Oral Oncology 71 (2017) 144–149

Contents lists available at ScienceDirect

Oral Oncology

journal homepage: www.elsevier.com/locate/oraloncology

Neighborhood deprivation and risk of head and neck cancer: A multilevel analysis from France

Joséphine Bryere [a,*], Gwenn Menvielle [b], Olivier Dejardin [a], Ludivine Launay [a], Florence Molinie [c], Isabelle Stucker [d], Daniele Luce [e], Guy Launoy [a], ICARE group

[a] "Cancers & Préventions" U1086 INSERM-UCN, Team Labeled « Ligue Contre le Cancer », Centre François Baclesse, Avenue Général Harris, 14076 Caen, France
[b] Sorbonne Université, UPMC Univ Paris 6, INSERM, Institut Pierre Louis d'Epidémiologie et Santé Publique (IPLESP UMRS 1136) 75012 Paris, France
[c] Registre des Cancers de Loire-Atlantique et Vendée, 50 route de Saint-Sébastien, 44093 Nantes Cedex 1, France
[d] INSERM UMRS 1018, Centre de Recherche en Epidémiologie et santé des Populations, 15/16 Avenue Paul Vaillant Couturier, 94807 Villejuif, France
[e] INSERM U1085, IRSET, Faculté de Médecine, Campus de Fouillole 97154 Point-à-Pitre, France

ARTICLE INFO

Article history:
Received 13 December 2016
Received in revised form 12 June 2017
Accepted 17 June 2017
Available online 26 June 2017

Keywords:
Head and neck cancer
Socioeconomic status
Neighborhood deprivation
Multilevel analysis
Case-control studies

ABSTRACT

Background: While it is known that cancer risk is related to area-level socioeconomic status, the extent to which these inequalities are explained by contextual effects is poorly documented especially for head and neck cancer.

Methods: A case-control study, ICARE, included 2415 head and neck cancer cases and 3555 controls recruited between 2001 and 2007 from 10 French regions retrieved from a general cancer registry. Individual socioeconomic status was assessed using marital status, highest educational level and occupational social class. Area-level socioeconomic status was assessed using the French version of the European Deprivation Index (EDI). The relationship between both individual and area-based socioeconomic level and the risk of head and neck cancer was assessed by multilevel analyses.

Results: A higher risk for head and neck cancer was found in divorced compared with married individuals (OR = 2.14, 95% CI = 1.78–2.57), for individuals with a basic school-leaving qualification compared with those with higher education (OR = 4.55 95% CI = 3.72–5.57), for manual workers compared with managers (OR = 4.91, 95% CI = 3.92–6.15) and for individuals living in the most deprived areas compared with those living in the most affluent ones (OR = 1.98, 95% CI = 1.64–2.41). The influence of area-level socioeconomic status measured by EDI remained after controlling for individual socioeconomic characteristics (OR = 1.51; 95% confidence interval: 1.23–1.85, p-value = 0.0003).

Conclusions: The role of individual socioeconomic status in the risk of head and neck cancer is undeniable, although contextual effects of deprived areas also increase the susceptibility of individuals developing the disease.

Introduction

Social inequalities in cancer incidence have been reported worldwide and for many cancer sites. An increased incidence in deprived populations has been observed for lung [1–4] head and neck [1,3–5], liver[1,5], cervix [1,4–6], bladder [4], stomach [1,5] and esophagus [1,5,7] and an increased incidence in affluent populations has been observed for breast [1,4,5,8] and prostate cancer [1,4,5,9], and for melanoma, [1,4,5,10]. The influence of area-based socioeconomic level on the incidence of cancer is well documented in the literature but the underlying mechanisms that create these associations are rarely addressed.

It is currently unclear whether the higher incidence in disadvantaged areas is correlated with the higher proportion of disadvantaged individuals in these areas (composition effect) or if other aspects specific to the areas (positive or negative externalities) are associated with cancer risk (context effect). For example, regarding context effects, the social environment of the residence area is thought to have an influence on the percentage of smokers [11]. It has also been demonstrated that lower neighborhood socioeconomic status and higher convenience store concentration can be associated with a higher proportion of smokers after accounting for individual characteristics [12]. Others suggest that people living in the most deprived areas in some countries have

* Corresponding author at: U1086 INSERM-UCN, Centre François Baclesse, Avenue du Général Harris, 14076 Caen, France.

E-mail address: josephine.bryere@inserm.fr (J. Bryere).

http://dx.doi.org/10.1016/j.oraloncology.2017.06.014
1368-8375/

greater exposure to environmental pollution [13]. More generally, the lives and health of individuals are affected not only by their personal characteristics but also by characteristics of the social groups (service availability, environmental exposition, job, education and leisure opportunities) to which they belong.

It appears essential to estimate the association between area-based socioeconomic level and incidence after controlling for individual socioeconomic variables to understand the extent of both composition effects and contextual effects. To our knowledge, while four studies of this type have focused on breast cancer [8,14–16], three on prostate cancer [15–17], three on colorectal cancer [16,18,19] and three on lung cancer [16,17,20] none has investigated head and neck cancer despite being one of the sites most affected by social inequalities in cancer incidence [1].

The objective of this study was to explore the hypothesis that a contextual effect could explain part of the higher incidence of head and neck cancers in deprived areas. This was done by jointly evaluating the influence of individual and area-based socioeconomic level on the incidence of cancer by performing a multilevel analysis [21] of data from the case-control study ICARE.

Materials and methods

Study population

The ICARE study design has been previously published [22]. Briefly, it is a multicenter case-control study on lung and head and neck cancers in the general population conducted between 2001 and 2007 in 10 French regions retrieved from a general cancer registry. The registry comprises approximately 13% of the French population (7.6 million inhabitants). Only histologically confirmed cases aged $\leq$ 75 at the time of diagnosis identified between 2001 and 2007 and living in one of the 10 regions of the study were eligible. 2415 cases of head and neck cancer were included. Controls were selected by list-assisted random digit dialing sampling, in the same "départements" as the cases, using incidence density sampling method. Recruitment of controls was done by telephone by a polling institute experienced in this type of procedure. Controls were frequency-matched to the cases by sex, age (in 4 categories: less than 40, 40–54, 55–64, >65) Additional stratification was used to achieve a distribution by socioeconomic status among controls comparable to that of the general population. 3555 control individuals were interviewed. The distribution of the main occupational and economic activity characteristics of the active population of the regions in the study is similar to their distribution in France [22].

Individual socioeconomic variables

Specifically trained investigators interviewed the subjects. The questionnaire included a demographic section consisting of variables: age, marital status and educational attainment. It also included a history of occupied professions. Marital status (married, widower, single, divorced), educational attainment (Higher degree meaning college degree, A-level allowing for university entrance, technician level meaning the obtaining of a technical qualification, basic school meaning compulsory minimum level), and category of longest period of occupation (manager meaning an individual with management responsibility, farmer meaning person engaged in agriculture, mid-level manager between managers and employees, employee performing office tasks, artisan meaning a skilled manual worker in a particular craft, manual worker performing manual tasks) during one's lifetime were used to assess socioeconomic status at the individual level.

Area-based socioeconomic variables

The last known address of the cases and controls was geocoded and assigned to an IRIS (Ilots Regroupés pour l'Information Statistique), the smallest French area for which census data are available. Deprivation level of each IRIS was assessed using the EDI (European Deprivation Index) calculated from the 2007 census [23]. The methodology used an individual deprivation indicator from the conceptual definition of deprivation and selected ecological census variables that are the most closely related to the individual deprivation indicator in the European Union Statistics on Income and Living Conditions tool. This was available as a continuous variable, increasing from −17.35 to 51.12. A categorical version of the EDI (quintiles calculated at the French level) was used. Owing to poor health, some subjects (257 cases and 74 controls) were interviewed using a shorter version of the questionnaire that did not include the residential history. In addition, because the geocoding process required the exact address of the individual to assign geographic coordinates in space (latitude, longitude) and then assign an IRIS, 227 cases and 282 controls were excluded because their address was incomplete. The final database included 1931 head and neck cancer cases and 3199 controls (Table 1). The subjects in the study were distributed in 2918 IRIS.

Statistical analysis

To study the relationship between socioeconomic level and risk of head and neck cancer, we used multilevel analyses justified by the non-independence of observations of subjects from the same geographical unit. This was done because of the hierarchical structure of individual data (level 1) and socioeconomic area-based data (level 2) [24].

- Step 0: Detection of potential existence of a 'group' effect

The first step of the multilevel analysis is based on analyzing the empty model without any explanatory variable. It contains only the random effects at the IRIS level and can detect the potential existence of a 'group' effect, which is also known to be the context effect on the dependent variable, i.e., the risk.

To verify the existence of a context effect, it is necessary to test the null hypothesis that the variance called level 2 variance (V2) is null. V2 quantifies the change in risk of one IRIS to another depending on the characteristics of IRIS. If this hypothesis is rejected, the multilevel model is justified.

- Step 1: Introduction of individual explanatory variables (model 1).

The second step is to add to model 0 the individual variables (marital status, educational attainment, occupational classification) related to the dependent variable in univariate analyses with a 5% threshold.

We tested whether variations between IRISs were still persistent after adding individual-level variables and observed if the V2 declined with the addition of these variables. If it was the case, this would indicate that certain characteristics of the IRIS (context effect) were associated with the likelihood of having cancer.

The addition of these individual variables can also identify a possible composition effect. A composition effect exists if the V2 decreases, indicating that some of the variations between the IRISs are due to differences in composition in terms of individual characteristics.

- Step 2: Introduction of the area-based explanatory variable (model 2).