and age differences. This approach was then employed in the subsequent studies. Since the 1995 alcohol consumption study (Karlsson 1995), the surveys have been conducted as a local government initiative (Ålands landskapsregering, former Ålands landskapsstyrelse). As these surveys have estimated total alcohol consumption in the region, one of the goals has been to compare local alcohol consumption with consumption in nearby regions, such as mainland Finland and Sweden. The regional programme for alcohol and drug policy was evaluated in the study of 2002 (Jordas & Lilja 2002), and in the 2005 study (Lilja & Jordas 2006), an insight into consumers' opinion concerning the regional alcohol policy was presented. Since 2011 (see Statistics and Research Åland 2011, 2016 and 2021), the changes in the alcohol consumption in Åland have been followed up over time, and a knowledge base has been provided for the upcoming programs on alcohol and drug policy.

During the past decades, the underlying assumptions of the TCM have been challenged by the researchers by acknowledging individual responsibilities in substance use (Tigerstedt 1999). Furthermore, a shift in the focus of alcohol control policies aiming at reducing average alcohol consumption in society has been observed, and instead, tailored alcohol policies that fit the needs of society at the regional level have been witnessed (Babor & the Alcohol and Public Policy Group 2004; Rossow & Baklien 2014). Active regional alcohol policy has been accompanied by the need to follow up on the effects of policies, for example, the projects targeting

a wide range of the population while effectively dispersing the limited regional resources (Spak & Blanck 2007).

So, how should we estimate alcohol consumption for policy formation in Åland, such that both context and content of consumption are recognized?

For effective alcohol policy formation, data on different alcohol consumption styles, such as heavy episodic drinkers, as well as evidence-based practices are needed (Poikolainen 2017; Spak & Blanck 2007). Both quantitative and qualitative measures need to be effectively combined. Furthermore, targeted groups need to be identified based on gender, age, socio-economic status, education, and other relevant background factors, since the distribution means may vary within the groups (Rossow 2019; Rossow et.al 2021). Changes in alcohol policies may, for instance, lead to reduced frequencies and raised intensity of alcohol consumption in certain subgroups. In a study conducted in Sweden, the tax increases appeared to reduce frequency but raise intensity of alcohol consumed, in particular, among binge drinkers (Heckley, Jarl, & Gerdtham 2017). Quantitative survey data need to serve the goals of understanding patterns in alcohol consumption in the local population, but also support implementation strategies such as education campaigns and improved training for professionals (see e.g. Doran et. al 2010; Meier, Warde & Holmes 2017; Warpenius & Mäkelä 2020).

The contexts for individuals' alcohol consumption and regional alcohol policies should be of particular interest in Åland, as the duty-free alcohol may contribute to opposing or competing interests among actors at the local level (for more, see Rossow & Baklien 2014). Furthermore, methodological solutions for taking the contextual factors into account may improve the understanding of patterns of alcohol consumption at the local level. The methodological solutions may include triangulation by using multiple datasets, methods and/or theories to address the contexts in alcohol consumption. For instance, triangulation of survey data with statistics that are relevant for alcohol consumption is needed (for more, see Rehm et. al 2020). Such triangulation may include statistical data on alcohol-related deaths, illnesses, and injuries, as well as statistics on alcohol-related crimes (for a meta-analysis on links between alcohol and violent behavior, see e.g. Duke et. al 2018). In particularly, the results of the previous studies have indicated that attitudes towards

alcohol use may be a stronger predictor of alcohol consumption and alcohol-related problems among the youth than the predominating norms in society (see DiBello et al. 2018; Dormal et. al 2018). Thus, measuring trends in the attitudes of population subgroups may be a central indicator for decisions and actions to be taken in local alcohol policies. In *Appendix 1*, we report the attitude questions in alcohol consumption surveys in Åland by estimation year.

Finally, to design and build a knowledge base for local alcohol policies, theories in alcohol research should be incorporated in studies aiming at explaining the associations between different indicators of alcohol consumption. In addition to a solid theoretical ground, alcohol research at the local level needs to effectively target strategies for implementation and for preventing alcohol-related harm (Norström & Ramstedt 2020). For evidence-based intervention strategies, it should be essential to acknowledge the central role of effective collaboration between researchers, authorities, health-care experts, and actors of civil society engaging in interventions. For instance, World Health Organization (WHO) has highlighted and proved evidence for the effectiveness of evidence-based actions to reduce alcohol-related harm, such as brief advice programmes and treatment programmes for alcohol use disorders (WHO, 2007; WHO, 2009).

In this overview, we have presented some actions that have been taken during the past decades when estimating alcohol consumption in the population studies in Åland. The methodological and contextual challenges of the estimation procedure have led to a continuous strive for improved measures enabling more accurate estimations on alcohol consumption, but, at the same time, potentially reducing comparability of the results over time. New methodological solutions, such as data retrieved from credit card or bank card payments, could arise as a solution for a more reliable estimation of alcohol consumption on the regional level. However, as the ultimate function of regional alcohol policies is to guide decisions influencing alcohol consumption at the local level (see also Holmes & Angus 2017; Pruce et al. 2020), the methods for measuring efficacy and effectiveness of these policies need to be developed (on regional studies, see Rossow & Baklien 2014; Treno, Marzell, Gruenewald & Holder 2014). Populations living in unique regional contexts may for various reasons consume alcohol in different patterns than what is suggested by the

national level indicators. Poorly fitting measures, and potentially even theories, may lead to an ineffective knowledge base for regional alcohol policies to rely on.

Numerous tools are needed for estimations on alcohol consumption at the regional level, which strongly emphasizes the need for regional statistics and research.

Likewise, this type of developmental issues highlights the need for bringing together Nordic statisticians and researcher to discuss and cooperate around future challenges that may be very distinctive.

List of references

Armor, DJ & Polich, MJ 1982. Measurement of alcohol consumption. In Pattison, E. M. and Kaufman, E. (eds.), *Encyclopedic Handbook of Alcoholism* (pp. 72–80). New York: Gardner Press.

Babor, TF & the Alcohol and Public Policy Group 2004. Alcohol policy and the public good: As simple as one, two, three? In R. Müller & H. Klingemann (eds.), *From Science to Action? 100 Years Later – Alcohol Policies Revisited* (pp. 29–47). Dordrecht: Kluwer Academic Publishers.

Boman, U, Engdahl, B, Gustafsson, NK, Selin, KH & Ramstedt, M 2006. *Alkoholkonsumtionen i Sverige fram till år 2005*. Stockholm: Stockholm University, Faculty of Social Sciences, Centre for Social Research on Alcohol and Drugs (SoRAD), Research report 39.

Bruun, K 1975. *Alcohol Control Policies in Public Health Perspective*, vol. 25. Helsinki: Finnish Foundation for Alcohol Studies.

Del Boca, FK & Darkes, J 2003. The validity of self-reports of alcohol consumption: state of the science and challenges ahead. *Addiction*, vol. 98, no. 2, pp. 1–12. doi.org/10.1046/j.1359-6357.2003.00586.x

DiBello, AM, Miller, MB, Neighbors, C, Reid, A & Carey, KB 2018. The relative strength of attitudes versus perceived drinking norms as predictors of alcohol use. *Addictive Behaviors*, 80, pp. 39–46. doi.org/10.1016/j.addbeh.2017.12.022

Doran, CM, Hall, WD, Shakeshaft, AP, Vos, T & Cobiac, L 2010. Alcohol policy reform in Australia: What can we learn from the evidence? *The Medical Journal of Australia*, vol. 192, no. 8, pp. 468–470. doi.org/10.5694/j.1326-5377.2010.tb03589.x

Dormal, V, Maurage, P, Lannoy, S & D'Hondt, F 2018. Positive attitude toward alcohol predicts actual consumption in young adults: An ecological implicit association test. *Journal of Studies on Alcohol and Drugs*, v. 79, no. 5, pp. 733–740. doi.org/10.15288/jsad.2018.79.733

Duke, AA, Smith, KMZ, Oberleitner, LMS, Westphal, A & McKee, SA. 2018. Alcohol, drugs, and violence: A meta-meta-analysis. *Psychology of Violence*, vol. 8, no. 2, pp. 238–249. doi.org/10.1037/vio0000106

Göransson, M & Hanson, BS 1994. How much can data on days with heavy drinking decrease the underestimation of true alcohol consumption? *Journal of Studies on Alcohol and Drugs*, vol. 55, no. 6, 695–700. doi.org/10.15288/jsa.1994.55.695

Heckley, G, Jarl, J & Gerdtham, UG 2017. Frequency and intensity of alcohol consumption: new evidence from Sweden. *The European Journal of Health Economics*, 18, pp. 495–517. doi.org/10.1007/s10198-016-0805-2

Hellman, M & Kettunen, T 2017. Nordic alcohol statistics 2010–2015. *Nordic Studies on Alcohol and Drugs*, vol. 34, no. 3, pp. 267–282.

Hogan, L, Patterson, CW & Cox, M 2020. Accurately estimating alcohol consumption: A comparison of self-administrated and interview methods. *Substance Use and Misuse*, vol. 55, no. 7, pp. 1184–1188. doi.org/10.1080/10826084.2020.1731544

Jordas, S & Lilja, J 2002. *Utvärdering av alkohol- och narkotikapolitiskt program för landskapet Åland 1996–2000*. Åländsk utredningsserie 2002:1. Ålands landskapsstyrelse [The Government of Åland].

Karlsson, T 1995. *Alkoholvanor på Åland*. Åländsk utredningsserie 1995:16. Ålands landskapsstyrelse [The government of Åland].

Karlsson, T 1999. A tax paradise in the making? Alcohol regulations in the Åland Islands. *Contemporary Drug Problems*, vol. 26, no. 1, pp. 3–30. doi.org/10.1177/009145099902600102

Lilja, J & Jordas, S 2006. *Undersökning om ålänningars alkohol- och narkotikabruk 2005*. Åländsk utredningsserie 2006:1. Ålands landskapsregering [The Government of Åland].

Meier, PS, Warde, A & Holmes, J 2017. All drinking is not equal: how a social practice theory lens could enhance public health research on alcohol and other health behaviours. *Addiction*, 113, pp. 206–213. doi.org/10.1111/add.13895

Midanik, L 1982. The validity of self-reported alcohol consumption and alcohol problems: A literature review. *British Journal of Addiction*, vol. 77, no. 4, pp. 357–382. doi.org/10.1111/j.1360-0443.1982.tb02469.x

Norström, T & Ramstedt, M 2005. Mortality and population drinking: A review of the literature. *Drug and Alcohol Review*, vol. 24, no. 6, pp. 537–547. doi.org/10.1080/09595230500293845

Nugawela, MD, Langley, T, Szatkowski, L & Lewis, S 2016. Measuring alcohol consumption in population surveys: A review of international guidelines and comparison with surveys in England. *Alcohol and Alcoholism*, vol. 51, no. 1, pp. 84–92. doi.org/10.1093/alcalc/agv073

Pettersson, B 1982. *Alkoholkonsumtionen på Åland 1980*. Mariehamn: Ålands nykterhetsförbund.

Poikolainen, K 2017. Does the tail wag the dog? Abstainers, alcohol dependence, heavy episodic drinkers and total alcohol consumption. *Alcohol and Alcoholism*, vol. 52, no. 1, pp. 80–83. doi.org/10.1093/alcalc/agw083

Pryce, R, Angus, C, Holmes, J, Gillespie, D, Buykx, P, Meier, P, Hickman, M, de Vocht, F & Brennan, A 2020. Reweighting national survey data for small area behaviour estimates: modelling alcohol consumption in Local Authorities in England. *Population Health Metrics*, vol. 18, no. 1. doi.org/10.1186/s12963-019-0201-0

Rehm, J, Kilian, C, Rovira, P, Shield, KD & Manthey, J 2020. The elusiveness of representativeness in general population surveys for alcohol. *Drug and Alcohol*, vol. 40, no. 2, pp. 161–165. doi.org/10.1111/dar.13148

Rossow, I 2019. The total consumption model applied to gambling: Empirical validity and implications for gambling policy. *Nordic Studies on Alcohol and Drugs*, vol. 36, no. 2, pp. 66–76. doi.org/10.1177/1455072518794016

Rossow, I & Baklien, B 2014. Alcohol policy making at the local level: Complex processes in multiple contexts. *Contemporary Drug Problems*, vol. 41, no. 4, pp. 507–521. doi.org/10.1177/0091450914567122

Rossow, I, Bye, EK, Moan, IS, Kilian, C & Bramness, JG 2021. Changes in alcohol consumption during the COVID-19 pandemic — Small change in total consumption,

but increase in proportion of heavy drinkers. *International Journal of Environmental Research and Public Health*, vol. 18, no. 4231. doi.org/10.3390/ijerph18084231

Single, E & Wortley, S 1994. A comparison of alternative measures of alcohol consumption in the Canadian national survey of alcohol and drug use. *Addiction*, vol. 89, no. 4, pp. 395–399. doi.org/10.1111/j.1360-0443.1994.tb00912.x

Sobell, MB & Sobell, LC 1995. Controlled drinking after 25 years: How important was the great debate? *Addiction*, vol. 90, no. 9, pp. 1149–1153. doi.org/10.1111/j.1360-0443.1995.tb01077.x

Sobell, LC & Sobell, MB 2003. Alcohol consumption measures. In John P. Allen & Veronica B. Wilson (eds.), *Assessing Alcohol Problems: A Guide for Clinicians and Researchers* (2nd ed., pp. 75–100). U.S. Department of Health and Human Services.

Spak, F & Blanck, P 2007. Implementing a national alcohol consumption prevention program at the local level: What does early evaluation tell us? *Substance Use and Misuse*, vol. 42, pp. 2063–2072. doi.org/10.1080/10826080701533450

Statistics and Research Åland 2011. Undersökning om ålänningars alkohol- och narkotikabruk samt spelvanor år 2011 (ÅSUB Rapport 2011:6). Retrieved from https://www.asub.ax/sites/www.asub.ax/files/reports/rapport_2011_6_0.pdf

Statistics and Research Åland 2016. Ålänningars alkohol-, narkotika- och tobaksbruk samt spelvanor 2016 (ÅSUB Rapport 2016:7). Retrieved from https://www.asub.ax/sites/www.asub.ax/files/reports/rapport_2016_7_0.pdf

Statistics and Research Åland 2019. Turismens samhällsekonomiska betydelse för Åland 2018 (ÅSUB Rapport 2019:2). Retrieved from https://www.asub.ax/sites/www.asub.ax/files/reports/turismrapport_2018.pdf

Statistics and Research Åland 2021. Ålänningars alkohol-, narkotika- och tobaksbruk samt spelvanor 2021 (ÅSUB Rapport 2021:4). Retrieved from https://www.asub.ax/sites/www.asub.ax/files/reports/andts_2021_10.6.2021.pdf

Stockwell, T, Donath, S, Cooper-Stanbury, M, Chikritzhs, T, Catalano, P & Mateo, C 2002. Under-reporting of alcohol consumption in household surveys: a comparison of quantity-frequency, graduated-frequency and recent recall. *Addiction*, vol. 99, pp. 1024–1033. doi.org/10.1111/j.1360-0443.2004.00815.x

Sulkunen, P., & Warsell, L. 2012. Universalism against particularism. Kettil Bruun and the ideological background of the Total Consumption Model. *Nordic Studies on Alcohol and Drugs*, vol. 29, no. 3, pp. 217–232,

Tigerstedt, C 1999. Alcohol policy, public health and Kettil Bruun. *Contemporary Drug Problems*, vol. 26, no. 2, pp. 209-235. doi.org/10.1177/009145099902600203

Treno, AJ, Marzell, M, Gruenewald, PJ & Holder, H 2014. A review of alcohol and other drug control policy research. *Alcohol and Drugs*, vol. 75, no. 17, pp. 98–107. doi.org/10.15288/jsads.2014.s17.98

Warpenius, K & Mäkelä, P 2020. The Finnish Drinking Habits Survey: Implications for alcohol policy and prevention. *Nordic Studies on Alcohol and Drugs*, vol. 37, no. 6, pp. 619–631. doi.org/10.1177/1455072520954328

WHO 2007. *Evidence-based strategies and interventions to reduce alcohol-related harm*. Sixtieth World Health Assembly, A60/14, World Health Organization.

WHO 2009. *Evidence for the effectiveness and cost-effectiveness of interventions to reduce alcohol-related harm*. WHO Regional Office for Europe, World Health Organization.

WHO 2021. *International guide for monitoring alcohol consumption and related harm*. Department of Mental Health and Substance Dependence, Noncommunicable Diseases and Mental Health Cluster, World Health Organization.

Wyllie, A, Zhang, JF & Casswell, S 1994. Comparison of six alcohol consumption measures from survey data. *Addiction*, vol. 89, pp. 425–430. doi.org/10.1111/j.1360-0443.1994.tb00917.x

Appendix 1

A selection of the attitude questions in alcohol consumption surveys in Åland, by estimation year

