

# METHODOLOGICAL EXPLORATORY STUDY APPLIED TO OCCUPATIONAL EPIDEMIOLOGY

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## ABSTRACT

The utilization of epidemiologic methods and techniques has been object of practical experimentation and theoretical-methodological reflection in health planning and programming process. Occupational Epidemiology is the study of the causes and prevention of diseases and injuries from exposition and risks in the work environment. In this context, there is no intention to deplete such a complex theme but to deal with basic concepts of Occupational Epidemiology, presenting the main characteristics of the analysis methods used in epidemiology, as investigate the possible determinants of exposition (chemical, physical and biological agents). For this study, the social-demographic profile of the IPEN-CNEN/SP work force was used. The knowledge of this reference population composition is based on sex, age, educational level, marital status and different occupations, aiming to know the relation between the health aggravating factors and these variables. The methodology used refers to a non-experimental research based on a theoretical methodological practice. The work performed has an exploratory character, aiming a later survey of indicators in the health area in order to analyze possible correlations related to epidemiologic issues.

## 1. INTRODUCTION

**Epidemiology** is the study of the distribution and determinants of health-related states and events in populations and the application of it to control health problems. The fundamental goal of these investigations is to obtain a valid and reasonably precise estimate of exposure-disease association in groups.

The occupational epidemiology is an important exposure-oriented sub discipline epidemiology; it is defined as the study of the disease occurrence in relation to work-related determinants. The idea is that, in reviewing any individual with a health-related problem or any workplace with a hazardous environment, the investigator must ask the following questions: Who is at risk? When? Where? [1].

In the intention of better knowing the population's health, the factors that determine it, the evolution of the disease process and the impact of the actions proposals to modify its course, the science men had developed numerous ways of boarding and investigation. As consequence, currently, there are many methods at our disposal. For one given situation, one of the methods could be more adjusted than the other, although several can be used in the study of a same subject. Each one has its advantages and its limitations, that way , knowing them, can be anticipated the easiness and difficulties found by people that use it, and to judge,

when evaluating the methodology used, the results presented and the interpretation given, and whether the theory was appropriately applied [2].

In demographic and epidemiologic studies is essential the knowledge of a reference population. In this context, the knowledge of the workforce composition, of the “Instituto de Pesquisas Energéticas e Nucleares, IPEN-CNEN/SP” was used. The objective of this paper is to identify firstly the social-demographic profile of the IPEN-CNEN/SP based on stratification variables and after to identify the possible exposure determinants (chemical, physical and biological agents) at the workplace.

The choice of the, variables sex, age and marital status is important for both demographic and epidemiological studies. In the field of epidemiology, sex and age are essential for the calculation of coefficients (morbidity and mortality) and the knowledge of the marital status (married, single and divorced) are important because many diseases (health risks) are strongly related with this variable. Accuracy analysis in demography and epidemiology depends on the population contingent’s information in each one of the modalities of these variables [3].

### **1.1 Main Types of Study Designs Used in Occupational Epidemiology**

Epidemiological studies are often classified as experimental or observational depending on the manner that the levels of the explanatory factors are determined. When the levels of at least one explanatory factor are under the control of the investigator, the study is called experimental. This type of study will not focus in this paper. When the levels of all explanatory factors are determined by observation only, the study is observational. The majority of studies relevant to the evaluation of risk in human populations are observational and it could be classified in two kinds: analytical and descriptive. The descriptive studies describe the frequency and the distribution of an event while the analytical studies have as objective to investigate the association among two events with the purpose to explain and establish relations between them. Some descriptions of kinds of analytical methods bellow.

**The cohort study or follow-up** is the most common type of study in occupational epidemiology. Information on a factor (or factors) is collected in a defined population that is followed over time for the occurrence of a disease (or diseases). The disease rate among those exposed is compared to the rate among the non-exposed to assess if there is an association between the study factor and the disease. This study takes a long time to be accomplished as investigators have to wait sometimes years before acquiring enough cases of disease or death. A retrospective cohort study may be used to eliminate this long follow-up period. Past records of individuals are used to characterize the exposure status of the study objects and the disease status is determined until an appointed date.

The major methodological advantage of the cohort study is that information on exposure is recorded before the development of the disease. This eliminates recall bias.

**The case-control** study examines two groups. One group consists of people with a particular disease and the other consists of those from the source population or study base without the disease. Information regarding past exposures and habits is obtained from each person in the two groups. If the exposure of interest is reported by a larger proportion of cases than controls, an association between the exposure and disease can be supposed to exist. Case control studies are more efficient and suitable for the study of rare diseases with long latency periods.

In the **cross-sectional study** people are selected regardless of exposure or disease status. This study design is often called a survey or prevalence study.

**The ecologic study** is a method of epidemiologic study in which rates of health effects outcome based on population rather than individual data are related to the measure by the population radiation exposure [4, 5, 6].

The Table 1, gives a summary of the main types of observational studies, its advantages and limitations.

**Table 1. Main observational studies: advantages and limitations**

Types of study	Advantage	Limitation
<u>Cohort or follow-up</u>	<ul style="list-style-type: none"> <li>-Good reputation</li> <li>-Preserves the sequence time</li> <li>-Allows the direct calculation of the relative risk</li> <li>-Less probability of false or inexact conclusions</li> <li>-Evidence associations of the factor of risk with other diseases</li> </ul>	<ul style="list-style-type: none"> <li>-Long duration and high cost</li> <li>-Modifications in the composition of the groups</li> <li>-Difficulty to keep the uniformity of the work</li> </ul>
<u>Case-control</u>	<ul style="list-style-type: none"> <li>-Short duration and low cost</li> <li>-Effective for diseases of low incidence</li> <li>-Allows to investigate many factors of risk simultaneously</li> <li>-Allows to evaluate the effectiveness and quality of the health care in a community</li> <li>-Reproducibility</li> </ul>	<ul style="list-style-type: none"> <li>-Necessity of homogeneous standards for disease definition</li> <li>-Difficulty in the control selection</li> <li>-Information of exposure depends on the interviewer's memory</li> </ul>
<u>Cross-sectional</u>	<ul style="list-style-type: none"> <li>-Short duration and low cost</li> <li>-Preliminary evaluation of a hypothesis</li> <li>-Useful in studies of precursory injuries and intermediate events of diseases;</li> <li>-Important in the follow-up and evaluation in prevention programs</li> </ul>	<ul style="list-style-type: none"> <li>-Loss of sequence time</li> <li>-Useless to demonstrate causal relation: it does not have guarantees that the exposition preceded the disease</li> <li>-Inefficient in studies to evaluate the clinical evolution of the disease</li> </ul>
<u>Ecological</u>	<ul style="list-style-type: none"> <li>-Short duration and low cost</li> <li>-Good estimate of the exposure effect when it varies little in the study area</li> <li>-Measures exposure for groups;</li> <li>-The conclusions are generalized; with more easiness that in individual studies</li> </ul>	<ul style="list-style-type: none"> <li>-No association with individual form (the data of the study represents levels of average exposure instead of individual levels)</li> <li>-Difficulty to control confounding factors</li> </ul>

Exposure to chemical, physical, and biological agents at the workplace is difficult to characterize. A worker's exposure is never constant over time. Workers within similar tasks groups and working environmental are rarely uniformly exposed.

The Radiation Protection Service of IPEN has conducted a rigorous program of radiological control and nuclear security control in all the installations of the IPEN and the conventional industrial security is carried out by the Service of Security at the Work. Currently, the data obtained from monitoring program and health-control are not used for epidemiologic studies purposes.

The main risk factors and its association are shown in the Table 2 [2,6].

**Table 2. Risk factors in epidemiology**

<b>ASSOCIATION</b>	<b>RISK FACTORS</b>
Habits of life	Tobacco smoke, alcohol, diet, sedentary life
Physicals	Noise, temperature, illumination, radiations
Chemicals	Dusts, toxic gases, chemical products
Biological	Infectious agents
Work's organization	Psychosocial stressors, ergonomic positions

## **2. METHODOLOGY**

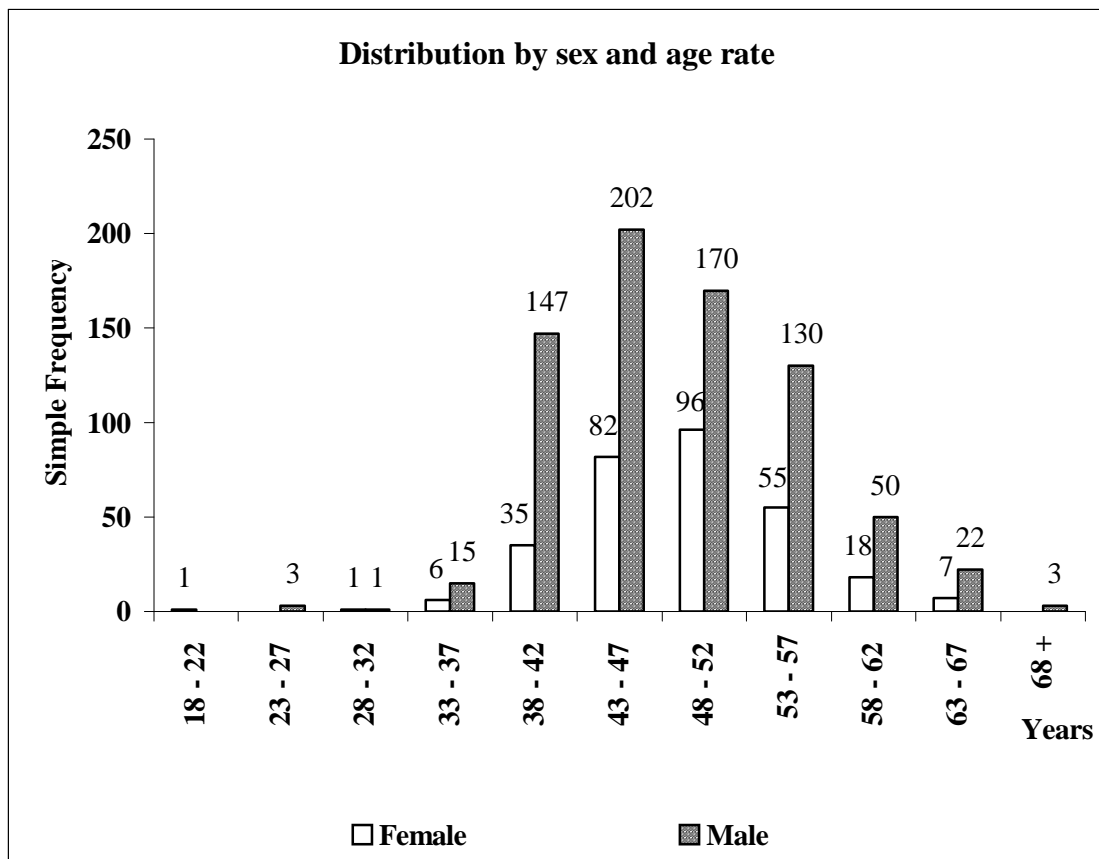
### **2.1 Selection of reference population**

The main hypothesis of this study considers that the frequency distribution of IPEN job in relation to variables sex, age, education, occupation and others of interest can identify and explain the demographic standards of this population as well as, in a later stage, to conduct in the planning and in the development of the determining factors to health hazards by the profile described.

The IPEN is an institution of research, development, education and production in the nuclear, energy and correlated areas. Currently, according to the administrative institution records, the workforce of the IPEN is composed of 1044 employees in labor age, with average of 49 years old.

## **3. RESULTS**

The process of variables stratification studied shows the following results: the profile of the workers, in its majority, is male sex (71%) and 29% is female sex. The frequency for age rate, with intervals of 5 years for male and female genders, is presented in the Fig. 1. It can be seen that most of the IPEN workforce is concentrated in the range of 43 to 52 years old, corresponding to 53% of the population, although the modal class corresponds to the range of 43 to 47 years old (27%). The population distribution of the IPEN for career /function is composed by 569 technologists (55%), 350 are administrative (34%) and 125 are researchers (11%). With regard to the marital state of the employees of the IPEN the majority of them is married (66%), 29% are single and 5% are divorced.



**Figure 1. The frequency by age rate, with intervals of 5 years for male and female genders (IPEN population).**

#### 4. DISCUSSION AND CONCLUSIONS

This work presents in a briefly summary with some basic concepts from epidemiology and the outlining of observational epidemiologic studies that can be used in order to investigate diseases and associated factors to them in IPEN population. Besides the boarded aspects, it is relevant to remember that the development of an epidemiologic study involves, at least, six steps: 1. definition goals; 2. choice of the adequate outlining, according to the viability of the study and the available resources; 3. identification of the studied population; 4. planning and conduction of the research; 5. collect, analysis and data interpretation; e 6. reporting of the results [6].

The quality of an epidemiologic study depends, besides other factors, on the participants' representatively, the quality of information about the exposure and the disease/condition related to health; the lack of biases and the adequate control of the confounding variables. Thus, before initiating a research is necessary to define carefully the study population, the size of the sample (when necessary) and the selection method of the participants. The data collect tools must be developed and pre-tested, according to the information set or measurements that you want to obtain.

For an epidemiologic study development it is important to consider appropriate ethical questions and applicable to the country to conduct the studies involving Human Beings [7].

The IPEN is constituted by a public employee population, presents a level of scholarship that allows the use of efficient methods in a data collection (for instance, filling forms on their own), social-economic heterogeneous, and work entail that facilitates the segment.

The possibility of using the administrative records to help in the segment forms an advantage in this kind of study. The regular up-dating of the register information has been done through a comparison between study files (workplace, occupation, name) with the Management of People Development and Management of IPEN's Health Benefits information, with seal warranted.

The knowledge of IPEN-CNEN/SP population composition was based on sex, age, educational level, marital status and occupation variables, aiming to know in a coming future the relation between the health aggravating factors associated to these variables considering exposure to radiation the factor of primary interest.

Finally it is important to improve the quality of future epidemiological studies with adequate and appropriate exposure information.

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