Midwifery 29 (2013) 33–43

Contents lists available at SciVerse ScienceDirect

Midwifery

journal homepage: www.elsevier.com/midw

Optimising the location of antenatal classes

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ARTICLE INFO

Article history:
Received 28 March 2011
Received in revised form
27 October 2011
Accepted 30 October 2011

Keywords:
Antenatal classes
Locating maternity services
Health geography

ABSTRACT

Objectives: To combine microsimulation and location-allocation techniques to determine antenatal class locations which minimise the distance travelled from home by potential users.
Design: Microsimulation modeling and location-allocation modeling.
Setting: City of Leeds, UK.
Participants: Potential users of antenatal classes.
Methods: An individual-level microsimulation model was built to estimate the number of births for small areas by combining data from the UK Census 2001 and the Health Survey for England 2006. Using this model as a proxy for service demand, we then used a location-allocation model to optimize locations.
Findings: Different scenarios show the advantage of combining these methods to optimize (re)locating antenatal classes and therefore reduce inequalities in accessing services for pregnant women.
Key Conclusions: Use of these techniques should lead to better use of resources by allowing planners to identify optimal locations of antenatal classes which minimise women's travel.
Implications for practice: These results are especially important for health-care planners tasked with the difficult issue of targeting scarce resources in a cost-efficient, but also effective or accessible, manner. (169 words).

Introduction

The aim of this paper is to offer a methodology to help reduce inequalities in accessing antenatal classes. Historically classes have been offered to prepare parents-to-be for childbirth and issues following birth such as advice on infant feeding. McMillan et al. (2009) provide more detail of the types of service provided by antenatal classes in the comprehensive review of antenatal education '*Birth and beyond: a review of the evidence about antenatal education*'. For example, access to classes can provide improved health benefits in terms of promoting breast feeding, especially for low income mothers. In addition to advice and support, antenatal classes help to increase the confidence of parents-to-be and can produce new social networks.

In 2004, the UK Department of Health (DoH) published the 'National Service Framework for Children, Young People and Maternity Services', which offered guidelines for the provision of maternity services of the 'highest standards' to meet the needs of pregnant women and mothers (Department of Health, 2004). It was argued that pregnant women need access to antenatal classes to prepare them for labour and birth. However, at the same time, antenatal classes in certain parts of the UK have been withdrawn, or the number of classes cut, due to financial problems (Clift-Matthews, 2007). This came at a time when UK Government policy was trying to encourage more community based services at the expense of centralised hospital treatment. The White Paper 'Our Health, Our Care, Our Say: a New Direction for Community Services' (Department of Health, 2006) outlined the aim of bringing maternity services (along with other health services) more into the community to provide better access to maternity care. A more recent White Paper 'Maternity Matters' (Department of Health, 2007) aimed to ensure that women have high quality, safe and accessible services and the choice of where to give birth. Therefore locations where antenatal services are offered should

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doi:10.1016/j.midw.2011.10.010

be women-focused and family-centred. The emphasis has again been placed on community maternity care to improve access and hence encourage a higher uptake of services.

The study area for this paper is Leeds, a city in West Yorkshire, UK with a population of around 750,000 people. In Leeds, in addition to the standard antenatal classes, services are also offered for different ethnic groups, such as ethnic minority communities (for example the 'Haamla Service'). Teenagers also get a separate 'parentcraft' package, which is incorporated into their care pathway. Specially trained midwives give teenagers one-to-one sessions rather than group sessions (as is the case for standard antenatal classes). The focus for Leeds Teaching Hospitals in recent years and local service commissioners has been to reduce health inequalities and improve access to services (Making Leeds Better, 2005). This paper focuses on the locations of standard antenatal classes and offers a methodology for comparing these to optimal locations based on the number of small-area births.

The rest of the paper is structured as follows. Firstly, we briefly review the key literature in the field including a short overview of the proposed methods and their application in health related areas. In the section 'Methods', we examine the problem of how to estimate birth rates for small geographical areas. We argue that taking one key demographic factor alone (age, social class, and ethnic status) can lead to very different estimates at the small-area level. Therefore, we introduce the modelling method of *microsimulation*, a technique, which enables us to estimate the number of small-area births based on a combination of demographic characteristics and *location-allocation* models, which can be used to locate classes 'optimally' in relation to the estimates of demand generated from the microsimulation process. In the section 'Findings', a number of scenarios regarding alternative policy options are given. In the final section, we offer some concluding comments.

Literature review

Inequalities in the uptake of antenatal classes are apparent for different population groups. For example, Hirst and Eisner (1999) noted that women from disadvantaged areas were least likely to access such services. Similarly, a study by Hamlyn et al. (2000) showed that there were variations in access rates to antenatal classes by women from different occupational groups. Their survey found that 82% of mothers in higher paid occupations attended antenatal classes in comparison to 54% from lower paid occupations. The lowest attendance rate (27%) was found for mothers who had never worked or who were long term unemployed. Women holding a university degree were almost eight times more likely to attend a class in comparison to mothers with a 'minimum' level of education. A recent study by Redshaw and Heikkila (2010) showed that the offer of antenatal classes was higher to first time mothers (87%) than mothers who have already given birth (50%). Further, the study showed that classes were more often offered to younger women aged less than 19 (80%) in comparison to older women aged 40 or more (65%) whereas Asian and Black women were least offered antenatal classes in comparison to White women. A key question, which then emerges is how to increase attendance rates, especially for disadvantaged mothers. One approach is to improve accessibility to services. The location of individual classes is important, especially when women are dependent on public transport (Cliff and Deery, 1997). Although the National Health Service (NHS) provides classes free of charge, a shortage of staff and resources means a limited universal provision of such services. This makes it more difficult for women in certain parts of cities or regions to access antenatal classes. Factors such as language differences may also prevent certain ethnic groups making use of services. Although some women may feel accessing education and support services are not as important as attending for antenatal checks and investigations, McMillan et al. (2009) report the importance of antenatal classes for helping prevent complications within pregnancy and that classes are highly supportive for preparing mothers-to-be for labour and birth and gaining access to good social support networks. Therefore, making services more accessible, and focusing on certain population groups, could potentially increase the uptake of antenatal classes.

In order to locate classes optimally, it is important to be able to estimate the likely distribution of women giving birth across spatial areas. This is especially necessary if facilities are to be located within communities rather than in central locations such as major hospitals. In the UK (as in many other countries), data on the residential location of pregnant women are difficult to obtain. Thus it is useful to employ modelling approaches (microsimulation in this case) that will estimate the likely number of births at the household level, which can then be aggregated into small zones such as Census output areas (effectively 2439 small community areas in Leeds). If this data can be provided or estimated, it will allow a much better spatial targeting of antenatal class locations. In the UK, the number of births is available from time to time at the Census ward level. In Leeds, this gives data for only 33 areas, and a number of these are very large, heterogeneous areas in terms of population characteristics. Nevertheless, this data are useful for this project as it allows us to test the results of the model—ensuring that when aggregated, the total number of births is close to the known Census ward level data.

Redshaw and Heikkila (2010) showed that in England most antenatal classes were offered in North-East (73%) and least classes were offered in the East Midlands (62%). Further, the attendance rate varied between 37% and 45%. The majority attended antenatal classes at the start of the third trimester and 12% of women preferred private and voluntary sector paid-for courses where women have to pay a contribution as these classes are not offered for free. These are non-profit charity organisations, which have to cover their expenses to exist. Such classes were less common for women aged below 30, women living in more deprived areas or women whose ethnic background are Black or who are from Minority Ethnic groups. The report by TNS (TNS, 2005) showed that antenatal classes are the maternity service least accessed by pregnant women, with only a 37% attendance rate (58% for first time mothers). Non-attendees stated that they believed such classes were not important or useful. In addition, only 53% of mothers who attended antenatal classes were satisfied with the choice offered of where and when the class took place. Further, the survey detected some differences within different population groups in accessing classes. Women in lower socio-economic groups attended antenatal classes less often than women in higher socio-economic groups. Since women in lower socio-economic groups tend not to have the resources to attend privately funded classes this may mean that they do not attend a class at all. Further, single women were less likely to attend a class in comparison to married women. In terms of ethnicity, Madhok et al. (1998) analysed satisfaction with health services among Pakistani women in Middlesbrough, UK. Their findings showed that, in general, Pakistani women claimed to be satisfied with health services, although only a few attended antenatal classes. In fact, only two pregnant women out of the 39 surveyed accessed classes, with a frequent complaint voiced around the difficulties of language barriers. The 37 non-attendees listed reasons that they 'were not aware of the service', which they 'did not have time to attend', there were 'language problems' and a minority reported that they simply 'did not bother'.