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# Parents' preferences for nursery care when children are unwell: a discrete choice experiment

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## Abstract

**Background:** Pre-school children's daycare is associated with increased incidence of respiratory and diarrhoeal illnesses. While the incidence might be reduced if all unwell children were kept at home, parental employment pressures make this difficult when children are marginally unwell.

**Methods:** A discrete choice experiment (DCE) was conducted to identify what aspects of daycare policy and provision would affect parents' decisions to keep marginally unwell children home. Prior qualitative research informed parameter choice. The DCE was accompanied by a best-worst scaling task examining preferences for four modifiable aspects of care: swapping unused daycare sessions; reimbursing unused sessions; daycare paracetamol policy; and presence of a 'quiet room'.

**Results:** Paracetamol guidelines and the presence of a quiet room had the strongest predicted influence on parents' decision-making. Conditional on assumptions about the set-up of the daycare, introducing a 'no paracetamol' policy would result in a fall from 62% to 25% in mean predicted probabilities of a parent sending a marginally unwell child to nursery, while introducing a quiet room would increase the mean probability from 34% to 53%.

**Conclusions:** Daycare policy, particularly the use of paracetamol prior to attendance, could impact parents' decisions to send unwell children to daycare, potentially influencing the transmission of children's infectious illness.

**Keywords:** *nursery; daycare; children; infectious illness; communicable diseases; preferences; choice experiment*

## Introduction

Children are important contributors to the transmission of infectious illnesses, both to each other and family contacts, including the elderly [1]. Children who attend daycare are known to be at increased risk of respiratory tract infections [2-5], which are more likely to result in healthcare use [6]. Children aged under five years frequently consult primary care services, typically with viral and/or self-limiting infections [7]. This can have considerable financial implications for health services: for example, two-thirds of pre-school-aged children in the UK consult general practitioners (GPs) for acute cough, at an annual cost (in 2006) of approximately £31M to the national health service (NHS)[8].

Over 70% of UK children aged under five years are enrolled in formal daycare,[9,10] most commonly in nursery and childminder settings [11]. Children's limited hygiene awareness, close contact with others, and common childhood behaviours (e.g. placing objects in the mouth) can promote infection transmission in these settings.

There are a number of potential strategies for reducing the burden of childhood infections on primary care services. One approach may be to encourage daycare providers to follow evidence-based exclusion policies: previous research indicates that providers often over-exclude children and/or implement re-admittance requirements that promote unnecessary GP consultation or prescriptions [12- 15]. Another strategy may be to reduce transmission in daycare settings by keeping unwell children at home. Interventions geared towards the latter need to be based on an evidence-based understanding of parents' and carers' attitudes to managing unwell children.

Parents' and other carers' (from here on 'parents') decision-making around whether to send symptomatic children to daycare is a complex process, informed by the nature and perceived severity of symptoms, personal circumstance (e.g. work pressures), and daycare policies. Decisions are particularly complex when children are 'marginally' unwell: a state where they may be 'subjectively well', yet show symptoms of infectious illness, such as mild fever, cough or loose stools. A previous qualitative investigation indicated that decision-making around marginally unwell children could be influenced by 'modifiable' daycare policy factors, such as fee reimbursement, or flexibility to change daycare sessions [16]. Using discrete choice methodology, we aimed to investigate and better understand the aspects of daycare provision that influence parents' decisions to prioritise keeping their marginally unwell children at home.

## Methods

This study was part of a wider investigation of parents' decision-making in relation to sending their children to daycare when there is doubt over whether the child is well enough to attend [16]. The study reported here relates to a discrete choice experiment (DCE) [17], quantifying trade-offs and investigating parents' preferences for daycare when children are unwell.

### *Discrete choice experiments*

DCEs have become increasingly popular in health services research and have been used to explore a range of health related services and treatments [18-21]. DCEs involve asking respondents to choose between hypothetical scenarios describing a good or service with the aim of establishing what features (commonly referred to as attributes) influence their decision-making and quantifying the marginal impact of these attributes. This method has been shown to demonstrate external validity and that choices made within a DCE correlate well with choices made in 'real-life' across a range of settings [22, 23, 28]. Scenarios within a DCE describe the service of interest (e.g. daycare) using the same set of attributes, but at different levels in each scenario. Choices between scenarios, or whether to accept or reject a scenario, are used to estimate the influence and value of the different attribute levels.

### *Qualitative work to identify attributes and levels of nursery provision*

To derive the attributes for use in a discrete choice experiment (DCE), qualitative methods are recommended [24]. To develop attributes for this study, themes were derived from an earlier qualitative phase of this project that explored parents' decision-making when considering sending children to nursery when unwell [16]. In this study, 31 parents were interviewed who provided information on the aspects of nursery or daycare they considered important when considering childcare arrangements.

Attributes were derived from the qualitative work based on identifying factors that: (i) might affect whether parents send their child to nursery when they are slightly unwell and (ii) were potentially 'modifiable' aspects of nursery care (i.e. parents' general attitudes or employment characteristics were not included). Potential attributes were piloted in separate interviews with a small number of parents who had previously taken part in the qualitative phase and had

expressed an interest in being involved in further similar work. These interviews explored the ease with which parents could 'trade' potential attributes, discussed the clarity of the questions, the use of language and the ease of completion (length of questionnaire/time taken/understanding). Once complete, a revised draft questionnaire was piloted with four members of staff at the University of Bristol who were all parents of young children. The final design included four attributes, each with two or four levels; the selection of attributes and levels are shown in Table I, alongside a description of the context scenario that was presented.

### *Questionnaire development*

When a child is marginally unwell, parents face a decision of whether or not to send them to daycare. A single scenario task, where respondents accept or reject scenarios describing hypothetical designs of daycare provision was deemed most appropriate for this research question. The addition of a best-worst task [25] where respondents are also asked to identify the 'best' and the 'worst' aspect/attribute within a profile, allows more data to be collected on respondents' preferences within each scenario and this was nested alongside the choice task.

The scenario described a decision about sending a slightly unwell child to nursery and respondents were asked to consider this as the background to the decision when answering the questions. The description of a 'marginally unwell' child was derived using the earlier qualitative work and the piloting. An orthogonal main effects plan [26] was used to identify a subset of scenarios (in this case 16) that enabled the main effect of each attribute to be quantified (Figure 1).

### *Participants*

An invitation email was sent to all nurseries within the local council area (Bristol, UK) registered with the 'Office for Standards in Education, Children's Services and Skills' (OFSTED). Eight nurseries responded and all eight were recruited due to the variation in socio-demographic location (informed through the Indices of Multiple Deprivation (IMD)) as well as the number of families registered and whether the establishment was privately or publicly funded.

All families registered at each of the eight participating nurseries (n=762) were invited initially to take part in the qualitative phase of the project [16]. Following completion of that phase of the study the same 762 families were re-contacted and provided (by the nursery) with a study

pack, including an invitation letter, information sheet and DCE questionnaire. Parents who wished to participate were asked to complete the questionnaire (including the enclosed consent form) and return it directly to the researchers using the prepaid envelope provided.

### *Data analysis*

Questionnaires were distributed and returned between November 2013 and February 2014. DCE data were effects coded [27] and analysed using STATA. The influence of the four attributes on parents' choices was analysed using a random effects probit model, to take into account the 16 repeated observations from each participant. As attribute levels are effects coded, the mean of all coefficients is 0 across each attribute. The coefficients indicate the strength of preference for each level where more positive values indicate a greater likelihood that the child would be sent to nursery with that particular attribute level. Marginal probabilities [28] were also calculated to show the impact of different attribute levels on the probability of a 'typical' parent choosing to send their child to nursery (as well as the average probability across the experiment). The probability of 'accepting' a given scenario was calculated by summing the coefficients associated with the scenario and applying the link function [28]. Best-worst data was analysed descriptively [29].

## **Results**

### *Participants*

169/762 questionnaires were returned (22%), and of these 122 individuals fully completed all aspects of the DCE task (Figure 2). Complete respondents were mostly mothers (94%), in employment (68%), where employed this was generally not flexible (67%), and most (90%) had one child in nursery care (Table II).

### *Discrete choice experiment and best-worst scaling task*

Table III shows the multivariable regression coefficients and the results from the 122 respondents completing the DCE and best-worst task. These indicate that if a nursery accepted children who had been given paracetamol and provided a quiet room, parents would be more likely to send their child if marginally unwell. However, a nursery that offered parents the option to swap or reimburse unused sessions would have a smaller impact on the likelihood of children being sent. The best-worst scaling results indicated a similarly strong preference for the paracetamol guidelines and quiet room. For example, not allowing paracetamol and an

absence of a quiet room were most frequently chosen as the least desirable attribute levels, while paracetamol allowed and presence of a quiet room were frequently chosen as best attribute levels and rarely as worst attribute levels.



### *Impact of attributes of nursery care on parental decision-making*

Across the whole experiment (16 scenarios x 122 participants) the average probability of a parent sending a marginally unwell child to nursery was 43%. Table 4 shows the marginal impact of each attribute level on the average probability of sending a marginally unwell child to nursery. This shows that parents' choices are most sensitive to the paracetamol guidelines. For example, the probability of sending a marginally unwell child to nursery is 25% (on average) where paracetamol is not allowed as compared to 62% (on average) where it is allowed. Conversely the presence of a quiet room results in a probability (on average) of 53% of sending a marginally unwell child to nursery as compared to 34% if no quiet room is available.

Assuming a 'typical nursery' has the following features - no quiet room provided, paracetamol allowed, no fee reimbursement available and no swapping of sessions - then the probability of a marginally unwell child being sent (from this sample) is 56%. Introducing a no paracetamol policy to the 'typical nursery' results in the predicted probability of a parent sending their marginally unwell child falling from 56% to 21%. Conversely, introducing a quiet room would increase the probability from 56% to 74% (all else being equal).

## **Discussion**

### ***Main findings***

This study aimed to investigate and better understand which aspects of nursery provision might influence parents' decisions about sending their 'marginally unwell' child to nursery. Four potentially relevant factors were identified through the qualitative work, of which the guidelines around the use of paracetamol and presence of a quiet room had most impact on parents' choices. In particular having clear guidelines that children who were unwell enough to need paracetamol should not be at nursery was most likely to deter parents, while having a quiet room would encourage parents to send a marginally unwell child. Offering parents the option to swap sessions or get reimbursed for sessions that their child missed had less impact on decision-making.

### ***What is already known on this topic?***

Children are probably the most important transmitters of infectious illness to all age groups in the community. Daycare is likely to be an important location for infection transmission[2-5] and could be the target for public health interventions, which is likely to be of benefit to the wider family, including the vulnerable elderly. It could be considered that by reducing minor infection rates in these settings, progression to more serious illnesses may be less likely, particularly in more vulnerable children within the setting, as well as the wider population outside of the daycare environment.

The net benefit/ harm of infection acquisition for the child is not clear: there is evidence of reduced allergic diseases in children with higher infection rates [30], but the infections and the use of antibiotics may adversely affect the microbiome, placing the child at higher risk of obesity and diabetes [31]. Viral infections treated with antibiotics within this group may also be contributing to the major public health issue of antibiotic resistance.

### ***What this study adds***

To our knowledge, this is the first study that attempts to quantify the impact of nursery policies on parents' decisions about sending in marginally unwell children. The discrete choice experiment enabled us to build on prior qualitative work to specify which aspects of nursery are most likely to influence child care decision and quantify the potential magnitude of the effects on child care decisions. Although the study suggests that introducing guidelines to prevent children who have had paracetamol from attending nursery could cut attendance, the

best-worst scaling findings indicate this would be perceived as highly undesirable. Conversely financial incentive factors such as fee reimbursement and session swapping for parents who keep their marginally unwell children at home were viewed more favourably, but had little effect on decision-making.

### ***Limitations of this study***

We are aware of two main weaknesses. First, our final analytic sample represented less than 20% of those invited. Previous research [32] suggests better educated, older mothers living in their own properties are more likely to complete questionnaires, for whom fee reimbursement might be less valuable. It may be that our method of inviting participants was not well received and only appealed to a particular group of parents; or that this group are a difficult population to engage in this type of anonymous research work given likely busy schedules and the lack of follow up/reminders possible due to the nature of the recruitment. That said, this was an initial exploration of the use of this method with this population and it gives a good starting point for further research in this topic area despite a relatively small response rate.

Second, our study explored parents' hypothetical decision making in relation to nursery care, rather than their actual decision-making. We attempted to make the context as plausible as possible, but we are aware that parents were not being faced with these decisions at the time of completion and this may have affected their choices. That said, there is evidence to suggest that DCEs reflect actual health related behaviours [22,23,33] and by using a hypothetical choice technique, we were able to explore the effect of different aspects of daycare in a way which would not be possible using observational data. By excluding sickness and diarrhoea from our definition of 'marginally unwell', parents were being asked to consider a common, but 'grey area' of decision making where there is no national guidance for attendance at daycare settings. This was a deliberate decision to attempt to elicit the choices made by parents where the choices are down to them, but could have wider consequences, rather than being necessarily influenced by well known policies/recommendations.

### ***Conclusion***

Daycare policy, particularly the use of paracetamol prior to attendance, could influence parental decision making, having potential implications for attendance when children are marginally unwell and the transmission of infectious illnesses in the community. Local authorities, public health physicians and daycare staff may wish to consider this evidence when developing future daycare policy. Any changes in policy would need to balance the potential

benefits of excluding children with a marginal illness in terms of reducing the transmission of infectious illness in this population, with the social and economic impact on employers and families. Future research with a larger number, and wider range of parents and carers is needed to confirm actual behaviour resulting from policy changes, and to understand the feasibility and acceptability to both parents and nurseries.

## **Ethical Approval**

The study protocol and materials were reviewed and approved by the Faculty of Medicine and Dentistry Committee for Ethics at the University of Bristol, UK (reference number: 111235, approval received: 21/06/2012).

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## **Authorship**

All authors listed on this manuscript have contributed to the conception and design of the work, the analysis and/or the interpretation of data. All authors were involved in drafting the article and confirm they have read and approved the final version of the manuscript.

Table I – Discrete choice experiment attributes and levels

<b>Context:</b> “Your child has not slept very well through the night, and in the morning, they don’t seem ‘quite themselves’, but don’t appear distressed or upset and have eaten breakfast. They have a bit of a runny nose and a slight cough, but have no signs of sickness or diarrhoea. Their temperature is a little bit high so you have given them a dose of paracetamol/ibuprofen (e.g. calpol, calprufen, nurofen for children)”	
<b>Attribute</b>	<b>Levels</b>
Flexibility with sessions – ability to swap for another day if child is unwell	<ol style="list-style-type: none"> <li>1. Unable to swap any sessions</li> <li>2. Able to swap up to 5 sessions per year if unused due to sickness</li> <li>3. Able to swap up to 10 sessions per year if unused due to sickness</li> <li>4. Able to swap up to 20 sessions per year if unused due to sickness</li> </ol>
Reimbursement of fees for sessions child is unwell	<ol style="list-style-type: none"> <li>1. No reimbursement</li> <li>2. Full reimbursement for up to 5 sessions per year</li> <li>3. Full reimbursement for up to 10 sessions per year</li> <li>4. Full reimbursement for up to 20 sessions per year</li> </ol>
Policy relating to admission	<ol style="list-style-type: none"> <li>1. Nursery states they would rather your child did not attend if they have a temperature and/or have had calpol in 12 hours prior to their session</li> <li>2. Nursery states they are happy for your child to attend if they have a temperature and/or have had calpol in the 12 hours prior to their session and you are happy to leave them</li> </ol>
Provision of a ‘quiet room’	<ol style="list-style-type: none"> <li>1. Nursery does not provide a ‘quiet room’</li> <li>2. Nursery provides a ‘quiet room’ where child can still attend, but will likely be doing lower level activities, sleep would be possible and child would be closely monitored</li> </ol>

Table II - Parent characteristics (n=122)

<b>Characteristic</b>	<b>Variants</b>	<b>n (%)</b>
Relationship to child/ren	Mother	117 (96%)
	Father	5 (4%)
	Non parental respondents	0 (0%)
Age	18-25	7 (6%)
	26-35	65 (53%)
	36-45	50 (41%)
Marital status	Married	92 (75%)
	Single	7 (6%)
	Divorced	3 (3%)
	Cohabiting	20 (16%)
Ethnicity	White	116 (95%)
	Other (non-white)	6 (5%)
Highest educational qualification	No formal qualification	1 (<1%)
	O Level/ GCSE/ NVQ/A Level/Other	37 (30%)
	First degree	47 (39%)
	Higher degree	26 (21%)
Employment status	Full time	22 (18%)
	Part time	61 (50%)
	Not employed	38 (31%)
	Not given	1 (<1%)
If employed, flexibility of working hours	Not flexible	56 (67%)
	Flexible	24 (29%)
	Not given	3 (4%)
Number of children in household	1	28 (23%)
	2	71 (58%)
	3+	23 (19%)
Mean (range) age of child(ren) by number of children in household	1 child	2.7 (<1 year - 4 years)
	2 children	3.1 (<1 year - 18 years)
	3+ children	5.4 (<1 year - 21 years)
Number of children in nursery	1	110 (90%)
	2	11 (9%)
	Not given	1 (<1%)
Total number of sessions used at nursery per week (1 session = 1 x morning or 1 x afternoon)	2-4	74 (61%)
	5-7	42 (34%)
	8+	6 (5%)
Do you pay for your nursery fees?	Yes, all	49 (40%)
	Yes, some	35 (29%)
	No	38 (31%)

Table III - Respondents' preferences for attributes of nursery based on random effects probit model (n=122 participants, n=1952 observations)

Attribute	Level	Mean (95% CI)	Number of times selected as 'best' feature	Number of times selected as 'worst' feature	Best minus worse scores
Ability to swap sessions (no. of sessions/ year)	0 sessions	-0.06	19	285	-239
	5 sessions	-0.11 (-0.24 to 0.03)	158	21	137
	10 sessions	0.09 (-0.04 to 0.22)	201	14	187
	20 sessions	0.08 (-0.05 to 0.21)	222	31	191
Quiet room provided?	No	-0.40 (-0.48 to -0.32)	46	458	-412
	Yes	0.40	288	103	185
Calpol guidelines	Calpol not allowed	-0.79	97	487	-390
	Calpol allowed	0.79 (0.70 to 0.88)	243	149	94
Fee reimbursement (no. of sessions/ year)	0 sessions	-0.12	12	254	-242
	5 sessions	0.23 (0.10 to 0.36)	163	113	50
	10 sessions	0.05 (-0.08 to 0.18)	248	27	221
	20 sessions	-0.16 (-0.29 to 0.02)	255	10	245
Constant		-0.285 (-0.610 to 0.040)			

**Model fit**

Log-likelihood: 762

Wald chi<sup>2</sup>: 362



Table IV - Range of effects of attributes around the average probability (43%) of sending a child to nursery

<b>Attribute</b>	<b>Level</b>	<b>Probability of sending unwell child</b>
<b>Ability to swap sessions (no. of sessions/ year)</b>	0	40%
	5	45%
	10	45%
	20	41%
<b>Quiet room</b>	<i>No quiet room</i>	36%
	<i>Quiet room</i>	53%
<b>Paracetamol guidelines</b>	<i>Paracetamol not allowed</i>	25%
	<i>Paracetamol allowed</i>	62%
<b>Fee reimbursement (no. of sessions/ year)</b>	0	49%
	5	44%
	10	39%
	20	40%

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