



# Geographical distribution of alcohol-attributable mortality in Chile: A Bayesian spatial analysis



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## HIGHLIGHTS

- Small-area alcohol mortality can be estimated combining data and methodologies.
- Local policies should use small-area estimates to identify populations at risk.
- More than 90% of alcohol related deaths are not attributable solely to alcohol.
- We obtain stable local estimates, while including partially attributable causes.
- Municipalities with excess mortality risk were most common in south central regions.

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## ABSTRACT

**Objective:** To describe the distribution of alcohol-attributable mortality (AAM) at the local level (345 municipalities) in Chile, including fully and partially attributable causes in 2009.

**Methods:** AAM was estimated for the population 15 years of age and older using per capita alcohol consumption combined with survey estimates. The effect of alcohol on each cause of death was extracted from the published scientific literature. We used Bayesian hierarchical models to smooth the Standardized Mortality Ratio for each municipality for six groups of causes related to alcohol consumption (total, neuro-psychiatric, cardiovascular, cancer, injuries and other causes).

**Results:** The percentage of municipalities with high risk for any group of causes in each region ranges from 0% to 87.0%. Municipalities with high risk were concentrated in south-central and southern Chile for all groups of causes related to alcohol.

**Conclusions:** AAM risk shows marked geographic concentrations, mainly in south-central and southern regions of Chile. This combination of methods for small-area estimates of AAM is a powerful tool to identify high risk regions and associated factors, and may be used to inform local policies and programs.

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## 1. Introduction

The impact of alcohol consumption on health has been analyzed in different studies and contexts and is recognized as a global public health problem (Rehm et al., 2004). In Chile, the first study of burden of disease was published in 2008, showing the extent of the problem at the

national level (9.7% of all deaths were attributable to alcohol consumption in 2004) (Ministerio de Salud y Pontificia Universidad Católica de Chile, 2008). Recently, a new study estimated deaths due to alcohol in 2009 in the population aged 15 and over and found similar results (Castillo-Carniglia, Kaufman, & Pino, 2013). However, at present no studies have yet estimated the impact of alcohol across smaller geographic areas, such as regional or municipal levels. This makes it difficult to design policies with local approaches that take account of the particular expression of the problem, as has been highlighted in the National Strategy on Drug and Alcohol and the Chilean Alcohol Strategy (Ministerio de Salud, 2010; Servicio Nacional para la Prevención y Rehabilitación de Drogas y Alcohol, 2011).

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Chile is a developing country that in the last decades has experienced pronounced economic growth, with a current GDP per capita of around US\$15,000 (World Bank, 2011). The economy is based primarily on mining (mostly in the northern regions), forestry, agriculture and fisheries (OECD, 2012). Chile is also a producer of wine and pisco (a distilled spirit made from grapes that contains 35–42% alcohol) that together constitute a market of more than 2.5 billion US dollars annually (Oficina de Estudios y Políticas Agrarias, 2012).

Previous studies had shown that general and cause-specific mortality is not homogeneous across the country (Icaza, Núñez, Díaz, & Varela, 2006, 2013, Icaza, Nunez, Torres-Avilés, Díaz, & Varela, 2007, Icaza et al., 2013). The volume and patterns of alcohol consumption as well as its consequences are no exception, which make it necessary to identify regions and municipalities with excess risk to facilitate targeted policy formation. The presentation in maps of the spatial distribution of health and related indicators is useful for this purpose and to identify possible hypotheses to explain the varying incidence rates and for the broad dissemination of this information (Barceló et al., 2008). This approach has been applied extensively through the elaboration of mortality atlases for various causes and geographic areas with different sizes around the world (Casper et al., 2003; Ocaña-Riola et al., 2008). However, no previous studies in developing countries have examined the distribution of alcohol-attributable mortality at regional or municipal levels. Furthermore, of the studies in different parts of the world that have analyzed mortality attributable to alcohol, only a few included partially attributable causes (attributable fractions < 1) or cases in which alcohol explains only a fraction of the events, such as some types of cancer (New Mexico Department of Health, 2013; New South Wales Ministry of Health, 2013). The inclusion of partially attributable causes is of great importance since they represent, in some contexts, over 90% of all deaths due to alcohol (Castillo-Carniglia et al., 2013).

The objective of this study is to describe the distribution of alcohol-attributable mortality at the local level (345 municipalities), including fully and partially attributable causes, for the year 2009 in Chile.

## 2. Methods

### 2.1. Design and population

We conducted an ecological study analyzing mortality attributable to alcohol consumption at the municipal level in Chile. The population is people 15 years and older nationwide in 2009.

### 2.2. Sources of information

To estimate alcohol-attributable mortality, information was collected from the following sources:

- Global Information System on Alcohol and Health of the World Health Organization to determine the volume of alcohol per capita consumed in Chile. This was used as a benchmark to estimate the volume of alcohol by sex, age and region from the Eighth National General Population Drug Survey (Consejo Nacional para el Control de Estupefacientes, 2008).
- The effect of alcohol consumption (expressed as relative risks) for each cause of death related to alcohol consumption, drawn from different meta-analyses published in the scientific literature (see Additional File 1).
- Mortality statistics from the Ministry of Health of Chile of 2009 and corresponding codes from the 10th revision of the International Classification of Diseases (ICD-10) to identify the causes of alcohol-related deaths (see Additional File 1).

### 2.3. Estimation of alcohol-attributable mortality

The details of the estimated mortality attributable to alcohol have been described previously (Castillo-Carniglia et al., 2013). In short, to estimate alcohol consumption in the Chilean population we triangulated the volume of alcohol per capita consumption in Chile, estimated

**Table 1**  
Population, area, density and number of high-risk municipalities, by region of Chile <sup>a,b</sup>.

	Regional demographic information				High-risk municipalities by group of causes and region.						
	Population <sup>c</sup>	(Municipalities population range)	Area (Km <sup>2</sup> ) <sup>d</sup>	Density (Pop./km <sup>2</sup> )	Municipalities by region <sup>d</sup>	Total causes	Neuro-psychiatric	Cardiovascular	Cancer	Injuries	Other causes
Arica y Parinacota	186,147	(1,242–181,932)	16,873	11.0	4 (1.2)	0 (0.0)	1 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (25.0)
Tarapacá	307,426	(1,053–184,838)	42,225	7.3	7 (2.0)	0 (0.0)	1 (14.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (14.3)
Antofagasta	568,432	(251–360,743)	126,049	4.5	9 (2.6)	0 (0.0)	2 (22.2)	0 (0.0)	0 (0.0)	0 (0.0)	2 (22.2)
Atacama	278,515	(4,839–158,081)	75,176	3.7	9 (2.6)	2 (22.2)	2 (22.2)	2 (22.2)	0 (0.0)	3 (33.3)	2 (22.2)
Coquimbo	708,369	(3,923–206,094)	40,579	17.5	15 (4.3)	5 (33.3)	1 (6.7)	3 (20.0)	8 (53.3)	6 (40.0)	1 (6.7)
Valparaíso	1,739,876	(817–291,760)	16,396	28.6	38 (11.0)	1 (2.6)	9 (23.7)	14 (36.8)	1 (2.6)	2 (5.3)	2 (5.3)
Metropolitana	6,814,630	(4,636–770,290)	15,403	442.7	52 (15.1)	8 (15.4)	11 (21.2)	6 (11.5)	1 (1.9)	11 (21.2)	5 (9.6)
O'Higgins	874,806	(3,191–242,833)	16,387	130.6	33 (9.6)	4 (12.1)	12 (36.4)	1 (3.0)	0 (0.0)	2 (6.1)	6 (18.2)
Maule	999,685	(4,076–238,817)	30,296	33.0	30 (8.7)	9 (30.0)	8 (26.7)	0 (0.0)	1 (3.3)	14 (46.7)	4 (13.3)
Biobío	2,022,995	(3,503–227,768)	37,068	54.6	54 (15.7)	38 (70.4)	28 (51.9)	47 (87.0)	29 (53.7)	26 (48.1)	36 (66.7)
Araucanía	962,120	(5,449–298,376)	31,842	30.2	32 (9.3)	16 (50.0)	13 (40.6)	7 (21.9)	11 (34.4)	19 (59.4)	5 (15.6)
Los Ríos	378,193	(5,083–158,626)	18,429	20.5	12 (3.5)	2 (16.7)	3 (25.0)	0 (0.0)	0 (0.0)	6 (50.0)	1 (8.3)
Los Lagos	825,830	(1,665–230,885)	48,583	17.0	30 (8.7)	10 (33.3)	13 (43.3)	2 (6.7)	1 (3.3)	15 (50.0)	1 (3.3)
Aisén	103,738	(610–57,349)	108,494	1.0	10 (2.9)	4 (40.0)	1 (10.0)	0 (0.0)	1 (10.0)	5 (50.0)	2 (20.0)
Magallanes	158,016	(365–124,624)	132,297	1.2	10 (2.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (10.0)
Country total	16,928,778	(251–770,290)	756,102	22.4	345 (100)	99 (28.7)	105 (30.4)	82 (23.8)	53 (15.4)	109 (31.6)	70 (20.3)
Population in low risk areas <sup>e</sup>						3,596,333	7,519,105	6,641,706	3,001,721	3,056,056	4,630,565
Populación in high risk areas <sup>f</sup>						2,154,122	2,983,107	2,826,963	1,921,704	2,239,115	2,718,288

<sup>a</sup> Ordered from north to south, according to the political-administrative division of 2009.

<sup>b</sup> Number of municipalities with RME > 1.3 by region. The percentage is relative to number of municipalities by region.

<sup>c</sup> Population estimated by the National Statistical Institute (INE) using 2002 Census records.

<sup>d</sup> Excludes overseas islands and Chilean Antarctic Territory.

<sup>e</sup> Population of 15 years of age and over (Chile = 13,066,156) living in municipalities with low risk (Standardized Mortality Ratio < 0.71) of alcohol attributable mortality.

<sup>f</sup> Population of 15 years of age and over (Chile = 13,066,156) living in municipalities with high risk (Standardized Mortality Ratio > 1.30) of alcohol attributable mortality.

using economic records of alcohol industry (production, import, export) plus an unrecorded percentage (i.e. home-made or smuggled alcohol) (World Health Organization, 2011) with the regional, sex and age group distribution of consumption observed in the Eighth National General Population Drug Survey. This is a three-stage randomly sampled study (n = 12,757 complete responses to the alcohol section), designed to be representative of the urban population at the national and regional levels, with face-to-face in-home interviews. The overall response rate was 77%. Methodological details of the survey can be found elsewhere (Consejo Nacional para el Control de Estupefacientes, 2008).

Then we modeled consumption levels for each region, sex and age group (15–29; 30–44; 45–59 and 60+ years) using the methodology proposed by Rehm et al. which assumes that the volume of consumption in a population follows a Gamma distribution (Kehoe, Gmel, Shield, Gmel, & Rehm, 2012; Rehm et al., 2010). To model these distributions we considered the percentage of abstainers and the triangulated average consumption for each category in question, estimating the standard deviation (needed to estimate each Gamma distribution) for men and women through the equation  $\sigma_{men} = 1.171 \times \mu_{men}$  and  $\sigma_{women} = 1.258 \times \mu_{women}$ .

We use Levin's formula to estimate the attributable fractions, which combine the regional alcohol prevalence (see Additional File 2) with the relative risk for each cause of death, sex and level of exposure reported in recent meta-analyses (see Additional File 1). With this information we estimate the alcohol-attributable fraction for each cause of death in each region, sex and age category, which was subsequently multiplied by the total number of deaths related to alcohol consumption

observed in each municipality in Chile to obtain the number of deaths attributable to alcohol in each of these territorial units.

Once we estimate the observed number of deaths at the municipal level ( $O_i$ ) we estimated the expected number of death in the same geographical unit ( $E_i$ ) through the indirect method of standardization, taking into consideration the sex and age (four age groups) distribution of the population, to then obtain the Standardized Mortality Ratio ( $SMR_i = O_i/E_i$ ).

Five groups of causes of death were generated for the presentation of the results, plus the group of all causes combined. We defined these groups taking into consideration the type of causes related to alcohol consumption, the number of observed deaths in each group by municipality (to avoid an excess of zero counts), and the number of these groups (to produce readable maps).

2.4. Smoothing the standardized mortality ratio

Mortality estimates in small geographic units or with low population are inherently imprecise (Barceló et al., 2008) and require consideration of the spatial dependence or autocorrelation of the geographical units for unbiased estimation.

In response to these problems we used Bayesian hierarchical models to smooth the SMR (Barceló et al., 2008; Torres-Avilés, Carrasco, Icaza, & Perez-Bravo, 2010) assuming that the observed number of deaths in each municipality ( $i = 1 \dots 345$ ) follows a Poisson distribution with mean  $\mu_i$ , where  $\mu_i = E_i \theta_i$ ,  $E_i$  is the expected number of deaths, and  $\theta_i$  the relative risk in the same geographical unit.

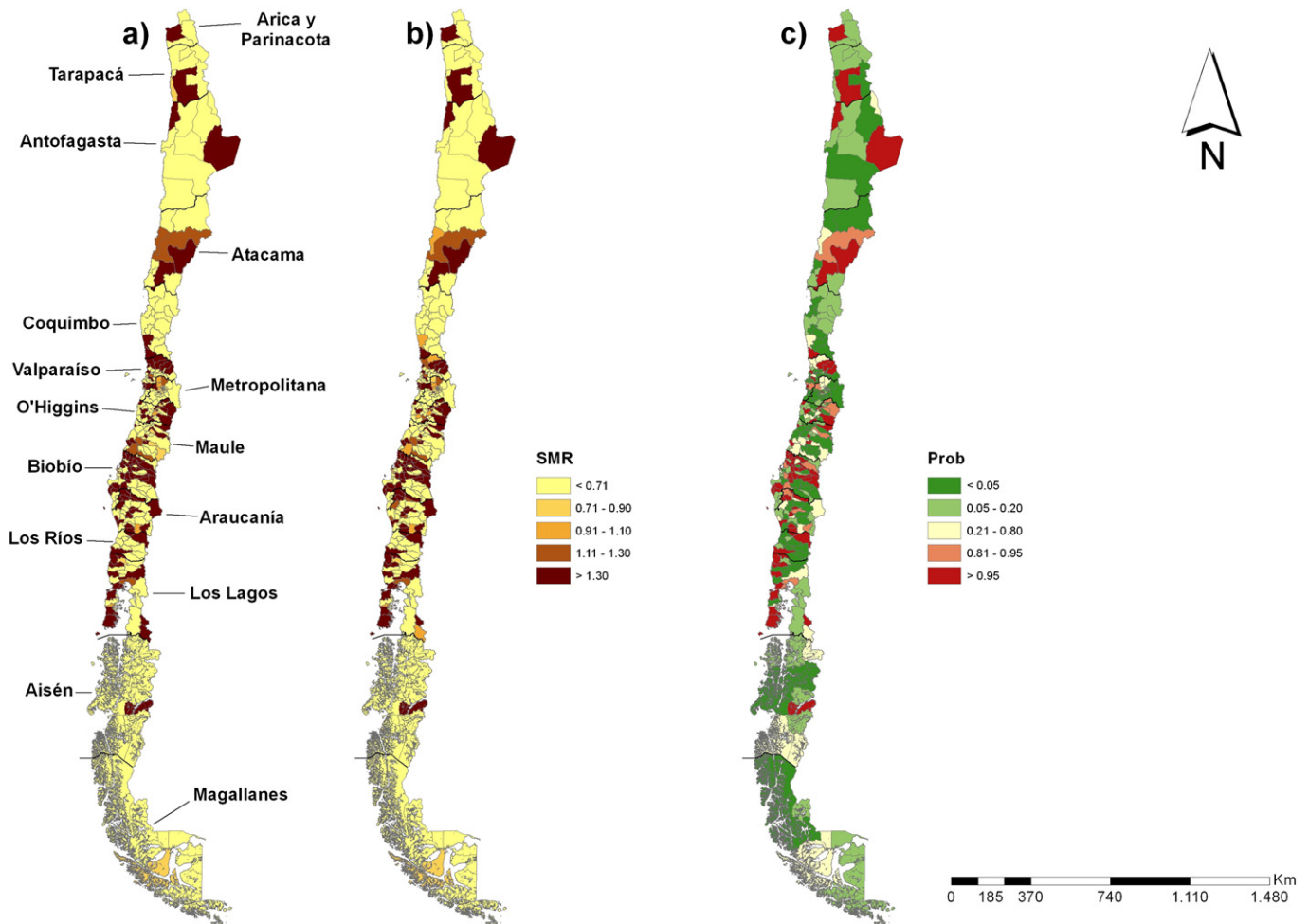


Fig. 1. Standardized Mortality Ratio (SMR) (a) crude and (b) smoothed from neuropsychiatric deaths attributable to alcohol consumption at the municipal level and (c) probability of SMR > 1, Chile, 2009.

To account for the clustering of deaths, the autocorrelation of geographical units and the possibility of overdispersion in the Poisson model (Clayton, Bernardinelli, & Montomoli, 1993; Lawson, Browne, & Vidal Rodeiro, 2003), we follow methods proposed by Besag, York and Mollie (BYM) (Besag, York, & Mollié, 1991; Lawson et al., 2003). The BYM (see Additional File 3) model includes two random effects, one to consider clustering of the deaths within a defined area ( $v_i$ ) and the other one being an unstructured effect which takes into account the heterogeneity between these territorial units ( $u_i$ ) (Lawson, 2008).

The model used was  $\theta_i = \exp(\beta_0 + v_i + u_i)$  where  $\theta_i$  is the Standardized Mortality Ratio (SMR) (which can be interpreted as a relative risk taking the national average level of risk as the reference),  $\beta_0$  is the model intercept with a non-informative prior,  $v_i$  are the structured random effects that assume a normal distribution with variance  $\sigma^2_v$  and  $u_i$  are random effects that capture the spatial autocorrelation between municipalities in a Gaussian CAR model with variance  $\sigma^2_u$  (Clayton et al., 1993).

We used the Deviance Information Criterion (DIC) to analyze the contribution of spatial effects in the estimation of SMR (Spiegelhalter, Best, Carlin, & Van der Linde, 2002a). The models that include the spatial term had on average about 60 points lower DIC score compared to the models that did not include the random term, which supports the decision to include the random spatial effects in our models. Also, three distributions were analyzed as a sensitivity analyses for the hyperparameters  $\sigma^2_u$  and  $\sigma^2_v$  (Gamma [0.5, 0.0005], Gamma [0.001, 0.001] and Gamma [10, 0.35]) and we found no difference in the results

or the performance of the models (see Additional File 4). Therefore, a Gamma distribution (0.5, 0.0005) was selected, which provides a plausible range for the relative risks and is considered a more conservative distribution for this kind of analysis (Bernardinelli, Clayton, & Montomoli, 1995; Pascutto et al., 2000).

The estimates were obtained through Markov Chain Monte Carlo simulation (MCMC) using the WinBUGS program, Version 1.4.3 (Spiegelhalter, Thomas, Best, & Lunn, 2002b). We ran two independent chains with different initial values and 125,000 replications, discarding the first 25,000 as burn-in and saving 1 out of 10. Convergence checking was assessed graphically through trace plots and Brooks and Gelman plots (Lawson et al., 2003).

For risk categories, we defined ranges used in previous studies, one of them conducted in Chile, which used a Receiver Operating Characteristic (ROC) analysis to identify municipalities with SMRs significantly below and above 1 (Icaza et al., 2007). For the probability that the SMR is greater than 1 we defined ranges discussed by Richardson, Thomson, Best, and Elliott (2004) where a posterior probability cut-point above 0.8 identifies with adequate sensitivity and specificity the municipalities at elevated risk and 0.95 for the municipalities with significant excess mortality.

To estimate deaths and for management of data we used Stata 13.0 software (College Station, TX). For the presentation of the results in maps we use ArcGis 10 (ESRI, Redlands, CA) with the Chilean shape upgraded by the Ministry of Social Development and adapted by Icaza et al. (2013).

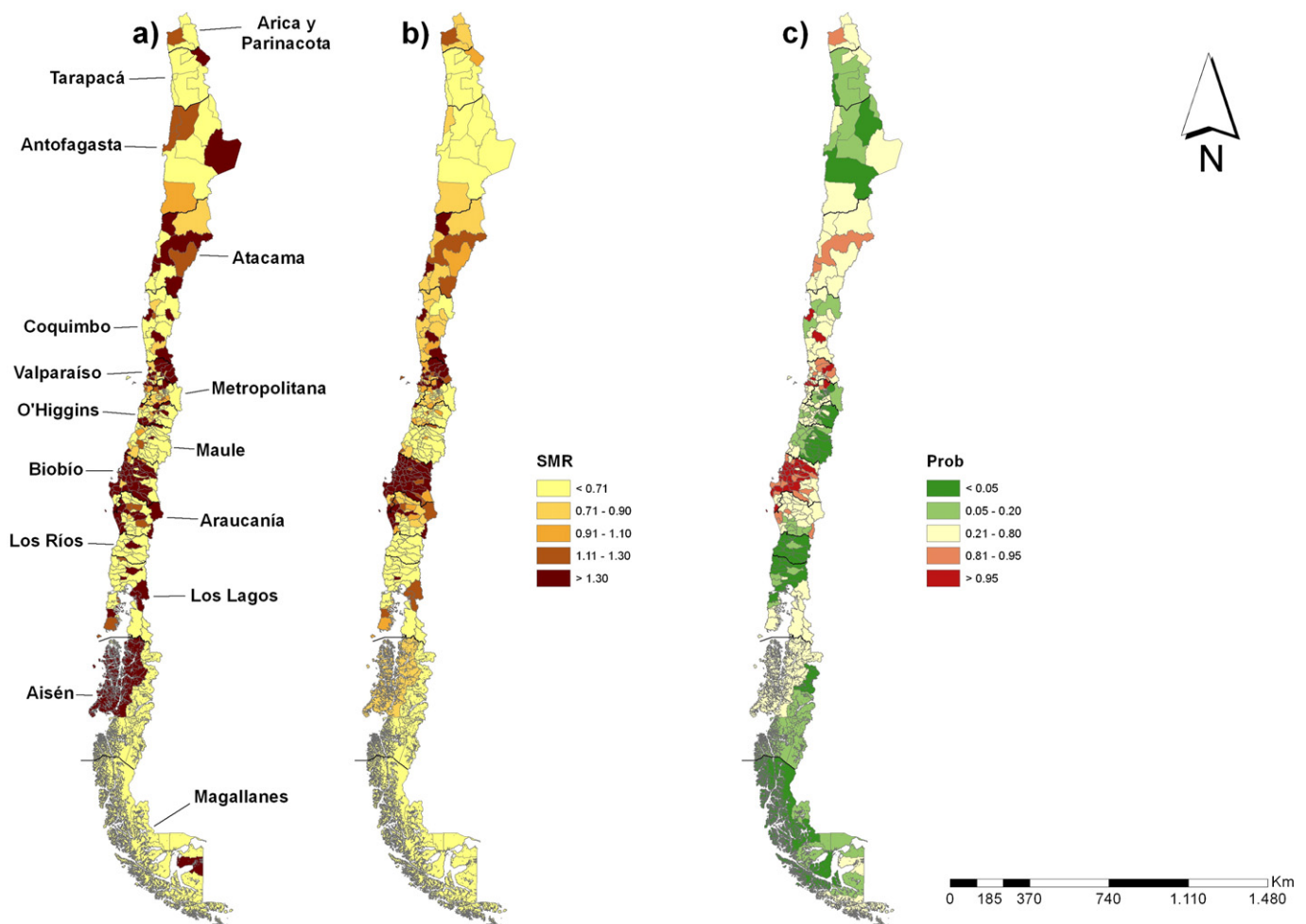


Fig. 2. Standardized Mortality Ratio (SMR) (a) crude and (b) smoothed from cardiovascular causes attributable to alcohol consumption at the municipal level and (c) probability of SMR > 1, Chile, 2009.

**3. Results**

Population, area, density of population, number of municipalities and the number of municipalities with increased risk for each of the 15 regions in Chile are described in Table 1. The Metropolitan region has the greatest number of people, mostly concentrated in the city of Santiago, which is the national capital. This is followed by the Biobío and Valparaíso regions, with about 2 million and 1.7 million people, respectively. The two most southern regions (Aisén and Magallanes) have the fewest inhabitants despite covering a large geographical area. The greatest density of population is found mainly in the metropolitan area and the region of Valparaíso (central Chile). The last six columns of the table show the number and percentage of municipalities per region which have an increased risk (SMR > 1.3), in relation to the country as a whole. Biobío has the largest percentage of municipalities with elevated risk for all mortality categories analyzed, followed by Araucanía, Los Lagos, and Aisén for neuropsychiatric causes and injuries.

The last two rows of Table 1 present the population of 15 years of age and over living in municipalities with low and high risk of alcohol-attributable mortality. The population living in low risk municipalities represents between 23 and 57.5% of the total population of that age range in Chile (13,066,156 inhabitants), whereas the population living in high risk municipalities of the same age range accounts between 14.7 and 22.8%.

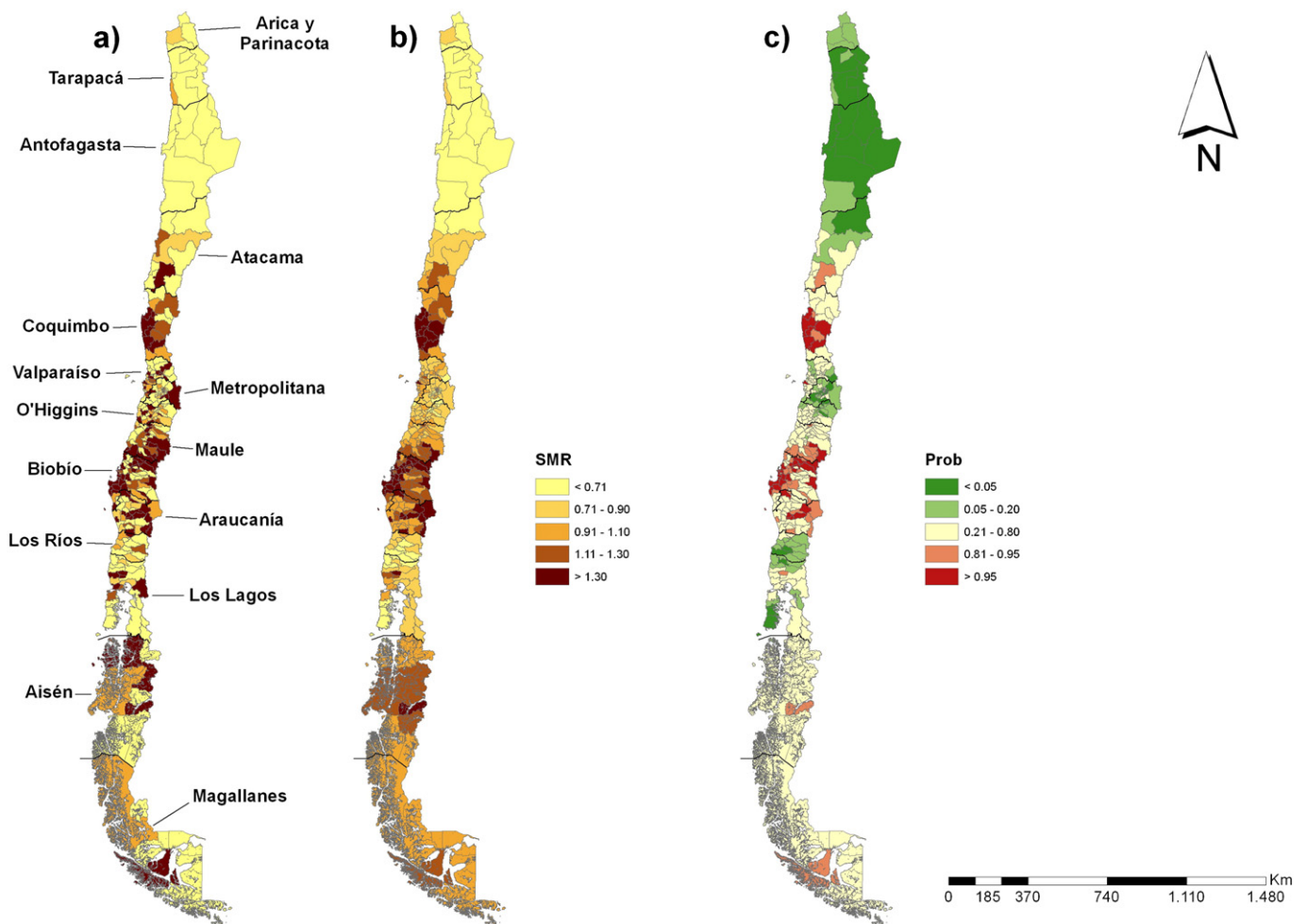
Maps showing the geographic distribution of the raw and smoothed SMR and the probability that the SMR is greater than one are presented

in Figs. 1 to 6. Additional maps showing the geographic distribution of the residuals are presented as a supplementary. The south central and southern regions of Chile (Biobío, Araucanía and Los Lagos) contain the largest percentages of municipalities with excess risk for almost all groups of causes of death. The greatest concentration of high-risk municipalities (47 of 54 municipalities; 87%) was observed for the cardiovascular group in the Biobío region (see map b of Fig. 2), while the largest dispersion was observed for the group of injuries and neuropsychiatric disorders (Figs. 1 and 4).

**4. Discussion**

In the present study we disaggregate the mortality attributable to alcohol in small areas combining different methodologies and sources of information. The results demonstrate that even when including partially attributable causes it is possible to obtain stable estimates that reveal the heterogeneity of alcohol-related harm at the local level.

In Chile, alcohol consumption is a major cause of preventable deaths. According to a previous report, 1 of every 10 deaths in 2009 was attributable to alcohol, 3.7% of these corresponding to neuropsychiatric causes, 13.8% to the cardiovascular group, 5.9% to cancers, 52.8% to injuries and 23.8% to the other causes related to alcohol consumption from which liver cirrhosis represents 84% of the group total (Castillo-Carniglia et al., 2013). The particular disaggregation of these results is part of efforts to generate indicators to target interventions and resources in areas with poorer health indicators. Previously, only a few



**Fig. 3.** Standardized Mortality Ratio (SMR) (a) crude and (b) smoothed from the group of cancer attributable to alcohol consumption at the municipal level and (c) probability of SMR > 1, Chile, 2009.

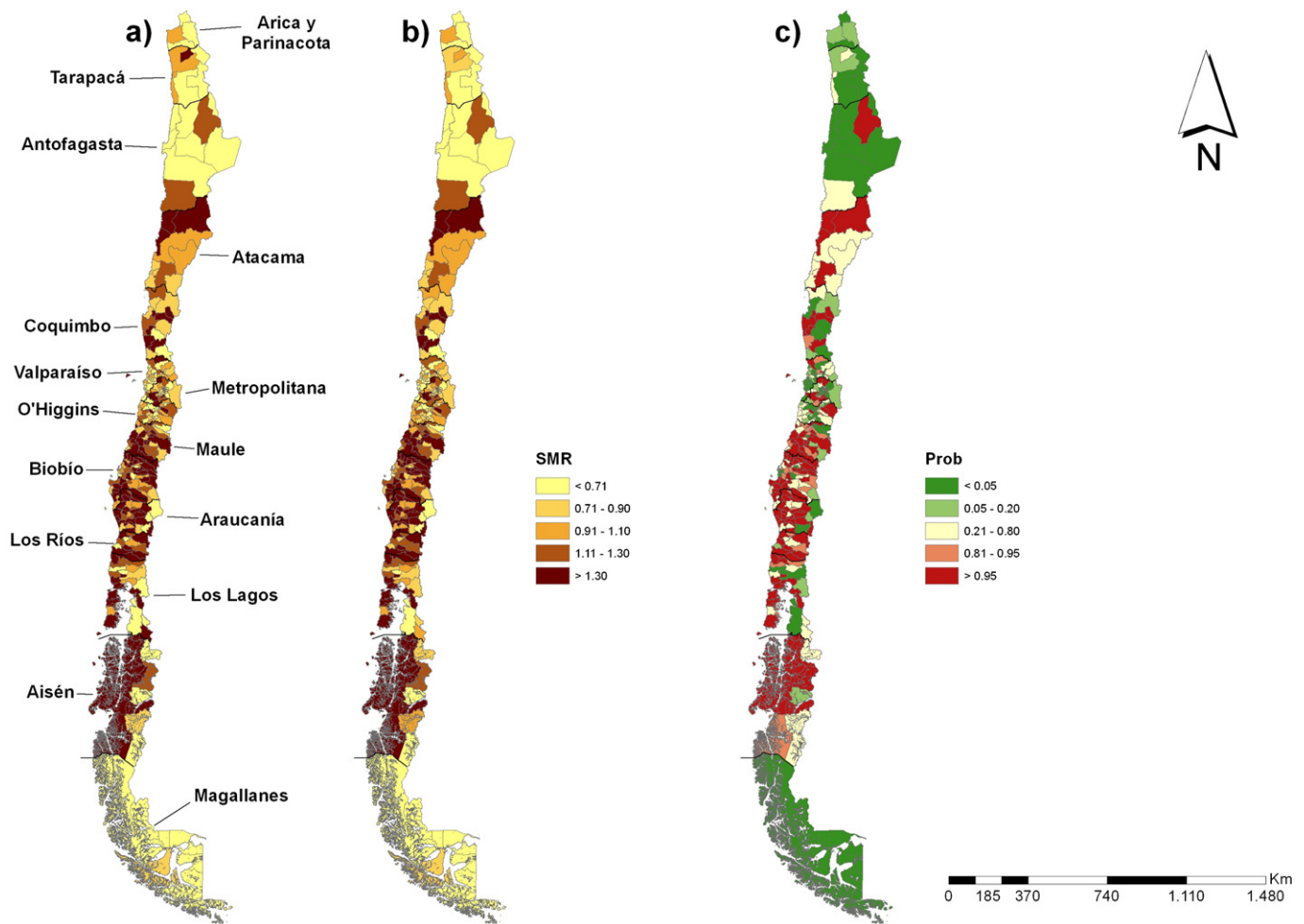


Fig. 4. Standardized Mortality Ratio (SMR) (a) crude and (b) smoothed from injuries attributable to alcohol consumption at the municipal level and (c) probability of SMR > 1, Chile, 2009.

studies had described the spatial distribution of alcohol attributable mortality while also including deaths from causes that are partially attributable, but none of these previous studies have local or regional estimates of alcohol-attributable fractions that consider different alcohol prevalence (New Mexico Department of Health, 2013; New South Wales Ministry of Health, 2013).

Our results show that south-central and southern Chile are the zones with greatest proportion of municipalities with high risk for all groups of causes (Biobío and Araucanía regions together account for approximately 17.5% of the Chilean population (Instituto Nacional de Estadísticas, 2010)). According to available data on alcohol consumption in Chile, there is no evidence that people in regions with excess risk consume a greater volume of alcohol compared with other regions of the country, or that they have higher prevalence of risky or abusive alcohol consumption (Servicio Nacional para la Prevención y Rehabilitación del Consumo de Drogas y Alcohol, 2012). These results confirm the need for further studies to analyze other hypotheses, such as high consumption of home-made or illegal alcohol (i.e. south-center Chile is a wine producing zone), poor response of health services to provide treatment for diseases related to alcohol consumption or concentration of individual and contextual factors associated with morbidity and mortality related to alcohol.

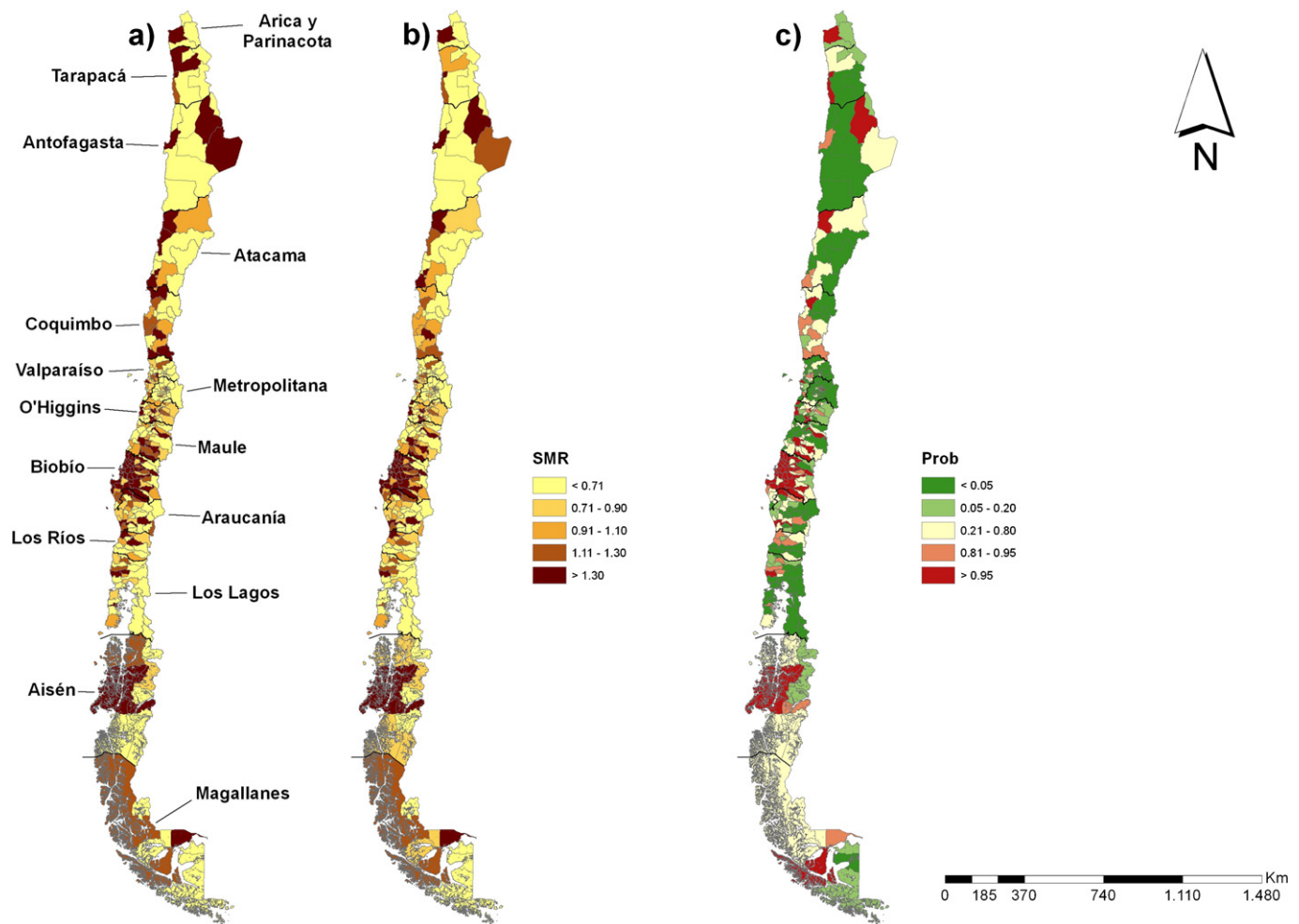
Overall, alcohol use disorders and alcohol effects are the result from a broad range of complex interactions, which include genetic, behavioral, social and environmental factors (Kendler, Prescott, Myers, & Neale, 2003). Thus, interventions that are undertaken to prevent and reduce

alcohol-related harm should be done at different levels taking into account the information and evidence available in Chile and the rest of the world.

One of the advantages of having local estimates in the form of maps is that it is a powerful tool to communicate the results to less specialized audiences and to administrative authorities. Even though Chile is not a federal country in which regions generate their own laws, policies and programs can consider the social, economic and epidemiological diversity at the local or regional level. In addition, local governments have within their powers the ability to implement effective actions to reduce alcohol consumption and its consequences, such as restricting hours of sale or granting patents for alcohol sale.

It is important to highlight the fact that smoothing of the SMR did not change substantially the distribution of the crude risks, except for cardiovascular and cancer group, even though municipalities with zero observed cases or very high risk (mostly rural municipalities with low population) had a greater degree of smoothing (see Additional File 3). This suggests that the data likelihood dominated in the estimation of the posterior distribution in each of the Bayesian hierarchical models.

Recently there have been some criticisms regarding the use of spatial models in the description and analysis of deaths in small areas. Among the questions raised are the overvaluing of the geographic effect (in this case of the municipalities), which may result in excessive smoothing, especially when one has very small areas or a small number of cases (Merlo et al., 2013). However, as already mentioned, the



**Fig. 5.** Standardized Mortality Ratio (SMR) (a) crude and (b) smoothed from other causes of death attributable to alcohol consumption at the municipal level and (c) probability of SMR > 1, Chile, 2009.

smoothing produced by spatial models did not substantially change our results, which is consistent with some previous studies that have studied the performance of spatial models (Richardson et al., 2004).

One of the limitations of the present study is that we could not estimate an attributable fraction for each municipality since there is no representative exposure data at this level. The best alternative was to estimate attributable fractions at the regional level as a way to take advantage of the greater variability possible with the available outcome data. Another limitation is related to the effect of alcohol on each cause of death included. In the present study the effects of alcohol consumption were derived from meta-analyses that considered studies mainly from North American and European countries, so they may not account for the possible cultural or genetic particularities of the Chilean population. Also, the effects of alcohol consumption were assumed to be exchangeable for all regions, differing only in the prevalence of alcohol exposure. This is relevant as it could be that there exist some national or regional differences in the effects of alcohol, particularly in the acute causes of death that are more sensitive to local prevention policies.

As mentioned above, with the information currently available we cannot distinguish the volume of alcohol consumed by type or quality of alcohol or reliably estimate the proportion of alcohol consumed outside the formal production and distribution system, which could be explaining part of the observed differences at regional and municipal

levels. The aggregation of causes into six groups could distort the cause-specific spatial distribution, even considering that each cause has its own regional attributable fraction.

Finally, all demographic and vital statistics have potential registration errors, although Chile is well-known to have high quality vital surveillance, with more than 99% of deaths registered and only about 3% of these assigned poorly defined causes (Danel & Bortman, 2008; Mahapatra et al., 2007). There may also be some bias associated with one of two sources of geographic misclassification: (1) the registration of the municipality of occurrence of death instead of the municipality of usual residence; (2) migration of chronic disease patients and older individuals from communities that do not have adequate health care services towards larger municipalities with more complex health services (Icaza et al., 2013).

### 5. Conclusions

The regions of south-central and southern Chile had a higher proportion of high-risk municipalities for all groups of causes of death related to alcohol consumption. Locally oriented policies should use small-area estimates such as these to identify high risk populations in order to facilitate decision making and resource allocation. The factors that explain this excess risk should be analyzed in other studies including designs and methodologies that identify risk factors at the individual and

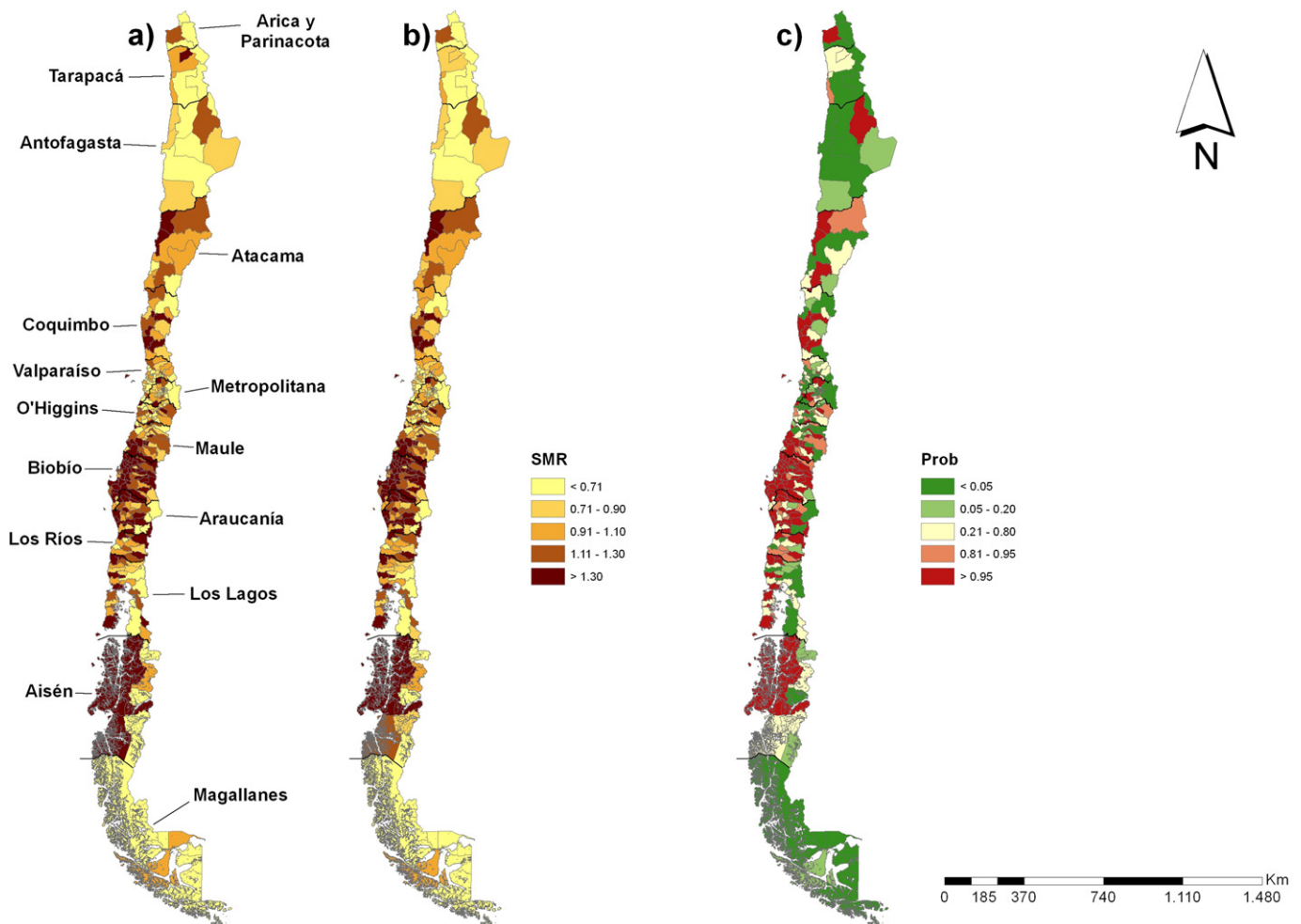


Fig. 6. Standardized Mortality Ratio (SMR) (a) crude and (b) smoothed from all causes attributable to alcohol consumption at the municipal level and (c) probability of SMR > 1, Chile, 2009.

contextual levels and that enable the design and implementation of future prevention programs.

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#### Contributors

ACC, JSK and PP were involved in the design, interpretation of results, and final revision of the article. ACC performed the data analysis and wrote the initial draft of the manuscript.

#### Conflicts of interest

No conflict declared.

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#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.addbeh.2014.11.025>.

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