RISK OF DYING OF CANCER IN THE VICINITY OF MULTIPLE POLLUTANT SOURCES ASSOCIATED WITH THE METAL INDUSTRY

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Risk of dying of cancer in the vicinity of multiple pollutant sources associated with the metal industry

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Abbreviations:

MWFS: Metalworking fluids

SMR: Standardized Mortality Ratio

ICD: International Classification of Diseases

EPER: European Pollutant Emission Register

IPPC: Integrated Pollution Prevention and Control

RR: Relative risk

95% CI: 95% confidence interval

p trend: *p*-value for trend

PAHs: Polycyclic aromatic hydrocarbons

IARC: International Agency for Research on Cancer

E-PRTR: European Pollutant Release and Transfer Register

Abstract

Background: Population exposure to emissions from multiple industrial sources, though little studied, is an aspect of great interest from an epidemiologic standpoint.
Objectives: To investigate whether risk of dying due to tumors of the digestive system in populations residing in the vicinity of Spanish metal production and processing installations increases with proximity to a greater number of industrial facilities.
Methods: An ecologic study was designed to ascertain municipal mortality due to malignant tumors of the digestive system (oral cavity and pharynx, esophagus, stomach, pancreas, liver, gallbladder and colon-rectum) during the period 1994-2003, in Spanish regions with the presence of multiple industrial sources in the metal sector. Population exposure to pollution was estimated on the basis of distance from town of residence to pollution source. Using Poisson regression models, we analyzed: the increased risk of dying of cancer with proximity to a given number of sources; and excess mortality in the vicinity of specific industrial clusters.
Results: The tumor responsible for the greatest number of regions with increased risk in both sexes was liver cancer (78% of the regions, being statistically significant in Valencia (*p*-value for trend (*p* trend) = 0.001 in both sexes), Madrid (*p* trend = 0.011 in women) and the Basque Country (*p* trend = 0.002 in men)), followed by colorectal and pancreatic cancers (56% of the regions, being statistically significant in both sexes in Valencia (*p* trend = 0.001) and Zaragoza (*p* trend = 0.018) for colorectal cancer; and Valladolid (*p* trend = 0.019 in men) and Barcelona (*p* trend = 0.049 in women) for pancreatic cancer). Valencia was the province that displayed increased risk with the proximity to metal industries for all tumors studied, while the Basque Country was the Autonomous Region that registered a rising risk trend for liver, stomach and colorectal tumors with proximity (≤ 5 km) to a greater number of sources.
Conclusions: The results could support the hypothesis that mortality due to certain tumors of the digestive system increases with proximity (≤ 5 km) to a greater number of metal industry sources. Nevertheless, in this type of ecologic study, conclusions cannot be obtained in terms of cause and effect, nor can individual inferences be made from grouped data.

Key Words: digestive tumors, colorectal cancer, liver cancer, metallurgical installations, multiple sources, industrial pollution.

1. Introduction

Residential proximity to industries that release pollution to air and water is a source of exposure to a high number of toxic substances. In recent years, many studies have been published that have linked such emissions to health problems, such as respiratory (Casella et al., 2005; Dubnov et al., 2007; Lopez et al., 2005; Peled et al., 2005) and cardiovascular disorders (Venners et al., 2003), complications in pregnancy (Brender et al., 2008; Suarez et al., 2007; Tang et al., 2008; Yang et al., 2004) and premature mortality (Hermann et al., 2004; Sarov et al., 2008), among populations residing in the vicinity of these installations. Insofar as cancer is concerned, a number of authors have described associations between certain tumors and proximity to industrial complexes (Casella et al., 2005; Garcia-Perez et al., 2009; Garcia-Perez et al., 2010a; Musti et al., 2009; Parodi et al., 2005; Ramis et al., 2009; Tsai et al., 2009; Viel et al., 2008).

When it comes to assessing public health risks stemming from exposure to industrial pollution, a common choice is to use distance from town or site of residence to pollution source as a proxy of exposure (Biggeri et al., 1996; De Roos et al., 2010; Garcia-Perez et al., 2009; Huang and Batterman, 2000; Johnson et al., 2003; Parodi et al., 2005; Verkasalo et al., 2004). Industries frequently form industrial clusters, with the result that independent analysis of each source fails to give a realistic picture of the possible risk to which the population is exposed. Yet, assessment of whether there is a greater risk in areas with multiple industrial sources than in those with only a single industrial facility continues to be a little studied aspect, in view of the additional analytical complexity posed by this factor. Metal production and processing installations are a clear example of industrial activities which often tend to be concentrated in large industrial areas, as occurs in certain parts of Spain. These types of industries emit a great amount of known or suspected carcinogens (arsenic, cadmium, chromium, tetrachloroethylene, lead and nickel) into the environment. Moreover, many of these facilities use metalworking fluids (MWFs) to cool and lubricate metalworking processes. There is reliable epidemiologic evidence of this chemical substance's carcinogenicity in humans (Savitz, 2003) being related, among other things, with certain tumor sites in the digestive system (esophagus, stomach, colon, rectum, and pancreas) (Canadian Centre for Occupational Health and Safety, 2005).

Hence, the aims of this study were: a) to ascertain whether risk of dying due to malignant tumors of the digestive system (buccal cavity and pharynx, esophagus, stomach, pancreas, liver, gallbladder, and colon-rectum) in populations residing in the vicinity of Spanish metal production and processing installations increased with proximity to a greater number of industrial sources; and, b) to study excess mortality in the environs of specific industrial clusters.

2. Materials and methods

We designed an ecologic study that modeled the standardized mortality ratio (SMR) for tumors of the digestive system at a municipal level in Spanish regions with presence of multiple metal sources and sufficient variability in the data to undertake the study (at least, there are two categories in the proximity areas with the aim of carrying out comparisons between them/ i.e., at least two categories in the proximity areas to allow for comparisons), for the period 1994-2003. "Multiple source" was defined as any group (cluster) of at least 2 sources within a radius of 5 kilometers of a town's municipal centroid. In Spain, municipal centroids are computed by taking only the inhabited area of the designated town into account, and are situated in the center of the most populous zone where the town hall and the main church tend to be located. The regions studied were the provinces of Asturias, Zaragoza, Valencia, Seville, Madrid, Cantabria, Barcelona, Valladolid, and the Autonomous Region of the Basque Country (provinces of Vizcaya, Guipuzcoa and Alava). Analyses were performed for the population, both overall and by sex.

2.1 Mortality data:

SMRs were calculated as the ratio of observed to expected deaths. Observed municipal mortality data were drawn from the records of the National Statistics Institute (*Instituto Nacional de Estadística*) for the study period, and corresponded to deaths coded as: malignant neoplasm of lip, oral cavity, and pharynx – codes 140-149 (International Classification of Diseases, 9th Revision/ICD-9) and C00-C14 (ICD-10); malignant neoplasm of esophagus – codes 150 (ICD-9) and C15 (ICD-10); malignant neoplasm of stomach – codes 151 (ICD-9) and C16 (ICD-10); malignant neoplasm of pancreas – codes 157 (ICD-9) and C25 (ICD-10); malignant neoplasm of primary liver – codes 155.0 (ICD-9) and C22.0 (ICD-10); malignant neoplasm of gallbladder and extrahepatic bile ducts – codes 156 (ICD-9) and C23-C24 (ICD-10); and malignant neoplasm of colon, rectum, and anus – codes 153-154,159.0 (ICD-9) and C18-C21, C26.0 (ICD-10). Municipal populations, broken down by sex and age group (18 groups: 0 – 4, 5 – 9, …, 80 – 84 years, and 85 years and over), were used to calculate expected deaths. These populations were obtained from the 1996 municipal electoral roll and 2001 census, which respectively corresponded to the mid-point of the two five-year periods included in the study (1994–1998, 1999–2003). Person-years for each quinquennium were calculated by multiplying the respective populations (with data corresponding to 1996 for the 1994–1998 quinquennium and 2001 for the 1999–2003 quinquennium being taken as the estimator of the population) by 5. Expected deaths were calculated by taking the specific mortality rates for Spain as a whole, broken down by age group, sex and five-year period, and multiplying these by the person-years for each town, broken down for the same strata.

2.2 Industrial pollution exposure data:

Population exposure to industrial pollution was estimated by taking the distance from the centroid of town of residence to the pollution source as reference (using a purpose-designed distance matrix between all industrial installations and towns). Data on industries were obtained from the European Pollutant Emission Register (EPER) (EPER, 2009), a public inventory of industries set up by the European Commission under the terms of Directive 96/61/EC. For the geographic areas studied, we selected the 83 Integrated Pollution Prevention and Control (IPPC) category-2 metal production and processing installations that went into operation prior to 1990 (to take the minimum induction periods of the tumors under study into account, generally 10 years in solid tumors (Armenian and Lilienfeld, 1974)) and reported their emissions to air and water in 2001, along with the previously validated geographic coordinates of their respective locations (Garcia-Perez et al., 2008). These installations included: production of pig iron or steel (16 installations) – category 2.2; hot-rolling mills (steel) (3 installations) – category 2.3.a; galvanizing (2 installations) – category 2.3.c; ferrous metal foundries (15 installations) – category 2.4; production of non-ferrous crude metals (2 installations) – category 2.5.a; smelting of non-ferrous metals (9 installations) – category 2.5.b; and surface treatment of metals and plastic materials using and electrolytic or chemical process (36 installations) – category 2.6. Data on the date of commencement of industrial activity were obtained from the official websites of the metal production companies themselves and the GoogleMaps server (Google Maps España, 2011).

2.3 Statistical analysis:

In a first phase, we performed an initial, exploratory "near vs. far" analysis to estimate the relative risks (RRs) of towns according to their exposure (proximity) to a given number of metal industry pollutant sources, with province as the geographic unit of analysis (except for the Basque Country, where the autonomous region was studied as a whole), and industrial clusters and isolated installations in each region taken into account. A 5-kilometer radius was arbitrarily selected for the proximity area (the range of distances used in point sources studies vary from 0.5 km to 10 km (Benedetti et al., 2001; Brown et al., 1984; Kibble and Harrison, 2005)). For analysis purposes, log-linear models were fitted on the assumption that the number of deaths per stratum followed a Poisson distribution. The RRs and their 95% confidence intervals (95% CIs) were estimated by means of a Poisson regression model proposed by Breslow and Day (Breslow and Day, 1987), using the following formula

$Obs_i \sim Poisson(\mu_i)$, with $\mu_i = Expec_i \lambda_i$

$$\log(\lambda_i) = \alpha_i Expos_i + \sum_j \beta_j Soc_i \Rightarrow \log(\mu_i) = \log(Expec_i) + \alpha_i Expos_i + \sum_j \beta_j Soc_i$$

where: Obs_i is the number of observed deaths in town i for each cancer site;

$Expec_i$ is the number of expected deaths in town i for each cancer site;

λ_i is the RR in town i;

$Expos_i$ is the variable of "exposure", coded as follows:

a) exposed or proximity area ("near"), i.e., towns having their municipal centroid at a distance ≤ 5 km from a metal production and processing installation (1 source, 2 sources, etc.);

b) intermediate area, i.e., towns situated at a distance ≤ 5 km from any industrial installation other than metal production and processing (energy industries – combustion installations -

(IPPC category-1); mineral industry – cement, glass, ceramic – (IPPC category-3); chemical industry (IPPC category-4); waste and wastewater management (IPPC category-5); paper and wood production and processing (IPPC category-6); textile industry (IPPC category-7); plants for the tanning of hides and skins (IPPC category-8); food and beverage sector and intensive livestock production (IPPC category-9); installations for surface treatment of substances using organic solvents (IPPC category-10); and installations for the production of carbon (IPPC category-11)); and,

c) unexposed area ("far"), i.e., towns having no EPER-registered industry within a 5-kilometer radius of their municipal centroid (reference group); and,

Soc_i are the following standardized sociodemographic variables chosen for their availability at a municipal level and potential explanatory ability vis-à-vis certain geographic mortality patterns (Lopez-Abente et al., 2006), namely, population size (categorized into three levels: 0 – 2000 (rural zone), 2000 – 10,000 (semi-urban zone) and ≥ 10,000 inhabitants (urban zone) (Capel, 1975)), percentages of illiteracy, farmers and unemployed persons, mean number of persons per household according to the 1991 census, and income level (Ayuso Orejana et al., 1993).

In this model, observed deaths were the dependent variable. As an external standard (Breslow and Day, 1987), we used concurrent Spanish cause-specific mortality rates, with expected deaths computed by age, sex, and period for each town in the study areas. A term denominated, "exposure", was included as the independent variable. The regression coefficient of this "exposure" term gave us the logarithm of the ratio between the respective SMRs for the exposed and reference zones, which we called, "RR". Expected deaths were used as offset in the model, for the total population, men and women, and estimates were adjusted for the above-mentioned sociodemographic variables. This Poisson regression model was applied to all provinces, and RRs were stratified by the number of industrial metal production and processing sources to which the towns were close (1 source / 2 sources for Valladolid, Zaragoza, Valencia, Seville and Madrid; 1 source / 2 sources / 3 sources for Asturias; and 1 source / 2 sources / ≥ 3 sources for Cantabria and Barcelona), for the purpose of showing the variations in the risk estimators. Bearing in mind that the construction of the variable of "exposure" included an intermediate category including towns close to any industry other than metal production and processing, we applied a test for trend excluding this category, so as to analyze the measure of association between increases in risk and proximity to a greater number of metal production and processing installations. Lastly, a mixed Poisson regression model was fitted for the Basque Country (Gelman and Hill, 2007), including province as a random effects term, to enable geographic variability and extra-Poisson dispersion to be taken into account and unexposed towns belonging to the same geographic setting (province) to be considered as the reference group in each case. RRs were stratified by the number of sources of proximity (1 / 2 / 3 / ≥ 4 sources). To take into account the problem of multiple comparisons or multiple testing (which occurs when a set of statistical inferences is considered simultaneously), *p*-values were also suitably adjusted by controlling for the expected proportion of false positives (False Discovery Rate), as proposed by Benjamini (Benjamini and Hochberg, 1995; Benjamini and Yekutieli, 2001). Finally, spatial autocorrelation was estimated by applying Moran's I statistic to the SMRs (Bivand et al., 2008), and residual analysis (based on deviance residuals) was used to test the models. Figure 1 depicts the different regions studied and the geographic situation of the metal production and processing installations, along with their EPER identification code.

In a second phase, the specific multiple sources or industrial clusters made up of 2 or 3 installations with at least two categories in the exposed or proximity area ("near") were analyzed, to estimate the risk posed to towns situated in their vicinity (≤ 5 km) and analyze possible increases in risk with proximity to a greater number of sources or metal installations. For this purpose, Poisson regression models were applied, adjusting for the above-mentioned sociodemographic variables. RRs were stratified by the respective categories in the proximity area (1, 2 or 3 sources), taking a an arbitrarily selected 50-kilometer radius (buffer) around the facilities constituting the industrial clusters (Figure 2) as our study area, so as to have a local comparison group.

Finally, we decided to conduct an additional study for the Basque Country, in view of this region's high density of metal production and processing industries. In order to select areas of proximity to multiple sources, we applied: the multivariate technique of cluster analysis to the industries, using agglomerative hierarchical clustering methods (whereby each observation starts in its own cluster, and pairs of clusters are then merged as one moves up the hierarchy); and

Euclidean distance between the respective facilities, using "single linkage clustering" (the distance between two clusters is computed as the distance between the two closest elements in the two clusters) and "average linkage clustering" criteria (the distance between two clusters is defined as the average of distances between all pairs of objects, where each pair is made up of one object from each group) (Hair et al., 1998). For each industrial cluster obtained, a "near vs. far" analysis (≤ 5 km) was performed to estimate the RR of dying in nearby towns due to different cancers of the digestive system.

3. Results

For each of the seven tumors studied, Table 1 shows the geographic areas in which towns registered increases in risk with proximity to a greater number of sources or metal production and processing installations, with at least 3 observed cases in each level of exposed area ("near"). The tumor responsible for the greatest number of regions with increased risk (7 of the 9 areas studied) was liver cancer, with this increase, moreover, affecting both sexes. Trend proved statistically significant in Valencia (both sexes, *p*-value for trend (*p* trend) = 0.001), Madrid (women, *p* trend = 0.011) and the Basque Country (men, *p* trend = 0.002). For colorectal cancer, the data revealed an association between the number of facilities in the proximity area and the estimated risk for the provinces of Valencia and Zaragoza (*p* trend = 0.001 and 0.018 in both sexes, respectively), Valladolid (women) and Barcelona (men), and for the Basque Country (women). In the case of stomach cancer, the results revealed increases in risk in the Basque Country (statistically significant in both sexes, *p* trend = 0.001), Valencia (men), and Madrid and Valladolid (women). For esophageal cancer, the main results of note were registered in Valencia (both sexes), Madrid (significant among women, *p* trend = 0.022) and Seville (men). Insofar as pancreatic cancer was concerned, the association between increases in risk and proximity to metallurgical installations was in evidence in Barcelona, Valencia, and Zaragoza (women, though statistically significant in Barcelona, *p* trend = 0.049), and Madrid (men) and Valladolid (statistically significant among men, *p* trend = 0.019). Whereas the principal increases in risk for cancer of oral cavity–pharynx were seen in Seville (both sexes), the Basque Country (total population), and Valencia (men), for gallbladder cancer a rising risk trend -albeit not statistically significant- was present in Valencia (both sexes) and Barcelona (men). Lastly, it should be noted that Valencia was the only region to display increases in risk for all tumors studied.

Analyses of the above table were performed separately for each tumor and region, as were their respective corrections, by means of multiple comparisons (see Supplementary data).

In the analysis of the spatial autocorrelation using Moran's I test, the great majority of regions and tumors showed *p*-values that were not statistically significant (see Supplementary data). In the residual analysis of each model used, the graphs plotting deviance residuals against the distance to the nearest metal installation displayed an apparently random scatter pattern, consistent with a well-fitted model (data not shown).

Table 2 shows the industrial clusters (referred to by their EPER code) that displayed increases in risk with proximity to a greater number of sources for the towns located in their vicinity, with at least 3 observed cases in each level of exposed area ("near"). The industrial cluster made up of facilities '2590' and '2658' (Valencia) registered increases in risk for all tumors (with this proving statistically significant in men for tumors of liver and colon–rectum, *p* trend = 0.011 and < 0.001, respectively), a result in accordance with the data shown in the previous table for the Province of Valencia. The same applied to cluster '3465'-'3517' (Madrid), with increases in risk for tumors of esophagus (*p* trend = 0.011 in women), stomach (*p* trend = 0.040 in women), pancreas and liver. Attention should be drawn to the fact that industrial cluster '3655'–'3666' (Guipuzcoa) displayed associations between the number of sources and a greater risk for tumors of esophagus, stomach (*p* trend = 0.014 in men) and colon–rectum, and cluster '460'-'492'-'3001' (Barcelona) also registered increases in risk with exposure to a greater number of sources for tumors of stomach, pancreas and colon–rectum. Lastly, it should be noted that industrial cluster '1488-2338 (Seville) displayed a trend statistically significant in men (*p* trend = 0.026).

In the above table, analyses were again performed separately for each tumor and industrial cluster, as were their respective corrections, using multiple comparisons (see Supplementary data).

Finally, Table 3 shows the industrial clusters of the metal sector in the Basque Country, for which the "near vs. far" analysis registered statistically significant RRs in their environs for tumors of stomach, pancreas, liver, gallbladder and colon–rectum. Figure 3 depicts the seven clusters obtained for the Basque Country and their proximity areas (≤ 5 km), as well as the dendrograms obtained using "average linkage clustering" and "single linkage clustering" criteria. Cluster 3 (facilities '3629', '3638', '3639', and '3642') was the one that registered excess risk for the greatest number of tumors (stomach, liver, gallbladder, and colon–rectum). The highest RRs appeared in the proximity of cluster 3 for liver (RR = 2.00; 95%CI = 1.19-3.34 in women) and gallbladder tumors (RR = 1.75; 95%CI =1.17-2.61 in women).

In this table too, analyses were performed separately for each tumor and industrial cluster, as were their respective corrections, using multiple comparisons (see Supplementary data).

4. Discussion

The results of this study could indicate that risk of dying due to certain tumors of the digestive system increases with proximity (≤ 5 km) to a greater number of metal production and processing installations, especially in the case of liver cancer in both sexes.

Risk analysis by geographic area showed that, without exception, proximity to a greater number of industrial sources resulted in a higher excess risk for a minimum of one tumor. Indeed, most of the regions studied (78%) displayed an increase in risk of liver cancer, with the Province of Valencia registering noteworthy results (increases in risk in both sexes) for all tumors of the digestive system.

The study of excess mortality in the vicinity of specific industrial clusters (with the study area being restricted to a 50-kilometer area around each installation) showed that many of these clusters displayed associations between number of sources and increased risk, principally for tumors of colon–rectum (58% of the industrial clusters), liver (58%), stomach (42%), and pancreas (42%). Moreover, in the Basque Country (the Spanish region with the greatest density of metal industries), special mention should be made of the industrial cluster in the centre of the Province of Alava, which registered a statistically significant excess risk for four tumors in the "near vs. far" analysis.

On the other hand, there were some results in the opposite direction, suggesting a negative association between risk of dying from cancer and proximity to metal industries (see Supplementary data). As there is no biological explanation for such results, and in some cases they were based on very few observed deaths in the proximity-area categories, in our opinion these must be regarded as spurious.

Studying population exposure to industrial pollution as a possible risk factor associated with cancer mortality has recently been reinforced, thanks to studies which have detected significant excess risks for various tumors (Garcia-Perez et al., 2009; Lopez-Cima et al., 2011; Musti et al., 2009; Ramis et al., 2009; Tsai et al., 2009; Viel et al., 2008). Indeed, this study is the continuation of another that was recently published by our group (Garcia-Perez et al., 2010b), which analyzed excess mortality due to tumors of the digestive system in the environs of metal production and processing installations, and focused its attention on "individual" sources. Here, we concentrate instead on industrial clusters, thereby making this one of the first studies to analyze excess risk associated with proximity to multiple industrial sources within a single industrial sector, from an epidemiologic standpoint.

One advantage of the chosen design is its inclusion of a great number of reported deaths (10,576 deaths due to oral and pharyngeal cancer, 8706 due to esophageal cancer, 27,8000 due to stomach cancer, 18,141 due to pancreatic cancer, 13,164 due to liver cancer, 6,304 due to gallbladder cancer and 54,078 due to colorectal cancer, in both sexes, in Spanish regions with presence of multiple metal sources, from 1994 to 2003), something that enables it to identify excess mortality of a lower magnitude, in consonance with the effects expected in the case of environmental exposures. Another advantage is that it eliminated the most recent installations, the possible influence of which on tumor development is debatable in view of the minimum induction periods of digestive tumors. Although the industries analyzed in this study reported pollution data in 2001, the date of commencement of their industrial activity was nevertheless taken into account for analysis purposes: the great majority began operations prior to the 1960s, so that the surrounding populations could have been exposed to their emissions for long periods of time, a fact that is coherent with the induction periods described for solid tumors (Armenian and Lilienfeld, 1974). Furthermore, regions such as the Basque Country and Asturias have a long tradition of industrial metal production and processing. Lastly, the inclusion of towns close to industrial installations other than metal production and processing as the "intermediate area" in the statistical analyses goes some way to avoiding the confounding effect of such industries (which release toxic substances that could be related to the tumors under study) and establishing a "clean" reference group of towns not near any industry.

This study also has its limitations. It uses distance from town of residence to industrial pollution source as a proxy of exposure, assuming an isotropic risk model, something that could entail a problem of misclassification, since real exposure is critically dependent on factors not taken into consideration, such as prevailing winds, geographic landforms, and releases into aquifers. Unfortunately, this type of ecologic design coupled with the fact that we analyze a great number of pollutant sources means that it is very difficult to specify the degree of "geophysical plausibility" for each individual installation, e.g., a demonstrable route of transport for the contaminant between the source and the receptor, resulting in exposure (Nuckols et al., 2004). A further possible bias in the allocation of exposure is the use of municipal centroids as coordinates to pinpoint the entire population of a town, when, in reality, the population may be fairly widely dispersed (e.g., in highly populated cities). In our case, however, this would amount to a non-differential bias (it would affect towns in both exposed and unexposed areas) which would limit the capacity to find positive results and, in turn, render the estimators of real risk greater than those found. Finally, in these types of studies account cannot be taken of the effect of possible confounding factors that might be associated with distance. Adjustment for socio-economic variables seeks to go some way towards mitigating this lack of information, since many lifestyle-related risk factors (that we could not include in our study) show a distribution correlated with socioeconomic status (e.g., tobacco (Borrell et al., 2000; Woitas-Slubowska et al., 2010), alcohol (Kogevinas et al., 1997; Menvielle et al., 2007), type of diet (Lakshman et al., 2010; Prattala et al., 2009) and infectious agents such as *Helicobacter pylori* (Kawachi and Kroenke, 2006; Moayyedi et al., 2002)). Finally, occupational exposures may also have influenced the difference between men and women, something impossible to control for, owing to the lack of occupational data at a municipal level.

Another critical decision when analyzing the risk of towns situated "near" pollution sources is the choice of radius. The fact of choosing a specific distance (5 km) directly affects the outcome of the study; therefore, we decided to select one based on sensibility analysis of previous studies (Garcia-Perez et al., 2010a; Garcia-Perez et al., 2010b).

One aspect addressed in the analyses is the problem of multiple comparisons or multiple testing (to find associations that are falsely positive by random chance). Although adjusted *p*-values are provided in the Supplementary data, from an epidemiologic standpoint we prefer to discuss the results in the light of a series of factors, namely, the consistency of the associations observed and biologic plausibility. Furthermore, on studying the regions and/or industrial clusters on a one-by-one basis, we estimated that for α=0.05, random chance would account for 0.7 positive associations (number of comparisons x percentage of statistically significant RR>1 expected under the null hypothesis, i.e., 2.5%) for each of the analyses by tumor in Table 1 (4.7 positive associations for all tumors as a whole), 0.9 positive associations in Table 2 (6.3 positive associations for all tumors), and 0.5 positive associations in Table 3 (3.7 positive associations for all tumors), numbers which are lower than those of the associations observed.

Clusters of metal production and processing plants in large industrial areas entail high concentrations of complex mixtures of pollutants being released into the environment. With respect to all the industrial groups registered in the EPER-Spain and the pollutants included in the register, metal production and processing installations are the principal emitters to air of arsenic, cadmium, chromium, copper, lead, zinc, hydrogen cyanide, CO, perfluorocarbons and tetrachloroethylene, and the principal emitters to water of nickel, polycyclic aromatic hydrocarbons (PAHs), dichloromethane, phenols, fluorides, cyanides, benzene, toluene, ethylbenzene and xylenes (Garcia-Perez et al., 2010a). The amounts released to both air and water in 2001 by the metallurgical installations included in our study are shown in the Supplementary data.

The metal sector -which encompass several types of industrial activities, such as production of steel, ferrous metals, non-ferrous metals, galvanizing installations and surface treatment using an electrolytic or chemical process- arouses great social concern, owing to the potential health and environmental problems that it may generate. Both aluminum production and iron and steel founding (occupational exposure during) are recognized by the International Agency for Research on Cancer (IARC) as carcinogens in humans (IARC, 1987; IARC, 2011), as are a number of substances released by such installations, including arsenic, benzene, cadmium, chromium, dioxins, asbestos, formaldehyde, coal-tar pitches and some PAHs. Other substances are either: probable carcinogens, such as tetrachloroethylene, trichloroethylene and nitrosamines;

or possible carcinogens, such as lead, nickel, furans and welding fumes (IARC, 2011; Tossavainen, 1990). Furthermore, installations for surface treatment of metals and plastic materials (many of which belong to the automobile sector) employ MWFs, a range of oils and other chemical substances, used to cool and/or lubricate metal workpieces when they are being machined, ground, milled, etc., and known to be carcinogens in humans (Savitz, 2003). Some MWFs have been associated with increased risk of certain tumors of the digestive system (Bardin et al., 2005; Malloy et al., 2007; Mirer, 2003). Lastly, it should be stressed that effluents from the metal industries are genotoxic, inasmuch as they induce cytogenetic damage, mutations, and DNA damage in repair processes (Claxton et al., 1998; Houk, 1992).

In brief, it can be said that industrial emissions from metal production and processing installations comprise a complex mix of carcinogens and toxic substances released to air and water. It is likely that chemical substances released to water pass into the soil and water catchment areas, and thence into the human food chain, where they cause damage to the digestive organs. With regard to substances released to air, on the one hand the population would be directly exposed to the polluted air, and on the other, the heavy metals would be deposited in plants, soil and water, and would then pass into the trophic chain affecting the population.

One of the most noteworthy results of our study is the association between number of facilities and increased risk detected for all tumors studied in the environs of the industrial group comprising facilities '2590' and '2658' (Valencia). The towns close to pollution released by these two industries, not only registered a higher risk than did towns close to a single industry, but this risk was also statistically significant in some tumors, such as those of liver and colon–rectum (Table 2). Furthermore, the test for trend also proved to be significant. Whereas the results affecting both men and women for tumors of esophagus, pancreas, liver and gallbladder could support the hypothesis of an environmental exposure in the environs of facilities '2590' and '2658', the results affecting only men (tumors of oral cavity and pharynx, stomach, and colon-rectum) may be indicative of a possible source of occupational exposure. The type of industrial activity of these two facilities is 'surface treatment of metals and plastic materials'. Facility '2590' reported releasing 318 kg of zinc into water in 2001, and facility '2658' reported releasing 21 kg of nickel into water in that same year. The Supplementary data shows all pollutants released by both facilities in the last decade but, due to the voluntary nature of the EPER, it is possible that these metallurgical installations could be releasing other pollutants, and/or that their emissions could be more substantial. This is why we preferred to use the Euclidean distance between towns and facilities rather than the magnitude of emissions. Once their emission records have been duly validated, it would then be advisable for these two industrial installations to be made the subject of a more specific study.

With respect to the industrial cluster formed by facilities '3465' and '3517' (Madrid), attention should be drawn to the statistically significant excess risk of tumors of liver, stomach and esophagus observed for women living in towns situated near both facilities; moreover, the same was true for the test for trend, which likewise proved to be significant. Among men, in contrast, not even a possible association between number of facilities and increased risk was detected. In Spain, women entered the job market comparatively recently, and it is difficult to imagine that occupational exposure would cause excess mortality among women and not among men, such as that observed in our data for facilities '3465' and '3517' (e.g., in 1989 the percentage of women working in the Spanish metal sector was only 6.96% (Instituto Nacional de Estadística, 2011)). Facility '3465' -whose industrial activity is 'hot-rolling mills (steel)'– reported releasing 689 mt of CO to air in 2001, whereas facility '3517 –whose industrial activity is 'surface treatment of metals and plastic materials'– reported releasing 183 kg of nickel into water in the same year (however, the pollutants released to air in the last decade -see Supplementary data- include other toxic substances such as NO_2, arsenic, chromium, copper, lead, zinc, benzene, dioxins and furans, PAH, chlorine and hydrogen cyanide).

Thanks to studies such as that reported here, new avenues of research can be developed vis-à-vis exposure to industrial pollution and increased risk of dying of cancer in towns lying in the vicinity of industrial activities. With the aid of publicly available EPER information, the type of emissions released by pollutant industries can be ascertained, while the updating of the register in the form of the new European Pollutant Release and Transfer Register (E-PRTR) will incorporate additional information on the amounts of hazardous waste discharged by these facilities. Although the EPER contains information on the quantities of substances emitted, in its 2001 edition this aspect was reported on a voluntary basis. Analysis of exposure to multiple sources could be improved: with estimated exposure quantified by reference to industrial emissions, something that will be possible once the new PRTR data become available, in which notification of the amount emitted is compulsory; or, with the availability of a greater breakdown of population data.

5. Conclusion

Our results could support the hypothesis that risk of dying due to certain tumors of the digestive system, and those of liver, stomach, pancreas and colon-rectum in particular, increases with proximity (≤ 5 km) to a greater number of metal production and processing sources.

The findings of this study support the need for more detailed exposure assessment and health risk analysis of certain chemical, chemical mixtures, and cancers in populations within 5 km of metallurgical installations.

Industrial pollutant emission registers, such as the EPER and E-PRTR, furnish highly useful information, which can be applied to studying the health consequences for the populations of towns situated in the environs of industrial facilities.

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Figure legends

Figure 1: Spanish regions with presence of multiple metal production and processing facilities.

Figure 2: Example of proximity to a specific industrial cluster made up of 2 metal installations.

Figure 3: Industrial clusters in the Basque Country (obtained by cluster analysis using average and single linkage clustering methods) and their proximity areas (≤ 5 km) in the "near vs. far" analysis

Table 1: Relative risk of dying from cancer in towns that registered an increase in risk with proximity (≤ 5 km) to a greater number of metal production and processing facilities, by Spanish region. Tumors of oral cavity and pharynx, esophagus, stomach, pancreas, liver, gallbladder, and colon-rectum.

	TOTAL					MEN					WOMEN				
Region	Obs[a]	RR[b]	95% CI	*p* trend[c]	pBH[d]	Obs[a]	RR[b]	95% CI	*p* trend[c]	pBH[d]	Obs[a]	RR[b]	95% CI	*p* trend[c]	pBH[d]
Cancer of oral cavity-pharynx															
Valencia															
1 source[e]	478	1.03	0.85-1.25			373	0.99	0.80-1.22			105	1.18	0.74-1.87		
2 sources[f]	16	1.19	0.71-2.00	0.539	0.906	14	1.25	0.71-2.18	0.732	0.967	2	0.88	0.21-3.77		
Seville															
1 source[e]	51	1.16	0.77-1.75			42	1.09	0.70-1.70			9	1.66	0.60-4.61		
2 sources[f]	450	1.37	0.87-2.14	0.078	0.804	374	1.30	0.80-2.12	0.119	0.804	76	1.77	0.57-5.53	0.391	0.906
Basque Country															
1 source[e]	185	0.88	0.70-1.12			154	0.85	0.66-1.10			31	1.12	0.64-1.95		
2 sources[f]	131	0.84	0.65-1.09			112	0.84	0.63-1.10			19	0.91	0.48-1.74		
3 sources[g]	175	0.99	0.77-1.26			153	0.96	0.74-1.26			22	1.10	0.57-2.14		
≥ 4 sources[h]	624	1.03	0.83-1.27	0.880	0.967	533	1.00	0.80-1.26	0.967	0.967	91	1.12	0.65-1.92		
Esophageal cancer															
Valencia															
1 source[e]	369	0.94	0.75-1.18			313	0.89	0.70-1.13			56	1.48	0.76-2.87		
2 sources[f]	12	1.24	0.68-2.26	0.998	0.998	10	1.18	0.61-2.28	0.717	0.935	2	1.71	0.38-7.71	0.323	0.799
Madrid															
1 source[e]	124	0.92	0.73-1.15			108	0.90	0.71-1.15			16	1.05	0.55-2.01		
2 sources[f]	50	1.07	0.78-1.47	0.983	0.998	38	0.92	0.65-1.32	0.399	0.828	12	2.25	1.09-4.68	**0.022**	0.585
Seville															
1 source[e]	38	1.11	0.70-1.74			32	1.05	0.64-1.72			6	1.54	0.47-5.05		
2 sources[f]	343	1.24	0.74-2.06	0.831	0.935	292	1.22	0.70-2.11	0.826	0.935	51	1.32	0.33-5.36		
Stomach cancer															
Valencia															
1 source[e]	1350	1.08	0.96-1.22			812	1.02	0.88-1.18			538	1.20	1.00-1.45		
2 sources[f]	41	1.14	0.83-1.58	0.175	0.428	26	1.31	0.87-1.98	0.433	0.617	15	0.93	0.55-1.58		
Madrid															
1 source[e]	479	0.98	0.87-1.10			320	0.99	0.85-1.14			159	0.96	0.78-1.17		
2 sources[f]	169	1.02	0.86-1.21	0.516	0.664	93	0.84	0.67-1.06			76	1.37	1.05-1.77	0.228	0.442
Valladolid															
1 source[e]	24	0.95	0.56-1.63			17	0.87	0.45-1.71			7	1.05	0.42-2.65		
2 sources[f]	632	0.81	0.50-1.31			377	0.65	0.36-1.20			255	1.15	0.53-2.50	0.671	0.824
Basque Country															
1 source[e]	465	1.09	0.94-1.27			306	1.11	0.92-1.33			159	1.12	0.87-1.43		
2 sources[f]	314	1.02	0.86-1.21			212	1.05	0.86-1.29			102	1.00	0.76-1.33		
3 sources[g]	368	1.27	1.08-1.50			234	1.23	1.00-1.51			134	1.35	1.02-1.79		
≥ 4 sources[h]	1494	1.26	1.09-1.45	**0.001**	**0.016**	953	1.23	1.04-1.47	**0.009**	0.064	541	1.34	1.06-1.70	**0.014**	0.064
Pancreatic cancer															
Valencia															
1 source[e]	937	1.12	0.97-1.30			474	1.11	0.91-1.36			463	1.13	0.91-1.40		
2 sources[f]	28	1.18	0.79-1.74	0.184	0.828	13	0.95	0.54-1.68			15	1.48	0.86-2.54	0.180	0.828
Madrid															
1 source[e]	254	0.93	0.79-1.09			149	0.93	0.76-1.15			105	0.91	0.71-1.17		
2 sources[f]	100	1.08	0.86-1.35	0.518	0.907	62	1.16	0.87-1.54	0.477	0.907	38	0.97	0.68-1.38	0.908	0.941
Zaragoza															
1 source[e]	7	1.02	0.46-2.25			4	0.90	0.32-2.57			3	1.19	0.35-4.00		
2 sources[f]	695	1.08	0.78-1.48	0.460	0.907	345	0.96	0.62-1.48	0.916	0.941	350	1.24	0.77-1.98	0.237	0.907
Valladolid															
1 source[e]	8	0.55	0.21-1.43			4	0.89	0.39-8.98			4	0.29	0.07-1.23		
2 sources[f]	348	0.94	0.40-2.22	0.062	0.419	179	1.96	0.57-6.72	**0.019**	0.419	169	0.38	0.11-1.39	0.902	0.941
Barcelona															
1 source[e]	465	1.01	0.89-1.15			269	1.05	0.88-1.25			196	0.97	0.79-1.19		
2 sources[f]	536	1.02	0.90-1.17			315	1.09	0.92-1.30			221	0.94	0.77-1.15		
≥ 3 sources[i]	12	1.00	0.57-1.79			6	0.89	0.39-2.00			6	1.16	0.51-2.63	**0.049**	0.419
Liver cancer															
Valencia															
1 source[e]	679	1.25	1.04-1.51			487	1.26	1.01-1.57			192	1.25	0.87-1.79		
2 sources[f]	23	2.22	1.42-3.48	**0.003**	**0.026**	14	1.87	1.06-3.30	**0.028**	0.146	9	3.11	1.49-6.52	**0.032**	0.146
Madrid															
1 source[e]	240	0.95	0.81-1.13			174	0.93	0.76-1.13			66	1.03	0.75-1.42		
2 sources[f]	99	1.16	0.92-1.45	0.082	0.246	62	0.99	0.74-1.31	0.632	0.742	37	1.62	1.10-2.40	**0.011**	0.077
Seville															
1 source[e]	42	1.09	0.69-1.72			32	1.12	0.66-1.90			10	0.99	0.40-2.45		
2 sources[f]	418	1.26	0.76-2.10	0.075	0.246	302	1.18	0.65-2.13	0.243	0.415	116	1.52	0.57-4.05	0.130	0.306
Asturias															

	TOTAL					MEN					WOMEN				
Region	Obs[a]	RR[b]	95% CI	*p* trend[c]	pBH[d]	Obs[a]	RR[b]	95% CI	*p* trend[c]	pBH[d]	Obs[a]	RR[b]	95% CI	*p* trend[c]	pBH[d]
1 source[e]	81	1.07	0.84-1.38			63	1.05	0.79-1.39			18	1.19	0.70-2.03		
2 sources[f]	0	--	--			0	--	--			0	--	--		
3 sources[g]	77	1.16	0.88-1.53	0.437	0.594	56	1.06	0.77-1.47	0.908	0.970	21	1.59	0.93-2.74	0.058	0.222
Cantabria															
1 source[e]	23	1.63	0.72-3.68			16	1.44	0.55-3.76			7	2.11	0.45-9.86		
2 sources[f]	3	1.14	0.28-4.66			3	1.39	0.31-6.22			0	--	--		
≥ 3 sources[i]	85	1.95	0.94-4.07	0.248	0.415	67	1.85	0.79-4.33	0.494	0.636	18	2.44	0.55-10.74	0.190	0.394
Barcelona															
1 source[e]	426	0.98	0.85-1.13			299	1.00	0.85-1.18			127	0.94	0.73-1.21		
2 sources[f]	475	0.94	0.81-1.08			351	0.98	0.83-1.16			124	0.84	0.64-1.09		
≥ 3 sources[i]	16	1.52	0.92-2.51	0.136	0.306	10	1.34	0.71-2.52	0.262	0.415	6	1.97	0.86-4.50	0.312	0.468
Basque Country															
1 source[e]	117	0.81	0.61-1.07			91	0.90	0.66-1.22			26	0.70	0.34-1.23		
2 sources[f]	111	1.00	0.75-1.33			88	1.10	0.80-1.53			23	0.83	0.46-1.50		
3 sources[g]	129	1.19	0.89-1.59			90	1.10	0.78-1.55			39	1.44	0.83-2.52		
≥ 4 sources[h]	532	1.27	0.99-1.63	**0.001**	**0.021**	386	1.22	0.92-1.63	**0.002**	**0.026**	146	1.46	0.91-2.37	0.101	0.273
Gallbladder cancer															
Valencia															
1 source[e]	348	1.14	0.90-1.43			102	1.09	0.71-1.68			246	1.17	0.89-1.54		
2 sources[f]	10	1.25	0.65-2.40	0.213	0.631	3	1.32	0.40-4.39	0.598	0.856	7	1.21	0.55-2.64	0.234	0.631
Barcelona															
1 source[e]	165	0.82	0.66-1.02			67	0.96	0.68-1.36			98	0.75	0.57-0.99		
2 sources[f]	207	0.88	0.71-1.09			76	0.97	0.68-1.39			131	0.84	0.65-1.10		
≥ 3 sources[i]	4	0.78	0.29-2.11			4	2.30	0.83-6.38	0.901	0.936	0	0.00	0-inf		
Colorectal cancer															
Valencia															
1 source[e]	2995	1.11	1.03-1.21			1589	1.17	1.05-1.31			1406	1.05	0.93-1.19		
2 sources[f]	91	1.37	1.10-1.71	**0.001**	**0.016**	55	1.66	1.25-2.20	**0.000**	**0.003**	36	1.07	0.76-1.51	0.573	0.778
Zaragoza															
1 source[e]	20	0.95	0.59-1.51			11	1.02	0.54-1.91			9	0.87	0.44-1.75		
2 sources[f]	1965	1.28	1.05-1.57	**0.018**	0.163	1101	1.26	0.96-1.66	0.102	0.549	864	1.32	0.97-1.79	0.085	0.549
Valladolid															
1 source[e]	33	1.28	0.81-2.03			20	1.04	0.56-1.93			13	1.62	0.80-3.28		
2 sources[f]	981	1.20	0.78-1.84			569	0.79	0.44-1.43			412	2.02	1.06-3.83	0.281	0.646
Barcelona															
1 source[e]	1487	1.08	1.00-1.16			806	1.10	0.99-1.22			681	1.05	0.94-1.17		
2 sources[f]	1603	1.04	0.97-1.13			918	1.13	1.02-1.25			685	0.95	0.84-1.06		
≥ 3 sources[i]	41	1.15	0.84-1.58	0.867	0.900	25	1.31	0.88-1.95	0.382	0.646	16	0.97	0.59-1.60		
Basque Country															
1 source[e]	689	0.92	0.82-1.03			401	0.79	0.69-0.91			288	1.16	0.97-1.40		
2 sources[f]	541	0.97	0.86-1.09			322	0.84	0.72-0.98			219	1.22	1.00-1.49		
3 sources[g]	576	1.04	0.92-1.19			361	0.96	0.81-1.13			215	1.20	0.97-1.49		
≥ 4 sources[h]	2470	1.03	0.93-1.15	0.583	0.778	1461	0.94	0.82-1.07	0.800	0.864	1009	1.20	1.01-1.44	0.681	0.836

[a]Observed deaths.
[b]RRs adjusted for population size, percentages of illiteracy, farmers and unemployed persons, average persons per household, and mean income.
[c]*p*-value for trend in regions that displayed increases in risk with proximity to a given number of sources (excluding the intermediate category in the variable of "exposure"), suggesting a positive association.
[d]p-value adjusted by Benjamini & Hochberg's method.
[e]Towns situated ≤ 5 km from 1 single metal production and processing installation.
[f]Towns situated ≤ 5 km from 2 metal production and processing installations.
[g]Towns situated ≤ 5 km from 3 metal production and processing installations.
[h]Towns situated ≤ 5 km from 4 or more metal production and processing installations.
[i]Towns situated ≤ 5 km from 3 or more metal production and processing installations.

Table 2: Relative risk of dying from cancer in the environs of specific industrial clusters which registered an increase in risk with proximity (≤ 5 km) to a greater number of sources. Tumors of oral cavity and pharynx, esophagus, stomach, pancreas, liver, gallbladder, and colon-rectum.

	TOTAL					MEN					WOMEN				
EPER code[a]	Obs[b]	RR[c]	95% CI	*p* trend[d]	pBH[e]	Obs[b]	RR[c]	95% CI	*p* trend[d]	pBH[e]	Obs[b]	RR[c]	95% CI	*p* trend[d]	pBH[e]
Cancer of oral cavity-pharynx															
2590-2658 (Valencia)															
1 source[f]	443	1.09	0.87-1.36			347	1.08	0.85-1.38			96	1.06	0.62-1.81		
2 sources[g]	16	1.23	0.72-2.10	0.264	0.813	14	1.30	0.73-2.30	0.356	0.813	2	0.92	0.21-4.08		
Esophageal cancer															
2590-2658 (Valencia)															
1 source[f]	348	0.98	0.76-1.26			293	0.90	0.69-1.18			55	2.03	0.93-4.42		
2 sources[g]	12	1.29	0.70-2.39	0.771	0.895	10	1.19	0.61-2.32	0.744	0.895	2	2.61	0.52-13.02	0.057	0.258
1488-2338 (Seville)															
1 source[f]	20	1.65	0.91-3.01			14	1.22	0.62-2.39			6	7.83	1.66-36.88		
2 sources[g]	343	2.10	1.19-3.70	**0.019**	0.217	292	2.17	1.18-3.97	**0.026**	0.217	51	2.05	0.40-10.44		
3655-3666 (Guipuzcoa)															
1 source[f]	16	0.68	0.38-1.20			14	0.66	0.36-1.20			2	0.93	0.18-4.79		
2 sources[g]	5	1.05	0.42-2.66	0.240	0.761	5	1.15	0.45-2.93	0.303	0.761	0	0.00	0-inf		
3465-3517 (Madrid)															
1 source[f]	89	0.95	0.73-1.24			79	0.93	0.71-1.23			10	1.25	0.55-2.84		
2 sources[g]	50	1.06	0.77-1.45	0.936	0.991	38	0.90	0.63-1.28			12	2.63	1.24-5.59	**0.011**	0.217
Stomach cancer															
2590-2658 (Valencia)															
1 source[f]	1250	1.15	1.01-1.31			752	1.10	0.93-1.30			498	1.24	1.00-1.53		
2 sources[g]	41	1.10	0.79-1.53			26	1.17	0.77-1.77	0.165	0.397	15	1.00	0.58-0.99		
3630-3694 (Alava)															
1 source[f]	17	1.74	1.03-2.92			11	1.67	0.87-3.18			6	1.87	0.78-4.50		
2 sources[g]	17	1.64	0.97-2.77			10	1.40	0.71-2.76			7	2.15	0.93-4.96	**0.014**	0.059
3655-3666 (Guipuzcoa)															
1 source[f]	51	1.45	1.04-2.02			31	1.35	0.88-2.06			20	1.65	0.96-2.85		
2 sources[g]	9	1.47	0.74-2.92	**0.014**	0.059	9	2.11	1.05-4.26	**0.014**	0.059	0	0.00	0-inf		
3465-3517 (Madrid)															
1 source[f]	348	1.04	0.91-1.19			234	1.07	0.91-1.26			114	0.99	0.79-1.25		
2 sources[g]	169	1.03	0.87-1.22			93	0.87	0.70-1.09			76	1.34	1.03-1.73	**0.040**	0.121
460-492-3001 (Barcelona)															
1 source[f]	50	1.00	0.75-1.35			36	1.17	0.82-1.66			14	0.73	0.42-1.27		
2 sources[g]	797	1.05	0.93-1.18	0.996	0.998	490	1.05	0.91-1.22			307	1.03	0.85-1.24	0.575	0.844
Pancreatic cancer															
2590-2658 (Valencia)															
1 source[f]	881	1.12	0.95-1.33			445	1.10	0.87-1.39			436	1.14	0.89-1.44		
2 sources[g]	28	1.31	0.88-1.96	**0.034**	0.617	13	1.14	0.64-2.05	0.287	0.952	15	1.50	0.86-2.61	0.059	0.703
3465-3517 (Madrid)															
1 source[f]	183	1.03	0.86-1.23			105	0.99	0.78-1.25			78	1.09	0.82-1.44		
2 sources[g]	100	1.12	0.90-1.40	0.558	0.952	62	1.18	0.89-1.57	0.549	0.952	38	1.04	0.73-1.48		
460-492-3001 (Barcelona)															
1 source[f]	34	1.06	0.74-1.51			17	0.95	0.58-1.57			17	1.19	0.72-1.99		
2 sources[g]	492	1.02	0.88-1.17			290	1.07	0.88-1.29	0.554	0.952	202	0.95	0.77-1.18		
2692-2705 (Valladolid)															
1 source[f]	8	0.60	0.28-1.25			4	0.48	0.17-1.36			4	0.76	0.26-2.21		
2 sources[g]	348	1.18	0.88-1.57	0.259	0.952	179	0.99	0.67-1.45	0.895	0.952	169	1.46	0.94-2.27	0.081	0.732
3655-3666 (Guipuzcoa)															
1 source[f]	42	1.32	0.90-1.93			24	1.57	0.94-2.61			18	1.07	0.60-1.90		
2 sources[g]	7	1.21	0.55-2.65			3	1.02	0.31-3.33			4	1.40	0.49-4.00	0.371	0.952
Liver cancer															
2590-2658 (Valencia)															
1 source[f]	622	1.23	0.99-1.52			453	1.41	1.10-1.80			169	0.83	0.55-1.27		
2 sources[g]	23	2.29	1.44-3.63	**0.005**	0.183	14	1.90	1.07-3.40	**0.011**	0.191	9	3.41	1.56-7.46	0.273	0.732
1488-2338 (Seville)															
1 source[f]	18	1.18	0.65-2.16			14	1.20	0.60-2.38			4	1.09	0.31-3.83		
2 sources[g]	418	1.32	0.76-2.32	0.513	0.811	302	1.12	0.59-2.14			116	2.10	0.68-6.47	0.331	0.732
3465-3517 (Madrid)															
1 source[f]	162	0.92	0.76-1.12			116	0.87	0.69-1.10			46	1.05	0.72-1.52		
2 sources[g]	99	1.13	0.90-1.41	0.744	0.956	62	0.95	0.71-1.26	0.366	0.732	37	1.61	1.09-2.37	0.058	0.414
460-492-3001 (Barcelona)															
1 source[f]	28	1.02	0.68-1.51			21	1.11	0.70-1.75			7	0.83	0.38-1.82		
2 sources[g]	458	1.02	0.87-1.19			336	1.13	0.94-1.36	0.683	0.946	122	0.81	0.61-1.07		
1477-1937-3551 (Asturias)															
1 source[f]	7	0.59	0.27-1.28			5	0.47	0.19-1.17			2	1.43	0.31-6.53		
2 sources[g]	0	--	--			0	--	--			0	--	---		
3 sources[h]	77	1.16	0.84-1.59	0.511	0.811	56	0.97	0.68-1.39	0.836	0.995	21	2.40	1.17-4.94	0.056	0.414
353-491-3193 (Barcelona)															
1 source[f]	14	0.85	0.49-1.46			12	1.05	0.58-1.90			2	0.40	0.10-1.62		

	TOTAL					MEN					WOMEN				
EPER code[a]	Obs[b]	RR[c]	95% CI	*p* trend[d]	pBH[e]	Obs[b]	RR[c]	95% CI	*p* trend[d]	pBH[e]	Obs[b]	RR[c]	95% CI	*p* trend[d]	pBH[e]
2 sources[g]	11	0.62	0.34-1.13			10	0.82	0.43-1.54			1	0.18	0.83-4.39		
3 sources[h]	16	1.59	0.96-2.64	0.945	0.995	10	1.45	0.77-2.75	0.712	0.949	6	1.91	0.83-4.39	0.518	0.811
3630-3694 (Alava)															
1 source[f]	4	1.98	0.73-5.42			3	2.03	0.57-7.16			1	1.28	0.14-11.37		
2 sources[g]	5	1.40	0.93-2.11			4	2.22	0.71-6.93	0.226	0.732	1	1.46	0.17-12.89	0.449	0.811
Gallbladder cancer															
2590-2658 (Valencia)															
1 source[f]	326	1.18	0.86-1.46			96	1.26	0.76-2.12			230	1.06	0.77-1.44		
2 sources[g]	10	1.30	0.66-2.54	0.324	0.704	3	1.84	0.52-6.46	0.417	0.704	7	1.12	0.51-2.49	0.565	0.726
353-491-3193 (Barcelona)															
1 source[f]	3	0.39	0.12-1.22			3	1.22	0.37-3.98			0	0.00	0-inf		
2 sources[g]	9	0.99	0.50-1.94			3	1.05	0.33-3.38			6	0.96	0.42-2.20		
3 sources[h]	4	0.80	0.29-2.16			4	2.47	0.88-6.90	0.233	0.695	0	0.00	0-inf		
Colorectal cancer															
2590-2658 (Valencia)															
1 source[f]	2821	1.14	1.04-1.24			1499	1.20	1.06-1.36			1322	1.06	0.93-1.22		
2 sources[g]	91	1.30	1.04-1.62	**0.004**	0.069	55	1.58	1.18-2.11	**0.000**	**0.013**	36	1.00	0.71-1.43		
3630-3694 (Alava)															
1 source[f]	12	0.59	0.33-1.07			8	0.64	0.31-1.33			4	0.52	0.19-1.42		
2 sources[g]	23	1.04	0.67-1.63	0.928	0.996	14	0.98	0.56-1.74	0.724	0.967	9	1.15	0.56-2.35	0.759	0.967
3655-3666 (Guipuzcoa)															
1 source[f]	69	0.83	0.63-1.10			42	0.76	0.53-1.08			27	0.98	0.63-1.55		
2 sources[g]	12	0.84	0.47-1.51			7	0.71	0.33-1.53			5	1.08	0.43-2.71	0.806	0.967
389-495 (Barcelona)															
1 source[f]	6	0.84	0.38-1.89			5	1.34	0.55-3.25			1	0.30	0.04-2.12		
2 sources[g]	54	1.08	0.82-1.43	0.583	0.954	28	1.09	0.74-1.60			26	1.08	0.72-1.61	0.864	0.972
2851-2864 (Zaragoza)															
1 source[f]	5	0.91	0.36-2.30			4	1.34	0.46-3.93			1	0.41	0.06-3.04		
2 sources[g]	5	1.73	0.70-4.25	0.258	0.814	3	1.89	0.59-6.05	0.234	0.814	2	1.56	0.38-6.41	0.741	0.967
353-491-3193 (Barcelona)															
1 source[f]	50	0.97	0.73-1.30			24	0.85	0.57-1.29			26	1.12	0.75-1.67		
2 sources[g]	75	1.22	0.96-1.54			40	1.20	0.87-1.66			35	1.23	0.88-1.74		
3 sources[h]	41	1.18	0.86-1.61	0.184	0.814	25	1.32	0.88-1.97	0.210	0.814	16	1.01	0.61-1.67		
460-492-3001 (Barcelona)															
1 source[f]	85	0.91	0.72-1.13			40	0.80	0.58-1.11			45	1.03	0.75-1.40		
2 sources[g]	1474	1.03	0.95-1.12	0.801	0.967	850	1.11	0.99-1.24	0.291	0.814	624	0.93	0.83-1.06		

[a]Analyses restricted to an area of 50 km surrounding each facility.
[b]Observed deaths.
[c]RRs adjusted for population size, percentages of illiteracy, farmers and unemployed persons, average persons per household, and mean income.
[d]*p*-value for trend in industrial clusters that displayed increases in risk with proximity to a given number of sources (excluding the intermediate category in the variable of "exposure"), suggesting a positive association.
[e]*p*-value adjusted by Benjamini & Hochberg's method.
[f]Towns situated ≤ 5 km from 1 single metal production and processing installation.
[g]Towns situated ≤ 5 km from 2 metal production and processing installations.
[h]Towns situated ≤ 5 km from 3 metal production and processing installations.

Table 3: Relative risk of dying from cancer in towns situated at a distance of less than 5 kilometers from industrial clusters[a] of the metal production and processing sector in the Basque Country, with statistically significant results in the proximity[b] analysis. Tumors of stomach, pancreas, liver, gallbladder, and colon-rectum.

	TOTAL					MEN					WOMEN				
	Obs[c]	RR[d]	95% CI	*p*[e]	pBH[f]	Obs[c]	RR[d]	95% CI	*p*[e]	pBH[f]	Obs[c]	RR[d]	95% CI	*p*[e]	pBH[f]
Stomach cancer															
Cluster 1	1533	**1.29**	**1.11-1.49**	**0.001**	**0.009**	990	**1.27**	**1.06-1.52**	**0.010**	**0.043**	543	1.27	0.99-1.62		
Cluster 3	396	**1.39**	**1.19-1.63**	**0.000**	**0.001**	249	**1.35**	**1.11-1.65**	**0.003**	**0.018**	147	**1.45**	**1.11-1.88**	**0.006**	**0.032**
Pancreatic cancer															
Cluster 5	49	1.37	0.99-1.90			27	**1.56**	**1.01-2.43**	**0.046**	0.390	22	1.20	0.74-1.93		
Liver cancer															
Cluster 3	155	**1.44**	**1.10-1.90**	**0.008**	0.088	107	1.27	0.92-1.75			48	**2.00**	**1.19-3.34**	**0.008**	0.088
Cluster 6	39	1.30	0.87-1.95			36	**1.51**	**1.00-2.29**	**0.049**	0.207	3	0.38	0.11-1.32		
Gallbladder cancer															
Cluster 3	105	**1.64**	**1.19-2.26**	**0.003**	0.059	33	1.46	0.84-2.54			72	**1.75**	**1.17-2.61**	**0.006**	0.062
Colorectal cancer															
Cluster 3	596	1.07	0.94-1.21			363	0.97	0.83-1.13			233	**1.25**	**1.02-1.53**	**0.031**	0.219
Cluster 4	312	0.94	0.82-1.08			165	0.72	0.60-0.87			147	**1.38**	**1.11-1.73**	**0.004**	**0.039**

[a]Cluster 1: facilities '3641', '3697', '3712', '3723', '3724', '3727', 3733', '3737', '3738, '3742' and '3745'. Cluster 2: facilities '3630' and '3694'. Cluster 3: facilities '3629', '3638', '3639' and '3642'. Cluster 4: '3654', '3669', '3682', '3704', '3708' and '3715'. Cluster 5: '3655' and '3666'. Cluster 6: '3645', '3673', '3685' and '3717'. Cluster 7: facilities '3656', '3657', '3675' and '3676'.

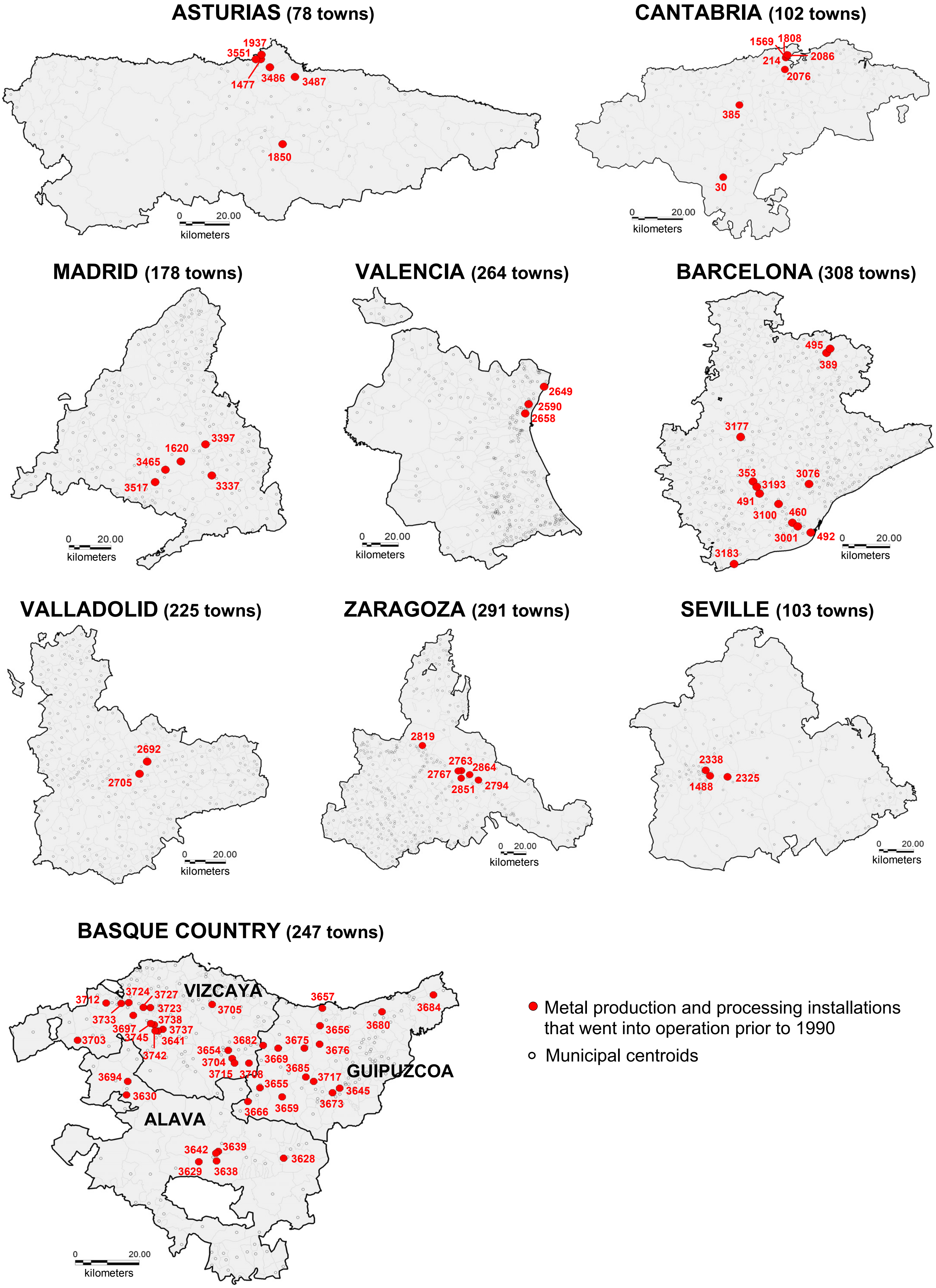
[b]"Near vs. far" analysis. The reference level was made up of towns in the Basque Country having no EPER-registered facility within 5 km of their municipal centroids.

[c]Observed deaths.

[d]RRs adjusted for population size, percentages of illiteracy, farmers and unemployed persons, average persons per household, and mean income.

[e]*p*-value associated with hypothesis test for the Poisson regression model in the "near vs. far" analysis, in statistically significant results suggesting a positive association.

[f]*p*-value adjusted by Benjamini & Hochberg's method.


ASTURIAS (78 towns)
1937
3551
1477
3486
3487
1850
0 20.00
kilometers
CANTABRIA (102 towns)
1569
1808
214
2086
2076
385
30
0 20.00
kilometers
MADRID (178 towns)
1620
3397
3465
3517
3337
0 20.00
kilometers
VALENCIA (264 towns)
2649
2590
2658
0 20.00
kilometers
BARCELONA (308 towns)
495
389
3177
353
3193
3076
491
3100
460
3001
492
3183
0 20.00
kilometers
VALLADOLID (225 towns)
2692
2705
0 20.00
kilometers
ZARAGOZA (291 towns)
2819
2763
2864
2767
2794
2851
0 20.00
kilometers
SEVILLE (103 towns)
2338
1488
2325
0 20.00
kilometers
BASQUE COUNTRY (247 towns)
VIZCAYA
3712
3724
3727
3723
3733
3738
3697
3737
3745
3641
3742
3703
3705
3657
3684
3656
3680
3675
3682
3676
3654
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3704
3715
3708
3685
3717
GUIPUZCOA
3694
3655
3645
3630
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3666
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ALAVA
3642
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3628
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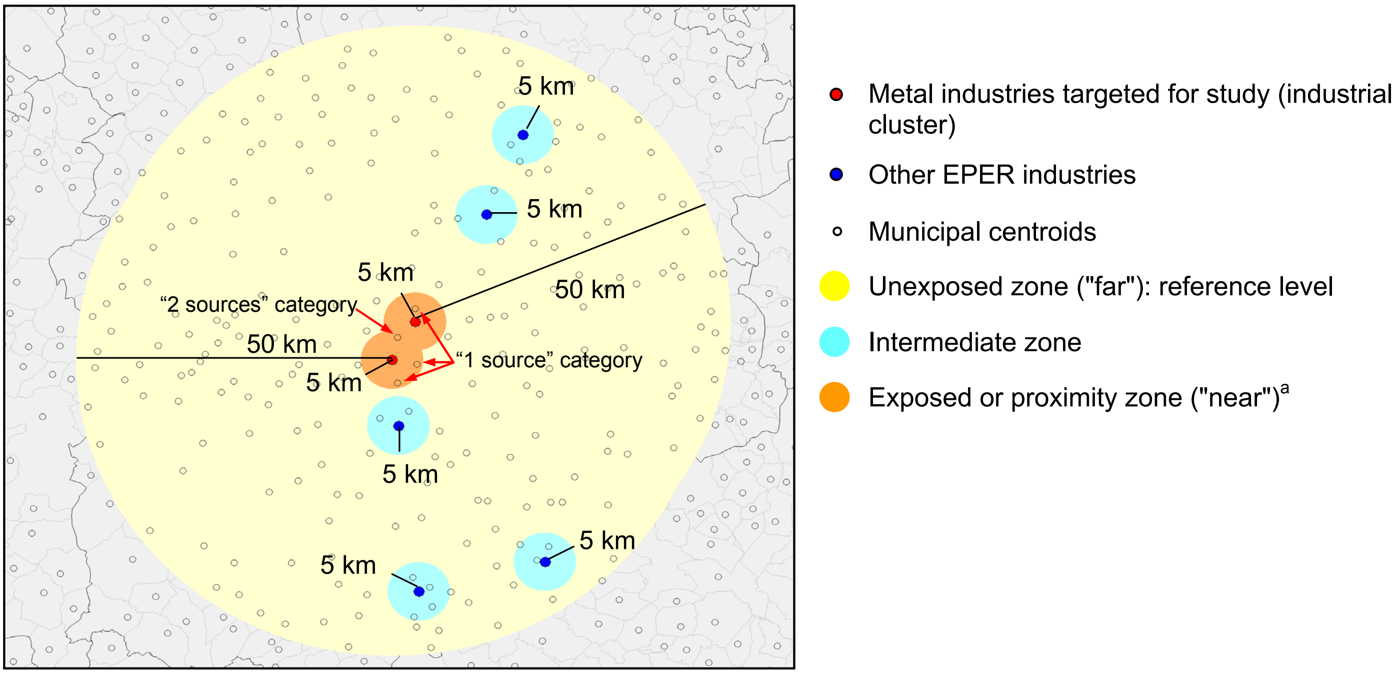
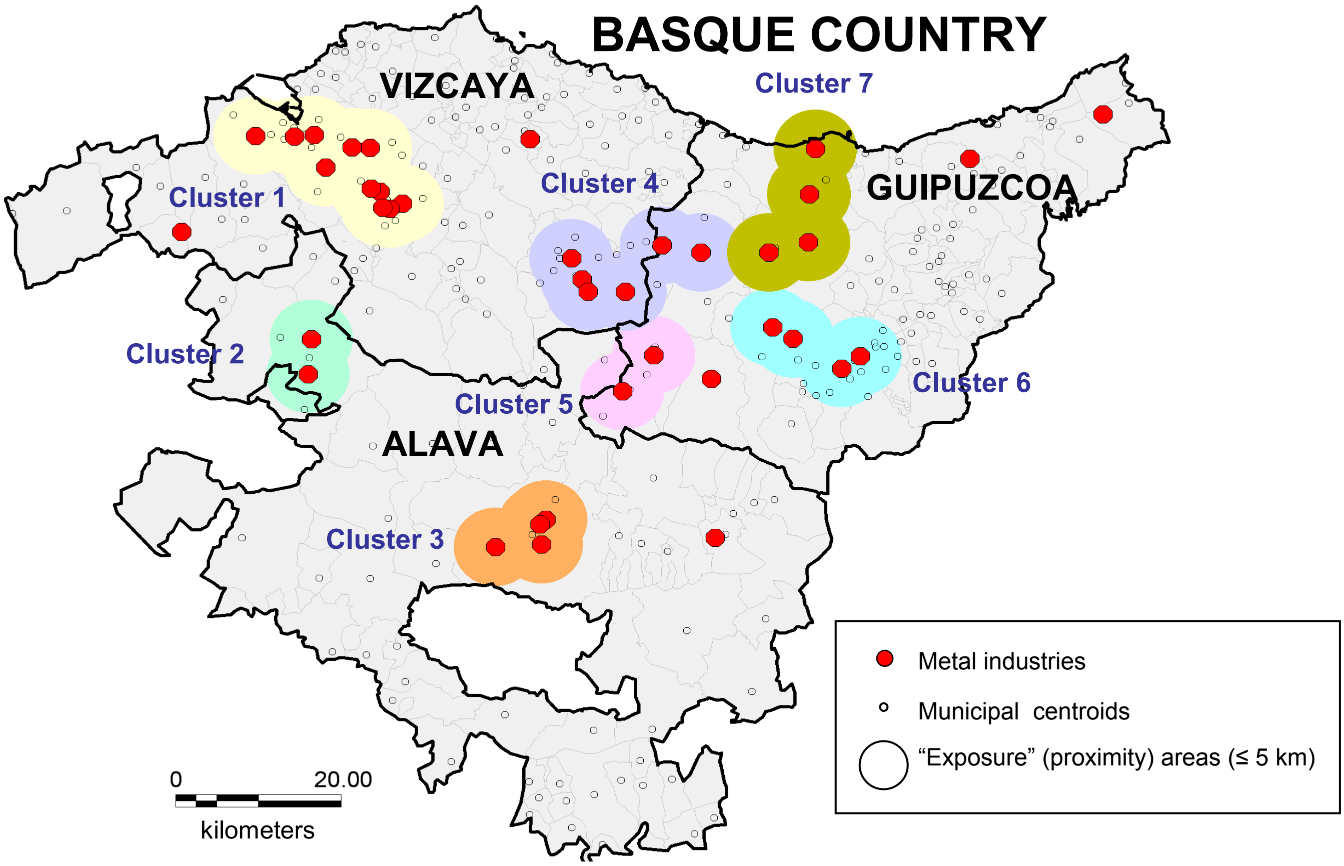
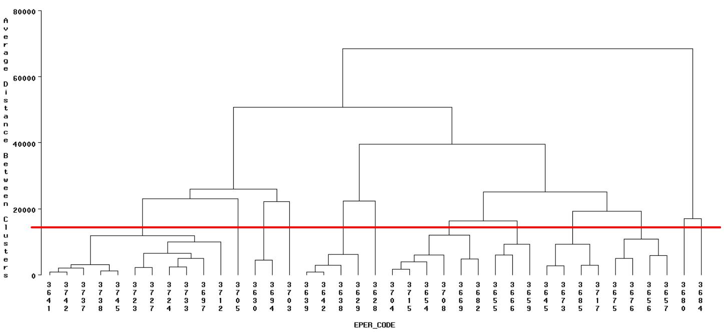
0 20.00
kilometers
Metal production and processing installations that went into operation prior to 1990
Municipal centroids



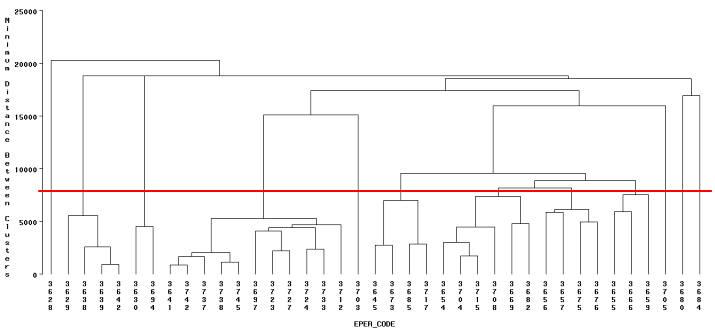
[a]In the above example, 3 municipal centroids are situated ≤ 5 km from a single metal installation ("1 source" category), and 1 municipal centroid is situated ≤ 5 km from the two metal facilities targeted for study ("2 sources" category).



Average linkage clustering



Single linkage clustering



Title of the manuscript: Risk of dying of cancer in the vicinity of multiple pollutant sources associated with the metal industry

Supplementary Data

This document is available as supplementary data for inclusion as online documentation. It includes:

a) Table 1, showing: observed cases; relative risk of dying from cancer in towns in Spanish regions with presence of multiple metal sources, according to their proximity (≤ 5km) to a given number of metal industry pollutant sources; their 95% confidence intervals (CIs); and respective corrections by means of multiple comparisons. Tumors of oral cavity and pharynx, esophagus, stomach, pancreas, liver, gallbladder, and colon-rectum.
b) Table 2, showing: observed cases; relative risk of dying from cancer in the environs of specific industrial clusters made up of 2 or 3 installations; 95% CIs; and their respective corrections by means of multiple comparisons. Tumors of oral cavity and pharynx, esophagus, stomach, pancreas, liver, gallbladder, and colon-rectum.
c) Table 3, showing: observed cases; relative risk of dying from cancer in towns situated at a distance of less than 5 kilometers from industrial clusters of the metal production and processing sector in the Basque Country; 95% CIs; and their respective corrections by means of multiple comparisons. Tumors of oral cavity and pharynx, esophagus, stomach, pancreas, liver, gallbladder, and colon-rectum.
d) Table 4, showing a description of industrial facilities covered by the paper, including the following information: EPER code; geographic region where the facility is located; municipality or town; industrial activity; industrial sub-activity; and pollutants released in the last decade to both air and water.
e) Table 5, showing the types of substances and amounts released to air by metal industries in Spanish regions with presence of multiple metal production and processing facilities (EPER-Spain, 2001).
f) Table 6, showing the types of substances and amounts released to water by metal industries in Spanish regions with presence of multiple metal production and processing facilities (EPER-Spain, 2001).
g) Table 7, showing Moran's I statistics and p-values for spatial autocorrelation analyses, by Spanish region and tumor. Tumors of oral cavity and pharynx, esophagus, stomach, pancreas, liver, gallbladder, and colon-rectum.

Supplementary data, Table 1.

		TOTAL						MEN						WOMEN					
Region	T[a]	Obs[b]	RR[c]	95% CI	p trend[d]	pBH[e]	pBY[f]	Obs[b]	RR[c]	95% CI	p trend[d]	pBH[e]	pBY[f]	Obs[b]	RR[c]	95% CI	p trend[d]	pBH[e]	pBY[f]
Cancer of oral cavity-pharynx																			
Valencia																			
Intermediate[g]	33	105	0.97	0.78-1.21				89	0.98	0.78-1.24				16	0.93	0.53-1.61			
1 source[h]	17	478	1.03	0.85-1.25				373	0.99	0.80-1.22				105	1.18	0.74-1.87			
2 sources[i]	7	16	1.19	0.71-2.00	0.539	0.906	1.000	14	1.25	0.71-2.18	0.732	0.967	1.000	2	0.88	0.21-3.77	0.571	0.906	1.000
Seville																			
Intermediate[g]	8	91	0.96	0.70-1.32				77	0.91	0.64-1.28				14	1.26	0.57-2.78			
1 source[h]	8	51	1.16	0.77-1.75				42	1.09	0.70-1.70				9	1.66	0.60-4.61			
2 sources[i]	4	450	1.37	0.87-2.14	0.078	0.804	1.000	374	1.30	0.80-2.12	0.119	0.804	1.000	76	1.77	0.57-5.53	0.391	0.906	1.000
Valladolid																			
Intermediate[g]	10	21	1.25	0.59-2.69				18	1.20	0.53-2.70				3	0.80	0.12-5.29			
1 source[h]	3	2	0.32	0.06-1.58				2	0.36	0.07-1.84				0	0.00	0-inf			
2 sources[i]	1	175	1.23	0.44-3.47	0.853	0.967	1.000	147	1.14	0.38-3.45	0.952	0.967	1.000	28	0.93	0.12-7.50	0.821	0.967	1.000
Zaragoza																			
Intermediate[g]	24	18	0.78	0.45-1.34				15	0.76	0.42-1.39				3	0.80	0.21-3.10			
1 source[h]	6	4	1.30	0.44-3.83				4	1.55	0.52-4.61				0	0.00	0-inf			
2 sources[i]	2	300	0.86	0.53-1.38	0.799	0.967	1.000	245	0.91	0.53-1.54	0.922	0.967	1.000	55	0.72	0.25-2.09	0.532	0.906	1.000
Madrid																			
Intermediate[g]	10	104	0.91	0.72-1.14				88	0.95	0.73-1.22				16	0.74	0.41-1.32			
1 source[h]	7	178	0.96	0.79-1.17				151	1.00	0.81-1.23				27	0.81	0.50-1.30			
2 sources[i]	1	50	0.82	0.60-1.11	0.362	0.906	1.000	42	0.84	0.60-1.17	0.509	0.906	1.000	8	0.74	0.35-1.59	0.485	0.906	1.000
Cantabria																			
Intermediate[g]	16	89	0.77	0.53-1.10				79	0.80	0.54-1.20				10	0.55	0.22-1.39			
1 source[h]	8	31	0.61	0.37-0.99				25	0.58	0.33-1.01				6	0.74	0.24-2.27			
2 sources[i]	1	11	1.15	0.56-2.37				9	1.13	0.51-2.52				2	1.26	0.24-6.69			
≥ 3 sources[j]	1	151	0.91	0.61-1.36	0.340	0.906	1.000	124	0.92	0.59-1.44	0.450	0.906	1.000	27	0.86	0.34-2.16	0.476	0.906	1.000
Asturias																			
Intermediate[g]	7	82	1.10	0.86-1.40				73	1.14	0.88-1.48				9	0.85	0.41-1.75			
1 source[h]	3	68	0.93	0.72-1.21				63	0.98	0.75-1.29				5	0.53	0.21-1.34			
2 sources[i]	0	0	--	--				0	--	--				0	--	--			
3 sources[j]	1	61	0.91	0.68-1.22	0.343	0.906	1.000	57	0.97	0.72-1.31	0.634	0.950	1.000	4	0.49	0.17-1.41	0.099	0.804	1.000
Barcelona																			
Intermediate[g]	100	1643	1.02	0.90-1.17				1322	1.05	0.91-1.22				321	0.90	0.65-1.24			
1 source[h]	21	305	0.98	0.82-1.15				261	1.02	0.85-1.22				44	0.77	0.51-1.18			
2 sources[i]	15	392	1.09	0.93-1.29				347	1.17	0.98-1.40				45	0.73	0.47-1.12			
≥ 3 sources[j]	1	6	0.74	0.33-1.66	0.504	0.906	1.000	6	0.90	0.40-2.03	0.162	0.874	1.000	0	0.00	0-inf	0.104	0.804	1.000
Basque Country																			
Intermediate[g]	53	281	0.96	0.76-1.22				238	0.96	0.74-1.23				43	1.07	0.63-1.84			
1 source[h]	46	185	0.88	0.70-1.12				154	0.85	0.66-1.10				31	1.12	0.64-1.95			
2 sources[i]	25	131	0.84	0.65-1.09				112	0.84	0.63-1.10				19	0.91	0.48-1.74			
3 sources[j]	10	175	0.99	0.77-1.26				153	0.96	0.74-1.26				22	1.10	0.57-2.14			
≥ 4 sources[k]	9	624	1.03	0.83-1.27	0.880	0.967	1.000	533	1.00	0.80-1.26	0.967	0.967	1.000	91	1.12	0.65-1.92	0.816	0.967	1.000
Esophageal cancer																			
Valencia																			
Intermediate[g]	33	89	0.95	0.75-1.20				76	0.89	0.69-1.15				13	1.53	0.80-2.93			
1 source[h]	17	369	0.94	0.75-1.18				313	0.89	0.70-1.13				56	1.48	0.76-2.87			
2 sources[i]	7	12	1.24	0.68-2.26	0.998	0.998	1.000	10	1.18	0.61-2.28	0.717	0.935	1.000	2	1.71	0.38-7.71	0.323	0.799	1.000
Madrid																			
Intermediate[g]	10	82	0.98	0.75-1.28				76	1.02	0.78-1.35				6	0.66	0.26-1.66			
1 source[h]	7	124	0.92	0.73-1.15				108	0.90	0.71-1.15				16	1.05	0.55-2.01			
2 sources[i]	1	50	1.07	0.78-1.47	0.983	0.998	1.000	38	0.92	0.65-1.32	0.399	0.828	1.000	12	2.25	1.09-4.68	0.022	0.585	1.000
Seville																			
Intermediate[g]	8	87	1.38	0.99-1.92				78	1.35	0.95-1.92				9	1.59	0.62-4.06			
1 source[h]	8	38	1.11	0.70-1.74				32	1.05	0.64-1.72				6	1.54	0.47-5.05			
2 sources[i]	4	343	1.24	0.74-2.06	0.831	0.935	1.000	292	1.22	0.70-2.11	0.826	0.935	1.000	51	1.32	0.33-5.36	0.960	0.998	1.000
Valladolid																			
Intermediate[g]	10	13	0.48	0.19-1.19				12	0.52	0.21-1.31				1	0.55	0.06-5.46			
1 source[h]	3	10	1.24	0.46-3.33				8	1.18	0.42-3.33				2	3.26	0.43-24.89			
2 sources[i]	1	129	0.38	0.13-1.12	0.326	0.799	1.000	119	0.42	0.14-1.29	0.440	0.850	1.000	10	0.64	0.12-3.43	0.656	0.935	1.000
Zaragoza																			
Intermediate[g]	24	18	0.86	0.50-1.47				16	0.79	0.45-1.41				2	0.80	0.12-5.49			
1 source[h]	6	3	0.81	0.24-2.71				3	0.88	0.26-2.95				0	0.00	0-inf			
2 sources[i]	2	224	0.82	0.49-1.38	0.538	0.907	1.000	194	0.72	0.43-1.22	0.326	0.799	1.000	30	6.83	0.29-160.66	0.297	0.799	1.000
Cantabria																			
Intermediate[g]	16	66	0.90	0.58-1.41				59	0.88	0.54-1.42				7	0.96	0.24-3.78			
1 source[h]	8	30	0.94	0.54-1.66				29	0.96	0.53-1.76				1	0.33	0.03-3.40			
2 sources[i]	1	8	1.37	0.58-3.25				4	0.71	0.23-2.21				4	6.65	1.19-37.13			
≥ 3 sources[j]	1	92	0.86	0.52-1.42	0.712	0.935	1.000	78	0.81	0.47-1.40	0.571	0.907	1.000	14	0.95	0.23-3.90	0.769	0.935	1.000
Asturias																			
Intermediate[g]	7	68	1.14	0.88-1.49				57	1.05	0.79-1.39				11	2.19	1.07-4.46			
1 source[h]	3	55	1.02	0.76-1.36				46	0.92	0.67-1.25				9	2.26	1.05-4.89			
2 sources[i]	0	0	--	--				0	--	--				0	--	--			
3 sources[j]	1	44	0.86	0.62-1.20	0.355	0.799	1.000	37	0.78	0.55-1.12	0.144	0.778	1.000	7	1.87	0.76-4.64	0.176	0.791	1.000
Barcelona																			
Intermediate[g]	100	1392	1.01	0.88-1.16				1191	1.01	0.87-1.18				201	0.96	0.64-1.44			
1 source[h]	21	269	1.02	0.85-1.22				246	1.06	0.88-1.28				23	0.73	0.42-1.26			
2 sources[i]	15	303	0.97	0.81-1.16				272	0.98	0.81-1.19				31	0.85	0.50-1.45			
≥ 3 sources[j]	1	5	0.74	0.30-1.79	0.525	0.907	1.000	5	0.83	0.34-2.02	0.763	0.935	1.000	0	0.00	0-inf	0.329	0.799	1.000
Basque Country																			
Intermediate[g]	53	277	1.09	0.88-1.34				246	1.12	0.90-1.41				31	0.86	0.47-1.59			
1 source[h]	46	192	1.05	0.85-1.31				169	1.06	0.84-1.35				23	1.02	0.55-1.90			
2 sources[i]	25	146	1.10	0.87-1.40				130	1.11	0.86-1.44				16	1.05	0.53-2.11			
3 sources[j]	10	144	1.03	0.80-1.34				128	1.04	0.79-1.38				16	1.02	0.47-2.20			
≥ 4 sources[k]	9	509	0.91	0.74-1.13	0.050	0.670	1.000	463	0.96	0.76-1.21	0.119	0.778	1.000	46	0.61	0.32-1.16	0.124	0.778	1.000
Stomach cancer																			
Valencia																			
Intermediate[g]	33	324	1.05	0.93-1.19				198	1.02	0.88-1.20				126	1.11	0.91-1.35			
1 source[h]	17	1350	1.08	0.96-1.22				812	1.02	0.88-1.18				538	1.20	1.00-1.45			
2 sources[i]	7	41	1.14	0.83-1.58	0.175	0.428	1.000	26	1.31	0.87-1.98	0.433	0.617	1.000	15	0.93	0.55-1.58	0.229	0.442	1.000
Madrid																			
Intermediate[g]	10	286	0.90	0.78-1.03				159	0.77	0.64-0.92				127	1.13	0.91-1.40			
1 source[h]	7	479	0.98	0.87-1.10				320	0.99	0.85-1.14				159	0.96	0.78-1.17			
2 sources[i]	1	169	1.02	0.86-1.21	0.516	0.664	1.000	93	0.84	0.67-1.06	0.896	0.969	1.000	76	1.37	1.05-1.77	0.228	0.442	1.000
Valladolid																			
Intermediate[g]	10	84	1.14	0.79-1.65				52	1.05	0.66-1.69				32	1.29	0.72-2.32			
1 source[h]	3	24	0.95	0.56-1.63				17	0.87	0.45-1.71				7	1.05	0.42-2.65			
2 sources[i]	1	632	0.81	0.50-1.31	0.029	0.099	0.383	377	0.65	0.36-1.20	0.014	0.064	0.248	255	1.15	0.53-2.50	0.671	0.824	1.000
Basque Country																			
Intermediate[g]	53	649	1.04	0.89-1.21				410	1.04	0.87-1.25				239	1.12	0.88-1.42			
1 source[h]	46	465	1.09	0.94-1.27				306	1.11	0.92-1.33				159	1.12	0.87-1.43			
2 sources[i]	25	314	1.02	0.86-1.21				212	1.05	0.86-1.29				102	1.00	0.76-1.33			

		TOTAL						MEN						WOMEN					
Region	T[a]	Obs[b]	RR[c]	95% CI	p trend[d]	pBH[e]	pBY[f]	Obs[b]	RR[c]	95% CI	p trend[d]	pBH[e]	pBY[f]	Obs[b]	RR[c]	95% CI	p trend[d]	pBH[e]	pBY[f]
3 sources[j]	10	368	1.27	1.08-1.50				234	1.23	1.00-1.51				134	1.35	1.02-1.79			
≥ 4 sources[k]	9	1494	1.26	1.09-1.45	0.001	0.016	0.064	953	1.23	1.04-1.47	0.009	0.064	0.248	541	1.34	1.06-1.70	0.014	0.064	0.248
Seville																			
Intermediate[g]	8	161	0.79	0.63-0.99				103	0.84	0.64-1.11				58	0.70	0.48-1.03			
1 source[h]	8	105	0.89	0.67-1.17				66	0.91	0.65-1.29				39	0.83	0.52-1.33			
2 sources[i]	4	824	0.71	0.52-0.98	0.247	0.444	1.000	506	0.76	0.51-1.13	0.434	0.617	1.000	318	0.62	0.40-1.06	0.378	0.601	1.000
Zaragoza																			
Intermediate[g]	24	83	0.91	0.74-1.17				47	0.81	0.58-1.13				36	1.04	0.70-1.53			
1 source[h]	6	20	1.44	0.89-2.34				14	1.63	0.91-2.93				6	1.13	0.48-2.69			
2 sources[i]	2	983	0.78	0.62-0.99	0.118	0.318	1.000	555	0.65	0.48-0.87	0.026	0.099	0.383	428	1.05	0.71-1.56	0.811	0.952	1.000
Cantabria																			
Intermediate[g]	16	208	0.97	0.75-1.24				128	0.98	0.71-1.36				80	0.94	0.62-1.42			
1 source[h]	8	106	1.00	0.73-1.38				68	1.06	0.71-1.57				38	0.92	0.55-1.56			
2 sources[i]	1	11	0.55	0.28-1.07				6	0.50	0.21-1.23				5	0.63	0.23-1.74			
≥ 3 sources[l]	1	295	0.87	0.65-1.15	0.203	0.442	1.000	177	0.92	0.64-1.32	0.477	0.644	1.000	118	0.81	0.51-1.28	0.300	0.506	1.000
Asturias																			
Intermediate[g]	7	205	1.10	0.94-1.29				135	1.30	1.07-1.59				70	0.85	0.65-1.10			
1 source[h]	3	167	0.94	0.79-1.11				106	1.06	0.86-1.31				61	0.78	0.60-1.03			
2 sources[i]	0	0	--	--				0	--	--				0	--	--			
3 sources[j]	1	117	0.74	0.61-0.91	0.002	0.026	0.101	70	0.81	0.62-1.05	0.064	0.191	0.743	47	0.67	0.49-0.92	0.010	0.064	0.248
Barcelona																			
Intermediate[g]	100	4093	0.97	0.89-1.05				2412	1.00	0.90-1.11				1681	0.92	0.81-1.05			
1 source[h]	21	780	1.03	0.93-1.14				511	1.11	0.98-1.27				269	0.89	0.75-1.06			
2 sources[i]	15	854	0.97	0.87-1.08				523	0.97	0.85-1.11				331	0.96	0.81-1.14			
≥ 3 sources[l]	1	16	0.82	0.50-1.35	0.969	0.969	1.000	11	0.92	0.50-1.68	0.941	0.969	1.000	5	0.67	0.28-1.62	0.956	0.969	1.000
Pancreatic cancer																			
Valencia																			
Intermediate[g]	33	205	1.13	0.96-1.32				108	1.10	0.88-1.36				97	1.16	0.92-1.45			
1 source[h]	17	937	1.12	0.97-1.30				474	1.11	0.91-1.36				463	1.13	0.91-1.40			
2 sources[i]	7	28	1.18	0.79-1.74	0.184	0.828	1.000	13	0.95	0.54-1.68	0.590	0.907	1.000	15	1.48	0.86-2.54	0.180	0.828	1.000
Madrid																			
Intermediate[g]	10	146	0.86	0.70-1.04				87	0.92	0.72-1.19				59	0.77	0.57-1.05			
1 source[h]	7	254	0.93	0.79-1.09				149	0.93	0.76-1.15				105	0.91	0.71-1.17			
2 sources[i]	1	100	1.08	0.86-1.35	0.518	0.907	1.000	62	1.16	0.87-1.54	0.477	0.907	1.000	38	0.97	0.68-1.38	0.908	0.941	1.000
Zaragoza																			
Intermediate[g]	24	43	0.89	0.63-1.25				26	0.92	0.59-1.44				17	0.83	0.48-1.42			
1 source[h]	6	7	1.02	0.46-2.25				4	0.90	0.32-2.57				3	1.19	0.35-4.00			
2 sources[i]	2	695	1.08	0.78-1.48	0.460	0.907	1.000	345	0.96	0.62-1.48	0.916	0.941	1.000	350	1.24	0.77-1.98	0.237	0.907	1.000
Valladolid																			
Intermediate[g]	10	23	0.58	0.29-1.15				9	0.69	0.27-1.75				14	0.40	0.14-1.12			
1 source[h]	3	8	0.55	0.21-1.43				4	0.89	0.39-8.98				4	0.29	0.07-1.23			
2 sources[i]	1	348	0.94	0.40-2.22	0.062	0.419	1.000	179	1.96	0.57-6.72	0.019	0.419	1.000	169	0.38	0.11-1.39	0.902	0.941	1.000
Seville																			
Intermediate[g]	8	113	0.90	0.69-1.19				55	0.87	0.59-1.28				58	0.95	0.64-1.42			
1 source[h]	8	70	1.01	0.72-1.43				36	0.96	0.60-1.54				34	1.07	0.65-1.78			
2 sources[i]	4	610	0.85	0.57-1.27	0.685	0.924	1.000	330	0.99	0.58-1.71	0.722	0.928	1.000	330	0.72	0.40-1.30	0.327	0.907	1.000
Cantabria																			
Intermediate[g]	16	178	1.12	0.82-1.53				86	0.97	0.63-1.49				92	1.29	0.81-2.06			
1 source[h]	8	80	1.14	0.77-1.69				46	1.10	0.65-1.87				34	1.17	0.65-2.11			
2 sources[i]	1	16	1.14	0.61-2.14				7	0.87	0.35-2.17				7	1.50	0.63-3.57			
≥ 3 sources[l]	1	226	1.04	0.73-1.47	0.607	0.907	1.000	115	1.00	0.62-1.63	0.941	0.941	1.000	111	1.08	0.65-1.80	0.421	0.907	1.000
Asturias																			
Intermediate[g]	7	118	1.05	0.86-1.28				61	1.06	0.81-1.41				57	1.03	0.77-1.38			
1 source[h]	3	112	1.07	0.87-1.31				53	0.94	0.70-1.27				59	1.21	0.91-1.61			
2 sources[i]	0	0	--	--				0	--	--				0	--	--			
3 sources[j]	1	96	1.00	0.79-1.26	0.898	0.941	1.000	51	0.99	0.72-1.36	0.771	0.941	1.000	45	1.01	0.72-1.42	0.612	0.907	1.000
Barcelona																			
Intermediate[g]	100	3123	1.09	0.98-1.20				1626	1.06	0.92-1.21				1497	1.12	0.96-1.31			
1 source[h]	21	465	1.01	0.89-1.15				269	1.05	0.88-1.25				196	0.97	0.79-1.19			
2 sources[i]	15	536	1.02	0.90-1.17				315	1.09	0.92-1.30				221	0.94	0.77-1.15			
≥ 3 sources[l]	1	12	1.00	0.57-1.79	0.326	0.907	1.000	6	0.89	0.39-2.00	0.638	0.907	1.000	6	1.16	0.51-2.63	0.049	0.419	1.000
Basque Country																			
Intermediate[g]	53	445	1.10	0.93-1.30				220	1.15	0.91-1.45				225	1.04	0.82-1.32			
1 source[h]	46	309	1.09	0.92-1.30				167	1.17	0.92-1.49				142	1.02	0.79-1.31			
2 sources[i]	25	206	0.99	0.81-1.21				94	0.89	0.67-1.18				112	1.10	0.84-1.45			
3 sources[j]	10	207	1.00	0.81-1.23				113	1.08	0.81-1.45				94	0.92	0.67-1.25			
≥ 4 sources[k]	9	872	1.03	0.87-1.22	0.383	0.907	1.000	487	1.21	0.96-1.53	0.436	0.907	1.000	385	0.87	0.68-1.11	0.040	0.419	1.000
Liver cancer																			
Valencia																			
Intermediate[g]	33	151	1.36	1.12-1.64				108	1.35	1.08-1.69				43	1.38	0.97-1.97			
1 source[h]	17	679	1.25	1.04-1.51				487	1.26	1.01-1.57				192	1.25	0.87-1.79			
2 sources[i]	7	23	2.22	1.42-3.48	0.003	0.026	0.101	14	1.87	1.06-3.30	0.028	0.146	0.567	9	3.11	1.49-6.52	0.032	0.146	0.567
Madrid																			
Intermediate[g]	10	122	0.77	0.62-0.95				85	0.74	0.58-0.95				37	0.83	0.56-1.22			
1 source[h]	7	240	0.95	0.81-1.13				174	0.93	0.76-1.13				66	1.03	0.75-1.42			
2 sources[i]	1	99	1.16	0.92-1.45	0.082	0.246	0.957	62	0.99	0.74-1.31	0.632	0.742	1.000	37	1.62	1.10-2.40	0.011	0.077	0.300
Seville																			
Intermediate[g]	8	63	0.80	0.55-1.15				47	0.83	0.54-1.27				16	0.72	0.34-1.49			
1 source[h]	8	42	1.09	0.69-1.72				32	1.12	0.66-1.90				10	0.99	0.40-2.45			
2 sources[i]	4	418	1.26	0.76-2.10	0.075	0.246	0.957	302	1.18	0.65-2.13	0.243	0.415	1.000	116	1.52	0.57-4.05	0.130	0.306	1.000
Asturias																			
Intermediate[g]	7	85	1.18	0.91-1.52				71	1.29	0.97-1.72				14	0.86	0.47-1.56			
1 source[h]	3	81	1.07	0.84-1.38				63	1.05	0.79-1.39				18	1.19	0.70-2.03			
2 sources[i]	0	0	--	--				0	--	--				0	--	--			
3 sources[j]	1	77	1.16	0.88-1.53	0.437	0.594	1.000	56	1.06	0.77-1.47	0.908	0.970	1.000	21	1.59	0.93-2.74	0.058	0.222	0.865
Cantabria																			
Intermediate[g]	16	55	1.57	0.81-3.05				44	1.65	0.77-3.56				11	1.25	0.34-4.58			
1 source[h]	8	23	1.63	0.72-3.68				16	1.44	0.55-3.76				7	2.11	0.45-9.86			
2 sources[i]	1	3	1.14	0.28-4.66				3	1.39	0.31-6.22				0	--	--			
≥ 3 sources[l]	1	85	1.95	0.94-4.07	0.248	0.415	1.000	67	1.85	0.79-4.33	0.494	0.636	1.000	18	2.44	0.55-10.74	0.190	0.394	1.000
Barcelona																			
Intermediate[g]	100	2702	1.04	0.93-1.16				1837	1.07	0.94-1.22				865	0.97	0.80-1.18			
1 source[h]	21	426	0.98	0.85-1.13				299	1.00	0.85-1.18				127	0.94	0.73-1.21			
2 sources[i]	15	475	0.94	0.81-1.08				351	0.98	0.83-1.16				124	0.84	0.64-1.09			
≥ 3 sources[l]	1	16	1.52	0.92-2.51	0.136	0.306	1.000	10	1.34	0.71-2.52	0.262	0.415	1.000	6	1.97	0.86-4.50	0.312	0.468	1.000
Basque Country																			
Intermediate[g]	53	184	0.88	0.67-1.16				126	0.89	0.66-1.20				58	1.05	0.63-1.76			
1 source[h]	46	117	0.81	0.61-1.07				91	0.90	0.66-1.22				26	0.70	0.34-1.23			
2 sources[i]	25	111	1.00	0.75-1.33				88	1.10	0.80-1.53				23	0.83	0.46-1.50			
3 sources[j]	10	129	1.19	0.89-1.59				90	1.10	0.78-1.55				39	1.44	0.83-2.52			
≥ 4 sources[k]	9	532	1.27	0.99-1.63	0.001	0.021	0.080	386	1.22	0.92-1.63	0.002	0.026	0.101	146	1.46	0.91-2.37	0.101	0.273	1.000
Valladolid																			
Intermediate[g]	10	10	1.13	0.39-3.26				6	1.24	0.33-4.60				4	0.99	0.16-6.03			
1 source[h]	3	7	2.37	0.68-8.33				4	1.87	0.39-8.98				3	4.34	0.52-36.51			

		TOTAL						MEN						WOMEN					
Region	T[a]	Obs[b]	RR[c]	95% CI	p trend[d]	pBH[e]	pBY[f]	Obs[b]	RR[c]	95% CI	p trend[d]	pBH[e]	pBY[f]	Obs[b]	RR[c]	95% CI	p trend[d]	pBH[e]	pBY[f]
2 sources[i]	1	157	1.48	0.38-5.77	0.704	0.792	1.000	112	1.79	0.32-9.95	0.582	0.714	1.000	45	1.21	0.13-11.61	0.989	0.989	1.000
Zaragoza																			
Intermediate[g]	24	20	1.10	0.64-1.89				14	1.34	0.69-2.59				6	0.81	0.31-2.16			
1 source[h]	6	1	0.33	0.04-2.45				1	0.49	0.06-3.78				0	0.00	0-inf			
2 sources[i]	2	305	1.10	0.64-1.89	0.934	0.970	1.000	231	1.51	0.73-3.13	0.440	0.594	1.000	74	0.62	0.27-1.40	0.227	0.415	1.000
Gallbladder cancer																			
Valencia																			
Intermediate[g]	33	76	1.00	0.78-1.29				22	1.06	0.66-1.70				54	0.98	0.73-1.33			
1 source[h]	17	348	1.14	0.90-1.43				102	1.09	0.71-1.68				246	1.17	0.89-1.54			
2 sources[i]	7	10	1.25	0.65-2.40	0.213	0.631	1.000	3	1.32	0.40-4.39	0.598	0.856	1.000	7	1.21	0.55-2.64	0.234	0.631	1.000
Seville																			
Intermediate[g]	8	48	0.76	0.51-1.13				18	0.79	0.41-1.52				30	0.74	0.49-1.22			
1 source[h]	8	22	0.70	0.40-1.21				9	0.77	0.32-1.86				13	0.65	0.32-1.32			
2 sources[i]	4	220	0.84	0.48-1.49	0.991	0.991	1.000	60	0.64	0.24-1.72	0.536	0.856	1.000	160	0.95	0.47-1.91	0.697	0.856	1.000
Valladolid																			
Intermediate[g]	10	5	0.48	0.13-1.73				2	0.47	0.06-3.89				3	0.45	0.09-2.41			
1 source[h]	3	2	0.57	0.09-3.52				0	0.00	0-inf				2	0.98	0.13-7.23			
2 sources[i]	1	109	1.08	0.20-5.78	0.164	0.553	1.000	43	1.28	0.07-24.84	0.260	0.639	1.000	66	0.86	0.11-6.92	0.441	0.856	1.000
Zaragoza																			
Intermediate[g]	24	7	0.34	0.16-0.75				2	0.34	0.08-1.47				5	0.35	0.14-0.89			
1 source[h]	6	1	0.27	0.04-2.03				0	0.00	0-inf				1	0.39	0.05-2.92			
2 sources[i]	2	242	0.77	0.47-1.25	0.695	0.856	1.000	84	0.78	0.34-1.79	0.739	0.868	1.000	158	0.76	0.42-1.40	0.792	0.891	1.000
Madrid																			
Intermediate[g]	10	80	1.39	1.04-1.85				32	1.96	1.20-3.22				48	1.16	0.81-1.67			
1 source[h]	7	77	0.92	0.69-1.22				23	0.95	0.56-1.61				54	0.91	0.65-1.28			
2 sources[i]	1	23	0.78	0.50-1.22	0.038	0.257	0.998	3	0.36	0.11-1.18	0.012	0.131	0.509	20	0.95	0.58-1.55	0.434	0.856	1.000
Cantabria																			
Intermediate[g]	16	49	1.33	0.73-2.44				18	1.49	0.56-4.00				31	1.14	0.51-2.51			
1 source[h]	8	21	1.14	0.53-2.42				11	1.93	0.61-6.14				10	0.68	0.24-1.93			
2 sources[i]	1	4	1.04	0.31-3.50				2	1.88	0.32-11.03				2	0.59	0.11-3.20			
≥ 3 sources[l]	1	62	1.09	0.57-2.12	0.528	0.856	1.000	19	1.28	0.43-3.80	0.869	0.936	1.000	43	0.90	0.38-2.11	0.494	0.856	1.000
Asturias																			
Intermediate[g]	7	28	0.93	0.61-1.40				12	1.01	0.53-1.91				16	0.86	0.50-1.49			
1 source[h]	3	14	0.48	0.28-0.83				5	0.40	0.16-1.01				9	0.54	0.27-1.07			
2 sources[i]	0	0	--	--				0	--	--				0	--	--			
3 sources[j]	1	15	0.51	0.30-0.90	0.002	0.067	0.262	8	0.66	0.30-1.43	0.089	0.399	1.000	7	0.42	0.19-0.95	0.015	0.131	0.509
Barcelona																			
Intermediate[g]	100	1054	0.96	0.81-1.13				382	0.99	0.75-1.31				672	0.94	0.77-1.16			
1 source[h]	21	165	0.82	0.66-1.02				67	0.96	0.68-1.36				98	0.75	0.57-0.99			
2 sources[i]	15	207	0.88	0.71-1.09				76	0.97	0.68-1.39				131	0.84	0.65-1.10			
≥ 3 sources[l]	1	4	0.78	0.29-2.11	0.161	0.553	1.000	4	2.30	0.83-6.38	0.901	0.936	1.000	0	0.00	0-inf	0.066	0.359	1.000
Basque Country																			
Intermediate[g]	53	174	1.23	0.91-1.66				57	1.16	0.73-1.86				117	1.33	0.92-1.93			
1 source[h]	46	109	1.11	0.82-1.51				38	1.13	0.69-1.85				71	1.15	0.78-1.69			
2 sources[i]	25	63	0.86	0.60-1.23				22	0.86	0.48-1.53				41	0.89	0.57-1.39			
3 sources[j]	10	53	0.81	0.55-1.19				21	0.97	0.52-1.81				32	0.74	0.45-1.20			
≥ 4 sources[k]	9	323	1.16	0.87-1.55	0.697	0.856	1.000	102	1.04	0.64-1.69	0.544	0.856	1.000	221	1.23	0.86-1.76	0.692	0.856	1.000
Colorectal cancer																			
Valencia																			
Intermediate[g]	33	629	1.07	0.98-1.16				332	1.05	0.93-1.19				297	1.08	0.95-1.23			
1 source[h]	17	2995	1.11	1.03-1.21				1589	1.17	1.05-1.31				1406	1.05	0.93-1.19			
2 sources[i]	7	91	1.37	1.10-1.71	0.001	0.016	0.061	55	1.66	1.25-2.20	0.000	0.003	0.011	36	1.07	0.76-1.51	0.573	0.778	1.000
Zaragoza																			
Intermediate[g]	24	141	1.03	0.85-1.25				79	1.05	0.81-1.36				62	1.02	0.76-1.36			
1 source[h]	6	20	0.95	0.59-1.51				11	1.02	0.54-1.91				9	0.87	0.44-1.75			
2 sources[i]	2	1965	1.28	1.05-1.57	0.018	0.163	0.633	1101	1.26	0.96-1.66	0.102	0.549	1.000	864	1.32	0.97-1.79	0.085	0.549	1.000
Valladolid																			
Intermediate[g]	10	95	1.04	0.75-1.44				50	0.73	0.46-1.17				45	1.58	0.99-2.52			
1 source[h]	3	33	1.28	0.81-2.03				20	1.04	0.56-1.93				13	1.62	0.80-3.28			
2 sources[i]	1	981	1.20	0.78-1.84	0.369	0.646	1.000	569	0.79	0.44-1.43	0.784	0.864	1.000	412	2.02	1.06-3.83	0.281	0.646	1.000
Barcelona																			
Intermediate[g]	100	9269	1.07	1.01-1.14				4986	1.12	1.03-1.21				4283	1.03	0.94-1.20			
1 source[h]	21	1487	1.08	1.00-1.16				806	1.10	0.99-1.22				681	1.05	0.94-1.17			
2 sources[i]	15	1603	1.04	0.97-1.13				918	1.13	1.02-1.25				685	0.95	0.84-1.06			
≥ 3 sources[l]	1	41	1.15	0.84-1.58	0.867	0.900	1.000	25	1.31	0.88-1.95	0.382	0.646	1.000	16	0.97	0.59-1.60	0.201	0.646	1.000
Basque Country																			
Intermediate[g]	53	1178	1.04	0.93-1.15				666	0.93	0.82-1.06				512	1.23	1.04-1.46			
1 source[h]	46	689	0.92	0.82-1.03				401	0.79	0.69-0.91				288	1.16	0.97-1.40			
2 sources[i]	25	541	0.97	0.86-1.09				322	0.84	0.72-0.98				219	1.22	1.00-1.49			
3 sources[j]	10	576	1.04	0.92-1.19				361	0.96	0.81-1.13				215	1.20	0.97-1.49			
≥ 4 sources[k]	9	2470	1.03	0.93-1.15	0.583	0.778	1.000	1461	0.94	0.82-1.07	0.800	0.864	1.000	1009	1.20	1.01-1.44	0.681	0.836	1.000
Seville																			
Intermediate[g]	8	399	1.06	0.91-1.23				221	1.03	0.84-1.27				178	1.09	0.86-1.37			
1 source[h]	8	223	1.05	0.86-1.28				127	1.03	0.79-1.33				96	1.08	0.80-1.45			
2 sources[i]	4	2140	0.95	0.76-1.18	0.383	0.646	1.000	1120	0.97	0.72-1.30	0.725	0.852	1.000	1020	0.92	0.65-1.29	0.359	0.646	1.000
Madrid																			
Intermediate[g]	10	562	0.99	0.89-1.09				304	1.01	0.88-1.16				258	0.95	0.82-1.11			
1 source[h]	7	796	0.92	0.84-1.01				442	0.94	0.84-1.07				354	0.89	0.78-1.02			
2 sources[i]	1	290	0.98	0.86-1.12	0.267	0.646	1.000	160	1.01	0.85-1.20	0.605	0.778	1.000	130	0.95	0.79-1.16	0.303	0.646	1.000
Cantabria																			
Intermediate[g]	16	404	1.17	0.96-1.43				246	1.24	0.95-1.61				158	1.07	0.79-1.46			
1 source[h]	8	183	1.16	0.90-1.49				110	1.20	0.86-1.68				73	1.09	0.75-1.60			
2 sources[i]	1	34	1.17	0.77-1.77				26	1.59	0.96-2.64				8	0.62	0.29-1.36			
≥ 3 sources[l]	1	596	1.14	0.91-1.43	0.966	0.966	1.000	347	1.28	0.95-1.74	0.486	0.771	1.000	249	1.00	0.71-1.39	0.552	0.778	1.000
Asturias																			
Intermediate[g]	7	339	1.01	0.90-1.14				189	0.98	0.83-1.15				150	1.04	0.87-1.25			
1 source[h]	3	330	1.06	0.94-1.20				201	1.08	0.92-1.26				129	1.03	0.85-1.24			
2 sources[i]	0	0	--	--				0	--	--				0	--	--			
3 sources[j]	1	254	0.87	0.75-1.00	0.141	0.636	1.000	152	0.87	0.72-1.04	0.339	0.646	1.000	102	0.86	0.69-1.07	0.223	0.646	1.000

[a]Number of towns.
[b]Observed deaths.
[c]RRs adjusted for population size, percentages of illiteracy, farmers and unemployed persons, average persons per household, and mean income.
[d]p-value for trend in regions that displayed increases in risk with proximity to a given number of sources (excluding the intermediate category in the variable of "exposure"), associated with hypothesis test for the Poisson regression model.
[e]p-value adjusted by Benjamini & Hochberg's method.
[f]p-value adjusted by Benjamini & Yekutieli's method.
[g]Towns situated at a distance ≤ 5 km from any industrial installation other than metal production and processing.
[h]Towns situated ≤ 5 km from 1 single metal production and processing installation.
[i]Towns situated ≤ 5 km from 2 metal production and processing installations.
[j]Towns situated ≤ 5 km from 3 metal production and processing installations.
[k]Towns situated ≤ 5 km from 4 or more metal production and processing installations.
[l]Towns situated ≤ 5 km from 3 or more metal production and processing installations.

Supplementary data, Table 2.

		TOTAL						MEN						WOMEN					
EPER code[a]	T[b]	Obs[c]	RR[d]	95% CI	p trend[e]	pBH[f]	pBY[g]	Obs[c]	RR[d]	95% CI	p trend[e]	pBH[f]	pBY[g]	Obs[c]	RR[d]	95% CI	p trend[e]	pBH[f]	pBY[g]
Cancer of oral cavity-pharynx																			
2590-2658 (Valencia)																			
1 source[h]	15	443	1.09	0.87-1.36				347	1.08	0.85-1.38				96	1.06	0.62-1.81			
2 sources[i]	7	16	1.23	0.72-2.10	0.264	0.813	1.000	14	1.30	0.73-2.30	0.356	0.813	1.000	2	0.92	0.21-4.08	0.528	0.880	1.000
1488-2338 (Seville)																			
1 source[h]	7	24	1.05	0.63-1.75				21	1.01	0.58-1.75				3	1.22	0.30-4.93			
2 sources[i]	4	450	0.92	0.57-1.49	0.851	0.998	1.000	374	0.88	0.52-1.48	0.697	0.935	1.000	76	1.15	0.34-3.86	0.679	0.935	1.000
3655-3666 (Guipuzcoa)																			
1 source[h]	4	25	1.05	0.64-1.73				22	1.00	0.59-1.71				3	1.40	0.35-5.72			
2 sources[i]	1	2	0.54	0.13-2.26	0.200	0.813	1.000	2	0.60	0.14-2.51	0.165	0.813	1.000	0	0.00	0-inf	0.977	0.998	1.000
3656-3657 (Guipuzcoa)																			
1 source[h]	3	7	0.82	0.37-1.82				4	0.56	0.20-1.55				3	2.33	0.61-8.97			
2 sources[i]	1	0	0.00	0-inf	0.701	0.935	1.000	0	0.00	0-inf	0.347	0.813	1.000	0	0.00	0-inf	0.258	0.813	1.000
3465-3517 (Madrid)																			
1 source[h]	3	124	0.92	0.74-1.15				107	0.98	0.77-1.24				17	0.72	0.41-1.28			
2 sources[i]	1	50	0.79	0.58-1.07	0.104	0.813	1.000	42	0.81	0.58-1.13	0.185	0.813	1.000	8	0.73	0.34-1.57	0.333	0.813	1.000
3630-3694 (Alava)																			
1 source[h]	2	4	0.73	0.26-2.06				4	0.85	0.30-2.41				0	0.00	0-inf			
2 sources[i]	1	4	0.65	0.23-1.84	0.646	0.935	1.000	3	0.56	0.17-1.84	0.447	0.826	1.000	1	1.34	0.15-11.83	0.361	0.813	1.000
2692-2705 (Valladolid)																			
1 source[h]	3	2	0.35	0.08-1.49				2	0.46	0.11-1.98				0	0.00	0-inf			
2 sources[i]	1	175	1.14	0.75-1.73	0.683	0.935	1.000	147	1.40	0.88-2.24	0.236	0.813	1.000	28	0.58	0.21-1.64	0.339	0.813	1.000
1477-1937-3551 (Asturias)																			
1 source[h]	1	14	0.86	0.49-1.50				12	0.81	0.44-1.49				2	1.16	0.26-5.18			
2 sources[i]	0	0	--	--				0	--	--				0	--	---			
3 sources[j]	1	61	0.93	0.67-1.29	0.459	0.826	1.000	57	0.98	0.69-1.38	0.316	0.813	1.000	4	0.53	0.17-1.63	0.997	0.998	1.000
460-492-3001 (Barcelona)																			
1 source[h]	2	30	1.39	0.94-2.05				25	1.42	0.93-2.19				5	1.16	0.45-3.03			
2 sources[i]	9	369	1.11	0.93-1.32	0.242	0.813	1.000	326	1.18	0.97-1.43	0.184	0.813	1.000	43	0.76	0.48-1.21	0.792	0.984	1.000
389-495 (Barcelona)																			
1 source[h]	2	2	1.50	0.36-6.19				2	1.63	0.39-6.75				0	0.00	0-inf			
2 sources[i]	3	8	0.92	0.44-1.90	0.871	0.998	1.000	7	0.98	0.45-2.14	0.961	0.998	1.000	1	0.65	0.08-5.06	0.793	0.984	1.000
353-491-3193 (Barcelona)																			
1 source[h]	2	8	0.71	0.35-1.44				7	0.78	0.37-1.68				1	0.41	0.06-3.02			
2 sources[i]	3	15	1.05	0.62-1.78				14	1.16	0.67-2.01				1	0.46	0.06-3.38			
3 sources[j]	1	6	0.71	0.32-1.61	0.538	0.880	1.000	6	0.86	0.38-1.95	0.938	0.998	1.000	0	0.00	0-inf	0.162	0.813	1.000
2851-2864 (Zaragoza)																			
1 source[h]	1	3	5.80	1.32-25.54				3	5.27	1.15-24.15				0	0.00	0-inf			
2 sources[i]	1	0	0.00	0-inf	0.456	0.826	1.000	0	0.00	0-inf	0.434	0.826	1.000	0	0.00	0-inf	0.998	0.998	1.000
Esophageal cancer																			
2590-2658 (Valencia)																			
1 source[h]	15	348	0.98	0.76-1.26				293	0.90	0.69-1.18				55	2.03	0.93-4.42			
2 sources[i]	7	12	1.29	0.70-2.39	0.771	0.895	1.000	10	1.19	0.61-2.32	0.744	0.895	1.000	2	2.61	0.52-13.02	0.057	0.258	1.000
1488-2338 (Seville)																			
1 source[h]	7	20	1.65	0.91-3.01				14	1.22	0.62-2.39				6	7.83	1.66-36.88			
2 sources[i]	4	343	2.10	1.19-3.70	0.019	0.217	0.907	292	2.17	1.18-3.97	0.026	0.217	0.907	51	2.05	0.40-10.44	0.428	0.761	1.000
3655-3666 (Guipuzcoa)																			
1 source[h]	4	16	0.68	0.38-1.20				14	0.66	0.36-1.20				2	0.93	0.18-4.79			
2 sources[i]	1	5	1.05	0.42-2.66	0.240	0.761	1.000	5	1.15	0.45-2.93	0.303	0.761	1.000	0	0.00	0-inf	0.641	0.824	1.000
3465-3517 (Madrid)																			
1 source[h]	3	89	0.95	0.73-1.24				79	0.93	0.71-1.23				10	1.25	0.55-2.84			
2 sources[i]	1	50	1.06	0.77-1.45	0.936	0.991	1.000	38	0.90	0.63-1.28	0.424	0.761	1.000	12	2.63	1.24-5.59	0.011	0.217	0.907
3656-3657 (Guipuzcoa)																			
1 source[h]	3	10	0.86	0.44-1.70				8	0.85	0.40-1.81				2	0.98	0.21-4.56			
2 sources[i]	1	0	0.00	0-inf	0.475	0.761	1.000	0	0.00	0-inf	0.426	0.761	1.000	0	0.00	0-inf	0.760	0.895	1.000
3630-3694 (Alava)																			
1 source[h]	2	5	0.73	0.29-1.86				5	0.83	0.32-2.12				0	0.00	0-inf			
2 sources[i]	1	2	0.22	0.05-0.89	0.047	0.243	1.000	1	0.12	0.02-0.87	0.036	0.217	0.907	1	1.21	0.13-11.33	0.868	0.971	1.000
2692-2705 (Valladolid)																			
1 source[h]	3	10	2.00	0.96-4.16				8	1.78	0.80-3.98				2	3.67	0.56-23.85			
2 sources[i]	1	129	0.92	0.61-1.38	0.450	0.761	1.000	119	0.95	0.62-3.98	0.633	0.824	1.000	10	0.63	0.20-2.01	0.317	0.761	1.000
1477-1937-3551 (Asturias)																			
1 source[h]	1	14	1.14	0.64-2.01				13	1.18	0.72-1.33				1	0.84	0.11-6.72			
2 sources[i]	0	0	--	--				0	--	--				0	--	---			
3 sources[j]	1	44	0.90	0.61-1.32	0.635	0.824	1.000	37	0.84	0.55-1.26	0.349	0.761	1.000	7	1.60	0.56-4.58	0.183	0.731	1.000
460-492-3001 (Barcelona)																			
1 source[h]	2	28	1.53	1.02-2.30				24	1.46	0.94-2.27				4	2.11	0.71-6.32			
2 sources[i]	9	293	0.99	0.81-1.20	0.331	0.761	1.000	264	1.01	0.82-1.24	0.486	0.761	1.000	29	0.84	0.48-1.49	0.370	0.761	1.000
389-495 (Barcelona)																			
1 source[h]	2	0	0.00	0-inf				0	0.00	0-inf				0	0.00	0-inf			
2 sources[i]	3	5	0.71	0.29-1.76	0.284	0.761	1.000	5	0.88	0.35-2.17	0.537	0.773	1.000	0	0.00	0-inf	0.993	0.996	1.000
353-491-3193 (Barcelona)																			
1 source[h]	2	5	0.53	0.22-1.30				5	0.61	0.25-1.50				0	0.00	0-inf			
2 sources[i]	3	5	0.42	0.17-1.03				3	0.28	0.09-0.89				2	1.62	0.38-6.96			
3 sources[j]	1	5	0.75	0.31-1.82	0.023	0.217	0.907	5	0.84	0.34-2.04	0.030	0.217	0.907	0	0.00	0-inf	0.529	0.773	1.000
2851-2864 (Zaragoza)																			
1 source[h]	1	1	2.00	0.23-17.62				1	1.92	0.22-17.09				0	0.00	0-inf			
2 sources[i]	1	1	3.52	0.45-27.50	0.209	0.751	1.000	0	0.00	0-inf	0.890	0.971	1.000	1	45.26	3.39-603.68	0.996	0.996	1.000
Stomach cancer																			
2590-2658 (Valencia)																			
1 source[h]	15	1250	1.15	1.01-1.31				752	1.10	0.93-1.30				498	1.24	1.00-1.53			
2 sources[i]	7	41	1.10	0.79-1.53	0.067	0.187	0.779	26	1.17	0.77-1.77	0.165	0.397	1.000	15	1.00	0.58-0.99	0.243	0.514	1.000
3630-3694 (Alava)																			
1 source[h]	2	17	1.74	1.03-2.92				11	1.67	0.87-3.18				6	1.87	0.78-4.50			
2 sources[i]	1	17	1.64	0.97-2.77	0.015	0.059	0.248	10	1.40	0.71-2.76	0.200	0.450	1.000	7	2.15	0.93-4.96	0.014	0.059	0.248
3655-3666 (Guipuzcoa)																			
1 source[h]	4	51	1.45	1.04-2.02				31	1.35	0.88-2.06				20	1.65	0.96-2.85			
2 sources[i]	1	9	1.47	0.74-2.92	0.014	0.059	0.248	9	2.11	1.05-4.26	0.014	0.059	0.248	0	0.00	0-inf	0.496	0.812	1.000
3465-3517 (Madrid)																			
1 source[h]	3	348	1.04	0.91-1.19				234	1.07	0.91-1.26				114	0.99	0.79-1.25			
2 sources[i]	1	169	1.03	0.87-1.22	0.998	0.998	1.000	93	0.87	0.70-1.09	0.128	0.329	1.000	76	1.34	1.03-1.73	0.040	0.121	0.505
460-492-3001 (Barcelona)																			
1 source[h]	2	50	1.00	0.75-1.35				36	1.17	0.82-1.66				14	0.73	0.42-1.27			
2 sources[i]	9	797	1.05	0.93-1.18	0.996	0.998	1.000	490	1.05	0.91-1.22	0.683	0.878	1.000	307	1.03	0.85-1.24	0.575	0.844	1.000
1488-2338 (Seville)																			
1 source[h]	7	37	0.79	0.53-1.17				23	0.81	0.49-1.32				14	0.76	0.40-1.46			
2 sources[i]	4	824	0.82	0.58-1.17	0.414	0.724	1.000	506	0.95	0.61-1.48	0.851	0.998	1.000	318	0.64	0.36-1.17	0.289	0.577	1.000
2692-2705 (Valladolid)																			
1 source[h]	3	24	0.90	0.58-1.39				17	0.87	0.51-1.47				7	0.94	0.42-2.08			
2 sources[i]	1	632	0.76	0.63-0.92	0.002	0.029	0.121	377	0.67	0.53-0.85	0.001	0.014	0.057	255	0.95	0.70-1.29	0.608	0.844	1.000
3656-3657 (Guipuzcoa)																			
1 source[h]	3	27	1.37	0.90-2.09				19	1.52	0.92-2.53				8	1.08	0.50-2.30			
2 sources[i]	1	2	4.43	1.08-18.15	0.026	0.095	0.397	2	6.29	1.51-26.13	0.009	0.059	0.248	0	0.00	0-inf	0.945	0.998	1.000

EPER code[a]	T[b]	TOTAL						MEN						WOMEN					
		Obs[c]	RR[d]	95% CI	p trend[e]	pBH[f]	pBY[g]	Obs[c]	RR[d]	95% CI	p trend[e]	pBH[f]	pBY[g]	Obs[c]	RR[d]	95% CI	p trend[e]	pBH[f]	pBY[g]
1477-1937-3551 (Asturias)																			
1 source[h]	1	27	0.72	0.48-1.08				18	0.86	0.52-1.41				9	0.56	0.28-1.11			
2 sources[i]	0	0	--	--				0	--	--				0	--	---			
3 sources[j]	1	117	0.68	0.54-0.85	0.001	0.014	0.057	70	0.73	0.55-0.99	0.037	0.121	0.505	47	0.63	0.44-0.90	0.008	0.059	0.248
389-495 (Barcelona)																			
1 source[h]	2	8	1.68	0.83-3.41				5	1.86	0.76-4.55				3	1.46	0.46-4.63			
2 sources[i]	3	28	1.00	0.68-1.47	0.755	0.938	1.000	18	1.05	0.65-1.71	0.635	0.846	1.000	10	0.91	0.48-1.73	0.907	0.998	1.000
353-491-3193 (Barcelona)																			
1 source[h]	2	43	1.62	1.18-2.21				25	1.52	1.01-2.29				18	1.78	1.09-2.91			
2 sources[i]	3	29	0.88	0.60-1.27				15	0.72	0.43-1.20				14	1.15	0.66-1.97			
3 sources[j]	1	16	0.88	0.53-1.44	0.946	0.998	1.000	11	0.96	0.53-1.76	0.610	0.844	1.000	5	0.73	0.30-1.79	0.544	0.844	1.000
2851-2864 (Zaragoza)																			
1 source[h]	1	5	1.82	0.70-4.79				3	1.36	0.39-4.72				2	2.94	0.64-13.62			
2 sources[i]	1	1	0.57	0.08-4.10	0.930	0.998	1.000	0	0.00	0-inf	0.422	0.724	1.000	1	1.62	0.22-12.02	0.388	0.724	1.000
Pancreatic cancer																			
2590-2658 (Valencia)																			
1 source[h]	15	881	1.12	0.95-1.33				445	1.10	0.87-1.39				436	1.14	0.89-1.44			
2 sources[i]	7	28	1.31	0.88-1.96	0.034	0.617	1.000	13	1.14	0.64-2.05	0.287	0.952	1.000	15	1.50	0.86-2.61	0.059	0.703	1.000
3465-3517 (Madrid)																			
1 source[h]	3	183	1.03	0.86-1.23				105	0.99	0.78-1.25				78	1.09	0.82-1.44			
2 sources[i]	1	100	1.12	0.90-1.40	0.558	0.952	1.000	62	1.18	0.89-1.57	0.549	0.952	1.000	38	1.04	0.73-1.48	0.867	0.952	1.000
460-492-3001 (Barcelona)																			
1 source[h]	2	34	1.06	0.74-1.51				17	0.95	0.58-1.57				17	1.19	0.72-1.99			
2 sources[i]	9	492	1.02	0.88-1.17	0.952	0.952	1.000	290	1.07	0.88-1.29	0.554	0.952	1.000	202	0.95	0.77-1.18	0.665	0.952	1.000
2692-2705 (Valladolid)																			
1 source[h]	3	8	0.60	0.28-1.25				4	0.48	0.17-1.36				4	0.76	0.26-2.21			
2 sources[i]	1	348	1.18	0.88-1.57	0.259	0.952	1.000	179	0.99	0.67-1.45	0.895	0.952	1.000	169	1.46	0.94-2.27	0.081	0.732	1.000
1488-2338 (Seville)																			
1 source[h]	7	34	1.15	0.74-1.78				17	0.99	0.54-1.83				17	1.34	0.71-2.55			
2 sources[i]	4	610	0.86	0.55-1.33	0.855	0.952	1.000	330	0.92	0.51-1.67	0.946	0.952	1.000	280	0.79	0.41-1.52	0.717	0.952	1.000
3655-3666 (Guipuzcoa)																			
1 source[h]	4	42	1.32	0.90-1.93				24	1.57	0.94-2.61				18	1.07	0.60-1.90			
2 sources[i]	1	7	1.21	0.55-2.65	0.229	0.952	1.000	3	1.02	0.31-3.33	0.414	0.952	1.000	4	1.40	0.49-4.00	0.371	0.952	1.000
3656-3657 (Guipuzcoa)																			
1 source[h]	3	11	0.82	0.43-1.54				5	0.64	0.26-1.63				6	1.06	0.44-2.53			
2 sources[i]	1	0	0.00	0-inf	0.297	0.952	1.000	0	0.00	0-inf	0.140	0.952	1.000	0	0.00	0-inf	0.776	0.952	1.000
3630-3694 (Alava)																			
1 source[h]	2	8	1.14	0.54-2.40				6	1.45	0.60-3.48				2	0.70	0.17-2.99			
2 sources[i]	1	11	1.07	0.56-2.06	0.413	0.952	1.000	3	0.53	0.16-1.75	0.429	0.952	1.000	8	1.74	0.77-3.92	0.026	0.617	1.000
1477-1937-3551 (Asturias)																			
1 source[h]	1	28	1.26	0.84-1.90				14	1.27	0.71-2.27				14	1.29	0.72-2.30			
2 sources[i]	0	0	--	--				0	--	--				0	--	---			
3 sources[j]	1	96	1.01	0.77-1.31	0.882	0.952	1.000	51	1.00	0.70-1.44	0.712	0.952	1.000	45	1.01	0.68-1.48	0.836	0.952	1.000
389-495 (Barcelona)																			
1 source[h]	2	2	0.83	0.21-3.39				1	0.75	0.10-5.434				1	0.95	0.13-6.89			
2 sources[i]	3	22	1.29	0.83-2.01	0.255	0.952	1.000	11	1.26	0.67-2.36	0.472	0.952	1.000	11	1.32	0.70-2.48	0.372	0.952	1.000
353-491-3193 (Barcelona)																			
1 source[h]	2	28	1.56	1.06-2.31				19	1.86	1.15-3.01				9	1.17	0.59-2.31			
2 sources[i]	3	22	1.05	0.68-1.62				14	1.13	0.66-1.95				8	0.93	0.46-1.89			
3 sources[j]	1	12	1.03	0.58-1.84	0.856	0.952	1.000	6	0.88	0.39-1.99	0.937	0.952	1.000	6	1.25	0.55-2.84	0.583	0.952	1.000
2851-2864 (Zaragoza)																			
1 source[h]	1	3	1.67	0.47-5.90				2	2.18	0.46-10.45				1	1.13	0.13-9.78			
2 sources[i]	1	1	1.05	0.14-7.69	0.644	0.952	1.000	0	0.00	0-inf	0.878	0.952	1.000	1	2.34	0.31-17.80	0.366	0.952	1.000
Liver cancer																			
2590-2658 (Valencia)																			
1 source[h]	15	622	1.23	0.99-1.52				453	1.41	1.10-1.80				169	0.83	0.55-1.27			
2 sources[i]	7	23	2.29	1.44-3.63	0.005	0.183	0.763	14	1.90	1.07-3.40	0.011	0.191	0.797	9	3.41	1.56-7.46	0.273	0.732	1.000
1488-2338 (Seville)																			
1 source[h]	7	18	1.18	0.65-2.16				14	1.20	0.60-2.38				4	1.09	0.31-3.83			
2 sources[i]	4	418	1.32	0.76-2.32	0.513	0.811	1.000	302	1.12	0.59-2.14	0.880	0.995	1.000	116	2.10	0.68-6.47	0.331	0.732	1.000
3465-3517 (Madrid)																			
1 source[h]	3	162	0.92	0.76-1.12				116	0.87	0.69-1.10				46	1.05	0.72-1.52			
2 sources[i]	1	99	1.13	0.90-1.41	0.744	0.956	1.000	62	0.95	0.71-1.26	0.366	0.732	1.000	37	1.61	1.09-2.37	0.058	0.414	1.000
460-492-3001 (Barcelona)																			
1 source[h]	2	28	1.02	0.68-1.51				21	1.11	0.70-1.75				7	0.83	0.38-1.82			
2 sources[i]	9	458	1.02	0.87-1.19	0.840	0.995	1.000	336	1.13	0.94-1.36	0.683	0.946	1.000	122	0.81	0.61-1.07	0.286	0.732	1.000
1477-1937-3551 (Asturias)																			
1 source[h]	1	7	0.59	0.27-1.28				5	0.47	0.19-1.17				2	1.43	0.31-6.53			
2 sources[i]	0	0	--	--				0	--	--				0	--	---			
3 sources[j]	1	77	1.16	0.84-1.59	0.511	0.811	1.000	56	0.97	0.68-1.39	0.836	0.995	1.000	21	2.40	1.17-4.94	0.056	0.414	1.000
353-491-3193 (Barcelona)																			
1 source[h]	2	14	0.85	0.49-1.46				12	1.05	0.58-1.90				2	0.40	0.10-1.62			
2 sources[i]	3	11	0.62	0.34-1.13				10	0.82	0.43-1.54				1	0.18	0.83-4.39			
3 sources[j]	1	16	1.59	0.96-2.64	0.945	0.995	1.000	10	1.45	0.77-2.75	0.712	0.949	1.000	6	1.91	0.83-4.39	0.518	0.811	1.000
3655-3666 (Guipuzcoa)																			
1 source[h]	4	6	0.42	0.18-1.02				5	0.46	0.17-1.24				1	0.29	0.04-2.31			
2 sources[i]	1	2	0.89	0.21-3.76	0.166	0.640	1.000	1	0.58	0.08-4.33	0.086	0.444	1.000	1	1.94	0.24-15.66	0.937	0.995	1.000
3656-3657 (Guipuzcoa)																			
1 source[h]	3	4	0.75	0.27-2.13				3	0.88	0.26-2.94				1	0.51	0.07-4.00			
2 sources[i]	1	0	0.00	0-inf	0.458	0.811	1.000	0	0.00	0-inf	0.645	0.928	1.000	0	0.00	0-inf	0.622	0.928	1.000
3630-3694 (Alava)																			
1 source[h]	2	4	1.98	0.73-5.42				3	2.03	0.57-7.16				1	1.28	0.14-11.37			
2 sources[i]	1	5	1.40	0.93-2.11	0.178	0.640	1.000	4	2.22	0.71-6.93	0.226	0.732	1.000	1	1.46	0.17-12.89	0.449	0.811	1.000
2692-2705 (Valladolid)																			
1 source[h]	3	7	1.34	0.51-3.47				4	0.84	0.25-2.85				3	3.81	0.80-18.30			
2 sources[i]	1	157	0.57	0.32-1.00	0.039	0.414	1.000	112	0.51	0.26-0.99	0.070	0.417	1.000	45	0.78	0.27-2.20	0.364	0.732	1.000
389-495 (Barcelona)																			
1 source[h]	2	2	1.20	0.29-4.90				2	1.86	0.45-7.68				0	0.00	0-inf			
2 sources[i]	3	6	0.51	0.22-1.16	0.135	0.606	1.000	5	0.59	0.24-1.46	0.319	0.732	1.000	1	0.32	0.04-2.33	0.251	0.732	1.000
2851-2864 (Zaragoza)																			
1 source[h]	1	0	0.00	0-inf				0	0.00	0-inf				0	0.00	0-inf			
2 sources[i]	1	0	0.00	0-inf	0.995	0.995	1.000	0	0.00	0-inf	0.993	0.995	1.000	0	0.00	0-inf	0.995	0.995	1.000
Gallbladder cancer																			
2590-2658 (Valencia)																			
1 source[h]	15	326	1.18	0.86-1.46				96	1.26	0.76-2.12				230	1.06	0.77-1.44			
2 sources[i]	7	10	1.30	0.66-2.54	0.324	0.704	1.000	3	1.84	0.52-6.46	0.417	0.704	1.000	7	1.12	0.51-2.49	0.565	0.726	1.000
1488-2338 (Seville)																			
1 source[h]	7	5	0.38	0.14-0.98				1	0.18	0.02-1.40				4	0.49	0.16-1.48			
2 sources[i]	4	220	0.99	0.52-1.88	0.496	0.704	1.000	60	1.20	0.40-3.63	0.886	0.938	1.000	160	0.91	0.42-2.00	0.444	0.704	1.000
3655-3666 (Guipuzcoa)																			
1 source[h]	4	9	0.85	0.39-1.81				3	0.82	0.24-3.28				6	0.83	0.32-2.13			
2 sources[i]	1	2	0.99	0.23-4.20	0.600	0.745	1.000	1	1.25	0.16-10.06	0.781	0.853	1.000	1	0.81	0.11-6.16	0.659	0.791	1.000
3656-3657 (Guipuzcoa)																			
1 source[h]	3	7	1.26	0.55-2.88				1	0.50	0.06-3.90				6	1.67	0.66-4.21			
2 sources[i]	1	0	0.00	0-inf	0.504	0.704	1.000	0	0.00	0-inf	0.494	0.704	1.000	0	0.00	0-inf	0.189	0.633	1.000

		TOTAL						MEN						WOMEN					
EPER code[a]	T[b]	Obs[c]	RR[d]	95% CI	p trend[e]	pBH[f]	pBY[g]	Obs[c]	RR[d]	95% CI	p trend[e]	pBH[f]	pBY[g]	Obs[c]	RR[d]	95% CI	p trend[e]	pBH[f]	pBY[g]
3465-3517 (Madrid)																			
1 source[h]	3	47	0.74	0.53-1.04				12	0.59	0.31-1.14				35	0.82	0.55-1.22			
2 sources[i]	1	23	0.71	0.46-1.10	0.095	0.487	1.000	3	0.30	0.09-0.96	0.040	0.475	1.000	20	0.90	0.56-1.46	0.509	0.704	1.000
3630-3694 (Alava)																			
1 source[h]	2	0	0.00	0-inf				0	0.00	0-inf				0	0.00	0-inf			
2 sources[i]	1	1	0.40	0.05-2.98	0.303	0.704	1.000	1	0.98	0.12-8.07	0.540	0.720	1.000	0	0.00	0-inf	0.991	0.995	1.000
2692-2705 (Valladolid)																			
1 source[h]	3	2	0.91	0.21-3.93				0	0.00	0-inf				2	1.99	0.43-9.10			
2 sources[i]	1	109	1.53	0.89-2.64	0.108	0.487	1.000	43	1.23	0.53-2.84	0.509	0.704	1.000	66	1.88	0.91-3.87	0.103	0.487	1.000
1477-1937-3551 (Asturias)																			
1 source[h]	1	6	1.02	0.43-2.46				1	0.47	0.06-3.54				5	1.55	0.55-4.35			
2 sources[i]	0	0	--	--				0	--	--				0	--	---			
3 sources[j]	1	15	0.51	0.28-0.95	0.069	0.487	1.000	8	0.62	0.27-1.46	0.356	0.704	1.000	7	0.48	0.19-1.21	0.193	0.633	1.000
460-492-3001 (Barcelona)																			
1 source[h]	2	12	0.82	0.45-1.50				3	0.61	0.19-1.97				9	0.94	0.47-1.90			
2 sources[i]	9	194	0.89	0.71-1.12	0.039	0.475	1.000	72	1.00	0.69-1.47	0.777	0.853	1.000	122	0.84	0.63-1.11	0.019	0.475	1.000
389-495 (Barcelona)																			
1 source[h]	2	0	0.00	0-inf				0	0.00	0-inf				0	0.00	0-inf			
2 sources[i]	3	4	0.49	0.18-1.35	0.137	0.549	1.000	1	0.38	0.05-2.86	0.366	0.704	1.000	3	0.55	0.17-1.76	0.251	0.695	1.000
353-491-3193 (Barcelona)																			
1 source[h]	2	3	0.39	0.12-1.22				3	1.22	0.37-3.98				0	0.00	0-inf			
2 sources[i]	3	9	0.99	0.50-1.94				3	1.05	0.33-3.38				6	0.96	0.42-2.20			
3 sources[j]	1	4	0.80	0.29-2.16	0.423	0.704	1.000	4	2.47	0.88-6.90	0.233	0.695	1.000	0	0.00	0-inf	0.061	0.487	1.000
2851-2864 (Zaragoza)																			
1 source[h]	1	0	0.00	0-inf				0	0.00	0-inf				0	0.00	0-inf			
2 sources[i]	1	1	2.12	0.28-16.02	0.759	0.853	1.000	0	0.00	0-inf	0.995	0.995	1.000	1	3.42	0.44-26.83	0.414	0.704	1.000
Colorectal cancer																			
2590-2658 (Valencia)																			
1 source[h]	15	2821	1.14	1.04-1.24				1499	1.20	1.06-1.36				1322	1.06	0.93-1.22			
2 sources[i]	7	91	1.30	1.04-1.62	0.004	0.069	0.289	55	1.58	1.18-2.11	0.000	0.013	0.052	36	1.00	0.71-1.43	0.716	0.967	1.000
3630-3694 (Alava)																			
1 source[h]	2	12	0.59	0.33-1.07				8	0.64	0.31-1.33				4	0.52	0.19-1.42			
2 sources[i]	1	23	1.04	0.67-1.63	0.928	0.996	1.000	14	0.98	0.56-1.74	0.724	0.967	1.000	9	1.15	0.56-2.35	0.759	0.967	1.000
3655-3666 (Guipuzcoa)																			
1 source[h]	4	69	0.83	0.63-1.10				42	0.76	0.53-1.08				27	0.98	0.63-1.55			
2 sources[i]	1	12	0.84	0.47-1.51	0.190	0.814	1.000	7	0.71	0.33-1.53	0.077	0.797	1.000	5	1.08	0.43-2.71	0.806	0.967	1.000
389-495 (Barcelona)																			
1 source[h]	2	6	0.84	0.38-1.89				5	1.34	0.55-3.25				1	0.30	0.04-2.12			
2 sources[i]	3	54	1.08	0.82-1.43	0.583	0.954	1.000	28	1.09	0.74-1.60	0.548	0.954	1.000	26	1.08	0.72-1.61	0.864	0.972	1.000
2851-2864 (Zaragoza)																			
1 source[h]	1	5	0.91	0.36-2.30				4	1.34	0.46-3.93				1	0.41	0.06-3.04			
2 sources[i]	1	5	1.73	0.70-4.25	0.258	0.814	1.000	3	1.89	0.59-6.05	0.234	0.814	1.000	2	1.56	0.38-6.41	0.741	0.967	1.000
353-491-3193 (Barcelona)																			
1 source[h]	2	50	0.97	0.73-1.30				24	0.85	0.57-1.29				26	1.12	0.75-1.67			
2 sources[i]	3	75	1.22	0.96-1.54				40	1.20	0.87-1.66				35	1.23	0.88-1.74			
3 sources[j]	1	41	1.18	0.86-1.61	0.184	0.814	1.000	25	1.32	0.88-1.97	0.210	0.814	1.000	16	1.01	0.61-1.67	0.561	0.954	1.000
460-492-3001 (Barcelona)																			
1 source[h]	2	85	0.91	0.72-1.13				40	0.80	0.58-1.11				45	1.03	0.75-1.40			
2 sources[i]	9	1474	1.03	0.95-1.12	0.801	0.967	1.000	850	1.11	0.99-1.24	0.291	0.814	1.000	624	0.93	0.83-1.06	0.382	0.860	1.000
1488-2338 (Seville)																			
1 source[h]	7	94	1.01	0.78-1.30				54	1.01	0.72-1.42				40	0.99	0.67-1.47			
2 sources[i]	4	2140	1.01	0.79-1.28	0.943	0.996	1.000	1120	1.02	0.74-1.42	0.968	0.996	1.000	1020	0.98	0.68-1.42	0.857	0.972	1.000
3465-3517 (Madrid)																			
1 source[h]	3	542	0.91	0.82-1.00				292	0.89	0.77-1.03				250	0.93	0.80-1.08			
2 sources[i]	1	290	0.98	0.86-1.11	0.449	0.918	1.000	160	0.98	0.83-1.17	0.520	0.954	1.000	130	0.97	0.80-1.18	0.691	0.967	1.000
3656-3657 (Guipuzcoa)																			
1 source[h]	3	31	0.90	0.61-1.31				17	0.79	0.48-1.32				14	1.07	0.60-1.89			
2 sources[i]	1	1	1.11	0.16-7.98	0.459	0.918	1.000	1	1.40	0.19-10.10	0.316	0.814	1.000	0	0.00	0-inf	0.997	0.997	1.000
2692-2705 (Valladolid)																			
1 source[h]	3	33	1.13	0.77-1.65				20	1.13	0.69-1.83				13	1.13	0.62-2.04			
2 sources[i]	1	981	0.96	0.81-1.13	0.380	0.860	1.000	569	0.88	0.71-1.09	0.134	0.814	1.000	412	1.07	0.83-1.37	0.732	0.967	1.000
1477-1937-3551 (Asturias)																			
1 source[h]	1	63	0.92	0.70-1.20				31	0.77	0.53-1.13				32	1.11	0.76-1.62			
2 sources[i]	0	0	--	--				0	--	--				0	--	---			
3 sources[j]	1	254	0.90	0.76-1.05	0.089	0.797	1.000	152	0.91	0.74-1.12	0.305	0.814	1.000	102	0.88	0.68-1.13	0.158	0.814	1.000

[a] Analyses restricted to an area of 50 km surrounding each facility.

[b] Number of towns.

[c] Observed deaths.

[d] RRs adjusted for population size, percentages of illiteracy, farmers and unemployed persons, average persons per household, and mean income.

[e] p-value for trend in industrial clusters that displayed increases in risk with proximity to a given number of sources (excluding the intermediate category in the variable of "exposure"), associated with hypothesis test for the Poisson regression model.

[f] p-value adjusted by Benjamini & Hochberg's method.

[g] p-value adjusted by Benjamini & Yekutieli's method.

[h] Towns situated ≤ 5 km from 1 single metal production and processing installation.

[i] Towns situated ≤ 5 km from 2 metal production and processing installations.

[j] Towns situated ≤ 5 km from 3 metal production and processing installations.

Supplementary data, Table 3.

		TOTAL						MEN						WOMEN					
	T[a]	Obs[b]	RR[c]	95% CI	p[d]	pBH[e]	pBY[f]	Obs[b]	RR[c]	95% CI	p[d]	pBH[e]	pBY[f]	Obs[b]	RR[c]	95% CI	p[d]	pBH[e]	pBY[f]
Cancer of oral cavity-pharynx																			
Cluster 1[g]	21	725	1.10	0.89-1.37	0.368	0.816	1.000	628	1.10	0.87-1.38	0.426	0.816	1.000	97	1.13	0.64-1.99	0.669	0.816	1.000
Cluster 2	3	8	0.73	0.35-1.52	0.398	0.816	1.000	7	0.75	0.34-1.67	0.488	0.816	1.000	1	0.56	0.07-4.27	0.575	0.816	1.000
Cluster 3	2	110	0.71	0.55-0.93	0.012	0.121	0.443	91	0.68	0.51-0.90	0.007	0.121	0.443	19	0.96	0.50-1.86	0.907	0.907	1.000
Cluster 4	16	83	0.91	0.69-1.20	0.505	0.816	1.000	75	0.95	0.70-1.28	0.722	0.816	1.000	8	0.65	0.29-1.50	0.316	0.816	1.000
Cluster 5	5	27	0.40	0.71-1.70	0.688	0.816	1.000	24	1.16	0.72-1.82	0.547	0.816	1.000	3	0.81	0.23-2.80	0.739	0.816	1.000
Cluster 6	19	41	0.96	0.66-1.39	0.822	0.863	1.000	31	0.84	0.55-1.27	0.403	0.816	1.000	10	1.68	0.77-3.67	0.194	0.816	1.000
Cluster 7	6	22	0.90	0.57-1.44	0.663	0.816	1.000	17	0.82	0.49-1.39	0.460	0.816	1.000	5	1.39	0.51-3.80	0.522	0.816	1.000
Esophageal cancer																			
Cluster 1[g]	21	568	0.96	0.77-1.20	0.695	0.998	1.000	514	1.00	0.79-1.27	0.996	0.998	1.000	54	0.69	0.35-1.33	0.266	0.998	1.000
Cluster 2	3	7	0.62	0.28-1.34	0.221	0.998	1.000	6	0.59	0.26-1.36	0.214	0.998	1.000	1	1.00	0.13-7.93	0.998	0.998	1.000
Cluster 3	2	121	0.99	0.75-1.30	0.930	0.998	1.000	109	1.00	0.76-1.32	0.985	0.998	1.000	12	0.90	0.41-1.98	0.792	0.998	1.000
Cluster 4	16	77	0.95	0.71-1.27	0.738	0.998	1.000	71	1.03	0.76-1.39	0.864	0.998	1.000	6	0.65	0.25-1.67	0.372	0.998	1.000
Cluster 5	5	21	0.87	0.54-1.41	0.578	0.998	1.000	19	0.96	0.58-1.58	0.872	0.998	1.000	2	0.79	0.17-3.57	0.756	0.998	1.000
Cluster 6	19	48	1.18	0.84-1.65	0.341	0.998	1.000	43	1.19	0.83-1.70	0.340	0.998	1.000	5	1.15	0.42-3.17	0.787	0.998	1.000
Cluster 7	6	28	1.06	0.70-1.62	0.773	0.998	1.000	23	1.08	0.68-1.70	0.749	0.998	1.000	5	1.21	0.44-3.38	0.710	0.998	1.000
Stomach cancer																			
Cluster 1[g]	21	1533	1.29	1.11-1.49	0.001	0.009	0.032	990	1.27	1.06-1.52	0.010	0.043	0.158	543	1.27	0.99-1.62	0.061	0.212	0.774
Cluster 2	3	34	1.19	0.82-1.72	0.367	0.453	1.000	21	1.14	0.71-1.82	0.587	0.684	1.000	13	1.47	0.81-2.70	0.208	0.386	1.000
Cluster 3	2	396	1.39	1.19-1.63	0.000	0.001	0.003	249	1.35	1.11-1.65	0.003	0.018	0.067	147	1.45	1.11-1.88	0.006	0.032	0.115
Cluster 4	16	157	0.91	0.75-1.11	0.346	0.453	1.000	96	0.84	0.66-1.08	0.170	0.357	1.000	61	1.04	0.75-1.43	0.813	0.854	1.000
Cluster 5	5	60	1.20	0.89-1.60	0.230	0.386	1.000	40	1.24	0.87-1.77	0.239	0.386	1.000	20	1.12	0.68-1.43	0.664	0.734	1.000
Cluster 6	19	109	1.19	0.94-1.50	0.151	0.353	1.000	79	1.28	0.97-1.69	0.081	0.244	0.891	30	0.99	0.65-1.51	0.961	0.961	1.000
Cluster 7	6	67	1.23	0.93-1.61	0.147	0.353	1.000	43	1.20	0.86-1.69	0.285	0.427	1.000	24	1.26	0.80-2.0	0.315	0.442	1.000
Pancreatic cancer																			
Cluster 1[g]	21	904	1.00	0.84-1.20	0.973	0.973	1.000	492	1.10	0.86-1.41	0.458	0.677	1.000	412	0.91	0.71-1.18	0.483	0.677	1.000
Cluster 2	3	19	1.20	0.74-1.95	0.459	0.677	1.000	9	1.04	0.52-2.09	0.915	0.960	1.000	10	1.41	0.72-2.77	0.317	0.625	1.000
Cluster 3	2	223	1.11	0.91-1.35	0.327	0.625	1.000	127	1.28	0.97-1.68	0.083	0.428	1.000	96	0.94	0.70-1.27	0.699	0.816	1.000
Cluster 4	16	139	1.14	0.92-1.42	0.233	0.612	1.000	66	1.08	0.79-1.48	0.634	0.783	1.000	73	1.21	0.89-1.64	0.219	0.612	1.000
Cluster 5	5	49	1.37	0.99-1.90	0.056	0.390	1.000	27	1.56	1.01-2.43	0.046	0.390	1.000	22	1.20	0.74-1.93	0.466	0.677	1.000
Cluster 6	19	59	0.91	0.68-1.23	0.546	0.716	1.000	34	1.05	0.71-1.56	0.815	0.901	1.000	25	0.78	0.50-1.22	0.276	0.625	1.000
Cluster 7	6	26	0.63	0.42-0.95	0.029	0.390	1.000	13	0.65	0.36-1.16	0.142	0.497	1.000	13	0.61	0.34-1.10	0.102	0.428	1.000
Liver cancer																			
Cluster 1[g]	21	529	1.25	0.96-1.64	0.098	0.322	1.000	386	1.09	0.80-1.47	0.584	0.682	1.000	143	1.45	0.87-2.44	0.153	0.322	1.000
Cluster 2	3	9	0.97	0.48-1.98	0.944	0.944	1.000	7	1.27	0.57-2.83	0.563	0.682	1.000	2	0.60	0.14-2.66	0.502	0.682	1.000
Cluster 3	2	155	1.44	1.10-1.90	0.008	0.088	0.323	107	1.27	0.92-1.75	0.142	0.322	1.000	48	2.00	1.19-3.34	0.008	0.088	0.323
Cluster 4	16	55	0.89	0.64-1.26	0.521	0.682	1.000	46	0.97	0.67-1.42	0.884	0.928	1.000	9	0.63	0.29-1.35	0.234	0.410	1.000
Cluster 5	5	8	0.41	0.19-0.86	0.018	0.124	0.454	6	0.40	0.17-0.92	0.032	0.168	0.612	2	0.48	0.11-2.14	0.335	0.540	1.000
Cluster 6	19	39	1.30	0.87-1.95	0.208	0.396	1.000	36	1.51	1.00-2.29	0.049	0.207	0.756	3	0.38	0.11-1.32	0.129	0.322	1.000
Cluster 7	6	20	1.26	0.76-2.08	0.369	0.553	1.000	13	1.06	0.58-1.94	0.850	0.928	1.000	7	1.98	0.82-4.79	0.130	0.322	1.000
Gallbladder cancer																			
Cluster 1[g]	21	290	0.90	0.66-1.22	0.506	0.791	1.000	96	0.85	0.51-1.41	0.524	0.791	1.000	194	0.85	0.51-1.41	0.888	0.982	1.000
Cluster 2	3	1	0.14	0.02-0.99	0.049	0.340	1.000	1	0.47	0.06-3.54	0.461	0.791	1.000	0	0.00	0-inf	0.992	0.992	1.000
Cluster 3	2	105	1.64	1.19-2.26	0.003	0.059	0.214	33	1.46	0.84-2.54	0.179	0.758	1.000	72	1.75	1.17-2.61	0.006	0.062	0.228
Cluster 4	16	34	0.83	0.55-1.26	0.376	0.791	1.000	13	0.90	0.46-1.76	0.755	0.880	1.000	21	0.80	0.47-1.37	0.418	0.791	1.000
Cluster 5	5	11	0.85	0.44-1.65	0.632	0.870	1.000	4	0.98	0.33-2.88	0.964	0.992	1.000	7	0.83	0.36-1.91	0.663	0.870	1.000
Cluster 6	19	18	0.75	0.44-1.30	0.310	0.791	1.000	6	0.66	0.27-1.63	0.368	0.791	1.000	12	0.88	0.45-1.72	0.706	0.872	1.000
Cluster 7	6	16	1.20	0.68-2.11	0.528	0.791	1.000	3	0.65	0.19-2.20	0.492	0.791	1.000	13	1.56	0.81-2.99	0.180	0.758	1.000
Colorectal cancer																			
Cluster 1[g]	21	2571	1.01	0.91-1.13	0.818	0.859	1.000	1531	0.93	0.81-1.06	0.277	0.485	1.000	1040	1.18	0.98-1.42	0.081	0.283	1.000
Cluster 2	3	35	0.82	0.58-1.16	0.259	0.485	1.000	22	0.78	0.50-1.21	0.262	0.485	1.000	13	0.89	0.50-1.59	0.698	0.804	1.000
Cluster 3	2	596	1.07	0.94-1.21	0.310	0.501	1.000	363	0.97	0.83-1.13	0.659	0.804	1.000	233	1.25	1.02-1.53	0.031	0.219	0.798
Cluster 4	16	312	0.94	0.82-1.08	0.394	0.551	1.000	165	0.72	0.60-0.87	0.001	0.013	0.047	147	1.38	1.11-1.73	0.004	0.039	0.141
Cluster 5	5	81	0.85	0.67-1.08	0.194	0.485	1.000	49	0.75	0.55-1.01	0.061	0.255	0.929	32	1.07	0.73-1.57	0.728	0.804	1.000
Cluster 6	19	184	1.08	0.91-1.29	0.354	0.531	1.000	116	0.99	0.80-1.23	0.921	0.921	1.000	68	1.26	0.95-1.67	0.111	0.334	1.000
Cluster 7	6	88	0.87	0.69-1.10	0.246	0.485	1.000	52	0.75	0.56-1.01	0.056	0.255	0.929	36	1.12	0.78-1.61	0.556	0.730	1.000

[a]Number of towns.
[b]Observed deaths.
[c]RRs adjusted for population size, percentages of illiteracy, farmers and unemployed persons, average persons per household, and mean income. The reference level was constituted by towns of the Basque Country having no EPER-registered facility within 5 km of their municipal centroid.
[d]p-value associated with hypothesis test for the Poisson regression model in the “near vs. far” analysis.
[e]p-value adjusted by Benjamini & Hochberg’s method.
[f]p-value adjusted by Benjamini & Yekutieli’s method.
[g]Cluster 1: facilities ‘3641’, ‘3697’, ‘3712’, ‘3723’, ‘3724’, ‘3727’, 3733’, ‘3737’, ‘3738, ‘3742’ and ‘3745’. Cluster 2: facilities ‘3630’ and ‘3694’. Cluster 3: facilities ‘3629’, ‘3638’, ‘3639’ and ‘3642’. Cluster 4: ‘3654’, ‘3669’, ‘3682’, ‘3704’, ‘3708’ and ‘3715’. Cluster 5: ‘3655’ and ‘3666’. Cluster 6: ‘3645’, ‘3673’, ‘3685’ and ‘3717’. Cluster 7: facilities ‘3656’, ‘3657’, ‘3675’ and ‘3676’.

Supplementary data, Table 4.

EPER code	Region	Municipality	Industrial activity	Industrial sub-activity	Pollutants released in the last decade[a] Air	Pollutants released in the last decade[a] Water
1477	Asturias	Aviles	Production of non-ferrous crude metals	Aluminium production	CO, CO_2, perfluorocarbons, SO_2, PAH, fluorine, PM_{10}	Zinc, PAH, fluorides
1850	Asturias	Mieres	Galvanizing	Manufacture of steel tubes	Zinc	Zinc
1937	Asturias	Aviles	Smelting of non-ferrous metals	Casting of light metals	Nickel, zinc, chlorine	
3486	Asturias	Aviles	Production of pig iron or steel	Casting of steel	Methane, CO, CO_2, NMVOC[b], ammonia, NO_2, SO_2, arsenic, cadmium, chromium, copper, mercury, nickel, lead, zinc, dioxins and furanes, benzene, PAH, chlorine, fluorine, hydrogen cyanide, PM_{10}	Nitrogen, phosphorus, arsenic, chromium, copper, mercury, nickel, lead, zinc, dichloromethane, halogenated organic compounds, ethylbenzene, phenols, PAH, total organic carbon, chlorides, cyanides, fluorides, fluoranthene, benzo[g,h,i]perylene
3487	Asturias	Gijon	Production of pig iron or steel	Casting of steel	Methane, CO, CO_2, ammonia, NMVOC[b], NO_2, SO_2, cadmium, chromium, copper, mercury, nickel, lead, zinc, dioxins and furanes, benzene, PAH, chlorine, fluorine, hydrogen cyanide, PM_{10}	Lead, zinc, phenols, HAP, total organic carbon, cyanides, fluorides
3551	Asturias	Castrillon	Production of non-ferrous crude metals	Lead, zinc and tin production	SO_2, zinc	Arsenic, cadmium, copper, mercury, nickel, lead, zinc, fluorides
30	Cantabria	Reinosa	Production of pig iron or steel	Casting of steel	CO, CO_2, NO_2, SO_2, lead, zinc, dioxins and furans, PAH	Arsenic, chromium, copper, nickel, lead, zinc, PAH
214	Cantabria	Santander	Production of pig iron or steel	Manufacture of basic iron and steel and of ferro-alloys (ECSC)	CO, CO_2, NO_2, SO_2, arsenic, cadmium, chromium, copper, mercury, nickel, lead, zinc, dichloromethane, benzene, PM_{10}	Cadmium, chromium, copper, lead, zinc, PAH, cyanides
385	Cantabria	Los Corrales de Buelna	Ferrous metal foundries	Casting of iron	PM_{10}	Copper, lead, zinc
1569	Cantabria	Santander	Ferrous metal foundries	Casting of iron	CO, CO_2, NO_2, SO_2, zinc, dioxins and furans, NMVOC[b], PM_{10}	Arsenic, cadmium, copper, nickel, lead, zinc, phenols
1808	Cantabria	Santander	Surface treatment of metals and plastic materials	Manufacture of electric domestic appliances		Nickel
2076	Cantabria	El Astillero	Surface treatment of metals and plastic materials	Treatment and coating of metals	Chromium	
2086	Cantabria	Santander	Surface treatment of metals and plastic materials	Manufacture of bodies (coachwork) for motor vehicles and trailers and semi-trailers	NO_2	
1620	Madrid	Madrid	Galvanizing	Treatment and coating of metals	Lead, zinc	
3337	Madrid	Arganda	Surface treatment of metals and plastic materials	Treatment and coating of metals		Nickel, zinc
3397	Madrid	San Fernando de Henares	Surface treatment of metals and plastic materials	Treatment and coating of metals		Nickel
3465	Madrid	Madrid	Hot-rolling mills (steel)	Manufacture of basic iron and steel and of ferro-alloys (ECSC)	CO, NO_2, arsenic, chromium, copper, nickel, lead, zinc, dioxins and furans, benzene, PAH, chlorine, hydrogen cyanide	
3517	Madrid	Fuenlabrada	Surface treatment of metals and plastic materials	Treatment and coating of metals		Nickel
2590	Valencia	Museros	Surface treatment of metals and plastic materials	Manufacture of fasteners, screw machine products, chain and springs		Zinc
2649	Valencia	Sagunto	Surface treatment of metals and plastic materials	Cold rolling of narrow strips	NMVOC[b]	Chromium, nickel, zinc, total organic carbon
2658	Valencia	Bonrepos y Mirambell	Surface treatment of metals and plastic materials	Treatment and coating of metals	Chromium, hydrogen cyanide	Nickel
353	Barcelona	Esparreguera	Surface treatment of metals and plastic materials	Manufacture of electronic valves and tubes and other electronic components		Copper
389	Barcelona	Torello	Surface treatment of metals and plastic materials	Cold rolling of narrow strips		Nickel
460	Barcelona	Sant Feliu de Llobregat	Surface treatment of metals and plastic materials	Treatment and coating of metals		Chromium, nickel
491	Barcelona	Sant Esteve de Sesrovires	Surface treatment of metals and plastic materials	Treatment and coating of metals		Chromium, nickel, zinc
492	Barcelona	Barcelona	Surface treatment of metals and plastic materials	Treatment and coating of metals		Chromium, nickel, zinc
495	Barcelona	Sant Pere de Torello	Surface treatment of	Aluminium production		Nickel, benzene, toluene, ethylbenzene and

EPER code	Region	Municipality	Industrial activity	Industrial sub-activity	Pollutants released in the last decade[a]	
					Air	Water
			metals and plastic materials			xylenes
3001	Barcelona	Sant Joan Despi	Smelting of non-ferrous metals	Casting of other non-ferrous metals		Mercury, chlorides
3076	Barcelona	Barbera del Valles	Surface treatment of metals and plastic materials	Treatment and coating of metals		Cyanides
3100	Barcelona	Castellbisbal	Production of pig iron or steel	Casting of steel	CO, CO_2, NO_2, SO_2, arsenic, cadmium, chromium, copper, mercury, lead, zinc, dioxins and furans, PAH, chroline, fluorine, PM_{10}	Arsenic, nickel, phenols, PAH, total organic carbon
3177	Barcelona	Manresa	Surface treatment of metals and plastic materials	Manufacture of parts and accessories for motor vehicles and their engines	NMVOC[b], NO_2	Nickel
3183	Barcelona	Vilanova i La Geltru	Smelting of non-ferrous metals	Casting of other non-ferrous metals	NO_2	Halogenated organic compounds, total organic carbon
3193	Barcelona	Esparraguera	Surface treatment of metals and plastic materials	Treatment and coating of metals	Chromium, copper, nickel, chlorine	Chromium, copper, nickel, dichloromethane
2692	Valladolid	Valladolid	Smelting of non-ferrous metals	Casting of light metals	Chlorine	
2705	Valladolid	Valladolid	Surface treatment of metals and plastic materials	Manufacture of lighting equipment and electric lamps		Phosphorus, cadmium, copper, mercury, nickel, lead, phenols
2763	Zaragoza	Zaragoza	Surface treatment of metals and plastic materials	Manufacture of electric domestic appliances		Phosphorus, nickel, zinc, chlorides, fluorides
2767	Zaragoza	Zaragoza	Smelting of non-ferrous metals	Other first processing of iron and steel; production of non-ECSC ferro-alloys	CO, NO_2, arsenic, copper, mercury, lead, zinc, benzene, PAH	
2794	Zaragoza	Nuez de Ebro	Surface treatment of metals and plastic materials	Treatment and coating of metals		PAH
2819	Zaragoza	Pradilla de Ebro	Smelting of non-ferrous metals	Aluminium production	Chromium, dioxins and furans, chlorine	
2851	Zaragoza	Zaragoza	Surface treatment of metals and plastic materials	Treatment and coating of metals	Chromium, nickel	
2864	Zaragoza	La Puebla de Alfinden	Surface treatment of metals and plastic materials	Manufacture of other fabricated metal products	Chromium, nickel	Chromium, copper, nickel
1488	Seville	Seville	Surface treatment of metals and plastic materials	Manufacture of aircraft and spacecraft	Chromium, trichloroethylene	
2325	Seville	Alcala de Guadaira	Ferrous metal foundries	Manufacture of basic iron and steel and of ferro-alloys (ECSC)	CO, NO_2, hexachlorebenzene, cadmium, mercury, lead, zinc, dioxins and furans, PM_{10}	Copper, PAH
2338	Seville	Guillena	Ferrous metal foundries	Casting of iron	CO_2	
3628	Alava	Salvatierra	Ferrous metal foundries	Casting of iron	Cadmium, lead, zinc, PAH, PM_{10}	
3629	Alava	Vitoria	Surface treatment of metals and plastic materials	Treatment and coating of metals		Phosphorus, arsenic, chromium, nickel, zinc, total organic carbon, cyanides
3630	Alava	Amurrio	Production of pig iron or steel	Manufacture of steel tubes	Chromium, copper, nickel, lead, zinc	
3638	Alava	Vitoria	Surface treatment of metals and plastic materials	Treatment and coating of metals		Zinc
3639	Alava	Vitoria	Hot-rolling mills (steel)	Manufacture of steel tubes	NO_2, zinc	
3642	Alava	Vitoria	Hot-rolling mills (steel)	Manufacture of basic iron and steel and of ferro-alloys (ECSC)	Chromium, copper, lead, zinc	
3694	Alava	Amurrio	Production of pig iron or steel	Manufacture of steel tubes	CO, NO_2, arsenic, cadmium, chromium, copper, mercury, lead, zinc, dioxins and furans, PM_{10}	
3645	Guipuzcoa	Beasain	Production of pig iron or steel	Manufacture of railway and tramway locomotives and rolling stock	NMVOC[b], cadmium, chromium, copper, lead, zinc, PM_{10}	
3655	Guipuzcoa	Arrasate/Mondragon	Surface treatment	Manufacture of electric domestic appliances	NMVOC[b]	Phosphorus, chromium, nickel, zinc
3656	Guipuzcoa	Zestoa	Ferrous metal foundries	Casting of iron	Benzene, hydrogen cyanide	
3657	Guipuzcoa	Zumaia	Ferrous metal foundries	Casting of iron	Benzene, hydrogen cyanide	
3659	Guipuzcoa	Oñati	Surface treatment of metals and plastic materials	Manufacture of locks and hinges		Copper, nickel, cyanides
3666	Guipuzcoa	Eskoriatza	Surface treatment of metals and plastic materials	Treatment and coating of metals		Arsenic, nickel
3669	Guipuzcoa	Soraluze / Placencia de las Armas	Surface treatment of metals and plastic materials	Manufacture of cutlery	Chlorine	Copper, nickel, zinc
3673	Guipuzcoa	Olaberria	Production of pig iron or	Manufacture of basic iron and steel and of ferro-alloys	CO, CO_2, NO_2, SO_2, arsenic, cadmium, chromium, copper,	

EPER code	Region	Municipality	Industrial activity	Industrial sub-activity	Pollutants released in the last decade[a]	
					Air	Water
			steel	(ECSC)	mercury, nickel, lead, zinc, dioxins and furans, PM_{10}	
3675	Guipuzcoa	Azkoitia	Production of pig iron or steel	Manufacture of basic iron and steel and of ferro-alloys (ECSC)	NO_2, arsenic, cadmium, chromium, copper, mercury, nickel, lead, zinc, PM_{10}	
3676	Guipuzcoa	Azpeitia	Production of pig iron or steel	Manufacture of basic iron and steel and of ferro-alloys (ECSC)	CO, CO_2, NO_2, SO_2, arsenic, cadmium, chromium, copper, mercury, nickel, lead, zinc, dioxins and furans, PM_{10}	
3680	Guipuzcoa	Usurbil	Ferrous metal foundries	Casting of iron	Benzene, hydrogen cyanide	
3682	Guipuzcoa	Eibar	Surface treatment of metals and plastic materials	Treatment and coating of metals	Chromium	
3684	Guipuzcoa	Irun	Surface treatment of metals and plastic materials	Manufacture of locks and hinges		Nickel, cyanides
3685	Guipuzcoa	Zumarraga	Production of pig iron or steel	Manufacture of basic iron and steel and of ferro-alloys (ECSC)	CO, CO_2, NO_2, SO_2, arsenic, cadmium, chromium, copper, mercury, nickel, lead, zinc, dioxins and furans, PAH, PM_{10}	Mercury, PAH
3717	Guipuzcoa	Ezkio-Itsaso	Ferrous metal foundries	Casting of steel	Hydrogen cyanide	
3641	Vizcaya	Basauri	Production of pig iron or steel	Manufacture of basic iron and steel and of ferro-alloys (ECSC)	CO_2, NO_2, SO_2, arsenic, cadmium, chromium, copper, mercury, nickel, lead, zinc, dioxins and furans, PM_{10}	
3654	Vizcaya	Abadiño	Smelting of non-ferrous metals	Casting of other non-ferrous metals		Cadmium, chromium, copper, nickel, lead, zinc, total organic carbon, fluorides
3697	Vizcaya	Barakaldo	Surface treatment of metals and plastic materials	Manufacture of wire products		Zinc
3703	Vizcaya	Balmaseda	Ferrous metal foundries	Production of abrasive products		Copper, lead, zinc
3704	Vizcaya	Abadiño	Ferrous metal foundries	Casting of iron	Benzene, hydrogen cyanide	
3705	Vizcaya	Gernika-Lumo	Surface treatment of metals and plastic materials	Manufacture of other plastic products	NMVOC[b]	Phosphorus, chromium, nickel
3708	Vizcaya	Elorrio	Ferrous metal foundries	Casting of iron	Benzene, hydrogen cyanide	
3712	Vizcaya	Abanto y Ciervana	Surface treatment of metals and plastic materials	Treatment and coating of metals	Nickel	
3715	Vizcaya	Atxondo	Ferrous metal foundries	Casting of iron	Benzene, hydrogen cyanide, PAH	
3723	Vizcaya	Loiu	Production of pig iron or steel	Manufacture of basic iron and steel and of ferro-alloys (ECSC)	Arsenic, cadmium, NO_2, chromium, copper, mercury, nickel, lead, zinc, chlorine	Chromium, nickel, fluorides
3724	Vizcaya	Sestao	Production of pig iron or steel	Manufacture of basic iron and steel and of ferro-alloys (ECSC)	CO, CO_2, NMVOC[b], NO_2, SO_2, arsenic, cadmium, chromium, copper, mercury, nickel, lead, zinc, dioxins and furans, polychlorinated biphenyls, benzene, naphthalene, PAH, chlorine, fluorine, PM_{10}	Cadmium, flourides
3727	Vizcaya	Sondika	Smelting of non-ferrous metals	Casting of other non-ferrous metals	Zinc	
3733	Vizcaya	Valle de Trapaga-Trapagaran	Production of pig iron or steel	Manufacture of basic iron and steel and of ferro-alloys (ECSC)	CO, CO_2, NO_2, SO_2, arsenic, cadmium, chromium, copper, mercury, nickel, lead, zinc, dioxins and furans, PM_{10}	Chromium, lead, zinc
3737	Vizcaya	Zaratamo	Smelting of non-ferrous metals	Casting of other non-ferrous metals	NMVOC[b], copper, lead, tetrachloroethylene	
3738	Vizcaya	Etxebarri	Surface treatment of metals and plastic materials	Treatment and coating of metals		Arsenic, chromium, nickel
3742	Vizcaya	Basauri	Ferrous metal foundries	Casting of iron	Dioxins and furans, benzene	
3745	Vizcaya	Etxebarri	Ferrous metal foundries	Casting of iron	Lead, benzene, PM_{10}	

[a]Pollutants released in the period 2001-2009 and included in EPER-Spain .
[b]Non-methane volatile organic compounds.

Supplementary data, Table 5.

EPER code	Region	Releases to air (EPER, 2001) (Mt/year) Ammonia	Arsenic	Benzene	Cadmium	Chlorine	Chromium	CO	CO_2	Copper	Dioxins and furans	Fluorine	Hexachlorobenzene	Hydrogen cyanide	Lead	Mercury	Methane	Nickel	NO_2	NMVOC[a]	Perfluorocarbons	PM_{10}	PAH	SO_2	Tetrachloroethylene	Trichloroethylene	Zinc	TOTAL
1477	Asturias	0	0	0	0	0	0	5120	160000	0	0	284	0	0	0	0	0	0	0	0	10	386	0	691	0	0	0	166491
1850	Asturias	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
1937	Asturias	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
3486	Asturias	21	0	31	0	22	0	4910	1230000	0	0	0	0	0	0	0.01	3970	0.36	4510	330	0	0	0.28	1250	0	0	0	1245045
3487	Asturias	0	0	25	0.18	23	2	108000	4340000	2	2.18E-05	9	0	0	20	0.10	1100	2	4860	291	0	535	0.11	4990	0	0	3	4459861
3551	Asturias	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1410	0	0	27	1437
30	Cantabria	0	0	0	0	0	0	2140	0	0	0	0	0	0	0.24	0	0	0	112	0	0	0	4	577	0	0	3	2836
214	Cantabria	0	0.24	0	0.82	0	0.91	0	0	2	0	0	0	0	2	0.18	0	0.82	166	0	0	154	0	180	0	0	120	627
385	Cantabria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	0	0	0	0	0	90
1569	Cantabria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	133	162	0	90	0	266	0	0	56	707
1808	Cantabria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2076	Cantabria	0	0	0	0	0	0.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2086	Cantabria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	321	0	0	0	0	0	0	0	0	321
1620	Madrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.65	1
3337	Madrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3397	Madrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3465	Madrid	0	0	0	0	0	0	689	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	689
3517	Madrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2590	Valencia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2649	Valencia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2658	Valencia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
353	Barcelona	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
389	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
460	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
491	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
492	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
495	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3001	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3076	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3100	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	228	0	0	0	0	0	0	0	17	247
3177	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3183	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3193	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2692	Valladolid	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
2705	Valladolid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2763	Zaragoza	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2767	Zaragoza	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2794	Zaragoza	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2819	Zaragoza	0	0	0	0	0	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2851	Zaragoza	0	0	0	0	0	0.30	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	5
2864	Zaragoza	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1488	Seville	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	13
2325	Seville	0	0	0	0	0	0	2400	0	0	3.81E-06	0	0.01	0	0	0.03	0	0	111	0	0	235	0	0	0	0	0	2746
2338	Seville	0	0	0	0	0	0	0	123000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	123000
3628	Alava	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	282	0	0	0	0	0	296
3629	Alava	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3630	Alava	0	0	0	4	0	0	0	0	0.17	0	0	0	0	0.62	0	0	1	0	0	0	0	0	0	0	0	21	27
3638	Alava	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3639	Alava	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
3642	Alava	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3694	Alava	0	0	0	0.14	0	0.51	0	0	0.58	0	0	0	0	3	0	0	0	415	0	0	0	0	0	0	0	47	466
3645	Guipuzcoa	0	0	0	0.04	0	0.33	0	0	0.31	0	0	0	0	2	0	0	0	0	0	0	56	0	0	0	0	19	78
3655	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3656	Guipuzcoa	0	0	1	0	0	0	0	0	0	0	0	0	0.86	0	0	0	0	0	0	0	0	0	0	0	0	0	2
3657	Guipuzcoa	0	0	1	0	0	0	0	0	0	0	0	0	0.81	0	0	0	0	0	0	0	0	0	0	0	0	0	2
3659	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3666	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3669	Guipuzcoa	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
3673	Guipuzcoa	0	0	0	0.01	0	0	689	273000	0.51	0	0	0	0	0	0.01	0	0.10	239	0	0	0	0	0	0	0	2	273930
3675	Guipuzcoa	0	0	0	0.04	0	0.99	0	0	0.31	0	0	0	0	6	0	0	0.07	0	0	0	141	0	0	0	0	80	228
3676	Guipuzcoa	0	0.09	0	0.21	0	0.26	3200	0	0.68	0	0	0	0	12	0.05	0	0.09	0	0	0	63	0	270	0	0	43	3589
3680	Guipuzcoa	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
3682	Guipuzcoa	0	0	0	0	0	0.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3684	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3685	Guipuzcoa	0	0	0	0.17	0	0	0	124000	0	0	0	0	0	1	0	0	0	561	0	0	0	0	356	0	0	2	124920
3717	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0.74	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3641	Vizcaya	0	0.08	0	0.01	0	0.38	0	0	0.18	0	0	0	0	1	0.05	0	0.12	0	0	0	62	0	0	0	0	16	80
3654	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3697	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3703	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3704	Vizcaya	0	0	1	0	0	0	0	0	0	0	0	0	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3705	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3708	Vizcaya	0	0	2	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	2
3712	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0	0	0	0	0	0	0
3715	Vizcaya	0	0	4	0	0	0	0	0	0	0	0	0	0.74	0	0	0	0	0	0	0	0	0	0	0	0	0	5
3723	Vizcaya	0	0.03	0	0.12	35	35	0	0	0.83	0	0	0	0	4	0.09	0	5	0	0	0	0	0	0	0	0	10	91
3724	Vizcaya	0	0.96	0	0.02	26	0.90	575	0	0.35	0	0	0	0	1	0.02	0	0.13	0	0	0	62	0.62	0	0	0	97	765
3727	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
3733	Vizcaya	0	0	0	0.09	10	0.16	0	0	0.10	0	0	0	0	7	0	0	0	470	0	0	0	0	165	0	0	27	680
3737	Vizcaya	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72	0	0	73
3738	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3742	Vizcaya	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
3745	Vizcaya	0	0	1	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0	68	0	0	0	0	0	70
TOTAL		21	1	71	6	155	42	127723	6250000	10	0	293	0	4	76	1	5070	16	12126	783	10	2225	5	10155	72	13	594	6409470

[a]Non-methane volatile organic compounds.

Supplementary data, Table 6.

		Releases to water (EPER, 2001) (Mt/year)																			
EPER code	Region	Arsenic	Benzene[a]	Cadmium	Chlorides	Chromium	Copper	Cyanides	Dichloromethane	Fluorides	Halogenated organic compounds	Lead	Mercury	Nickel	Nitrogen	Phenols	Phosphorus	PAH	Total organic carbon	Zinc	TOTAL
1477	Asturias	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0
1850	Asturias	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	Asturias	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3486	Asturias	0	14	0	3760	0	0.28	151	0	54	0	0	0	0.39	1200	186	14	2	0	0	5382
3487	Asturias	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3551	Asturias	0.04	0	0.20	0	0	0.17	0	0	6	0	0.35	0.09	0.49	0	0	0	0	0	27	34
30	Cantabria	0.01	0	0	0	0.11	0.08	0	0	0	0	0.35	0	0.11	0	0	0	0.01	0	0.16	1
214	Cantabria	0	0	0.15	0	0.15	0.09	0.06	0	0	0	0.88	0	0	0	0	0	0.06	0	0.20	2
385	Cantabria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.95	1
1569	Cantabria	0	0	0	0	0	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0
1808	Cantabria	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0	0	0	0	0	0	0
2076	Cantabria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2086	Cantabria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1620	Madrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3337	Madrid	0	0	0	0	0	0	0	0	0	0	0	0	0.04	0	0	0	0	0	0.22	0
3397	Madrid	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0	0	0	0	0	0	0
3465	Madrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3517	Madrid	0	0	0	0	0	0	0	0	0	0	0	0	0.18	0	0	0	0	0	0	0
2590	Valencia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.32	0
2649	Valencia	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	66	0.20	66
2658	Valencia	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0
353	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
389	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0
460	Barcelona	0	0	0	0	0.07	0	0	0	0	0	0	0	0.06	0	0	0	0	0	0	0
491	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0	0	0	0	0	0	0
492	Barcelona	0	0	0	0	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
495	Barcelona	0	8	0	0	0	0	0	0	0	0	0	0	0.03	0	0	0	0	0	0	8
3001	Barcelona	0	0	0	6480	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6480
3076	Barcelona	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
3100	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0
3177	Barcelona	0	0	0	0	0	0	0	0	0	0	0	0	0.07	0	0	0	0	0	0	0
3183	Barcelona	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
3193	Barcelona	0	0	0	0	0.21	0	0	0.21	0	0	0	0	0.02	0	0	0	0	0	0	0
2692	Valladolid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2705	Valladolid	0	0	0.01	0	0	0.09	0	0	0	0	0	0	0	0	0	19	0	0	0	19
2763	Zaragoza	0	0	0	36700	0	0	0	0	7	0	0	0	3	0	0	158	0	0	17	36886
2767	Zaragoza	0	0	0.04	0	0.08	0.08	0	0	0	0	0.20	0	0	0	0	0	0	0	0	0
2794	Zaragoza	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.18	0	0	0
2819	Zaragoza	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2851	Zaragoza	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2864	Zaragoza	0	0	0	0	0.53	0.84	0	0	0	0	0	0	3	0	0	0	0	0	0	5
1488	Seville	0	0	0	0	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2325	Seville	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0	0	0
2338	Seville	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3628	Alava	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3629	Alava	0.02	0	0	0	0.30	0	0	0	0	0	0	0	0	0	0	78	0	150	10	239
3630	Alava	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3638	Alava	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.42	0
3639	Alava	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3642	Alava	0	0	0	0	0.08	0.14	0	0	0	0	0.03	0	0	0	0	0	0	0	0.11	0
3694	Alava	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3645	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3655	Guipuzcoa	0	0	0	0	0.67	0	0	0	0	0	0	0	0.74	0	0	6	0	0	3	10
3656	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3657	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3659	Guipuzcoa	0	0	0	0	0	0.09	0.41	0	0	0	0	0	0.24	0	0	0	0	0	0	1
3666	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0
3669	Guipuzcoa	0	0	0	0	0	0.06	0	0	0	0	0	0	0.11	0	0	0	0	0	0.23	0
3673	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3675	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		Releases to water (EPER, 2001) (Mt/year)																			
EPER code	Region	Arsenic	Benzene[a]	Cadmium	Chlorides	Chromium	Copper	Cyanides	Dichloromethane	Fluorides	Halogenated organic compounds	Lead	Mercury	Nickel	Nitrogen	Phenols	Phosphorus	PAH	Total organic carbon	Zinc	TOTAL
3676	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3680	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3682	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3684	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0
3685	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3717	Guipuzcoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3641	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3654	Vizcaya	0	0	0.01	0	0.12	0.34	0	0	5	0	0.25	0	0.48	0	0	0	0	222	0.15	228
3697	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.21	0
3703	Vizcaya	0	0	0	0	0	0.07	0	0	0	0	0.18	0	0	0	0	0	0	0	1	1
3704	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3705	Vizcaya	0	0	0	0	0.11	0	0	0	0	0	0	0	0.06	0	0	7	0	0	0	7
3708	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3712	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3715	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3723	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3724	Vizcaya	0	0	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	19
3727	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3733	Vizcaya	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0
3737	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3738	Vizcaya	0.01	0	0	0	2	0	0	0	0	0	0	0	0.03	0	0	0	0	0	0	2
3742	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3745	Vizcaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL		0.07	22	0.41	46940	4	2	154	0.21	91	1	2	0.09	10	1200	186	282	3	438	62	49398

[a]Benzene, toluene, ethylbenzene and xylenes.

Supplementary data, Table 7.

Region	Tumor	Sex	Moran's I statistic	P-value
Asturias	Oral cavity-pharynx	Total	-0.05249172	0.5856
Asturias	Oral cavity-pharynx	Men	-0.03502037	0.7355
Asturias	Oral cavity-pharynx	Women	-0.03781249	0.6841
Asturias	Esophagus	Total	-0.02376768	0.8587
Asturias	Esophagus	Men	-0.01617601	0.9438
Asturias	Esophagus	Women	0.05656923	0.3239
Asturias	Stomach	Total	0.14603880	0.0447
Asturias	Stomach	Men	0.05902542	0.3554
Asturias	Stomach	Women	0.04909646	0.4301
Asturias	Pancreas	Total	-0.03060977	0.7897
Asturias	Pancreas	Men	-0.00063758	0.8792
Asturias	Pancreas	Women	-0.02549145	0.8491
Asturias	Liver	Total	0.17075770	0.0188
Asturias	Liver	Men	0.16556910	0.0243
Asturias	Liver	Women	0.13051900	0.0628
Asturias	Gallbladder	Total	0.17597560	0.0165
Asturias	Gallbladder	Men	0.17876650	0.0155
Asturias	Gallbladder	Women	0.02647231	0.6475
Asturias	Colon-rectum	Total	0.05155111	0.4234
Asturias	Colon-rectum	Men	0.11984490	0.0932
Asturias	Colon-rectum	Women	0.02061725	0.6887
Cantabria	Oral cavity-pharynx	Total	-0.01861709	0.8851
Cantabria	Oral cavity-pharynx	Men	-0.04151307	0.6061
Cantabria	Oral cavity-pharynx	Women	-0.10358460	0.0895
Cantabria	Esophagus	Total	-0.06748631	0.3538
Cantabria	Esophagus	Men	-0.07320437	0.3125
Cantabria	Esophagus	Women	0.00433499	0.8251
Cantabria	Stomach	Total	-0.00469432	0.9597
Cantabria	Stomach	Men	0.12171950	0.0540
Cantabria	Stomach	Women	-0.01027018	0.9822
Cantabria	Pancreas	Total	-0.10429660	0.1635
Cantabria	Pancreas	Men	-0.02573515	0.8002
Cantabria	Pancreas	Women	-0.07685203	0.2788
Cantabria	Liver	Total	0.00663622	0.8154
Cantabria	Liver	Men	0.00135581	0.8779
Cantabria	Liver	Women	-0.04896579	0.4920
Cantabria	Gallbladder	Total	-0.13958230	0.0432
Cantabria	Gallbladder	Men	-0.10486900	0.1008
Cantabria	Gallbladder	Women	-0.11583990	0.0850
Cantabria	Colon-rectum	Total	0.09517670	0.1532
Cantabria	Colon-rectum	Men	0.08605570	0.1751
Cantabria	Colon-rectum	Women	0.01362985	0.7464
Madrid	Oral cavity-pharynx	Total	0.02129113	0.7521
Madrid	Oral cavity-pharynx	Men	0.10391630	0.0810
Madrid	Oral cavity-pharynx	Women	-0.01828760	0.6860
Madrid	Esophagus	Total	0.01895712	0.7777
Madrid	Esophagus	Men	0.01117469	0.8722
Madrid	Esophagus	Women	0.00372271	0.9867
Madrid	Stomach	Total	0.02573120	0.6693
Madrid	Stomach	Men	0.03300560	0.5752
Madrid	Stomach	Women	-0.00496516	0.9725
Madrid	Pancreas	Total	-0.03800347	0.5936
Madrid	Pancreas	Men	-0.01755548	0.8186
Madrid	Pancreas	Women	0.06033369	0.2982
Madrid	Liver	Total	0.11820930	0.0487
Madrid	Liver	Men	0.07746423	0.1752
Madrid	Liver	Women	0.06936556	0.1320
Madrid	Gallbladder	Total	0.04481397	0.4213
Madrid	Gallbladder	Men	0.00328953	0.9521
Madrid	Gallbladder	Women	0.09308102	0.0675
Madrid	Colon-rectum	Total	0.03110942	0.6055
Madrid	Colon-rectum	Men	-0.00026691	0.9565
Madrid	Colon-rectum	Women	-0.07132777	0.2980
Valencia	Oral cavity-pharynx	Total	-0.00027553	0.9561
Valencia	Oral cavity-pharynx	Men	0.00483554	0.8440
Valencia	Oral cavity-pharynx	Women	-0.00542445	0.9445
Valencia	Esophagus	Total	-0.04774053	0.2650
Valencia	Esophagus	Men	-0.07302589	0.0809
Valencia	Esophagus	Women	-0.07302589	0.0809
Valencia	Stomach	Total	0.12468570	0.0035
Valencia	Stomach	Men	0.08791083	0.0313
Valencia	Stomach	Women	0.01433823	0.6680
Valencia	Pancreas	Total	-0.01710840	0.7286
Valencia	Pancreas	Men	-0.00320420	0.9696
Valencia	Pancreas	Women	-0.03557692	0.4151
Valencia	Liver	Total	-0.01949292	0.6910
Valencia	Liver	Men	0.02057096	0.5549
Valencia	Liver	Women	-0.04809808	0.2132
Valencia	Gallbladder	Total	-0.02613325	0.5549
Valencia	Gallbladder	Men	0.01034442	0.7322
Valencia	Gallbladder	Women	-0.00225570	0.9792
Valencia	Colon-rectum	Total	0.03480152	0.3509
Valencia	Colon-rectum	Men	0.06350675	0.1031
Valencia	Colon-rectum	Women	-0.01367203	0.8021
Barcelona	Oral cavity-pharynx	Total	-0.03281543	0.4484
Barcelona	Oral cavity-pharynx	Men	-0.03351041	0.4155
Barcelona	Oral cavity-pharynx	Women	-0.00876344	0.7914
Barcelona	Esophagus	Total	0.00905504	0.7335
Barcelona	Esophagus	Men	0.01531047	0.6471
Barcelona	Esophagus	Women	-0.02603431	0.2954
Barcelona	Stomach	Total	0.07823288	0.0525

Region	Tumor	Sex	Moran's I statistic	P-value
Barcelona	Stomach	Men	0.04291818	0.2404
Barcelona	Stomach	Women	0.00648034	0.8184
Barcelona	Pancreas	Total	-0.02111495	0.6529
Barcelona	Pancreas	Men	0.01146527	0.7182
Barcelona	Pancreas	Women	-0.02385808	0.5507
Barcelona	Liver	Total	-0.02658364	0.5312
Barcelona	Liver	Men	-0.00065076	0.9560
Barcelona	Liver	Women	-0.00544329	0.9052
Barcelona	Gallbladder	Total	-0.00999078	0.8399
Barcelona	Gallbladder	Men	0.01563666	0.6002
Barcelona	Gallbladder	Women	-0.03300347	0.3237
Barcelona	Colon-rectum	Total	-0.00995652	0.8467
Barcelona	Colon-rectum	Men	-0.00065915	0.9584
Barcelona	Colon-rectum	Women	-0.00662018	0.9164
Valladolid	Oral cavity-pharynx	Total	-0.01995271	0.6963
Valladolid	Oral cavity-pharynx	Men	-0.02209699	0.6418
Valladolid	Oral cavity-pharynx	Women	-0.00480654	0.9689
Valladolid	Esophagus	Total	0.07197028	0.0619
Valladolid	Esophagus	Men	0.08540183	0.0387
Valladolid	Esophagus	Women	-0.02304709	0.3116
Valladolid	Stomach	Total	-0.03771659	0.4499
Valladolid	Stomach	Men	-0.09776875	0.0371
Valladolid	Stomach	Women	0.07549162	0.0568
Valladolid	Pancreas	Total	0.03124156	0.4086
Valladolid	Pancreas	Men	0.05311891	0.1646
Valladolid	Pancreas	Women	-0.00569739	0.9486
Valladolid	Liver	Total	-0.05341691	0.2052
Valladolid	Liver	Men	-0.03530222	0.4156
Valladolid	Liver	Women	-0.01762064	0.6861
Valladolid	Gallbladder	Total	-0.01524231	0.7532
Valladolid	Gallbladder	Men	-0.02136918	0.5666
Valladolid	Gallbladder	Women	0.01437210	0.6200
Valladolid	Colon-rectum	Total	0.01366294	0.6993
Valladolid	Colon-rectum	Men	0.04767828	0.2463
Valladolid	Colon-rectum	Women	-0.00707476	0.9393
Zaragoza	Oral cavity-pharynx	Total	-0.04017275	0.2984
Zaragoza	Oral cavity-pharynx	Men	-0.03442942	0.3694
Zaragoza	Oral cavity-pharynx	Women	-0.01098540	0.7153
Zaragoza	Esophagus	Total	-0.00772464	0.8814
Zaragoza	Esophagus	Men	-0.01013554	0.8369
Zaragoza	Esophagus	Women	-0.01073500	0.6906
Zaragoza	Stomach	Total	0.02579629	0.4815
Zaragoza	Stomach	Men	0.00133780	0.9179
Zaragoza	Stomach	Women	0.02840821	0.4149
Zaragoza	Pancreas	Total	-0.02408424	0.5754
Zaragoza	Pancreas	Men	-0.03131857	0.4356
Zaragoza	Pancreas	Women	-0.06573825	0.0743
Zaragoza	Liver	Total	0.04518992	0.2030
Zaragoza	Liver	Men	0.04670934	0.1689
Zaragoza	Liver	Women	-0.00079340	0.9898
Zaragoza	Gallbladder	Total	-0.00878780	0.8457
Zaragoza	Gallbladder	Men	-0.01517525	0.6600
Zaragoza	Gallbladder	Women	0.00050388	0.9496
Zaragoza	Colon-rectum	Total	-0.01567457	0.7759
Zaragoza	Colon-rectum	Men	0.05432516	0.1737
Zaragoza	Colon-rectum	Women	-0.01264159	0.7866
Seville	Oral cavity-pharynx	Total	0.05194080	0.3548
Seville	Oral cavity-pharynx	Men	0.09093647	0.1311
Seville	Oral cavity-pharynx	Women	-0.11485750	0.0753
Seville	Esophagus	Total	0.12151200	0.0444
Seville	Esophagus	Men	0.09099713	0.1303
Seville	Esophagus	Women	0.01923590	0.6590
Seville	Stomach	Total	0.07422710	0.1994
Seville	Stomach	Men	0.00621517	0.8182
Seville	Stomach	Women	0.06828401	0.2299
Seville	Pancreas	Total	0.02419712	0.6253
Seville	Pancreas	Men	-0.07149874	0.3221
Seville	Pancreas	Women	-0.00240683	0.9416
Seville	Liver	Total	-0.00701086	0.9821
Seville	Liver	Men	0.01071595	0.7570
Seville	Liver	Women	-0.06513266	0.3524
Seville	Gallbladder	Total	-0.02744449	0.7444
Seville	Gallbladder	Men	0.03947993	0.4487
Seville	Gallbladder	Women	-0.02673533	0.7441
Seville	Colon-rectum	Total	0.11698910	0.0471
Seville	Colon-rectum	Men	0.17133120	0.0051
Seville	Colon-rectum	Women	-0.07903881	0.2634
Basque Country	Oral cavity-pharynx	Total	0.06216550	0.1473
Basque Country	Oral cavity-pharynx	Men	0.04201258	0.2778
Basque Country	Oral cavity-pharynx	Women	0.02475904	0.4195
Basque Country	Esophagus	Total	0.00402974	0.8470
Basque Country	Esophagus	Men	-0.01648397	0.7718
Basque Country	Esophagus	Women	0.03559119	0.1949
Basque Country	Stomach	Total	0.10254620	0.0185
Basque Country	Stomach	Men	0.06202347	0.1244
Basque Country	Stomach	Women	0.07109544	0.0897
Basque Country	Pancreas	Total	0.05103042	0.2046
Basque Country	Pancreas	Men	0.01445336	0.6655
Basque Country	Pancreas	Women	-0.03749667	0.4298
Basque Country	Liver	Total	0.09214795	0.0321
Basque Country	Liver	Men	0.03371544	0.3675
Basque Country	Liver	Women	0.08352763	0.0374
Basque Country	Gallbladder	Total	-0.00708044	0.9270

Region	Tumor	Sex	Moran's I statistic	P-value
Basque Country	Gallbladder	Men	0.09498786	0.0279
Basque Country	Gallbladder	Women	0.00876108	0.7637
Basque Country	Colon-rectum	Total	-0.02607310	0.6244
Basque Country	Colon-rectum	Men	0.01989171	0.6009
Basque Country	Colon-rectum	Women	-0.08382174	0.0720