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INVESTIGATING WOMEN'S PREFERENCES FOR INTRAPARTUM CARE: HOME VERSUS HOSPITAL BIRTHS

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Paper presented to the Health Economists' Study Group Conference, University of Newcastle, January 2000

Acknowledgements

The authors are particularly grateful to Stella Axom, Lorna Branczik and Peter Edwards for their help in identifying the sample and questionnaire administration.

INTRODUCTION

The number of women giving birth at home has nearly doubled in the last decade and, providing present trends continue, the proportion of women giving birth at home is expected to reach between 5 and 10% of all births in the year 2005 [Lang, 1998]. A MORI poll conducted on behalf of the Cumberlege committee suggested that up to 22% of women would choose a home birth if given a free choice

[Department of Health, 1993]. In addition, a review undertaken in 1993 by the Scottish Home and Health Department concluded that 'a substantial proportion of total maternity care takes place in a setting that is more hospital based and expensive, than is necessary or desirable'... and that 'there is much more scope for women to use less hospital based maternity care than is presently exercised' [Scottish Office Home and Health Department, 1993]. Several clinical cohort studies have suggested that delivery at home, for a woman defined clinically as low risk, is as safe as a hospital delivery [Wiegers *et al*, 1996, Davies *et al* 1996, Chamberlain *et al*, 1997]. A recent study of options in maternity care in inner London found that women who had a home birth experienced at least as good or better clinical outcomes than women who gave birth in hospital [Lang, 1998]. The study reported in this paper emanates from the Lang study.

If it is the case that there are little or no differences in the clinical outcomes between home and hospital birth, then traditional measures used in health economics (e.g. quality adjusted life years or QALYs) would detect little or no difference between the alternative modes of delivery. From this, the conclusion would be that the utility values associated with each mode of delivery are similar. However, there is strong evidence to suggest that the *process* of giving birth is also important for women and they may have clearly defined preferences about characteristics of the care provided during labour and delivery.

The main objective of this study was to identify the key characteristics or features of maternity care provided during labour and delivery for women who have chosen to give birth at home compared with the key characteristics or features for women who have chosen to give birth in hospital. A conjoint measurement approach was used to estimate the relative values attached to each of these characteristics by both groups of women in order to assess the extent to which their preferences for the location of delivery may or may not differ. A secondary objective of the study was to address a methodological issue in the conduct of conjoint measurement exercises in health care by examining the structural reliability of the conjoint measurement approach over attribute set whereby the number of levels for some of the attributes in the exercise are varied.

Conjoint analysis

Conjoint analysis (CA) can be categorised as belonging to a family of techniques, which can be placed under the umbrella term of 'stated preference'. Stated preference techniques refer to a number of different approaches for determining individual preferences in hypothetical controlled experimental conditions. Such techniques have been used extensively by market researchers to determine consumer preferences for a range of goods and services [Cattin and Wittink, 1982; Carroll *et al*, 1995]; in the transport sector to determine passengers valuation of time and the valuation of other journey related attributes [Ryan, 1992]; and in the public utilities to determine consumers preferences for improvements in the quality of service provision [Cave *et al*, 1994].

To date, within the health care sector, the majority of applications of stated preference techniques have been used to obtain relative values for health states. The various techniques in existence which have been used to obtain relative valuations for health states include the standard gamble [Bass *et al*, 1994], time trade off [Buxton and Ashby, 1988], rating scale [EuroQol, 1990], magnitude estimation [Rosser and Kind, 1978], equivalence of numbers [Nord, 1992] and paired comparisons [Kind, 1996]. More recently, stated preference techniques have also been used to ascertain the relative importance of non-health outcomes and/or factors associated with the process of health care through the application of CA and willingness to pay methodologies [Ryan, 1996].

CA can be defined as:
'a technique for establishing the relative importance of different attributes (that is characteristics or features) in the provision of a good or service' [Ryan, 1996A].

The origins of the technique stem from the discipline of mathematical psychology [Green and Wind, 1975] and it was first used extensively in the marketing research field [Cattin and Wittink, 1982]. The main principle underlying CA (as with all stated preference techniques) is the assumption that individuals' preferences are reflected in their respective utility functions. Where CA differs from other stated preference techniques is in its ability to dis-aggregate total utility such that the impact of *each* attribute on total utility can be estimated, thereby indicating its relative importance.

To date, the use of CA within health care has been limited. However an increasing number of studies have been undertaken in recent years [Ryan and Farrar, 1994; Propper, 1995; Ryan and Hughes, 1997; Bryan *et al*, 1998; Ryan 1999]. In contrast, the technique has been widely used and reported upon for many years in the transport economics literature, and in the environmental economics literature [Kocur *et al*, 1982; Bates, 1986; Wardman, 1986; Magat *et al*, 1988; Bunch *et al*, 1993; Yoo and Ohta, 1995; Hensher, 1997; Dennis, 1998].

There are five main stages to the conduct of a CA exercise. A full description of each of these stages and the issues associated with each stage have been well documented elsewhere and hence will not be repeated again within the context of this paper [see Ryan 1996A for example]. Briefly, the key features or attributes of a service are identified and levels are assigned to each of these attributes. The attributes and their levels are then combined into scenarios for presentation. Preferences are established using a self-completion questionnaire or interview technique. Finally the data generated are analysed and results obtained.

The conduct of a CA exercise raises a number of important methodological issues including data collection methods, the potential for ordering and framing effects, reliability and validity and testing of theoretical axioms [Ryan *et al*, 1996]. Despite it's widespread use in the transport and environmental

economics fields, little methodological work has been carried out on CA in these fields since the late 1980's. Ryan *et al* suggest that one possible reason for the scarcity of information relating to methodological issues is that most of the work in these areas has been carried out by consultancy companies who do not have the time or incentives to address methodological issues. However, if CA is to become established as a useful tool for the measurement of patient preferences in health care, it is essential that methodological issues are addressed within this context.

One important methodological issue of interest for CA in health care concerns the structural reliability of the conjoint measurement approach over attribute set. This can be assessed by examining the stability of preferences for attributes that remain common throughout the exercise whilst other attributes in the exercise are varied [Bateson *et al*, 1987]. Currim et al [1981] found that attribute importance weights inferred from CA results may be influenced by the number of levels over which an attribute is defined. In their study, three attributes were defined on two levels each, whilst three other attributes were defined on three levels each. The results suggested that the three level attributes were considerably more important on average than the two level attributes. The authors suggest that these empirical findings may be due to a psychological phenomenon whereby respondents pay more attention to attributes as the number of levels increases. A study by Wittink *et al* [1982] found that varying the number of levels for two of the attributes in the exercise had a significant impact upon the estimated coefficients for the remaining three attributes whose levels remained common throughout, although Wittink *et al* were able to offer no conclusions about the possible existence of a psychological effect. However, an earlier study by Green and Wind [1973] found that varying the number of levels for some of the attributes in the exercise did not have a significant impact upon the estimated coefficients for the remaining attributes.

The only study, to the authors' knowledge, to be reported upon in the health economics literature to date where the impact of varying the nature of the levels in the exercise has been assessed, is a study assessing women's preferences for screening for cervical cancer by Ryan and Wordsworth [1999]. This study included five attributes: time between smears (in days), time for results (in days), chance of being recalled, chance of abnormality, chance of dying from cervical cancer and the cost of each smear. In the second version of the questionnaire the absolute values assigned to each level for the time for results, chance of dying from cervical cancer and the cost attribute were changed although the number of levels remained the same for all attributes in both versions of the questionnaire. Whilst estimated coefficients were not significantly different across five of the six attributes included in the experiment, it was found that using the cost attribute information, mean willingness to pay estimates (WTP) were significantly different for four of the five welfare estimates. For a more detailed discussion upon the use of CA to estimate WTP in health care, see Ratcliffe [1999]. In this paper we investigate in more detail the possible relationship between derived importances and the number of attribute levels (rather than the absolute values of levels) for an application of conjoint analysis in health care.

METHODS

The design of the questionnaire

Firstly it was necessary to identify the key characteristics or features of maternity care during the intrapartum stage which were important for women choosing a home or hospital birth respectively. This task was undertaken using two focus group meetings convened in inner London. The first focus group meeting was for women who had booked to deliver at home within the preceding 12 months and the second focus group meeting was for women who had booked to deliver in hospital within the same time period. The groups comprised ten individuals and were convened on consecutive days. The meetings lasted approximately two hours. The women in the home focus group were informed that the purpose of the meeting was to find out from them what were the key characteristics or features of a home birth which distinguished it from a hospital birth. Similarly the women in the hospital focus group were informed that the purpose was to find out what were the key characteristics of a hospital birth which distinguished it from a home birth. The home birth group identified several key characteristics which it was felt distinguished a home birth from that of a hospital birth including:

- Choice and control: you have choice and control over the kind of birth you want
- Physical environment: a familiar, safe and secure environment
- Natural childbirth: a relaxing natural experience with minimal medical intervention
- Continuity of care: continuity of contact with the same midwives throughout labour and delivery.

In contrast the key characteristics identified by the hospital birth group were as follows:

- Management of labour and delivery: the management and organisation of the birth experience is taken care of by health care professionals
- Physical environment: a clean spacious and pleasant environment
- Pain relief: medication for pain relief is readily available
- Medical facilities: psychological reassurance that all medical facilities are available on site should these be required

These characteristics were then formulated into attributes with their chosen levels to be included in the CA exercise. The CA literature suggests that the chosen attribute levels should be realistic and sensible to respondents and be capable of being traded off [Cave *et al*, 1994]. The attributes and the levels chosen for the study are detailed in Table 1 overleaf.

If all possible combinations of attributes and levels were employed, this would give rise to a very large number of scenarios. Hence it is necessary to reduce the number of scenarios which are presented to individuals. However, the exercise was also constrained by the need for realism in the formulation of the scenarios presented. For example, it is not realistic for a woman who is having her baby in a hospital to be transferred to another location during labour or delivery. Similarly it is not possible for a woman who is having her baby at home to have an epidural for pain relief.

Table 1: Attributes and levels included in the study

Attribute	Levels
CONT: Continuity of contact with the same medical staff[1]	• None* • Yes: limited • Yes: high
LOCAT: Location of delivery	• Hospital labour ward* • Maternity unit with a home like environment • Home
PAINREL: Availability of pain relief	• Gas and air only • Gas and air plus birthing pool • All types*
DECIS: Decision making[1]	• By medical staff* • Jointly by medical staff and woman • By woman
TRANSFER: Probability of transfer during labour	• None* • Yes: low probability • Yes: high probability

** indicates levels of attributes for constant comparator*

Given such constraints, a constant comparator was used throughout the exercise, which most closely resembled the characteristics associated with a hospital birth.

The levels of the attributes which were used in formulating the constant comparator are indicated by an asterix (*) in Table 1. The remaining attribute levels were formulated into scenarios using the computer software package SPEED version 2.1 [Bradley, 1991]. In order to assess the structural reliability over attribute set of the CA technique two scenario formulation tasks were undertaken. In the first task the attributes (CONT and DECIS) had only their highest and lowest levels included, whilst in the second task all three levels for these two attributes were included. The levels included for all other attributes remained the same throughout both tasks. The SPEED software produces a fractional factorial design, which ensures the absence of multicollinearity. In both the first and second tasks, the SPEED software produced 16 scenarios for comparison.

Two maternity units with a relatively high proportion of home births per annum (one in the inner London and one in the outer London region) were approached and invited to participate in the study. Ethics committee approval was sought and granted to administer the study at both hospitals. For ease of completion and understanding, it was decided to use the discrete choice approach. Hence, each of the two versions of 16 scenarios chosen by the SPEED software were randomly split into two groups of eight scenarios and four versions of the questionnaire were produced with eight pairwise comparisons (constant comparator versus alternative scenario) in each version. A small pilot study (n=30, 15 home birth and 15 hospital birth) was conducted in advance of the main study to check that women understood the questions and were completing the choice tasks as instructed. The four versions of the questionnaire were then randomly allocated to all women who had received a home birth at the two

hospitals over the time period May 1998-April 1999 inclusive (n=192) and a 50% larger sample of hospital births (n=290). The hospital birth sample was randomly chosen from the cohort of women who had given birth in hospital during the same time period and who, in the opinion of the head midwife at each hospital, were clinically defined as low risk prior to labour and delivery, and hence would have been eligible to give birth at home. The hospital birth cohort was greater than the home birth cohort in the main study to allow for the potential for a lower response rate amongst the hospital birth group when compared to the home birth group. This finding was observed in the pilot study (response rates being 65% for the home birth group and 35% for the hospital birth group). In responding to the questionnaire, women were asked to consider what they would decide if they were offered the choice between alternative packages of intrapartum care with different characteristics. The questionnaire was administered by post to the woman's home address and included a covering letter by a midwife from the hospital who had been involved in administering her intrapartum care. One reminder was sent to non-respondents after a time interval of approximately four weeks.

Data analysis

Discrete choice data needs to be analysed by adopting a probabilistic choice model where the dependent variable is binary. Within the random utility framework, common regression techniques which can be used to value such data are probit and logit. The logit model is the most widely applied to explain and forecast discrete choice data. However, the logit model assumes that the error term in the model is independent and identically distributed across all observations. This may not hold for CA data where multiple observations are obtained from every individual thus increasing the likelihood of non-randomness in the error term. Such non-randomness will result in an underestimation of the standard errors of the model and may then lead to the conclusion that some coefficients are significant when in fact they are not. The random effects probit model [Propper, 1995] is a regression technique which takes account of the potential for correlation between observations from any one individual. Hence, this regression technique was employed for the analysis of the CA data from this study.

Assuming a linear additive utility function, the utility to be estimated in moving from hospital based care to home based care is:

$$Ui=_1CONTDIF+_2LOCATDIF+_3PAINRELDIF+_4DECISDIF+_5TRANSFERDIF + e + u$$

where Ui is the change in utility in moving from hospital to home based care and 1-5 are the parameters of the model to be estimated. 'CONTDIF' is the difference in continuity of care experienced, 'LOCATDIF' is the difference in location of care, 'PAINRELDIF' is the difference in pain relief available, 'DECISDIF' is the difference in the level of autonomous decision making, 'TRANSFERDIF' is the difference in the probability of transfer. e and u are the unobservable error terms where e is due to

differences amongst observations and u is the error term due to differences amongst respondents. The estimated coefficients indicate the relevant importance of the different attributes on the individual preferences. In general, the higher the size of the coefficient, the greater the importance of the attribute in determining overall utility (though where different units of measurement of the attributes have been used, care must be taken in interpreting these results). A positive sign on a coefficient indicates that as the level of the attribute increases so does the utility derived. Conversely, a negative sign on a coefficient indicates that as the level of the attribute increases, the utility derived from that attribute falls. The significance levels of each of the coefficients indicate whether the attributes have a significant impact on preferences or utility.

For every respondent, tests were carried out to see if any of the attributes were dominant, and further, whether a strict lexicographic order could be established [Drakopoulus, 1994; Scott, 1998]. A dominant attribute implies that the scenario with the higher level of this attribute is always chosen, irrespective of the levels of the remaining attribute. A situation of dominance can be distinguished from a strict lexicographic ordering in that it places no restrictions upon the ordering or extent of trading for other attributes. A lexicographic ordering implies that there is an absolute ordering of preferences and there is no degree of substitution between any of the attributes in the CA exercise.

The results from the random effects probit model were used to test the theoretical validity of CA i.e. the extent to which the results are consistent with prior expectations. It was hypothesized that women booked to deliver at home would have a preference for a homely environment, for more natural methods of pain relief and autonomy in decision making. Alternatively, it was hypothesized that women booked to deliver in hospital would prefer a hospital location, would have a preference for the availability of all types of pain relief and would be more inclined to accept less autonomy in decision making. In order to check the ease of completion of the discrete choice CA questions, respondents were also asked to indicate how easy/difficult they found the questionnaire was to complete and the amount of time they had spent filling in the questionnaire.

RESULTS

Characteristics of respondents and response patterns

A total of 118 useable home birth questionnaires (61% of total home birth sample) and 139 useable hospital birth questionnaires (48% of total hospital birth sample) were returned giving an overall response rate of 55%. The descriptive characteristics of responders are summarised in Table 2.

Table 2: Descriptive characteristics of the respondents

Characteristic	All respondents – Number (%)	Booked for Home - Number (%)	Booked for Hospital - Number (%)
Age	*17-25* 32 (12.3%) *26-35* 160 (62.4%) *>35* 65 (25.3%)	*17-25* 4 (3.4%) *26-35* 79 (66.9%) *>35* 35 (29.7%)	*17-25* 28 (20.1%) *26-35* 81 (58.3%) *>35* 30 (21.6%)
Highest education level obtained	*No qual*.13 (5.1%) *O'level* 69 (26.8%) *A' level* 47 (18.3%) *Degree* 92 (35.8%) *Post-grad*.31 (12.1%) *Other* 5 (1.9%)	*No qual*. 4 (3.4%) *O'level* 22 (18.6%) *A' level* 20 (16.9%) *Degree* 52 (44.1%) *Post-grad*.17 (14.4%) *Other* 3 (2.6%)	*No qual*. 9 (6.5%) *O'level* 47 (33.8%) *A' level* 27 (19.4%) *Degree* 40 (28.8%) *Post-grad*.14 (10.1%) *Other* 2 (1.4%)
Where was baby delivered?	*Hospital* 126 (48.9%) *Home* 117 (45.5%) *Transfer* 1 (0.004%) *Other* 13 (5.6%)	*Home* 117 (99.2%) *Transfer* 1 (0.08%)	*Hospital* 126 (90.6%) *Other* 13 (9.4%)
How was baby delivered?	*Vaginal* 233 (90.1%) *Forceps* 1 (0.004%) *Ventouse* 6 (0.02%) *Caesarean* 12 (0.05%) *Other* 5 (0.02%)	*Vaginal* 116 (98.3%) *Other* 2 (1.7%)	*Vaginal* 117 (84.2%) *Forceps* 1 (0.7%) *Ventouse* 6 (4.3%) *Caesarean* 12 (8.6%) *Other* 3 (2.2%)
Considered home birth during pregnancy?	*Yes* 122 (47.5%) *No* 135 (52.5%)	*Yes* 118 (100%) *No* 0 (0%)	*Yes* 4 (2.9%) *No* 135 (97.1%)
Given information on alternative locations?	*Yes* 107 (42%) *No* 150 (58%)	*Yes* 83 (70.3%) *No* 35 (29.7%)	*Yes* 24 (17%) *No* 115 (83%)

The mean age of respondents was 32 years and 95% were qualified to O'level/GCSE grade or above. The vast majority of respondents reported that their last baby was delivered as an uncomplicated vaginal delivery (91%). A total of 46% of respondents indicated that they had considered a home birth during pregnancy. Interesting, given the context of this study, is the observation that 42% of respondents had not been given any information at any time during their pregnancy about alternative locations for delivery e.g. home, midwife managed birth centre or hospital labour ward, by far the greatest proportion of these women emanating from the hospital birth sample. It is possible that a greater proportion of women giving birth in hospital would consider a home birth if they were given more information about this possibility during pregnancy from their health care providers.

Analysis of the response patterns of individuals revealed that 28% (n=73) of respondents exhibited dominant preferences for home births, 38% (n=98) of respondents exhibited dominant preferences for hospital births and the remainder 34% (n=86) were prepared to trade between scenarios on the basis of the changing levels of the attributes presented. It was found that, of the women exhibiting dominant preferences for the home birth option, none had a strict lexicographic ordering of preferences and all had given birth to their last baby at home. Given that the hospital birth option was represented as a constant scenario throughout the questionnaire, it was not possible to ascertain whether any of the women exhibiting dominant preferences for the hospital birth option had a strict lexicographic ordering of

preferences, although all had given birth to their last baby at hospital. Of the traders, hospital birth women represented the highest proportion (57%).

Model estimation

The results of the random effects probit regression model for hospital birth respondents are given in Table 3. The results indicate that all of the attributes were highly statistically significant in influencing hospital birth respondents with the exception of 'an ability to make your own decisions', which was only just statistically significant at the 5% level. The positive sign on the continuity (CONTDIF), and decision (DECISDIF) coefficients indicate that this group have a preference for higher levels of continuity of care and more autonomy in decision making. The negative sign on the location (LOCATDIF), pain (PAINRELDIF) and transfer (TRANSFERDIF) coefficients indicates that this group have a preference for a hospital setting, a variety of pain relief facilities and a preference not to be transferred during labour from one location to another. In contrast only three of the attributes were statistically significant in determining preferences for the home birth respondents (Table 4): the level of continuity of care experienced, the location of delivery and the level of autonomy in decision making. All three of these attributes were highly statistically significant for this group (P<0.001). The positive signs on the continuity, location and decision coefficients, indicate that home birth respondents have a strong preference for continuity of care, a home birth setting and autonomy in decision making.

Table 3: Random effects probit model for hospital birth respondents

Attributes	Coefficient	*P*	*95% CI*
CONTDIF	0.2000	0.001	0.0777 to 0.3225
LOCATDIF	-0.5211	<0.001	-0.7033 to -0.3389
PAINRELDIF	-0.2963	0.004	-0.4982 to -0.0945
DECISDIF	0.1303	0.042	0.0049 to 0.2556
TRANSFERDIF	-0.3222	0.006	-0.5511 to -0.0933

Number of observations = 1110
Number of groups = 55
Observations per group (min / avg / max) =1 / 7.73 / 8
Wald Chi^2 =125.85 (p=<0.001)

Table 4: Random effects probit model for home birth respondents

Attributes	Coefficient	*P*	*95% CI*
CONTDIF	0.3369	< 0.001	0.1664 to 0.5074
LOCATDIF	0.9777	<0.001	0.7397 to 1.2156
PAINRELDIF	-0.0149	0.913	-0.2824 to 0.2527
DECISDIF	0.2749	<0.001	0.1238 to 0.4259
TRANSFERDIF	-0.2097	0.157	-0.5000 to 0.0806

Number of observations = 917
Number of groups = 50
Observations per group (min / avg / max) =1 / 7.82 / 8
Wald Chi^2 =162.45 (p=<0.001)

Home birth respondents were relatively less concerned about the availability of a wide variety of pain relief options or the possibility of being transferred during labour to another location if complications develop. These results provide some support for the theoretical validity of CA since it was hypothesized in advance that women booked to deliver in hospital would prefer a hospital location, would be more inclined to accept less autonomy in decision making and would prefer the availability of all types of pain relief. Alternatively it was hypothesized that women booked to deliver at home would have a preference for a homely environment, for more natural methods of pain relief and autonomy in decision making.

The traders varied their choice between hospital and home according to the levels provided for each attribute. The estimated utility equation for this group is presented in Table 5. It can be seen that the only attribute that is significant in influencing the preferences of traders is the level of continuity of care received with higher levels of continuity of care being preferred. Given the relative size of the coefficients, the basic model for the traders illustrates that giving birth in a homely environment is more important than the availability of a wide variety of pain relief options which in turn is more important than an ability for the woman to make her own decisions and the risk of being transferred during labour to another location.

Table 5: Random effects probit model for trading respondents

Attributes	Coefficient	*P*	*95% CI*
CONTDIF	0.2424	0.004	0.0762 to 0.4087
LOCATDIF	0.1464	0.185	-0.0700 to 0.3628
PAINRELDIF	-0.1275	0.302	-0.3697 to 0.1148
DECISDIF	0.1003	0.213	-0.0575 to 0.2582
TRANSFERDIF	-0.0847	0.544	-0.3584 to 0.1891

Number of observations = 671
Number of groups = 54
Observations per group (min / avg / max) =1 / 7.67 / 8
Wald Chi^2 =14.77 (p=0.01)

The estimated utility equation can be used to establish benefit or utility scores for the alternative packages of care presented to individuals in the questionnaire. The alternative packages can then be ranked in order of preference (Table 6). From this it can be seen that the package of care ranked first by the trading respondents would be a situation in which there is high continuity of care, the location of delivery is a maternity unit with a home like environment, there is access to a birthing pool and gas and air for pain relief, the woman has autonomy in decision making and the probability of being transferred during labour is low.

Table 6: Differences in choices in CA study, marginal utilities and ranking of choices

CHOICE	CONTDIF	LOCATDIF	PAINRELDIF	DECISDIF	TRANSFERDIF	M. UTILITY*	RANK
1	1	2	1	2	2	0.439	4
2	0	2	1	1	1	0.181	9
3	1	1	2	1	2	0.065	12
4	0	2	2	0	1	-0.047	14
5	0	1	2	2	2	-0.077	15
6	0	1	2	0	2	-0.278	16
7	1	1	1	0	1	0.177	10
8	0	2	1	2	2	0.197	7
9	2	1	2	2	2	0.407	5
10	1	2	2	2	1	0.396	6
11	0	2	1	1	1	0.181	8
12	0	1	1	2	1	0.135	11
13	2	2	2	1	1	0.538	2
14	2	1	1	2	1	0.620	1
15	2	2	1	0	2	0.481	3
16	0	1	2	2	1	0.007	13

* Marginal utility= ((0.2424*(CONTDIF))+(0.1464*(LOCATDIF))
+(-0.1275*(PAINRELDIF)+(0.1003*(DECISDIF)+(-0.0847*(TRANSFERDIF)))

Test of structural reliability

As previously described, the structural reliability of the CA exercise was tested by comparing two scenario formulation tasks for the hospital and home birth samples. In the first task the attributes (CONT and DECIS) had only their highest and lowest levels included, whilst in the second task all three levels for these two attributes were included. The levels included for all other attributes remained the same throughout both tasks. The results from the test of structural reliability for the hospital birth respondents are presented in Tables 7a and 7b. It can be seen that there are no statistically significant differences in the coefficient values for the three common attributes as the 95% CI overlap for all three attributes which provides evidence of structural reliability. However, the coefficient for pain relief (PAINDIFF) is statistically significant in the first model but not in the second, whereas the coefficient for transfer (TRANSFERDIFF) is not statistically significant in the first model but is in the second model. These results illustrate that the relative importance of the attributes remaining constant throughout the exercise has changed as a consequence of variation in the levels of the two remaining attributes.

Table 7a: Testing structural reliability for hospital respondents: model 1

Attributes	Coefficient	*P*	*95% CI*
CONTDIF	0.2198	0.043	0.0070 to 0.4326
LOCATDIF	-0.8546	<0.001	-1.2581 to –0.4511
PAINRELDIF	-0.6207	0.005	-1.0584 to -0.1829
DECISDIF	0.0141	0.902	-0.2110 to 0.2393
TRANSFERDIF	-0.0455	0.858	-0.5437 to 0.4528

Number of observations = 503
Number of groups = 37
Observations per group (min / avg / max) = 1 /7.71/ 8
Wald Chi^2 = 64.62 (p=<0.001)

Table 7b: Testing structural reliability for hospital respondents: model 2

Attributes	Coefficient	*P*	*95% CI*
CONTDIF	0.2796	0.003	0.0927 to 0.4665
LOCATDIF	-0.4446	<0.001	-0.6826 to –0.2067
PAINRELDIF	-0.1711	0.222	-0.4455 to 0.1033
DECISDIF	0.2457	0.009	0.0616 to 0.4297
TRANSFERDIF	-0.4582	0.003	-0.7634 to -0.1529

Number of observations = 575
Number of groups = 43
Observations per group (min / avg / max) = 1 /7.67/ 8
Wald Chi^2 = 72.73 (p=<0.001)

In addition, the coefficient values for the two attributes which were varied (CONTDIF and DECISDIF) are greater in the second model that the first, indicating that the relative importance of these attributes has increased as the number of levels for each attribute have increased.

For the home birth respondents (Tables 8a and 8b) it also the case that there are no statistically significant differences in the coefficient values for the three common attributes as the 95% CI overlap for all three attributes. This provides evidence in favour of structural reliability. However, the coefficient for transfer (TRANSFERDIF) is statistically significant in the first model but not in the second model. These results are similar to the models generated for hospital birth respondents in illustrating that the relative importance of the attributes remaining constant throughout the exercise has changed as a consequence of variation in the levels of the two remaining attributes. Also in common with the models generated for hospital birth respondents, the coefficient values for the two attributes which were varied (CONTDIF and DECISDIF) are greater in the second model that the first, indicating that the relative importance of these attributes has increased as the number of levels for each attribute have increased.

Table 8a: Testing structural reliability for home respondents: model 1

Attributes	Coefficient	*P*	*95% CI*
CONTDIF	0.3773	0.005	0.1122 to 0.6425
LOCATDIF	1.3918	<0.001	0.9043 to 1.8794
PAINRELDIF	-0.1654	0.486	-0.6310 to 0.3002
DECISDIF	0.3114	0.019	0.0506 to 0.5723
TRANSFERDIF	-0.6559	0.012	-1.1679 to -0.1439

Number of observations = 458
Number of groups = 44
Observations per group (min / avg / max) = 1 /7.59/ 8
Wald Chi^2 = 72.52 (p=<0.001)
Number of observations = 671

Table 8b: Testing structural reliability for home respondents: model 2

Attributes	Coefficient	*P*	*95% CI*
CONTDIF	0.5603	< 0.001	0.2428 to 0.8779
LOCATDIF	1.22517	<0.001	0.7932 to 1.6570
PAINRELDIF	-0.0146	0.949	-0.4299 to 0.4591
DECISDIF	0.5217	<0.001	0.2546 to 0.47888
TRANSFERDIF	-0.1920	0.442	-0.6820 to 0.2979

Number of observations = 459
Number of groups = 40
Observations per group (min / avg / max) = 1 /7.64/ 8
Wald Chi^2 = 51.30 (p=<0.001)

Discussion

This study has illustrated that characteristics associated with the process of care provided during labour and delivery are important to women. The key features of intrapartum care which are of value for women who have chosen to give birth at home differ from those valued by women who have chosen to give birth in hospital. Home birth respondents value continuity of care, a homely environment and the ability to make their own decisions about what happens during labour and delivery. In contrast, women who have chosen to give birth in hospital prefer a hospital environment and place a relatively high value on the availability of all types of pain relief and the impossibility of being transferred to another location

during labour. The results of the study suggest that women have clearly defined preferences for intrapartum care that would be unlikely to be detected by traditional benefit measures used in health economics e.g. QALYs. This finding is important where issues relating to aspects of maternity care service delivery are being considered. A utility function which is defined only in terms of health outcome would overlook the utility generating influences of features associated with the process of maternity care.

A relatively high proportion of respondents to this survey expressed dominant preferences for either a homely environment or a hospital location regardless of the levels of the remaining attributes presented. Other CA studies in health care have also reported high proportions of respondents (55-71%) exhibiting dominant preferences [San Miguel *et al*, 1997; Bryan *et al*, 1998; Ryan *et al*, 1999]. The main difficulty with the existence of a large proportion of dominant respondents is that there is some controversy surrounding the definition of a utility function for such respondents. Deaton and Muellbauer [1980] suggest that a utility function can only be defined when preferences for attributes can be combined into a single ordinal index of utility for each alternative. The existence of such an index is based upon the assumption that attributes can be traded off. This assumption would suggest that those individuals who do no trade should be excluded from the estimation of a utility function [Scott, 1998]. On the other hand, it has been suggested that such individuals should not be excluded since from a public policy perspective it is the preferences of the group as a whole which are most relevant [Bryan *et al*, 1998]. It is our opinion that it is *theoretically* correct to exclude non-traders from utility estimation on the basis that such respondents are not conforming to the continuity axiom of random utility theory, hence it is not possible to estimate marginal rates of substitution between alternative levels of attributes for these respondents. However the authors would welcome comments as to the views of other HESG members on this subject.

For the traders, we have illustrated how utility scores for alternative service configurations can be generated. This type of exercise has also been carried out in previous CA studies in health care [see Ryan *et al,* 1999 for a recent example]. Unfortunately, given our stance on non-traders, it was not possible to generate such utility scores for non-traders. From a policy perspective, it is also important to note that the utility scores generated from CA studies in health care are specific to the study being considered and it is not possible to compare the utility scores across studies in a manner akin to the comparison of the results of cost utility studies. Whilst the CA technique can currently be usefully employed in addressing questions relating to service delivery, it is clear that further methodological developments are required before the technique can be used meaningfully as a measure of benefit within the context of the economic evaluation of health care interventions.

The evidence from this paper relating to the structural reliability of the CA technique in health care is essentially mixed. It was found that there were no statistically significant differences in the coefficient

values for the three common attributes within the two models relating to hospital and home birth respondents respectively. However for the hospital birth respondents, the coefficient for pain relief was found to be statistically significant in the first model but not in the second, whereas the coefficient for transfer was found not to be statistically significant in the first model but significant in the second. Similar differences in the common attributes were observed for the home birth respondents. These findings provide evidence that the relative importance of the common attributes presented may be influenced by the number of levels presented for the attributes whose levels are varied, although the direction of this influence is not clear from the results presented here. The authors would welcome comments from readers as to possible explanations for these puzzling findings. It was also found that the relative importance of the two attributes whose levels were increased was greater in the second model than in the first. As noted earlier in the paper, this finding has been reported elsewhere in previous applications of CA in other disciplines [Currim *et al*, 1981]. This provides evidence in favour of the potential existence of a 'psychological effect' whereby respondents place more importance upon specific attributes as the number of levels for these attributes increases. However, it is very difficult to verify the true existence of a psychological effect within the context of a quantitative study. It is therefore important that qualitative research techniques are also employed in attempting to understand how individuals actually make preferences between alternative scenarios in CA studies. Further research of a qualitative, as well as a quantitative, nature should be conducted to assess the reproducibility (or otherwise) of these results in other CA studies in health care.

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