

Estimation with the capture-recapture method of the number of economic immigrants in Mallorca

M. Ramos Monserrat and J.C. March Cerdá

Aim. estimate the number of irregular economic immigrants in Mallorca.

Design. We used the capture-recapture method, an indirect method based on contrasts of data from two or more sources. Data were obtained from the Delegación de Gobierno (police and immigration authority), Comisiones Obreras (labor union), and institutions that provide health-related services to immigrants. Individuals were identified by birth date and country of origin.

Results. The total number of economic immigrants estimated with this method was 39 392. According to the Delegación de Gobierno data, the number of regular immigrants on the date of our inquiry was 9000. With the capture-recapture method, the number of irregular immigrants in Mallorca was therefore estimated at 30 000.

Conclusions. The capture-recapture method can be useful to estimate the population of irregular immigrants in a given area at a given time, if sufficiently precise information on the identity of each individual can be obtained.

Key words: Economic immigrants. Capture-recapture.

ESTIMACIÓN DE LOS INMIGRANTES ECONÓMICOS EN MALLORCA MEDIANTE EL MÉTODO DE CAPTURA-RECAPTURA

Objetivo. Estimar el número de inmigrantes económicos irregulares en Mallorca.

Diseño. Se ha utilizado el método de captura-recaptura, método indirecto basado en el cruce de dos o más fuentes de datos. Como fuentes de datos se han empleado: la Delegación del Gobierno; Comisiones Obreras y, por último, las entidades que prestan servicios a los inmigrantes relacionados con la salud. Para identificar a los individuos se utilizaron la fecha de nacimiento y el país de origen.

Resultados. El número total de inmigrantes económicos estimado a través de este método fue de 39.392 individuos. De acuerdo con la Delegación del Gobierno, el número de inmigrantes regularizados en esa fecha era de 9.000, por lo que, de acuerdo con la estimación del método de captura-recaptura, el número de inmigrantes económicos irregulares en Mallorca sería de 30.000.

Conclusiones. El método de captura-recaptura podría ser útil para estimar la población de inmigrantes irregulares en un área determinada, en un momento dado, si se obtienen variables suficientemente identificativas de cada individuo.

Palabras clave: Inmigrantes económicos. Captura-recaptura.

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A commentary follow this article (pág. 466)

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Introduction

The number of foreign residents in Spain had doubled during the previous decade.¹ Of the 938 783 foreign residents now in Spain, 55% are economic immigrants,² ie, they are from countries that are economically disadvantaged in comparison to Spain. To this figure must be added an unknown number of irregular immigrants (with no residency or work permit); although several authors have estimated the number of such persons, the published figures are contradictory.^{3,4} In the Autonomous Community of the Balearic Islands there are 40 399 legal foreign residents, one third of whom are economic immigrants. The number of irregular economic immigrants in this community is unknown, although the Council of Social Wellbeing of the autonomous regional government estimates that there are 5000 such immigrants in the entire archipelago.⁵

The *objective* of this study was to estimate the number of irregular economic immigrants on the island of Mallorca.

Material and methods

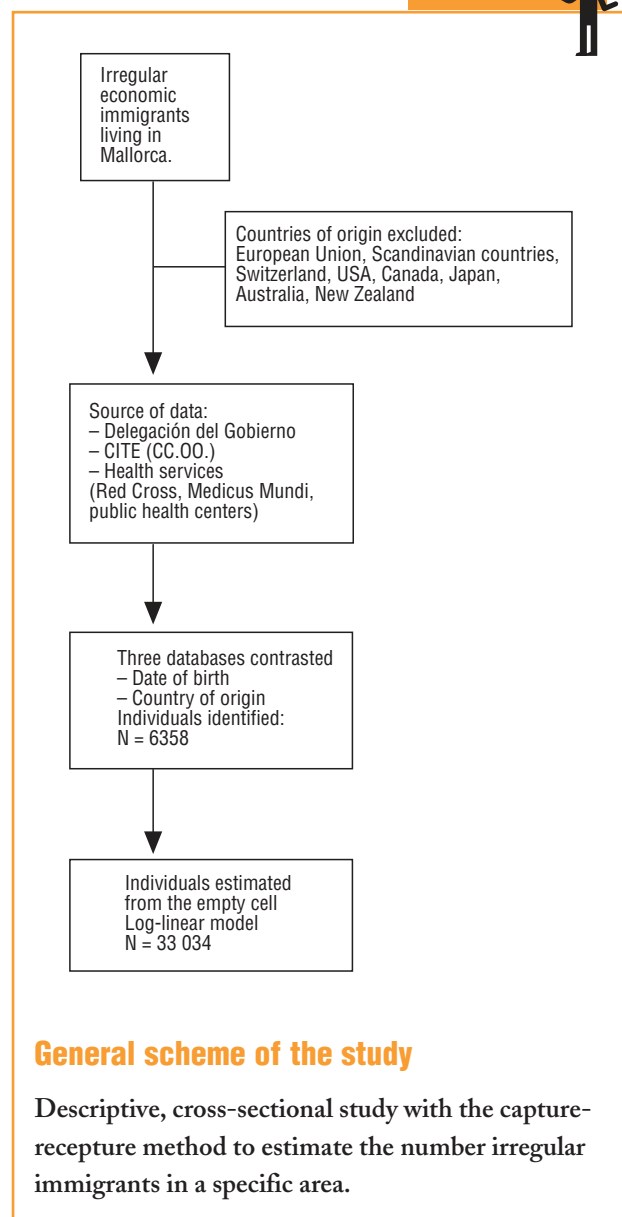
This descriptive, cross-sectional study was carried out in Mallorca. The study population was all irregular economic immigrants residing on the island. Economic immigrants⁶ were considered those from any country that was economically disadvantaged in comparison to Spain. We therefore excluded immigrants from the European Union, Scandinavian countries, Switzerland, the USA, Canada, Japan, Australia and New Zealand.

We used the *capture-recapture method*, an indirect method based on contrasts of data from two or more sources.⁷⁻⁹ First we determined the numbers of individuals who appeared in only one of the sources consulted, and those who appeared in two or more sources. These figures were used to construct a matrix with 2^k cells, where k is the number of sources of data. The empty cell, calculated with log-linear models,¹⁰ was taken to represent the number of individuals who did not appear in any source.

As data sources we used the Delegación de Gobierno (police and immigration authority) (immigrants who had applied in that year for residency or work permits), the Centro de Información al Inmigrante (CITE) run by Comisiones Obreras (labor union), and institutions that provide health-related services to immigrants (Red Cross, Medicus Mundi and public health services). The police and immigration authority provided information on all immigrants who applied for regularization of their legal status during the special application period in the year 2000. The CITE, Red Cross and Medicus Mundi provided information on all immigrants registered with these organisms since they had begun to operate in the region. Public health services provided the numbers of immigrants who, between 1 January and 30 June 2000, had visited any of the five health centers that served areas with large numbers of economic immigrants or any of the emergency services of the island's two public hospitals.

The variables used to identify individuals were passport number, date of birth, town or city and country of origin, and legal status. However, to maintain confidentiality of the data individuals were identified only by birth date and country of origin. This made it necessary to consider all records appearing in a given data ba-

Material and methods



se as (for example) «1/1/70 Morocco» as duplicates representing the same individual; although such records probably represented different persons, we counted such duplicate records as referring to a single individual.

The values for cells in the $2 \times 2 \times 2$ table were calculated with the MS Access program, and the BMDP program was used to apply log-linear models to the data. The MS Excel spreadsheet program was used to select the best models on the basis of Akaike (AIC), Bayesian (BIC) and a modified Bayesian (BIC[$\text{Sin}2\text{Pi}$]) set of criteria.

Results

Table 1 shows the $2 \times 2 \times 2$ matrix obtained by contrasting then data from all three databases (D, Delegación del Go-

Discussion
Key points



TABLE 1
Table 2 x 2 x 2 matrix used in the capture-recapture method

H	C	D		Total
		Yes	No	
Yes	Yes	45	60	105
	No	158	1585	1743
	Total	203	1645	1848
No	Yes	146	841	987
	No	3523	0	3523
	Total	3669	841	4510

H indicates institutions that provide health-related services; C, Centro de Información al Inmigrante (CC.OO.); D, Delegación del Gobierno.

bierno; C, CITE; H, health services). Source D identified 3872 individuals, source C 1848, and source H 1092. In all, 6538 individuals were identified. The $2 \times 2 \times 2$ table was used to develop 14 log-linear models, and those models that best explained the characteristics of the data were selected. The CH, DC model yielded the lowest values, and was therefore the one that best accounted for the data. According to this model, the value of the empty cell, ie, the number of individuals not included in any of the databases, was 33 034. When added to the numbers of individuals identified in all three database, this figure gave a total of 39 392 individuals. This final figure can be considered the estimated number of all economic immigrants in Mallorca.

Discussion

Determining the number of irregular economic immigrants is a difficult challenge.¹¹ The fact that different institutions in Mallorca provide services to immigrants was considered an opportunity to attempt an accurate estimate.

The capture-recapture method, developed in the field of zoology, has been used in epidemiology to calculate the size of special populations such as drug abusers¹² and homeless persons,¹³ and to determine disease prevalences.¹⁴⁻¹⁷ We therefore wondered whether it would be useful in estimating the number of immigrants in a given setting.

Certain conditions must be met for the capture-recapture method to work. All individuals must have the same likelihood of being «captured»; the sources of capture must be independent; the population must be closed; and all individuals must be identifiable.⁷ In our study we assumed that all individuals had the same likelihood of using the services provided by the CITE, the nongovernmental organizations, the Office of Immigration (regional government immigration authority) and the health centers. We initially assumed that our method would estimate only the number of irregular economic immigrants. This error would have been avoided by stratifying the population,¹⁴ although heterogeneity does not always affect the results¹⁸.

What is known about the subject

- In the previous decade the number of foreign residents in Spain has doubled.
- The number of irregular economic immigrants is unknown.

What this study contributes

- The capture-recapture method can be useful to estimate the number of economic immigrants in a given area at a given time.
- For the capture-recapture method to work, variables that identify individuals with a sufficient degree of reliability must be used.

The second condition need not be met when log-linear models are to be used. The third condition represents a theoretical assumption typical of epidemiologic studies, as it is currently difficult to find an entirely closed population.

The greatest limitation of this study was the unavailability of variables that would identify all individuals unequivocally. This was the reason why none of the models fit our data well on the basis of the maximum likelihood ratio. Consequently our results should be considered with caution until they can be confirmed.

The population of economic immigrants in Mallorca that we estimated with the capture-recapture method is 39 392 individuals. According to data provided by the Delegación del Gobierno,¹⁹ there are approximately 9000 regularized economic immigrants in Mallorca. Thus according to the capture-recapture method, the estimated population of irregular immigrants in Mallorca at the time of the study (July 2000) was approximately 30 000. In other words, the legal status of approximately three out of every four economic immigrants on the island was irregular.

Conclusions

The capture-recapture method can be useful to estimate the population of immigrants in a given area if institutions provide variables that identify persons with a sufficient degree of reliability.

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COMMENTARY

Immigration, inequality and primary care: current situation and priorities

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Equal access to health services to ensure the health status of the population should constitute one of the priorities of developed countries, with particular attention to actions and measures aimed at guaranteeing the elimination of inequities based on age, sex, social class or country of origin. Nevertheless, inequities in health, and in the access to and use of health services, have been widely reported in relation with these social factors.¹ Specifically, economic immigration and persons from countries that are economically disadvantaged in comparison to Spain are related with problems surrounding access to health services, a fact that cannot be ascribed exclusively to this population's lower socioeconomic level.²

The notable increase that has occurred essentially since 1999 in the population of foreign-born residents in Spain is giving rise to a new social and demographic reality throughout the country. The numbers of economic immigrants need to be permanently updated inasmuch as there are notable differences between areas, between culturally-defined nationalities and administratively autonomous regions, between rural and urban areas, and between boroughs and districts within large cities. The data published by the Ministry of the Interior—updated as of 31 December 2001—note that the total number of foreign residents in Spain is 1 109 060; subtracting 449 881 residents from other countries in the European Union reduces the

Priorities in immigration and primary care

- The regularization of immigrants and their incorporation into the social security system, along with improvements in the efficiency of administrative procedures for obtaining a personal health card, are requisites for access to the system and for guaranteeing quality care.
- Improving the information available to the immigrant population about the characteristics of the Spanish health care system and its mechanisms of use and access will require specific actions and information materials.
- Training for practitioners and enhancing the resources for cultural mediation at centers that serve large numbers of immigrants should form part of planning strategies for primary care services.
- Improving the information available in health records and sources of health information is a priority for increasing our knowledge of immigrants' health characteristics and needs.

figure to 659 179 persons. On the basis of projections from the 1991 census for the year 2001, these figures represent 2.7% and 1.6% respectively of the entire population of Spain.^{3,4} The number of economic immigrants these figures include is probably somewhat lower, although assuming that the status of a considerable number of persons is irregular, the overall proportion of economic immigrants in Spain may currently stand at about 3% of the whole population.

The article in this issue titled «Estimation with the capture-recapture method of the number of economic immigrants in Mallorca» raises an interesting question that centers on how to determine the population of immigrants in Spain. According to the authors' estimate, there are currently 39 392 economic immigrants in Mallorca, of whom only approximately 9000 enjoy fully legal status. The implication of these figures is that three out of every four immigrants in Mallorca do not hold the necessary documents that authorize them to reside or work there. Although the situation in Mallorca probably can not be extrapolated to the rest of Spain, the study reveals the large number of immigrants who are not identified in official sources.

It should be noted that although the rate of immigration in Spain during 2001 (24% of all immigrants) was the highest in the European Union, the total number of immigrants residing in Spain is far below that in other coun-

tries. For example, in 2000 the percentage of the total resident population born in other countries was 9% in The Netherlands and 11.3% in Sweden; the mean figure for Europe was 4%.

In Spain, the right of members of the immigrant population to health and health care is regulated by the set of laws dealing with immigration and naturalization (*Ley de Extranjería*): health care is guaranteed for minors and pregnant women, persons with a medical emergency, and immigrants registered with their local census bureau—a necessary prior step in the process of obtaining a personal health card (which permits access by the bearer to all publicly-provided health care services). According to some authors, registration at some local census bureaus is arbitrary, and the necessary health services are not always available; these factors do not facilitate immigrants' right to health.⁵

In addition, the erratic immigration policies of the most recent government administrations (characterized by multiple processes of regularization and a number of changes in the law and its attendant regulations) have led to the current situation in which many immigrants in Spain have not obtained their immigration and work papers, with the consequent difficulties and stress this implies in their everyday life. These bureaucratic obstacles make it difficult to obtain a personal health card, and hence interfere with the planning of resources and services.

The incorporation of immigrant populations in the social security system—for which administrative regulation and an employment contract are prerequisites—should be a clear source of strength for the public health system, which supports the ever-increasing burden of an aging population. If we add to this the low birth rate in Spain, increasing immigration represents a clear opportunity to recover the balance between the demand for health services and contributions to the system.⁶ In this connection, facilitating the process to obtain a personal health card, which would represent an undeniable step toward access to health care for immigrants, should lead to the incorporation of these persons within the social security regimen and help normalize a situation which otherwise, depending on the number of immigrants, could lead to an imbalance between the demand for health care and the resources available.

One of the settings in which immigration has had, and continues to have, particular repercussions is in health care, particularly in primary care services located in areas with large immigrant populations. In these settings—and despite the fact that the need to endow these centers with complementary resources (ie, training for primary care practitioners,⁷ cultural mediators, and administrative back-up) has been recognized for years—the current situation, although somewhat improved, still fails to meet real demands and needs as they currently stand. With regard to training, it should be emphasized that apart from

enhancing knowledge and management skills for specific parasitic diseases or other health problems of normally low prevalence in Spain, it is essential to improve practitioners' knowledge of the social, cultural and anthropological characteristics of different collectives of immigrants residing in Spain.

Although immigration and its repercussions have become part of some leaders' political agenda, concerns have yet to be reflected as concrete actions such as the provision of necessary resources to cover the new needs. As a result, in some primary care centers the work overload generated by the new situation has meant that such basic goals as the scheduling of appointments have suffered setbacks.

Moreover, various issues have yet to be dealt with regarding immigration and primary health care. Questions remain in relation with the characteristics of accessibility to the public health care system and its services, and in connection with immigrants' expectations and interpretations. Some studies have noted that immigrants tend to use primary care services more than members of the autochthonous population, whereas they use specialized and complementary services less often. This can not be explained exclusively by the lower socioeconomic level of immigrants.² Rather, this pattern of use may reflect barriers to access, but it may also represent immigrants' interpretation or knowledge of the health system. Their health characteristics and sociodemographic profiles may make them more likely to seek primary services rather than other types of care. Another issue to keep in mind is that when they have a health problem, irregular economic immigrants turn to health services less often.⁸ Recalling that most immigrants are irregular, this situation reveals the existence of barriers to access which clearly violate the principle of equality of access for equality of need.

A further issue related with the article published in this issue centers on the sources of information available, and the variables that each source covers. In this connection, to respond appropriately to the health priorities of the immigrant population and to anticipate resources and services, it is necessary to strike a balance between data confidentiality and information needed on the country of origin or nationality. This information should be included routinely in the clinical records of public health centers.

It is worth emphasizing once again that inasmuch as patterns of morbidity and mortality among foreign immigrants do not differ substantially from those of the autochthonous population, the main health needs of immigrants can be satisfied by improving their awareness of primary care services and of how the health system functions, and by adapting existing resources to new needs. Considering the different social and cultural patterns that often characterize immigrant populations, and the needs with regard to health promotion and disease prevention, one useful approach may be to enhance and adapt community health programs associated with local health care strategies.

In the extent to which we are able to understand, orient and plan primary care resources as a new challenge rather than simply as a means to reduce work overloads will parallel our ability to achieve positive results towards ensuring equal health for all groups within the population.

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