







BMJ Open Provision of educational events and subsequent questionnaire response rates in a large-scale birth cohort study from Japan

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ABSTRACT

Objectives We examined whether providing educational events for participants in a birth cohort study would increase the response rates of study questionnaires.

Design Birth cohort study.

Setting Questionnaires were distributed and returned by post twice in 1 year. We developed and implemented two educational sessions; a Baby Food lecture for mothers with children around 8 months old (analysis 1) and a Eurythmic session for mothers with children around 1 year and 8 months old (analysis 2). Mothers with children over the target ages were not invited (not-invited group). The invited participants were divided into three groups: those who did not apply to attend (not-applied group), those who applied but did not attend (applied group), and those who applied and attended (attended group).

Participants The participants were 5379 mother–child pairs registered with the Toyama Regional Center of the Japan Environment and Children's Study (JECS).

Outcome measure The outcome measure was return of the JECS questionnaire for 1 year old sent out after the Baby Food lecture and the JECS questionnaire for 2 years old sent out after the Eurythmic session. The questionnaires were returned to us by post.

Results The response rate for the attended group of the Baby Food lecture was 99.7%, and the odds ratio (OR) was significantly higher for this group than for the not-invited group (crude OR 24.54; 95% confidence interval (CI) 3.42 to 176.13; analysis 1). After the exclusion of participants who had previously attended the Baby Food lecture, the response rate for the attended group of the Eurythmic session was 97.8%, and the OR was significantly higher for this group than for the not-invited group (adjusted OR 5.66; 95% CI 1.93 to 16.54; analysis 2).

Conclusion Providing educational events that are appropriate to the age and needs of the participants may increase questionnaire response rates in birth cohort studies.

Trial registration number UMIN 000030786.

INTRODUCTION

Surveys and follow-up studies conducted over the last 30 years have tended to have low participation rates.^{1–6} Even when the required sample size has been secured during

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study prospectively evaluated whether educational events implemented as a retention strategy were associated with response rates of questionnaires sent after the events were held.
- ⇒ Eligible participants were 5379 mother–child pairs registered with the Toyama Regional Center of the Japan Environment Children's Study.
- ⇒ The allocation of comparison groups was not randomised.
- ⇒ Factors such as maternal personality traits should have been adjusted for, but information for these was not available.
- ⇒ Because this is an observational study, no causal relationship can be inferred from our results.

the recruitment phase, participants may drop out or not respond to questionnaires during the study period. Previously reported background factors and causes of non-response to questionnaires or attrition from interviews are young age, smoking, number of children, psychological stress and lower socioeconomic status.^{7–10} It has also been reported that the motivation to participate in a longitudinal study may be the desire to receive one's own results from the study or the expectation that the research results will contribute positively to society.^{11 12} For this reason, various retention strategies have been tried in observational studies to keep participants motivated to continue participating and responding throughout the duration of the study.^{13 14}

One such retention strategy commonly used by researchers in prospective studies is the use of participation incentives. The effects of distributing financial incentives (eg, gift certificates) and non-financial incentives (eg, stationery and daily necessities) have been investigated.^{13 15–17} Educational programmes designed to keep participants healthy have also been implemented to try

to maintain participants' motivation to continue their participation.^{18 19} These programmes were conducted in populations at high risk of HIV infection and it is not clear whether they can be generalised to a birth cohort of apparently healthy mother–child pairs.

This study investigated whether providing educational events as non-financial incentives was associated with subsequent questionnaire response rates for participants in one Regional Center (RC) of the Japan Environment and Children's Study (JECS), a large-scale birth cohort study.

METHODS

JECS study design

The JECS is a large-scale nationwide birth cohort study funded by the Ministry of the Environment, Japan. Approximately, 100 000 pregnant women were enrolled during the recruitment period from 2011 to 2014. RCs were established as study bases in 15 regions throughout Japan, from the northernmost to southernmost prefectures of Hokkaido to Okinawa. To recruit mother–child pairs as participants, research coordinators approached pregnant women who visited cooperating healthcare providers in each region to explain the study and obtain their written informed consent to participate. The male partners of the participating women were also informed of their participation in the JECS and their written informed

consent was obtained. Participants are being followed up primarily by questionnaire, with questionnaires mailed twice a year until the children reach 13 years of age. Participants mail their questionnaires to their registered RC, and the RCs enter the questionnaire information into the study database on JECS' dedicated server. Each RC is responsible for the follow-up of enrolled participants and is given discretion to implement various retention strategies to maintain participants' motivation to continue the survey and return questionnaires.

The details of the JECS design have been reported elsewhere.^{20–22} The JECS is registered in the Clinical Trials Registry of the University Hospital Medical Information Network (UMIN 000030786).

Present study design

Toyama RC is following up on 5379 participants recruited in the JECS study area located in Toyama Prefecture. In this study, eligible participants were mother–child pairs enrolled in the JECS with Toyama RC. From registration during pregnancy until 1 month after birth, the questionnaires were distributed and collected by the research coordinators when the mothers and children received health check-ups at cooperating healthcare providers (figure 1, term 1). From 6 months after birth, questionnaires were distributed and returned by post twice a year (figure 1, term 2).

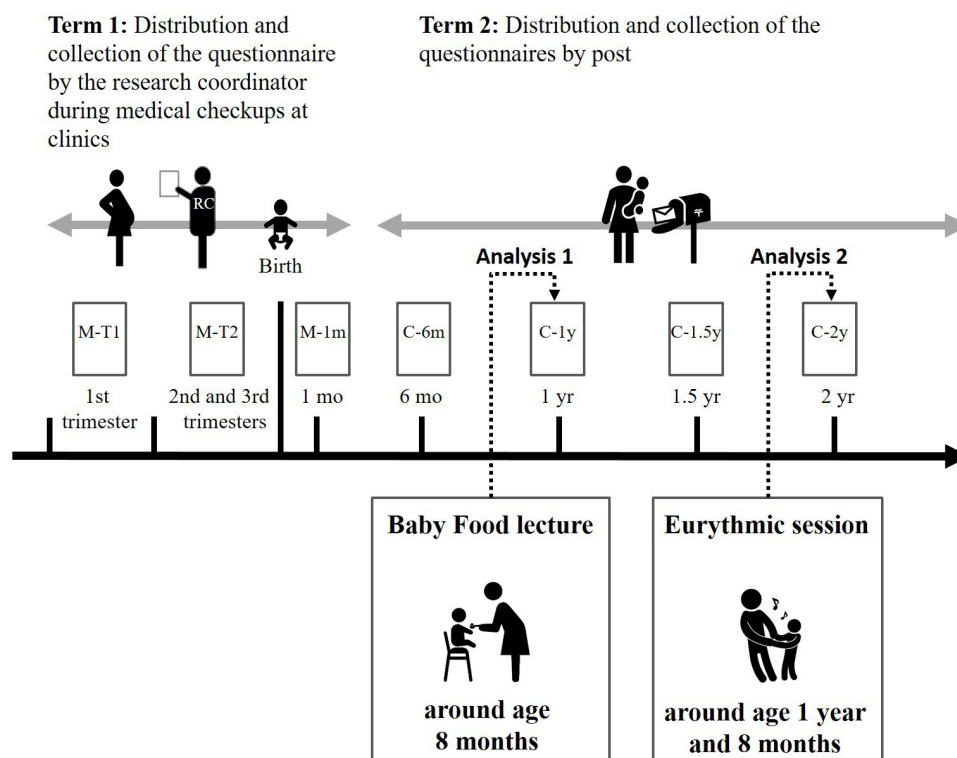


Figure 1 Timeline of questionnaire distribution and educational programmes. M-T1, JECS questionnaire distributed during the first trimester; M-T2, JECS questionnaire distributed during the second to third trimester; M-1m, JECS questionnaire distributed before 1 month of age and collected at 1 month of age; C-6m, JECS questionnaire distributed at 6 months of age; C-1y, JECS questionnaire distributed at 1 year of age; C-1.5y, JECS questionnaire distributed at 1 year and 6 months of age; C-2y, JECS questionnaire distributed at 2 years of age. JECS, Japan Environment and Children's Study.

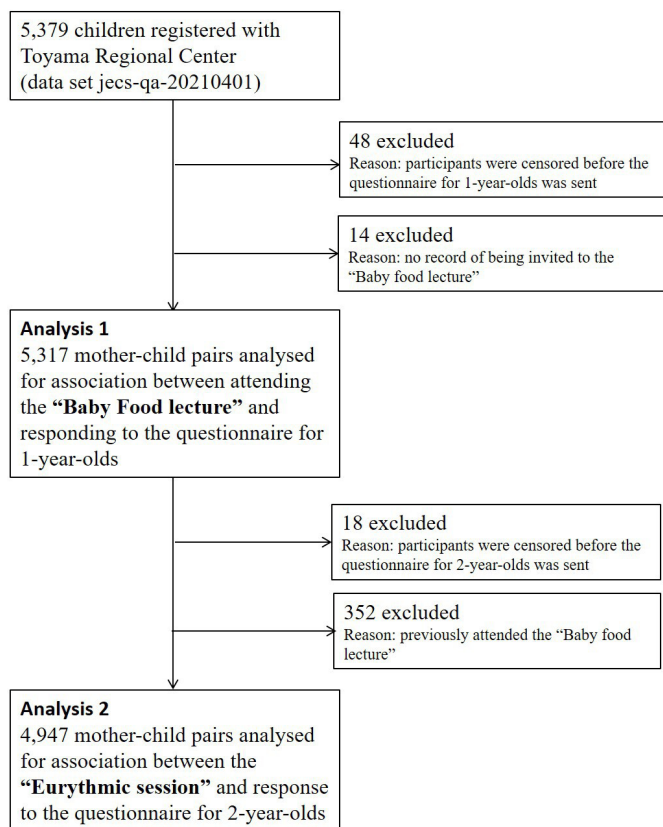


Figure 2 Flow diagram of the registration and exclusion process for participants in this study.

When questionnaires are returned during follow-up, all RCs distribute a ¥1000 gift certificate to each participant who returns the questionnaire. In addition, to maintain the participants' motivation to participate in the JECS, the RCs are responsible for implementing retention strategies. These strategies consist of circulating JECS newsletters, distributing gifts such as daily necessities and providing some educational events, such as those investigated in the present study. In term 2, Toyama RC developed and implemented two educational events for participants, a Baby Food lecture and a Eurythmic session, aimed at helping to maintain the physical and mental health of the registered mothers and children. We sent out an invitation for the Baby Food lecture held for participants when the children reached around 8 months of age and another for the Eurythmic session when the children reached around 1 year and 8 months of age (figure 1).

In analysis 1, we examined the association between attendance of the Baby Food lecture and the response rate to the JECS questionnaire for 1 year old. In analysis 2, we examined the association between attendance of the Eurythmic session and the response rate to the JECS questionnaire for 2 years old. Two analyses were performed for internal validation.

This study targeted the 5379 mother-child pairs registered with the Toyama RC whose data were contained in the study dataset provided by the JECS Programme Office

(figure 2). In analysis 1, data for 5317 mother-child pairs were analysed after excluding 48 participants who were censored (deceased, address unknown or withdrew) before the questionnaire for 1 year old was sent out and 14 participants with no record of being invited to the educational events. In analysis 2, data for 4947 mother-child pairs were analysed after excluding 18 participants who were censored before the questionnaire for 2 years old was sent out and also 352 participants who had previously attended the Baby Food lecture, because we wanted to analyse only the relationship between the Eurythmic session and the response rate to the questionnaire for 2 years old.

Invitation and holding educational programmes

The two educational events were designed to suit the age range of the participating children. An invitation was sent by post to participants 6 weeks before the start of each educational event, with applications to attend accepted by email or telephone. If the number of applicants exceeded the capacity of each event, a lottery was held and the applicant was informed by post 3 weeks before the start of the programme whether or not they could attend.

The Baby Food lecture was a 1-hour lecture on nutrition and making baby food given by a nutritionist. A total of 10 Baby Food lectures were held between August 2013 and July 2015. Mothers and their partners were invited to attend the lecture with their 8-month-old children and to sample the baby food prepared by the nutritionist. The child participants in this study were born between July 2011 and November 2014, so we selected children who would reach the age of around 8 months at the time of each Baby Food lecture and sent out the invitations. Each lecture could accommodate from 30 to 40 mother-child pairs. We did not send invitations to 1903 JECS participants because the children were older than the target age when the first lecture was held in 2013. Also, participants who did not reside in Toyama Prefecture at the relevant age were not invited.

The Eurythmic session was a 1-hour lecture on physical fitness through rhythmic dancing under the guidance of an instructor. A total of 15 sessions were held between March 2013 and March 2016. Mothers were invited to attend the session with their children and to join in the rhythmic dancing and learn about physical fitness. We selected children who would reach the age of around 1 year and 8 months at the time of each Eurythmic session and sent out the invitations. Each session could accommodate around 30 mother-child pairs. We did not send invitations to 277 participants whose children were older than the target age or who moved outside Toyama Prefecture.

Both educational events included time for the director or research fellows of the RC to report on the progress and results of the JECS to attendees, and there was also time for health or dietary consultations with specialists such as medical doctors, public health nurses and nutritionists for those who wanted it.

Table 1 Demographic characteristics of participants according to attendance status for the Baby Food lecture (n=5317)

Characteristics	Invited			
	Not-invited n=1903 (35.8%)	Not-applied n=2857 (53.7%)	Applied n=204 (3.8%)	Attended n=353 (6.6%)
Maternal age (years), n (%)				
<25	166 (8.7)	230 (8.1)	15 (7.4)	12 (3.4)
25–29	571 (30.0)	792 (27.7)	53 (26.0)	108 (30.6)
30–34	684 (35.9)	1063 (37.2)	75 (36.8)	114 (32.3)
35–39	429 (22.5)	658 (23.0)	50 (24.5)	106 (30.0)
≥40	53 (2.8)	114 (4.0)	11 (5.4)	13 (3.7)
Maternal highest educational level (years), n (%)				
<13	500 (26.5)	801 (28.3)	39 (19.3)	47 (13.3)
13–15	903 (47.8)	1298 (45.8)	93 (46.0)	152 (43.1)
≥16	486 (25.7)	736 (26.0)	70 (34.7)	154 (43.6)
Maternal employment status				
No	623 (33.1)	898 (31.7)	69 (33.8)	73 (20.8)
Yes	1260 (66.9)	1937 (68.3)	135 (66.2)	278 (79.2)
Annual household income (JPY), n (%)				
<4 million	499 (28.3)	761 (28.8)	45 (24.2)	68 (20.3)
4– <6 million	651 (37.0)	961 (36.4)	67 (36.0)	122 (36.4)
≥6 million	612 (34.7)	918 (34.8)	74 (39.8)	145 (43.3)
Maternal smoking status, n (%)				
Never smoked	1171 (62.3)	1731 (61.0)	147 (72.4)	265 (75.1)
Quit smoking	444 (23.6)	704 (24.8)	37 (18.2)	66 (18.7)
Currently smoking	264 (14.1)	403 (14.2)	19 (9.4)	22 (6.2)
Maternal alcohol consumption, n (%)				
Never drank	683 (36.3)	964 (34.0)	84 (41.2)	118 (33.4)
Quit drinking	340 (18.1)	493 (17.4)	33 (16.2)	57 (16.2)
Currently drinking	861 (45.7)	1379 (48.6)	87 (42.7)	178 (50.4)
Paternal participation in the JECS, n (%)				
Never participated	644 (33.8)	1220 (42.7)	76 (37.3)	137 (38.8)
Participated	1259 (66.2)	1637 (57.3)	128 (62.8)	216 (61.2)
Number of older siblings, n (%)				
0	807 (42.4)	1060 (37.1)	122 (59.8)	276 (78.2)
1	788 (41.4)	1271 (44.5)	64 (31.4)	66 (18.7)
≥2	308 (16.2)	526 (18.4)	18 (8.8)	11 (3.1)
Postpartum depression, n (%)				
EPDS <9	1613 (86.9)	2411 (86.3)	163 (79.9)	291 (84.6)
EPDS ≥9	243 (13.1)	383 (13.7)	41 (20.1)	53 (15.4)

EPDS, Edinburgh Postnatal Depression Scale; JECS, Japan Environment and Children's Study; JPY, Japanese yen.

Survey of participants who did not apply to attend the educational events

Research coordinators visited community facilities that carry out the 3-year health check-ups for participants and conducted a survey asking the mothers why they did not attend either educational event and what kind of events they would like to attend in the future. The research coordinators handed the questionnaires to the mothers, who answered and returned them on-site.

Patient and public involvement

There was no patient or public involvement in this study.

Statistical analyses

We categorised participants according to invitation status and their reactions to each educational event. Participants who were not invited because the children were older than the target age at the time of the first lecture session were designated as 'not-invited'. The participants

who were invited were divided into three groups for analysis: those who were invited but did not apply to attend were designated as ‘not-applied’; those who were invited and applied but were not chosen in the lottery, cancelled due to illness such as fever or were otherwise unable to attend on the day of the programme were designated as ‘applied’; and those who applied and actually attended the programme were designated as ‘attended’.

To determine the association between attendance status and questionnaire response rate, we performed logistic regression analysis and calculated the odds ratio (OR) and 95% confidence intervals (CIs). All statistical analyses were performed using JMP Pro15 and SAS ver. 9.4 (SAS Institute). The following variables were considered as covariates for the analyses between attendance status and questionnaire response rate: maternal age, maternal highest educational level, maternal employment status, annual household income, maternal smoking status, maternal alcohol consumption, paternal participation in the J ECS, number of older siblings and postpartum depression.⁹ Postpartum depression was assessed using the Japanese version of the Edinburgh Postnatal Depression Scale (EPDS), with a score of 9 or higher indicating postpartum depression.²³ The relationship between these variables and questionnaire response rate was reported in our previous study.⁹

RESULTS

Analysis 1

Invitations were sent to 3414 participants (64.2% of the dataset), 557 applied and 353 attended a Baby Food lecture. Mothers who attended were more likely to be 35–39 years old, to have ≥16 years of education, to be employed, to have an annual household income in excess of ¥6 million, to have never smoked and not to have older siblings. In addition, the attended group tended to have more paternal participation in the J ECS than the not-applied group (table 1).

Table 2 shows the response rates and ORs for the questionnaire for 1 year old according to attendance status for the Baby Food lecture (n=5317). The response rate for the attended group of the Baby Food lecture was 99.7%, and the crude OR was significantly

higher for this group than for the not-invited group (crude OR 24.54; 95% CI 3.42 to 176.13). Adjusted ORs could not be calculated because there were too few unreturned questionnaires in the attended group.

Analysis 2

Invitations to the Eurythmic session were sent to 4670 participants (94.4% of the dataset) and 229 attended. Those who attended were more likely to have ≥16 years of education, to be employed, to have an annual household income in excess of ¥6 million, to have never smoked, to have paternal participation in the J ECS and to have an EPDS score ≥9. In addition, fewer of these participants had older siblings (table 3).

Table 4 shows the response rates and ORs for the J ECS questionnaire for 2 years old according to attendance status for the Eurythmic session (n=4947). The response rate for the attended group was 97.8%, and the OR was significantly higher for this group than for the not-invited group (adjusted OR, 5.66; 95% CI 1.93 to 16.54). Moreover, positive associations were found between the not-applied group and response to the questionnaire for 2 years old and between the applied group and response to the questionnaire; the ORs were significantly higher for the not-applied group (adjusted OR, 1.55; 95% CI 1.02 to 2.36) and applied group (adjusted OR, 10.27; 95% CI 1.36 to 77.73) compared with the not-invited group.

DISCUSSION

In this study, there was a strong association between attending the educational events and the response rate to each of the standard J ECS questionnaires sent out after the events. Furthermore, participants who were invited to attend the Eurythmic session had a higher response rate than those who were not invited. Overall, providing educational events was associated with decreased risk of non-response to questionnaires. To our knowledge, this is the first report on the relationship between providing educational events and questionnaires response rates in a large-scale birth cohort study.

Although research organisers cannot meet face-to-face with participants in postal questionnaire surveys, it has

Table 2 Association between attending the Baby Food lecture and response to the J ECS questionnaire for 1 year old (n=5317)

	Response to questionnaire for 1 year old			
	Responses, n	Subtotal, n	Response rate, %	Crude model OR (95% CI)
(1) Not-invited	1779	1903	93.5	Reference
(2) Not-applied	2662	2857	93.2	0.95 (0.75 to 1.20)
(3) Applied	200	204	98.0	3.49 (1.27 to 9.53)
(4) Attended	352	353	99.7	24.54 (3.42 to 176.13)

Bold indicates a significant difference (p<0.05).

CI, Confidence Interval; J ECS, Japan Environment and Children’s Study; OR, Odds Ratio.

Table 3 Demographic characteristics of participants according to attendance status for the Eurythmic session (n=4947)

Characteristics	Invited			
	Not-invited n=277 (5.6%)	Not-applied n=4353 (88.0%)	Applied n=88 (1.8%)	Attended n=229 (4.6%)
Maternal age (years), n (%)				
<25	29 (10.5)	364 (8.4)	6 (6.8)	11 (4.8)
25–29	84 (30.3)	1237 (28.4)	28 (31.8)	60 (26.2)
30–34	89 (32.1)	1613 (37.1)	32 (36.4)	81 (35.4)
35–39	69 (24.9)	984 (22.6)	18 (20.5)	64 (28.0)
≥40	6 (2.2)	155 (3.6)	4 (4.6)	13 (5.7)
Maternal highest educational level (years), n (%)				
<13	59 (21.5)	1217 (28.2)	24 (27.9)	34 (15.0)
13–15	132 (48.2)	2010 (46.5)	40 (46.5)	102 (44.9)
≥16	83 (30.3)	1095 (25.3)	22 (25.6)	91 (40.1)
Maternal employment status				
No	124 (45.3)	1356 (31.4)	33 (37.9)	72 (31.6)
Yes	150 (54.7)	2960 (68.6)	54 (62.1)	156 (68.4)
Annual household income (JPY), n (%)				
<4 million	64 (25.7)	1162 (28.8)	27 (34.6)	51 (24.2)
4– <6 million	83 (33.3)	1489 (36.9)	26 (33.3)	77 (36.5)
≥6 million	102 (41.0)	1386 (34.3)	25 (32.1)	83 (39.3)
Maternal smoking status, n (%)				
Never smoked	168 (61.3)	2652 (61.5)	52 (60.5)	166 (72.5)
Quit smoking	70 (25.6)	1039 (24.1)	26 (30.2)	47 (20.5)
Currently smoking	36 (13.1)	624 (14.5)	8 (9.3)	16 (7.0)
Maternal alcohol consumption, n (%)				
Never drank	97 (35.4)	1514 (35.1)	33 (37.9)	82 (35.8)
Quit drinking	53 (19.3)	746 (17.3)	18 (20.7)	45 (19.7)
Currently drinking	124 (45.3)	2057 (47.7)	36 (41.4)	102 (44.5)
Paternal participation in the JECS, n (%)				
Never participated	84 (30.3)	1753 (40.3)	28 (31.8)	64 (28.0)
Participated	193 (69.7)	2600 (59.7)	60 (68.2)	165 (72.1)
Number of older siblings, n (%)				
0	124 (44.8)	1672 (38.4)	43 (48.9)	143 (62.5)
1	117 (42.2)	1903 (43.7)	24 (27.3)	70 (30.6)
≥2	36 (13.0)	778 (17.9)	21 (23.9)	16 (7.0)
Postpartum depression, n (%)				
EPDS <9	237 (90.1)	3674 (86.2)	76 (86.4)	188 (83.2)
EPDS ≥9	26 (9.9)	586 (13.8)	12 (13.6)	38 (16.8)

EPDS, Edinburgh Postnatal Depression Scale; JECS, Japan Environment and Children's Study; JPY, Japanese yen.

been reported that providing opportunities to communicate, including face-to-face meetings or talking on the phone, generally, correlates with high study participation rates^{24 25} and increases willingness to participate in a prospective study.²⁶ In the JECS, the research coordinators were able to meet participants at the clinic

periodically from recruitment to 1 month after birth and collect questionnaires in person. However, the distribution and collection of questionnaires after 6 months of age were done only by post, and thus the opportunity to meet was lost. Our findings suggest that providing opportunities for communication between research organisers

Table 4 Association between attending the Eurythmic session and response to the J ECS questionnaire for 2 years old (n=4947)

	Response to questionnaire for 2 years old			Crude model OR (95% CI)	Adjusted model OR (95% CI)
	Responses, n	Subtotal, n	Response rate, %		
(1) Not-invited	239	277	86.3	Reference	Reference
(2) Not-applied	3915	4353	89.9	1.42 (0.995 to 2.03)	1.55 (1.02 to 2.36)
(3) Applied	87	88	98.9	13.83 (1.87 to 102.28)	10.27 (1.36 to 77.73)
(4) Attended	224	229	97.8	7.12 (2.76 to 18.42)	5.66 (1.93 to 16.54)

Adjusted for maternal age, maternal highest educational level, maternal employment status, annual household income, maternal smoking status, maternal alcohol consumption, paternal participation in the J ECS, number of older siblings, postpartum depression. Bold indicates a significant difference ($p < 0.05$).

CI, Confidence Interval; J ECS, Japan Environment and Children's Study; OR, Odds Ratio.

and participants may lower the risk of non-response in birth cohort studies.

Previous studies examining incentives for continuing study participation and questionnaire recovery have reported that the distribution of money and other items as rewards can be effective.^{27–29} However, other studies have indicated that this approach may not be effective,^{30–34} so consensus has not yet been reached. In addition, retention strategies other than financial incentives have been suggested to be effective, but this cannot be analysed using a unified method.¹³ The results of the present study suggest that providing educational events might be effective in motivating continued participation. Although our findings do not explain why attending an educational event would motivate the participants, we presume that they may have realised the benefits of attending the programmes and so increased their engagement with the study. This suggests that attending an educational event may act as a non-financial incentive for participants. We distributed a questionnaire at the end of each event asking the participants to rate their satisfaction with it. In all cases, nearly 90% of the participants said they were satisfied (data not shown), suggesting that the events provided met their needs.

It is interesting to note that, for the Eurythmic session, the response rate of the not-applied group of was higher than that of the not-invited group, suggesting that merely receiving an invitation to participate in an educational event may increase motivation to continue participation in the study. When we additionally surveyed 202 mothers who had not applied to attend either event and asked them why they did not apply, most responded that while they were interested in the event, they did not apply for reasons such as inconvenient timing (54.5%) and a venue far from home (20.8%; online supplemental table 1). When asked which event programmes they would like to attend in the future, only 3.5% did not respond (online supplemental table 2). These results indicate that many in the not-applied group actually wanted to participate in the events we organised. This also suggests that educational events can be a non-financial incentive for many study participants.

We distinguished those who 'applied' from those who 'attended' the events, because we were interested in the difference between people showing interest in the event but not attending and people having actually attended the event. We had assumed that the Attended group would have a higher response rate, but there was no significant difference between the two groups. While it is not possible to determine whether the experience of attending the event itself could be a motivator for responding to the survey, it is possible that the announcement of an event could serve as an incentive for people to express interest in the event.

It has been reported that even if remuneration or similar financial incentives are not offered, advantages such as the survey being beneficial for child development and maternal health or being able to receive counselling may function as incentives for study participation.^{35 36} It has also been reported that some participants express gratitude and anticipation.³⁶ The educational events provided at the Toyama RC also allowed time for health consultations for participants who requested them and time to report on the progress of the study, both of which may have contributed to participants' satisfaction and confidence in the study, as seen in previous studies.^{35 36}

This study has some limitations. First, the allocation of comparison groups was not randomised; the not-invited group that was used as the reference group was simply a cohort of participants with children older than the target age for the events in our study time series. In the future, randomised controlled trials should be conducted to evaluate the effectiveness of retention strategies, including educational events. Second, in analysis 1, the adjusted OR could not be calculated because of the very high response rates of the compared groups. Third, we were not able to collect information on the mothers' personality traits, and therefore, could not include them in the adjusted model. Given that this study was not designed to verify cost-effectiveness, it is difficult to know whether the expenses associated with each event were reasonable. In the future, we need to consider conducting a cost-effectiveness study with regard to holding educational events.

Despite these limitations, a major strength of this study is that we were able to target a population with few drop-outs and had a high response rate of more than 85% in all groups—and this was seen for two different educational events conducted at different points in time. It would be interesting to see if educational events offered in other birth cohort studies with long-term follow-up find similar associations with response rates.

CONCLUSIONS

Our results suggest that providing educational events might increase the response rate among participants in birth cohort studies. Accordingly, providing educational events can be a non-financial incentive to motivate continued participation among mothers who have enrolled in long-running birth cohort studies.

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Contributors AT and MK designed and carried out this study. AT, MK, MI, TT, KH and HI collected the data. AT performed the statistical analysis and wrote the paper. KM checked the statistical analysis. AT, MK, MI, TT, KH and HI organised the educational events. All authors have read and approved the final manuscript. AT is responsible for the overall content as the guarantor.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study was approved by the Institutional Review Board of the University of Toyama (approval no.: Clin. 28-77, approval date: 23 September 2016). Participants gave informed consent to participate in the study before taking part.

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Data availability statement Data available on request from the authors. Data are unsuitable for public deposition due to ethical restrictions and the legal framework of Japan. Publicly depositing data containing personal information is prohibited by the Act on the Protection of Personal Information (Act No. 57 of 30 May 2003; amended 9 September 2015). The open sharing of epidemiological data is also restricted by the Ethical Guidelines for Medical and Health Research Involving Human Subjects enforced by the Japan Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Health, Labour and Welfare. All inquiries about access to data should be sent to: jecs-en@nies.go.jp. The person responsible for handling enquiries sent to this email address is Dr Shoji F. Nakayama, JECS Programme Office, National Institute for Environmental Studies.

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