| Baseline characteristics | 2001 cohort, N (%) | P-value | 2010 cohort, N (%) | P-value |
|--------------------------|-------------------|---------|-------------------|---------|
|                          | Not included (N=6,573) | Included (N=17,019) | | Not included (N=14,221) | Included (N=24,333) | |
| **Parental factors**     |                   |         |                   |         |                   |         |
| Income quintile          |                   |         |                   |         |                   |         |
| 5th (highest)            | 732 (14.6)        | 3828 (22.5) | < 0.01            | 1,633 (15.3) | 5,411 (22.2) | < 0.01 |
| 4th                      | 823 (16.4)        | 3673 (21.6) | < 0.01            | 1,860 (17.5) | 5,396 (22.2) | < 0.01 |
| 3rd                      | 897 (17.8)        | 3515 (20.7) | < 0.01            | 1,859 (17.5) | 4,630 (19.0) | < 0.01 |
| 2nd                      | 1,114 (22.2)      | 3297 (19.4) | < 0.01            | 2,425 (22.8) | 4,853 (19.9) | < 0.01 |
| 1st (lowest)             | 1,463 (29.1)      | 2706 (15.9) | < 0.01            | 2,862 (26.9) | 4,043 (16.6) | < 0.01 |
| Missing                  | 1,544             | 3,582     |                   | 3,582     |           | |
| Mother's education       |                   |         |                   |         |                   |         |
| 4-year college or greater| 462 (9.4)         | 2,594 (15.2) | < 0.01            | 1,663 (18.6) | 7,125 (29.3) | < 0.01 |
| Junior college           | 1,738 (35.4)      | 7,397 (43.5) | < 0.01            | 3,460 (38.7) | 10,227 (42.0) | < 0.01 |
| High school              | 2,213 (45.1)      | 6,352 (37.3) | < 0.01            | 2,982 (33.3) | 6,136 (25.2) | < 0.01 |
| Junior high school       | 485 (9.9)         | 656 (3.9)  | < 0.01            | 812 (9.1)  | 778 (3.2)  | < 0.01 |
| Others                   | 9 (.2)            | 20 (.1)   | < 0.01            | 27 (0.3)   | 67 (0.3)   | < 0.01 |
| Missing                  | 1,666             | 5,277     |                   | 5,277     |           | |
| Household structure      |                   |         |                   |         |                   |         |
| Two parents (two-generation) | 4,886 (74.3)   | 13,237 (77.8) | < 0.01            | 11,056 (77.8) | 20,488 (84.2) | < 0.01 |
| Two parents (three-generation) | 1,387 (21.1) | 3,496 (20.5) | < 0.01            | 2,351 (16.5) | 3,704 (15.2) | < 0.01 |
| Single parent (two-generation) | 133 (2.0)     | 120 (.7)   | < 0.01            | 342 (2.4)  | 45 (0.2)   | < 0.01 |
| Single parent (three-generation) | 167 (2.5)    | 166 (1.0)  | < 0.01            | 466 (3.3)  | 96 (0.4)   | < 0.01 |
| Missing                  | 0                 | 6         |                   | 6         |           | |
| Number of siblings       |                   |         |                   |         |                   |         |
| 0                       | 3,292 (50.1)      | 8,341 (49.0) | < 0.01            | 6,781 (47.7) | 11,737 (48.2) | < 0.01 |
| 1                       | 2,358 (35.9)      | 6,400 (37.6) | < 0.01            | 5,050 (35.5) | 9,320 (38.3) | < 0.01 |
| 2                       | 726 (11.0)        | 1,932 (11.4) | < 0.01            | 1,899 (13.4) | 2,784 (11.4) | < 0.01 |
| ≥3                      | 197 (3.0)         | 346 (2.0)  | < 0.01            | 485 (3.4)  | 492 (2.0)  | < 0.01 |
| Missing                  | 0                 | 6         |                   | 6         |           | |
| Nationality of parents   |                   |         |                   |         |                   |         |
| Japanese                 | 6,138 (93.4)      | 16,626 (97.7) | < 0.01            | 13,157 (92.5) | 23,849 (98.0) | < 0.01 |
| Foreign national         | 435 (6.6)         | 393 (2.3)  | < 0.01            | 1,064 (7.5) | 484 (2.0)  | < 0.01 |
| Mother’s age | 155 (2.4) | 81 (5.5) | < 0.01 | 278 (2.0) | 58 (0.2) | < 0.01 |
|--------------|------------|----------|--------|-----------|---------|--------|
| <20          | 6,316 (96.1) | 16,615 (97.6) | 13,540 (95.2) | 23,380 (96.1) |< 0.01 |
| 20–39        | 102 (1.6) | 323 (1.9) | 403 (2.8) | 895 (3.7) |< 0.01 |
| ≥40          | 102 (1.6) | 323 (1.9) | 403 (2.8) | 895 (3.7) |< 0.01 |
| Child factors |            |          |        |           |         |        |
| Child’s sex  |            |          |        |           |         |        |
| Boy          | 3,427 (52.1) | 8,938 (52.5) | 7,239 (50.9) | 12,605 (51.8) |0.09 |
| Girl         | 3,146 (47.9) | 8,081 (47.5) | 6,982 (49.1) | 11,728 (48.2) |        |
| Preterm birth|            |          |        |           |         |        |
| Full-term    | 6,179 (94.2) | 16,198 (95.2) | 13,348 (93.9) | 23,101 (94.9) |< 0.01 |
| Moderately preterm | 333 (5.1) | 735 (4.3) | 770 (5.4) | 1,086 (4.5) |        |
| Very preterm | 44 (.7) | 86 (.5) | 96 (0.7) | 146 (0.6) |        |
| Missing      | 17 | 7 |         |          |        |
| Congenital diseases | | | | | |
| With         | 38 (.8) | 180 (1.1) | 168 (1.2) | 468 (1.9) |< 0.01 |
| Without      | 4,945 (99.2) | 16,839 (98.9) | 14,053 (98.8) | 23,865 (98.1) |        |
| Missing      | 1,590 | 0 | | |        |

*a* These include factors that was assessed at the first wave except for the mother’s education (assessed at Wave 2).

*b* Chi-square test was conducted to compare the participants who were and were not followed by the categories of factors.
Table 2. Details of factor assessment

| Factor                        | Data source | Details of assessment and categorization                                                                 |
|-------------------------------|-------------|--------------------------------------------------------------------------------------------------------|
| **Parental factors**          |             |                                                                                                        |
| Household income              | Wave 1      | Household income was categorized into quintiles.                                                        |
| Mother’s education            | Wave 2      | Educational level was subdivided into graduation from junior high school, high school, junior college, college or greater, and others. |
| Mother’s employment status    | Wave 2      | Mother’s employment status was categorized into not employed, self-employed, part-time employed, full-time employed, and others. |
| Household structure           | Wave 1      | Household structure was categorized into the following four groups, considering the presence of grandparents who might offer childcare support: two parents (two-generation), two parents (three-generation), single parent (two-generation), and single parent (three-generation). |
| Number of siblings            | Wave 1      | The number of siblings was categorized into 0, 1, 2, and ≥3.                                             |
| Nationality of parents        | Birth records | Nationality of parents was determined based on how fathers or mothers listed their nationality in the birth record, i.e., Japanese or citizens of countries other than Japan. |
| Concerns over child rearing   | Wave 2      | Concerns over child rearing were assessed at three levels, i.e., little, some, and much.                 |
| **Child factors**             |             |                                                                                                        |
| Sex                           | Birth records | Sex was assigned as boy or girl.                                                                      |
| Preterm birth                 | Birth records | Preterm birth was defined as delivery before 37 gestational weeks and was further categorized into very preterm (i.e., 31 weeks or earlier) and moderately preterm (i.e., 32–36 weeks). |
| Congenital diseases           | Wave 2      | Congenital diseases were assessed based on parental report of visiting a physician for congenital diseases during the previous year. |
| Developmental delay           | Wave 3      | Developmental delay was defined as children whom their parents reported they could not do at least one of the following six activities: 1) walk, 2) run, 3) climb stairs, 4) say meaningful words such as “mama” and “bubu” (meaning a toy car in Japanese), 5) say a two-word sentence, and 6) say one’s name. |
| **Environmental factors**     |             |                                                                                                        |
| Size of residential area | Wave 3   | The size of the residential area was classified into three levels, i.e., counties, small-to-medium cities, and large cities, and an additional category, namely, foreign country. |
|--------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Region in which survey participants were residing | Wave 3   | Forty-seven prefectures were grouped into eight regions, i.e., Hokkaido, Tohoku, Kanto, Chubu, Kansai, Chugoku, Shikoku, and Kyushu/Okinawa, and an additional category, namely, foreign country. |
### Table 3. Associations between parental and child factors

| Parental factors          | 2001 birth cohort |          |          | 2010 birth cohort |          |          |
|---------------------------|-------------------|----------|----------|-------------------|----------|----------|
|                           | Preterm birth     | Congenital diseases | Developmental delay | Preterm birth | Congenital diseases | Developmental delay |
|                           | Very              | Moderately |          | Very              | Moderately |          |
| Income quintile           |                   |           |          |                   |           |          |
| 5th (highest)             | 0.4               | 4.1       | 1.4      | 12.8              | 0.6       | 4.6      | 2.1     | 10.9 |
| 4th                       | 0.3               | 4.0       | 1.3      | 13.2              | 0.5       | 4.8      | 2.2     | 13.6 |
| 3rd                       | 0.6               | 4.5       | 0.9      | 14.0              | 0.6       | 4.7      | 1.9     | 14.3 |
| 2nd                       | 0.5               | 4.3       | 0.8      | 11.5              | 0.7       | 4.1      | 1.7     | 13.5 |
| 1st (lowest)              | 0.8               | 4.9       | 0.7      | 13.5              | 0.6       | 3.9      | 1.6     | 14.1 |
| **Chi-square test**       | **p=0.09**        | **p=0.01**| **p=0.03**| **p=0.27**        |          |          |          |
| Mother's education        |                   |           |          |                   |           |          |
| 4-year college or greater | 0.6               | 3.8       | 1.4      | 12.9              | 0.5       | 4.3      | 1.9     | 11.8 |
| Junior college            | 0.5               | 4.2       | 1.2      | 12.3              | 0.6       | 4.7      | 1.9     | 13.2 |
| High school               | 0.4               | 4.7       | 0.8      | 13.8              | 0.7       | 4.3      | 2.0     | 14.8 |
| Junior high school        | 0.8               | 4.3       | 0.9      | 14.0              | 0.9       | 5.0      | 1.4     | 13.9 |
| Others                    | 0.0               | 10.0      | 0.0      | 0.0               | 0.0       | 0.0      | 3.0     | 6.0  |
| **Chi-square test**       | **p=0.49**        | **p=0.08**| **p=0.03**| **p=0.34**        |          |          |          |          |

Note: Numbers are percentages.
### eTable 4. Responsible caregiver for children without center-based childcare by birth cohort and age group

|                        | 2001 cohort | 2010 cohort |
|------------------------|-------------|-------------|
|                        | 3-year      | 4-year      | 3-year      |
| Mother                 | 92.7        | 90.2        | 95.6        |
| Father                 | 0.1         | 0.5         | 0.6         |
| Grandmother (maternal)| 2.4         | 1.9         | 2.1         |
| Grandfather (maternal)| 0.2         | 0.2         | 0.1         |
| Grandmother (paternal)| 2.0         | 2.6         | 1.2         |
| Grandfather (paternal)| 0.1         | 0.2         | 0.1         |
| Others                 | 2.5         | 4.4         | 0.4         |

Note: Numbers are percentages.
Table 5. Crude odds ratios with 95% confidence intervals for the associations between parental, child, and environmental factors and non-use of center-based childcare with the 2001 and 2010 cohorts and age group

|                                | 2001 cohort | 2010 cohort |
|--------------------------------|-------------|-------------|
|                                | 3-year cOR (95% CI) | 4-year cOR (95% CI) | 3-year cOR (95% CI) |
| **Parental factors**           |             |             |                         |
| **Income quintile**            |             |             |                         |
| 5th (highest)                  | Ref         | Ref         | Ref                     |
| 4th                            | 1.56 (1.38, 1.78)* | 1.28 (1.02, 1.60)* | 1.66 (1.40, 1.96)* |
| 3rd                            | 1.74 (1.54, 1.98)* | 1.46 (1.17, 1.82)* | 2.08 (1.76, 2.46)* |
| 2nd                            | 1.91 (1.68, 2.17)* | 1.44 (1.15, 1.80)* | 2.48 (2.11, 2.92)* |
| 1st (lowest)                  | 1.82 (1.59, 2.09)* | 1.86 (1.49, 2.33)* | 3.14 (2.67, 3.69)* |
| **Mother’s education**         |             |             |                         |
| 4-year college or greater      | 0.77 (0.82, 5.58)* | 1.09 (0.89, 1.35) | 0.76 (0.67, 0.86)* |
| Junior college                | Ref         | Ref         | Ref                     |
| High school                   | 1.29 (1.19, 1.41)* | 1.20 (1.03, 1.40)* | 1.49 (1.33, 1.66)* |
| Junior high school            | 1.60 (1.32, 1.93)* | 1.66 (1.22, 2.28)* | 1.75 (1.40, 2.19)* |
| Others                        | 2.14 (0.82, 5.58)* | 2.34 (0.54, 10.14) | 0.37 (0.09, 1.52) |
| **Mother’s employment status**|             |             |                         |
| Not employed                  | Ref         | Ref         | Ref                     |
| Self-employed                 | 0.41 (0.33, 0.50)* | 0.55 (0.39, 0.79)* | 0.43 (0.33, 0.56)* |
| Part-time employed            | 0.33 (0.28, 0.40)* | 0.39 (0.28, 0.54)* | 0.28 (0.23, 0.34)* |
| Full-time employed            | 0.18 (0.15, 0.21)* | 0.22 (0.16, 0.30)* | 0.18 (0.15, 0.22)* |
| Others                        | 0.60 (0.30, 1.23) | 0.79 (0.25, 2.52) | 0.33 (0.12, 0.91)* |
| **Household structure**       |             |             |                         |
| Two parents (two-generation)  | Ref         | Ref         | Ref                     |
| Two parents (three-generation)| 0.75 (0.68, 0.83)* | 0.72 (0.59, 0.87)* | 0.96 (0.84, 1.09) |
| Single parent (two-generation)| 0.52 (0.29, 0.93)* | 0.78 (0.32, 1.91) | 1.40 (0.55, 3.55) |
| Single parent (three-generation) | 0.52 (0.32, 0.85)* | 1.52 (0.86, 2.69) | 0.75 (0.33, 1.71) |
| **Number of siblings**        |             |             |                         |
| 0                              | Ref         | Ref         | Ref                     |
| 1                              | 0.90 (0.83, 0.98)* | 0.88 (0.76, 1.03) | 1.11 (1.00, 1.23) |
| 2                              | 1.21 (1.07, 1.37)* | 1.24 (1.00, 1.52)* | 1.44 (1.25, 1.66)* |
| ≥3                            | 1.39 (1.08, 1.79)* | 1.72 (1.16, 2.55)* | 1.66 (1.25, 2.20)* |
| **Nationality of parents**    |             |             |                         |
| Japanese                      | Ref         | Ref         | Ref                     |
| Foreign national              | 1.03 (0.79, 1.33) | 1.70 (1.18, 2.46)* | 1.40 (1.05, 1.86)* |
| **Concerns over child rearing** |            |             |                         |
| Little                        | Ref         | Ref         | Ref                     |
| Some                          | 0.87 (0.81, 0.95)* | 0.86 (0.74, 0.99)* | 0.89 (0.81, 0.98)* |
| Much                          | 0.78 (0.63, 0.95)* | 1.07 (0.78, 1.47) | 1.11 (0.90, 1.37) |
| **Child factors**             |             |             |                         |
| Child’s sex                   |             |             |                         |
| Boy                           | Ref         | Ref         | Ref                     |
| Girl                          | 1.11 (1.02, 1.20)* | 1.15 (1.00, 1.32)* | 1.02 (0.93, 1.12) |
| **Preterm birth**             |             |             |                         |
| Full-term                     | Ref         | Ref         | Ref                     |
| Moderately preterm           | 1.14 (0.95, 1.38) | 1.91 (1.47, 2.49)* | 1.17 (0.95, 1.45) |
|                                | 1.22 (0.73, 2.05) | 2.02 (0.97, 4.20) | 2.36 (1.53, 3.64)* |
|--------------------------------|-----------------|-----------------|-----------------|
| **Congenital diseases**        |                 |                 |                 |
| Without                        | Ref             | Ref             | Ref             |
| With                           | 1.27 (0.89, 1.81)| 0.88 (0.43, 1.79)| 1.55 (1.17, 2.05)*|
| **Developmental delay**        |                 |                 |                 |
| Without                        | Ref             | Ref             | Ref             |
| With                           | 1.19 (1.07, 1.34)*| 1.25 (1.03, 1.51)*| 1.64 (1.46, 1.85)*|
| **Environmental factors**      |                 |                 |                 |
| **Size of residential area**   |                 |                 |                 |
| County                         |                 |                 |                 |
| Small-to-medium city           | 1.34 (1.20, 1.49)*| 1.34 (1.10, 1.63)*| 1.04 (0.90, 1.21) |
| Large city                     | 1.26 (1.11, 1.44)*| 1.40 (1.12, 1.76)*| 0.85 (0.72, 0.99)* |
| Foreign country                | —               | —               | —               |
| **Region**                     |                 |                 |                 |
| Hokkaido                       | 1.45 (1.21, 1.75)*| 1.62 (1.20, 2.19)*| 1.07 (0.83, 1.38) |
| Tohoku                         | 1.17 (1.02, 1.36)*| 1.36 (1.07, 1.73)*| 1.28 (1.07, 1.54)* |
| Kanto                          | Ref             | Ref             | Ref             |
| Chubu                          | 0.15 (0.13, 0.18)*| 0.20 (0.14, 0.28)*| 0.32 (0.27, 0.39)* |
| Kansai                         | 1.26 (1.13, 1.40)*| 1.28 (1.07, 1.54)*| 1.80 (1.60, 2.03)* |
| Chugoku                        | 0.82 (0.69, 0.98)*| 0.87 (0.64, 1.19)| 1.24 (1.03, 1.50)* |
| Shikoku                        | 0.50 (0.38, 0.67)*| 0.47 (0.27, 0.83)*| 0.79 (0.58, 1.08) |
| Kyushu/Okinawa                 | 0.88 (0.76, 1.00) | 0.94 (0.74, 1.20) | 0.88 (0.74, 1.04) |
| Foreign country                | —               | —               | —               |

CI, confidence interval; cOR, crude odds ratio.
eAppendix 1. Three types of center-based childcare in Japan

The Japanese system of early childhood education and care (ECEC) and the cultural context are different from those in the European countries and the United States. In Japan, two types of center-based ECEC programs have been institutionalized by the government and have been the main source of non-parental childcare. These programs receive public funding if facilities fulfill the standards set by the national and local governments. The first type, known as Hoiku-En, is administered under the Ministry of Health, Labour and Welfare, and a full-day program is provided for children between the ages of 0 and 6. Because this type is considered to be a welfare program for working parents, the fee is on a sliding scale according to their household income, meaning lower fees for families with lower income. Families that receive public assistance can enroll their children in the program for free and are often given a high priority for enrollment. The second type, known as Youchi-En, is administered under the Ministry of Education, Culture, Sports, Science and Technology, and a half-day program is provided for children between the ages of 3 and 6. The third type, known as Kodomo-En, was institutionalized in 2006 and is administered under the Cabinet Office. This type is a hybrid of the first two types and provides a full-day or half-day program for children between the ages of 0 and 6.

Because the programs need to comply with standards set by the government in order to receive public funding, the minimum quality of education and care is likely to be maintained among licensed facilities though great variability in quality is most likely to be present. Although the availability of center-based childcare has been a problem for working mothers in metropolitan areas such as Tokyo, the issue of short supply has been limited to
children under the age of 2 because of the teacher-child ratio: 6 or fewer children for one teacher for the child’s age of 2 and 20 or more children for one teacher for the child’s age of 3 or above. In other words, the availability of center-based childcare for children above the age of 3 years is not likely to be a problem. Other types of ECEC in Japan, such as childcare for a small number of children by a professional childminder/baby-sitter at one’s home, have been rare in Japan.