



Could mobile mammography reduce social and geographic inequalities in breast cancer screening participation?



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ABSTRACT

Evaluation of mobile mammography for reducing social and geographic inequalities in breast cancer screening participation.

We examined the responses to first invitations to undergo breast cancer screening from 2003 to 2012 in Orne, a French department. Half of the participants could choose between screening in a radiologist's office or a mobile mammography (MM) unit. We calculated the participation rate and individual participation model according to age group, deprivation quintile and distance.

Among participants receiving an MM invitation, the preference was for MM. This was especially the case in the age group >70 years and increased with deprivation quintile and remoteness. There were no significant participation trends with regard to deprivation or remoteness. In the general population, the influence of deprivation and remoteness was markedly diminished. After adjustment, MM invitation was associated with a significant increase in individual participation (odds ratio = 2.9).

MM can target underserved and remote communities, allowing greater participation and decreasing social and geographic inequalities in the general population.

Proportionate universalism is an effective principle for public health policy in reducing health inequalities.

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1. Introduction

Reducing health inequalities is a major public health challenge for many countries. Even beyond the health field, the persistence or worsening of these inequalities is a major obstacle to social and economic cohesion within the European Union (*Reducing health inequalities in the European Union, 2010*). Socioeconomic differences in cancer incidence and survival have been found for many cancers and in many populations (*Faggiano et al., 1997*). More socially disadvantaged patients show consistently poorer survival than those who are more affluent. Cancer prognosis may be partly related to differences in disease stage at diagnosis, (*Woods et al., 2006*) and social inequalities in participation to cancer screening are partially the cause of social inequalities in cancer patient survival.

Organized cancer-screening programs are deployed nationally. However, in many countries, participation remains insufficient with

regard to the effects on incidence and rates of mortality reduction. Moreover, even in countries where screening is free and conducted according to universalist principles as in France, multiple barriers (social, economic, cultural, behavioral and systemic) have delayed participation (*Alexandraki and Mooradian, 2010; Gimeno García, 2012*). Screening is reported to be unfair, with low socioeconomic status being associated with lower screening participation (*Pornet et al., 2010a; Pornet et al., 2010b*).

In France, a national breast screening program for women aged 50–74 years has been in operation since 2004. The main factors influencing participation are low socioeconomic level and rurality (*Ouédraogo et al., 2015*). The program relies on mammography, which is available in only a limited number of radiologist practices, so a mobile mammography (MM) unit could be an appropriate means for reducing such social and geographic inequalities.

MM is used to increase the rate of participation in breast screening in many countries. According to Buzek, (*Buzek, 2010*) the evaluation of MM has most often addressed the following: specific population minorities (Latinos) (*Coronado et al., 2016; Massin-Short et al., 2010*); underserved, (*Chen et al., 2016; Vieira et al., 2015*) older, (*Engelman et al., 2002*) or rural populations (*Haikel et al., 2012*); the characteristics

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of women using MM (Drake et al., 2015; Mizuguchi et al., 2014; Vyas et al., 2013); screening rates (Coronado et al., 2016; Fontenoy et al., 2013); and the number of cancers detected. (Haikel et al., 2012; Renck et al., 2014). However, rates of MM participation in the general population have received little attention.

The aim of the present study was to assess the efficacy of MM in reducing social and geographic inequalities with regard to participation in breast cancer screening in a well-defined general population in a French territory.

2. Methods

2.1. Organization of breast cancer screening in France

Breast cancer screening has been organized at the national level in France since 2004. Every woman aged 50–74 years is invited to undergo a free mammogram every 2 years. Women are invited to visit any radiologist in a list of certified radiologists. After 6 months, a reminder is sent to those who failed to attend. Following the recommendations of the National Authority for Health, the examination includes two steps: a clinical examination and a double reading of all negative screens with immediate assessment in the event of a positive result. In 2012, >2.4 million women underwent screening, i.e. 52.7% of the target population and the overall trend has been stable since 2008 (52%–53%). The program is implemented at local level by screening associations, which are responsible for collating information and inviting target subjects.

2.2. Breast cancer screening in the study area

The study area was the department of Orne, which has an area of 1710 km² and 290,015 inhabitants. With a population density of 48 inhabitants/km², this department is well below the national average (95 inhabitants/km²). The female population is composed of 54% of women under 50 years of age, 31% aged from 50 to 74, and 15% aged over 75. Among women aged over 50, 66% were retired, 24% were employees and 2% were unemployed (National Institute of Statistics and

Economic Studies, 2013). The screening targeted female residents aged 50–74 years (45,916 in 2012). In Orne, an MM van has been in use since 1992, i.e., before organized screening began in 2003, a year before the national program began. The van is parked in 109 different places throughout the department, mostly in rural areas, far from radiologists' offices, and evenly distributed around the department (Fig. 1). From September 2003 to December 2012, screening took place in the form of five successive screening rounds, each lasting about 24 months. The van has been parked at the same locations for each successive screening round since 2003. Though the locations have remained unchanged, the van can be parked in the same area at different times during a screening round. Women living in an administrative district covered by the parking area can choose where they wish to undergo screening: either at a radiologist's office (RO) or in the MM van. ROs are situated in the five main towns in Orne (Fig. 1). The delay between making an appointment with the RO and being screened was on average 1 month.

2.3. Data

For each screening invitation, we collected information regarding the individual's address, date of invitation, and date and modality (RO or MM) of the mammography, if performed. Addresses were geolocalized using a Geographic Information System (ARCGIS 10.2, Esri France) and assigned to an IRIS (grouped block for statistical information), a geographic area defined by the National Institute for Statistical and Economic Studies. An IRIS is the smallest geographic unit for which census data are available. On January 1, 2012, Orne comprised 538 IRISs based on urban municipalities with at least 10,000 inhabitants; most municipalities have 5000–10,000 inhabitants. With the smallest municipalities, an IRIS was considered equivalent to the municipality. The aggregated deprivation index used in the study was the French version of the European Deprivation index whose principles of construction have been detailed in previous publications (Ponnet et al., 2012; Guillaume et al., 2016). Briefly, it is based on the identification of fundamental needs associated with both objective and subjective

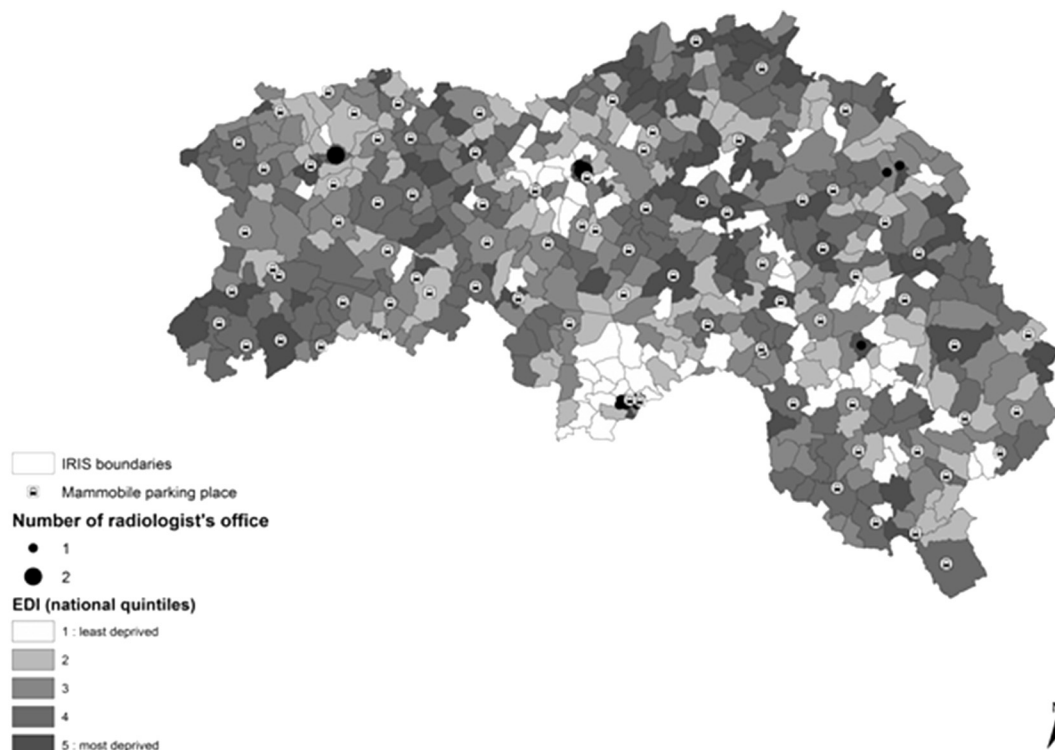


Fig. 1. Map of Orne department with IRIS boundaries.

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