Impact evaluation of baby books project on unintentional injuries

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1. Introduction and methodology

There is a concern that children’s unintentional injuries may be one of the most costly factors to the society, and that parents especially mothers should therefore try to improve their parenting skills and protect their kids from getting preventable injuries. One potential approach is that of educational books, which give out safety knowledge and focus on whether reading may have critical influence on child protection.

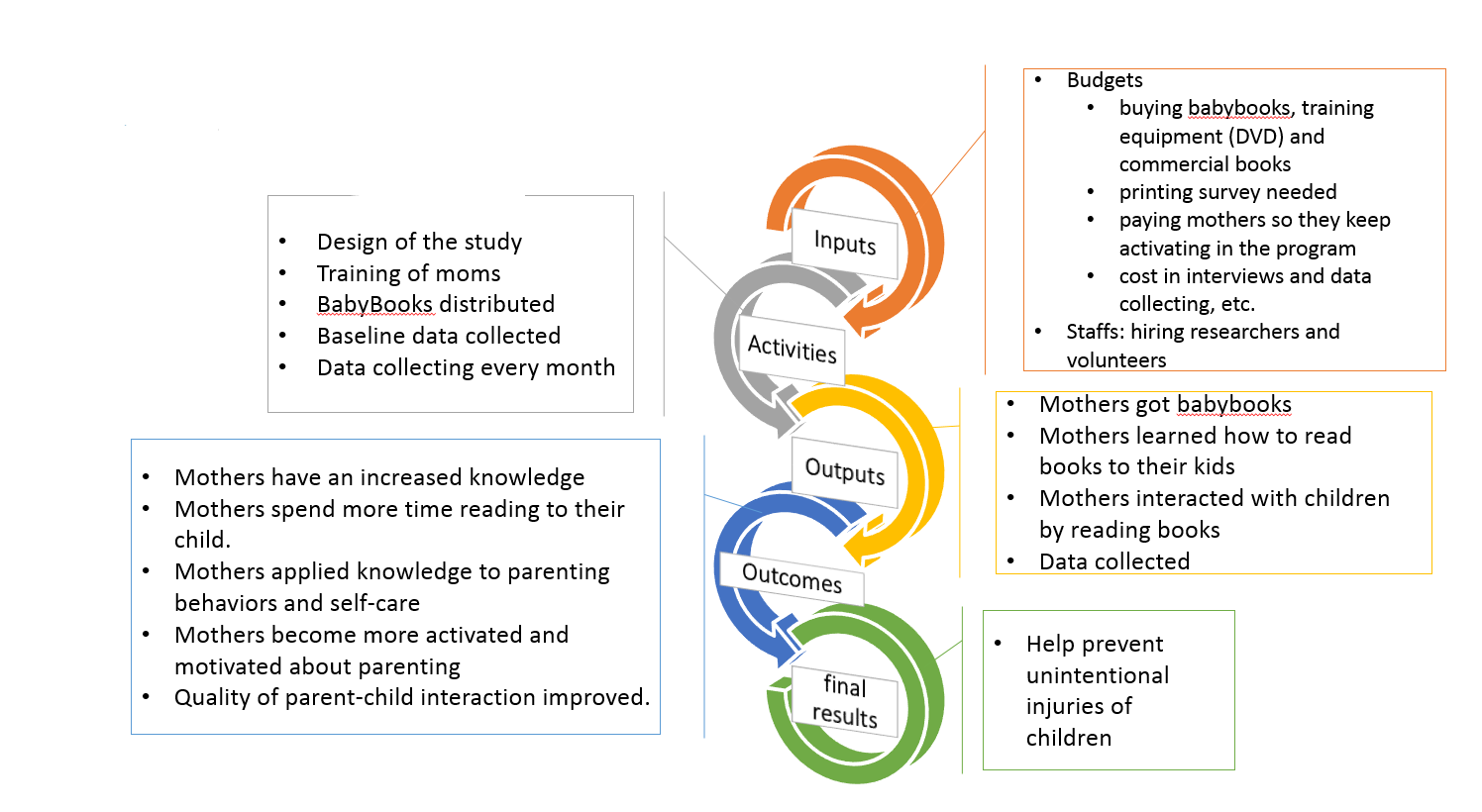
Baby book program, targeting at the relevant anticipatory guidance about physical, cognitive, socio-emotional development, safety, nutrition, crying, and sleep, were conducted. The study were designed to educate first-time young mothers on children development and injuries prevention. The intervention books, also referred as the Baby books, are given to mothers at prenatal period, and when the baby is 2, 4, 6, 9, and 12 months of age dealing with unique age-relevant parenting issues. These books contain pictures and text about child safety and development and point out specific content hiding behind certain child behaviors. In order to test if reading, regardless of types of books, also benefit parent-child interaction and help reduce unintentional injuries, the study introduced the commercial books as one of control groups. However, the commercial books are not designed to contain anticipatory guidance as the baby books do, which is provided by clinical providers during routine well-child examinations and covers both injury prevention and health promotion. Thus the intervention books are expected to have a critical difference in mothers’ knowledge and parenting behavior as well as better children health outcome.

Primiparious women in their third trimester of pregnancy will be recruited for the study. All visible pregnant women inside waiting room of Vanderbilt hospital were invited to join the program. A total of 180 women participants were given a pilot research. Based on the characteristic shown in this survey, researchers were able to exclude those women who are not eligible and who refused to provide information. In order to minimizing differential attrition, the background information had been collected during this process before they were randomly assigned to different study groups. In the end, only 167 out of 180 women remained in the program and were divided into three different study groups. 53 of them were assigned to the baby book group while 56 of them were in the commercial book group and the remaining 58 in the no book group. Data were collected through 7 face to face home visits during prenatal and when the child is 2, 4, 6, 9, 12, 18 months old respectively and approximately every months through random phone call visits.

The mothers in the intervention groups were asked to read the baby book to their kids at least once a day. In order to insure effective and attractive reading process, mothers were trained. At the completion of each data collection home visit, mothers were given a new baby book and shown a video that demonstrated how to read that book to children at similar age with proper speed, soft voice and physical interaction. Although the control groups were having different reading condition, this instruction above were also shown to them and thus the researchers were able to remain data collection time intervals, payment, and the amount of researcher contact being equivalent among all groups.

Based on this program, our group has made a ITT as well as a TOT analysis on whether this intervention significantly reduced children’s unintentional injuries. There are two main questions in our study. Did the baby books actually help increasing mothers’ safety knowledge? And did the baby books result in visibly less preventable injuries compares to both commercial books and no books?

First of all we compares baseline characteristic among groups and are able to find internal validity of the study. Based on the t-tests, only a few characteristics are significantly different by groups, which is saying that the control groups will serve as a good counterfactual in our cost-effectiveness analysis. But we also observed that commercial books group and no books group are not very much identical. And in order to create a better counterfactual, we merge these two control groups and randomly selected approximately half out to be a new control group. In the following sector we will show the randomization process and how it works on better internal validity.

 Secondly, we are able to catalog 4 types of injuries which includes doctor visit, hospital stays, emergency visit and other injuries. Based on the data, we find that few observations show up in the first three types and thus fail to show observable differences among groups. However, the other injuries, which includes all accidents not severe enough for mothers to ask for professional medical help, are applied as dependent variable since it better meets concerns of sufficiency and comparability between groups.

Thirdly, we form a result chain which should implies all logical relationship linking the baby book intervention and our outcome of interest. As it is shown blow, our analysis starts with inputs which contains budget and staffing. Except budget in book preparation and data collection, money were also used as motivation for positive participation. Activities are those implantation that coverts inputs into useful outputs. In the study, we find five major activities all of which have been discussed above. As for the outputs, we focus more on mothers’ action to see if the intervention lead to a change in parenting behavior directly. And if applied properly, the information in the book as well as the book itself should have several proximal outcomes: 1) mothers learned more about anticipatory knowledge; 2) mothers spend time reading and accompany their kids; 3) mothers find information useful and actually apply this knowledge to parenting behaviors and self-care; 4) mothers may become more activated and motivated in childhood development since the books help them get rid of parenting problems and make the process more enjoyable; 5) mothers finds joy and so are the babies, thus, a higher quality of parent-child interaction should definitely occur. In the end we are able to say that with the improvement in anticipatory knowledge and also in parenting behavior, mothers should be able to prevent the unintentional injuries and we may see an observable drop of injuries reports.

Finally, we use stata software to run regressions to see the relationship between the baby book project and unintentional injuries. As in the first ITT(intention-to-treat) estimate approach using baby book group as treatment group and new merged control group, we are able to find a significantly negative effect saying that baby book group has a visibly lower injuries outcome. Time is also a significant variable in the estimate which means the injuries increases slightly as time goes on. This may because of that babies are more likely to get hurt when they grow up and become able to crawl and move by themselves. Apart from time, we find three baseline factors that somehow correlated with our outcomes, which are employment situation, public assistance acceptance and household financial dependence. And in the second ITT estimate, we find that the baby book project has a significantly positive effect on parenting knowledge, which meet our assumption that reading book is a effective way to educate mothers, and that the type of books also shows critical difference in knowledge outcome. Thus we are confident to use knowledge as an instrument variable for group assignment and able to conduct a TOT regression. In the TOT (treatment on the treated) estimate, knowledge has a negative effect on injuries, however, we fail to find a significant result in knowledge in any models. Thus we conclude that with a better access to parenting and safety knowledge, mothers are able to reduce more of children’s preventable injuries and that more data and researches are needed to prove that this outcome does not exist by chance.

1. Data description
   1. Sample size at different ages of babies.

In order to explore relationship between time-varying variables and outcome of interest, simplifying the variable, time, and reviewing how many observations researchers have done at different time period should be our first task. Count the subtraction between the date when implementing interviews and date of birth of each baby interviewed in days, and then make it divided by 30.4, which is the average days per month in a year, so as to gain the baby’s age in months. Next, round the month value we got to the nearest integer in the previous step, and then we get the table as below, showing observation size at different baby ages in months. Some baby samples received multiple interviews within a month, resulting in a frequency of more than original 167 samples at some certain months. The last sample, who received interview at the age of 18.62, has been rounded to 19 months. We merged those repeated samples when doing regression. See that the number of observations are significantly more at baby’s age of 2, 4, 6, 9, 12 and 18 than at other ages, for researchers made home visit for collecting data and upgrading new baby books for mothers in these months. There were a certain number of samples quitting the research on the half way for various reasons, which might cause bias for the regression outcome. Further explanations proving internal validity will be given.

Table Number of observations at different baby's ages

* 1. Description of characteristics at baseline for each group.

All observations have been divided into three groups. The intervention group with baby books consists of 53 samples. The first comparison group with commercial books consists of 56 samples. The second comparison group with no books consists of 58 samples.

Select 29 variables from background questionnaire, and describe them by groups at baseline. Tables below shows the cross-sectional dataset for each group and the entire samples including individual information and time fixed variables collected at baseline. Values of Obs stands for the number of answers collected at all time periods, but only baseline data was chosen to count the mean value and standard deviation.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Intervention Group | | | Commercial Group | | | No Books Group | | | Total | | |
| label | Obs | Mean | Std. Dev. | Obs | Mean | Std. Dev. | Obs | Mean | Std. Dev. | Obs | Mean | Std. Dev. |
| Current health | 331 | 2.10 | 0.98 | 350 | 2.14 | 0.93 | 379 | 2.25 | 0.91 | 1060 | 2.17 | 0.94 |
| Weekly spending on child care | 136 | 38.18 | 43.80 | 148 | 37.68 | 45.45 | 167 | 55.36 | 73.39 | 451 | 44.38 | 57.52 |
| Main job: weeks worked for pay in last month | 297 | 1.95 | 1.87 | 325 | 2.11 | 1.90 | 359 | 2.13 | 1.87 | 981 | 2.07 | 1.88 |
| Hours worked in past 7 days | 360 | 26.46 | 14.86 | 423 | 29.21 | 16.06 | 496 | 30.10 | 14.86 | 1279 | 28.78 | 15.33 |
| Hourly rate of pay in past 7 days | 339 | 10.25 | 8.16 | 399 | 9.70 | 5.42 | 467 | 11.88 | 8.11 | 1205 | 10.70 | 7.40 |
| Family income last year | 73 | 3.51 | 2.66 | 67 | 3.34 | 2.42 | 72 | 4.57 | 3.21 | 212 | 3.82 | 2.83 |
| Maternal age | 700 | 23.45 | 5.01 | 754 | 22.49 | 4.44 | 885 | 23.81 | 4.48 | 2339 | 23.28 | 4.66 |
| Public assistance programs | 331 | 85% |  | 347 | 83.57% |  | 377 | 74.01% |  | 1055 | 80.66% |  |
| Spanish/Hispanic | 685 | 5% |  | 754 | 9.42% |  | 885 | 9.04% |  | 2324 | 8.09% |  |
| Home with healthy baby | 322 | 77.02% |  | 320 | 87.50% |  | 377 | 80.11% |  | 1019 | 81.45% |  |
| Home with sick baby | 322 | 0.62% |  | 320 | 0.94% |  | 377 | 3.18% |  | 1019 | 1.67% |  |
| Family/personal obl | 322 | 9.94% |  | 320 | 4.69% |  | 377 | 10.88% |  | 1019 | 8.64% |  |
| Personal medical | 322 | 1.86% |  | 320 | 1.56% |  | 377 | 3.18% |  | 1019 | 2.26% |  |
| Social Security limits | 322 | 0.31% |  | 320 | 1.88% |  | 377 | 0.00% |  | 1019 | 0.69% |  |
| Laid off | 322 | 4.97% |  | 320 | 4.38% |  | 377 | 6.90% |  | 1019 | 5.50% |  |
| Not enough work | 322 | 0.93% |  | 320 | 2.81% |  | 377 | 3.98% |  | 1019 | 2.65% |  |
| New job about to begin | 322 | 8.39% |  | 320 | 8.13% |  | 377 | 5.57% |  | 1019 | 7.26% |  |
| Looking for better job | 322 | 22.98% |  | 320 | 24.69% |  | 377 | 25.73% |  | 1019 | 24.53% |  |
| School/training | 322 | 25.47% |  | 320 | 19.69% |  | 377 | 18.04% |  | 1019 | 20.90% |  |
| Civic/military duty | 322 | 0.31% |  | 320 | 0.00% |  | 377 | 0.00% |  | 1019 | 0.10% |  |
| Other | 322 | 7.14% |  | 320 | 8.13% |  | 377 | 11.67% |  | 1019 | 9.13% |  |
| Whetherthe primary caregiver | 277 | 98.19% |  | 294 | 99.66% |  | 320 | 97.50% |  | 891 | 98.43% |  |
| Whether the pregnancy are planned | 53 | 11% |  | 56 | 17.86% |  | 58 | 29.31% |  | 167 | 19.76% |  |
| Baby's gender （Male=1) | 98 | 61% |  | 107 | 50.47% |  | 111 | 48.65% |  | 316 | 53.16% |  |

Table 2 Characteristics description at base line--part 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | intervention group | commercial group | no books group | merged group | total |
| Highest grade | | | | | |
| Some high school | 9.43% | 17.86% | 8.62% | 13.16% | 11.98% |
| Completed high school or GED | 33.96% | 26.79% | 32.76% | 29.82% | 31.14% |
| Some college but no degree | 22.64% | 37.50% | 27.59% | 32.46% | 29.34% |
| Associate degree | 16.98% | 8.93% | 15.52% | 12.28% | 13.77% |
| Bachelor degree | 15.09% | 7.14% | 1.72% | 4.39% | 7.78% |
| Some graduate school | 0.00% | 0.00% | 1.72% | 0.88% | 0.60% |
| Graduate degree | 1.89% | 1.79% | 12.07% | 7.02% | 5.39% |
| Marital status | | | | | |
| Never married/single | 67.92% | 73.21% | 60.34% | 66.67% | 67.07% |
| Now married | 15.09% | 12.50% | 24.14% | 18.42% | 17.37% |
| Living as married | 11.32% | 8.93% | 8.62% | 8.77% | 9.58% |
| Widowed | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Divorced | 3.77% | 0.00% | 3.45% | 1.75% | 2.40% |
| Seperated | 1.89% | 5.36% | 3.45% | 4.39% | 3.59% |
| Employment situation | | | | | |
| Full time job | 1.89% | 3.57% | 13.79% | 8.77% | 6.59% |
| Part time job | 11.32% | 14.29% | 6.90% | 10.53% | 10.78% |
| Working in home not for pay | 1.89% | 1.79% | 5.17% | 3.51% | 2.99% |
| Unemployed | 69.81% | 66.07% | 53.45% | 59.65% | 62.87% |
| Disabled/Not working | 5.66% | 3.57% | 6.90% | 5.26% | 5.39% |
| Other | 5.66% | 7.14% | 10.34% | 8.77% | 7.78% |
| Both full&part time job | 3.77% | 3.57% | 3.45% | 3.51% | 3.59% |
| Financially dependent | | | | | |
| Mostly on you | 3.77% | 3.57% | 8.62% | 6.14% | 5.39% |
| Equally on you&other person | 11.32% | 23.21% | 20.69% | 21.93% | 18.56% |
| Mostly on someone else | 83.02% | 73.21% | 70.69% | 71.93% | 75.45% |
| Other, Specify | 1.89% | 0.00% | 0.00% | 0.00% | 0.60% |
| Race | | | | | |
| African american or black | 66.04% | 62.50% | 50.00% | 56.14% | 59.28% |
| American indian or alaskan native | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Asian | 0.00% | 1.79% | 0.00% | 0.88% | 0.60% |
| Caucasian or White | 24.53% | 26.79% | 37.93% | 32.46% | 29.94% |
| Native Hawaiian or others pacific islands | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Other | 3.77% | 8.93% | 6.90% | 7.89% | 6.59% |
| Multi-ethnic | 5.66% | 0.00% | 5.17% | 2.63% | 3.59% |

Table 3 Characteristics description at baseline -- part 2

Health status. Pregnant women in all three groups have an average of very good health status, with average points of 2.1, 2.14, 2.25, where 2 represents very good and 3 represents good.

Financial condition. Samples in group 3 have a relatively better financial condition than other 2 groups, with longer weekly working hours, higher hourly rate of pay, higher family income, lower proportion of receiving public assistance program and higher weekly spending on their child care. Specially, family income of group 3 is 4.57 thousands, while income of other 2 two groups are 3.51 and 3.34. Weekly spending on child care is 55.36 in group 3 while 38.18, 37.68 in other two groups.

Maternal age and Spanish/Hispanic proportion are similar.

Unemployment rate. Group 3 has a much lower unemployment rate of 50%, while other 2 groups have a unemployment rate of 69.81%, 66.07%. As for the reasons for not employment, mostly it is because they have to be home taking care of healthy babies. Plus, looking for a better job and receiving school or training are also main reasons for not employment. They are similar.

Group 1 has a higher baby gender imbalance.

Marital status. All three groups have similar marital status, and nearly 2/3 of them are never married or single.

Education level. Group 3 holds a higher proportion of graduate degree while group 1 holds a higher proportion of bachelor degree. Education level is higher for group 3.

In a word, at baseline, pregnant women in group are highly educated, have better financial status, lower unemployment rate. Group 3 is quite different from others in many characteristics. That might result in some negative influence on outcome if we do not make any adjustments, for we can assume that higher sample quality would cause lower baby injuries naturally.

* 1. Validity analysis.

The intervention has a valid counterfactual, as both external validity and internal validity can be explained. Plus, variables between attrition group and non-attrition group can be proved of no significant difference.

External validity. Basing on data we hold on, it is not enough to prove external validity, since we do not have population characteristics at baseline that should have been compared to samples group selected from clinic waiting room. However, we assume that pregnant women in this area randomly go to the Vanderbilt clinic and interviewees selected can represent the whole population.

Internal validity. They are randomly assigned to three groups, treatment group with baby books, comparison group with commercial books and comparison group with no books. We make t-tests for selected characters based on the background questionnaire between each two groups to ensure that every two groups have similar baseline characters. Data is showed as below.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Group 1 and 2 | | Group 1 and 3 | | Group 2 and 3 | | Group 1 and merged Group | |
| Label | t | P(|T|<|t|) | t | P(|T|<|t|) | t | P(|T|<|t|) | t | P(|T|<|t|) |
| Highest grade completed in school | 2.84 | 0.9977\*\*\* | -2.57 | 0.0052 | -5.05 | 0 | -2.28 | 0.0114 |
| Current maternal health | -0.63 | 0.2643 | -2.09 | 0.0185 | -1.50 | 0.0666 | 0.50 | 0.6924 |
| Current Marital Status | -0.60 | 0.2752 | -3.86 | 0.0001 | -2.93 | 0.0018 | -3.73 | 0.0001 |
| Current Employment Situation | 1.68 | 0.9532\*\* | 3.00 | 0.9986\*\*\* | 1.24 | 0.8932 | 3.65 | 0.9999\*\*\* |
| Reasons for not employment |  |  |  |  |  |  |  |  |
| Home with healthy baby | -3.50 | 0.0002 | -0.99 | 0.1606 | 2.63 | 0.9956\*\*\* | -1.37 | 0.0861 |
| Home with sick baby | -0.46 | 0.3245 | -2.42 | 0.008 | -2.04 | 0.0209 | -1.46 | 0.0724 |
| Family/personal obl | 2.56 | 0.9947\*\*\* | -0.40 | 0.3434 | -3.01 | 0.0014 | 0.62 | 0.7313 |
| Personal medical | 0.29 | 0.6153 | -1.10 | 0.1364 | -1.38 | 0.0837 | -1.31 | 0.0958 |
| Social Security limits | -1.91 | 0.0282 | 1.08 | 0.8602 | 2.68 | 0.9962\*\*\* | -1.71 | 0.0439 |
| Laid off | 0.36 | 0.639 | -1.07 | 0.1429 | -1.43 | 0.0771 | -0.23 | 0.408 |
| Not enough work | -1.76 | 0.0394 | -2.54 | 0.0056 | -0.84 | 0.2004 | -0.50 | 0.3075 |
| New job about to begin | 0.12 | 0.5476 | 1.47 | 0.9286\* | 1.34 | 0.9097\* | 0.29 | 0.6157 |
| Looking for better job | -0.51 | 0.3063 | -0.84 | 0.2001 | -0.32 | 0.3764 | 0.31 | 0.6231 |
| School/training | 1.75 | 0.9599\*\* | 2.39 | 0.9915\*\*\* | 0.56 | 0.7105 | 1.42 | 0.9223\* |
| Civic/military duty | 1.00 | 0.8404 | 1.08 | 0.8602 | . | . | 1.08 | 0.8589 |
| Other | -0.47 | 0.32 | -2.03 | 0.0214 | -1.55 | 0.0605\* | -1.06 | 0.1438 |
| Whether the mother is the primary caregiver or not | -1.72 | 0.0432 | 0.58 | 0.7187 | 2.23 | 0.9869\*\* | 0.02 | 0.5068 |
| Weekly spending on child care | 0.09 | 0.5375 | -2.40 | 0.0084 | -2.53 | 0.0059 | -1.17 | 0.1223 |
| Main job: weeks worked for pay in last month | -1.05 | 0.1473 | -1.22 | 0.1118 | -0.14 | 0.4456 | -1.40 | 0.0806 |
| Hours worked in past 7 days | -2.47 | 0.0068 | -3.54 | 0.0002 | -0.87 | 0.1919 | -3.47 | 0.0003 |
| Hourly rate of pay in past 7 days | 1.09 | 0.8627 | -2.81 | 0.0025 | -4.57 | 0 | -1.75 | 0.04 |
| Family income last year | 0.38 | 0.6476 | -2.17 | 0.0157 | -2.53 | 0.0062 | -1.78 | 0.0384 |
| public assistance programs | 0.58 | 0.7192 | 3.69 | 0.9999\*\*\* | 3.15 | 0.9992\*\*\* | 2.69 | 0.9963\*\*\* |
| On whom does family financially depend | 2.62 | 0.9955\*\*\* | 2.90 | 0.9981\*\*\* | 0.37 | 0.6352 | 2.84 | 0.9977\*\*\* |
| race | -1.64 | 0.0506 | -7.54 | 0 | -5.99 | 0 | -6.57 | 0 |
| Spanish/Hispanic | -2.89 | 0.0019 | -2.73 | 0.0032 | 0.26 | 0.6036 | -3.43 | 0.0003 |
| maternal age | 3.86 | 0.9999\*\*\* | -1.53 | 0.0627 | -5.98 | 0 | -0.10 | 0.4614 |
| Whether the pregnancy are planned | -0.96 | 0.1699 | -2.37 | 0.0097 | -1.44 | 0.0766\* | -2.03 | 0.0223 |
| Baby's gender | 1.55 | 0.9387\* | 1.83 | 0.9655\*\* | 0.27 | 0.6053 | 1.40 | 0.9192\* |

Table 4 T-test results for every 2 groups

As we can see, there are 4, 4 and 3 baseline characteristics of significant difference at 1% significance level between group 1 and group 2, group 1 and group 3, group 2 and group 3, respectively. Even though most variables can be considered similar between every two groups, meaning that the three groups might have similar baseline characteristics, we try merging group 2 and group 3 to see if the differences between treatment group and the newly merged comparison group would be less significant. Meanwhile, the conclusion made at previous part that group 3 is quite different from other 2 groups, also makes it necessary to generate a new comparison group more comparable to treatment group.

Use the random function of Excel to generate random value between 0 and 1 and attribute them to every observation in group 2 and group 3. Those getting random value more than 0.5 were selected as the newly merged comparison group. Finally, we randomly selected 61 observations of 124 samples as the new comparison group. Then do the t-test for every characteristic between treatment group and merged group, and the table above also shows the result. As we can see, 3 variables show significant different and that means, the newly merged group is comparable to group 1 at baseline and it can be a good counterfactual.

Attrition. Notice that there were some mothers having quitted research on the half way as showed below. At baby’s age of 18 months, 9, 9 and 4 mothers quitted research in group1, group 2 and group 3, respectively. Making sure that people randomly quitted research is important, or it would cause bias on outcome. So put the 22 quitted mothers into attrition group, and others as non-attrition group, and do T-test for characteristics between attrition group and non-attrition group at baseline. Results are presented as below. No variables show significant different between attrition group and non-attrition group at baseline, even at 10% significant level. Therefore, people randomly quitted research and no potential bias will be caused by attrition on the outcome.



Table 5 Number of participants at every baby's monthly age

|  |  |  |
| --- | --- | --- |
| Label | t-value | P(|T|<|t|) |
| Highest grade completed in school | -2.0016 | 0.0235 |
| Current maternal health | -0.4525 | 0.3257 |
| Current Marital Status | -0.5311 | 0.298 |
| Current Employment Situation | -0.0743 | 0.4704 |
| Reasons for not employment |  |  |
| Home with healthy baby | 1.0633 | 0.8545 |
| Home with sick baby |  |  |
| Family/personal obl | 0.4768 | 0.6826 |
| Personal medical | -0.8863 | 0.1891 |
| Social Security limits |  |  |
| Laid off | -0.2975 | 0.3835 |
| Not enough work | -0.6757 | 0.2507 |
| New job about to begin | -0.6757 | 0.2507 |
| Looking for better job | 1.2835 | 0.8984 |
| School/training | 0.7633 | 0.7762 |
| Civic/military duty | -0.3842 | 0.351 |
| Other | -0.3668 | 0.3574 |
| Main job: weeks worked for pay in last month | -1.2625 | 0.1044 |
| Hours worked in past 7 days | -0.3495 | 0.3638 |
| Hourly rate of pay in past 7 days | -0.0948 | 0.4624 |
| Family income last year | -0.166 | 0.4342 |
| public assistance programs | 1.1687 | 0.8779 |
| On whom does family financially depend | 0.6877 | 0.7537 |
| race | 0.7248 | 0.7652 |
| Spanish/Hispanic | 0.1184 | 0.547 |
| maternal age | -1.2942 | 0.0987 |
| Whether the pregnancy are planned | -0.1984 | 0.4215 |

Table 6 T-test results for characteristics between attrition group and non-attrition group at baseline

* 1. Description of Different Injuries Types

As mentioned before, based on Interview, data of unintended injuries comes from four sources: whether the children went to emergency room, hospital stay, doctor visit, and suffer other injuries. We conduct analysis descripting data on each source by different injury types and study group based on numbers of children.

|  |  |  |  |
| --- | --- | --- | --- |
| Type | Study Group | | |
|  | 1 | 2 | 3 |
| fall | 30.0% | 36.1% | 29.5% |
| burn | 0.0% | 2.8% | 3.3% |
| cut | 3.3% | 0.0% | 0.0% |
| strike | 10.0% | 2.8% | 1.6% |
| other | 16.7% | 16.7% | 23.0% |
| accidents | 40.0% | 41.7% | 42.6% |
| choke | 0.0% | 0.0% | 0.0% |
| car | 0.0% | 0.0% | 0.0% |
| drown | 0.0% | 0.0% | 0.0% |
| break bone | 0.0% | 0.0% | 0.0% |
| spank | 0.0% | 0.0% | 0.0% |
| shake | 0.0% | 0.0% | 0.0% |
| Total | 100.0% | 100.0% | 100.0% |

*Table 7 Relative Frequency of Different Injuries Types in “Other Injuries”*

From the table above, we can see in Other Injuries, other injuries are approximately similarly distributed in each study group. Looking into every type of injuries, accidents are reported highest numbers---more than 40% in each group. Meanwhile fall comes next, about 30% in each study group. However, such injury types like car accidents, drowning, breaking bones, spank or shake were reported zero, which means no babies in Other Injuries suffer those.

|  |  |  |  |
| --- | --- | --- | --- |
| Type | Study Group | | |
|  | 1 | 2 | 3 |
| fall | 0 | 3 | 0 |
| burn | 0 | 0 | 1 |
| cut | 0 | 1 | 0 |
| strike | 2 | 0 | 0 |
| choke | 2 | 0 | 0 |
| car | 0 | 0 | 0 |
| drown | 0 | 0 | 0 |
| sprain | 3 | 2 | 6 |
| other | 0 | 0 | 0 |
| spank | 0 | 0 | 0 |
| shake | 0 | 0 | 0 |
| Total | 7 | 6 | 7 |

*Table 8 Frequency of Different Injuries Types of “Emergency Room”*

|  |  |  |  |
| --- | --- | --- | --- |
| Type | Study Group | | |
|  | 1 | 2 | 3 |
| fall | 0.0% | 50.0% | 0.0% |
| burn | 0.0% | 0.0% | 14.3% |
| cut | 0.0% | 16.7% | 0.0% |
| strike | 28.6% | 0.0% | 0.0% |
| choke | 28.6% | 0.0% | 0.0% |
| car | 0.0% | 0.0% | 0.0% |
| drown | 0.0% | 0.0% | 0.0% |
| sprain | 42.9% | 33.3% | 85.7% |
| other | 0.0% | 0.0% | 0.0% |
| spank | 0.0% | 0.0% | 0.0% |
| shake | 0.0% | 0.0% | 0.0% |
| Total | 100.0% | 100.0% | 100.0% |

*Table 9 Relative Frequency of Different Injuries Types of “Emergency Room”*

As for the case of Emergency Room, from the table above we find that sprain is the most common cause resulting into emergency room---42.9% in group1, 33.3% in group 2, and 85.7% in the third group. However, since we can see from table 8 that observations of unintentional injuries resulting into Emergency Room is deficient, we therefore lack the data to claim anything further.

As for Hospital Stay, since there is only one case (StudyGroup 2, fall), we therefore do not take it into consideration. On the other hand, the data of Doctor Visit are gathered by numbers of injuries reported on every interview, instead of injury type, we therefore do not take it into consideration.



*Table 10 Numbers of Doctor Visit in Each Interview*

We cannot exclude the possibility of transfer, which means the babies transfer from one category to another. When digging into the data, we find there existing one case that the child first went to emergency room and then transferred to hospital. We pick it up and table some of the basic information below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Family ID | Study Group | Interview Date | Transfer from | Transfer to | Type of Injury |
| 1465 | 2 | 5/27/2008 | Emergency Room | Hospital Stay | Fall |

*Table 11 The Case of Transfer*

In conclusion, based on what we have mentioned in this part, there are some deficiencies about data in Hospital Stay, Emergency Room, and the data of Doctor Visit is not comparable to the data in other three categories, we therefore choose the data (138 observations) of Other Injuries to conduct our research.

* 1. Identify Control Variables

In earlier part, we test all the important variables by every two of all three study groups (see table 4). Based on results of t test, it is possible for us to identify control variables in ITT model. Here the significant variables at 5% significance level are listed below:

|  |  |  |
| --- | --- | --- |
| variable label | t | P(|T|<t) |
| Current employment situation | 3.65 | 0.9999\*\*\* |
| Family financially dependent | 2.84 | 0.9977\*\*\* |
| Public assistance programs | 2.69 | 0.9963\*\*\* |

\* *p* >0.9, \*\* *p* > 0.95, \*\*\* *p* >0.99

*Table 12 Significant Variables of T Test*

The statistically significant variables are listed under the result of ttest of study group 1 and the merged group. The three significant variables are: mother’s current employment situation, on whom the family financially depend, and public assistance programs. We therefore identify these variables as control variables and put them in the ITT regression model.

1. Regression outcomes and analysis

First, we do the ITT analysis with the merged group, in the model of

*Other\_Injury = ß0+ ß1StudyGrp+ß2time+ ß 3time\_tx. Then we get the regression result*

*Other Injury = 0.0107 + 0.0101Study Group + 0.00666time - 0.00281time\*StudyGroup*

We estimate the injuries in this model from time 0 to time 18, and we graph the trend of the estimates and the observations, which can be shown in graph 1.

|  |  |
| --- | --- |
|  | (1) |
|  | Other\_Injury |
| time | 0.00666\*\* |
|  | (3.02) |
|  |  |
| StudyGrp | 0.0101 |
|  | (0.28) |
|  |  |
| time\_tx | -0.00281 |
|  | (-0.85) |
|  |  |
| \_cons | 0.0107 |
|  | (0.44) |
| *N* | 1325 |

*t* statistics in parentheses

\* *p* < 0.05, \*\* *p* < 0.01, \*\*\* *p* < 0.001

Table 13 regression with merged group without control variables

|  |  |  |
| --- | --- | --- |
| **time** | **Control** | **Baby Books** |
| 0 | 0.011 | 0.021 |
| 1 | 0.017 | 0.025 |
| 2 | 0.024 | 0.029 |
| 3 | 0.031 | 0.032 |
| 4 | 0.037 | 0.036 |
| 5 | 0.044 | 0.040 |
| 6 | 0.051 | 0.044 |
| 7 | 0.057 | 0.048 |
| 8 | 0.064 | 0.052 |
| 9 | 0.071 | 0.055 |
| 10 | 0.077 | 0.059 |
| 11 | 0.084 | 0.063 |
| 12 | 0.091 | 0.067 |
| 13 | 0.097 | 0.071 |
| 14 | 0.104 | 0.075 |
| 15 | 0.111 | 0.079 |
| 16 | 0.117 | 0.082 |
| 17 | 0.124 | 0.086 |
| 18 | 0.131 | 0.090 |

Table 14 estimated within regression model without control variables

Graph 1 estimates without control variables

What we can see from this graph is that, at the baseline, there is only slight difference between the control group and the treatment group, where the treatment group has a bit higher injuries than the control group. As time passes by, the unintentional injuries in the control group grows much faster, when reaching the 18 months, there is a much higher injuries in the control group than the treatment group.

Then, we do the ITT in the merged groups with control variables, employment, financial dependent and public assistance in the model

*Other\_Injury = ß0+ß1employment+ß2publicass+ß3findepend+ß4StudyGrp+ß5time*

*+ ß 6time\_tx*

What we get from the regression is

*Other Injury = -0.0588 + 0.0450Employment + 0.0574Publicass + 0.0264Findepend + 0.00696StudyGroup + 0.00743time + 0.00235time\*study group*

First, we estimate the injuries in this model from time 0 to time 18 without considering the control variables, and graph the trend of the estimates without control variables.

Then, considering the model with the control variables, first, we estimate the injuries without the impact of the control variables, and we estimate the injuries with employment and public assistance, since the financial dependent is not significant, we do not take it into account. And we see the graph here, all the treatment groups grow slower than the control groups and we finally have a lower injuries in the treatment groups. And within employment and public assistance, we have a high injuries than without these variable, which is because mother with a job has less time to take care her baby and the mothers who own public assistance may be disable ones.

|  |  |
| --- | --- |
|  | (2) |
|  | Other\_Injury |
| time | 0.00743\*\*\* |
|  | (3.34) |
|  |  |
| employment | 0.0450\*\* |
|  | (2.81) |
|  |  |
| publicass | 0.0574\*\* |
|  | (2.62) |
|  |  |
| findepend | 0.0264 |
|  | (1.10) |
|  |  |
| StudyGrp | 0.00696 |
|  | (0.19) |
|  |  |
| time\_tx | -0.00235 |
|  | (-0.72) |
|  |  |
| \_cons | -0.0588\* |
|  | (-2.06) |
| *N* | 1325 |

*t* statistics in parentheses

\* *p* < 0.05, \*\* *p* < 0.01, \*\*\* *p* < 0.001

Table 15 regression with merged group with control variables

|  |  |  |
| --- | --- | --- |
| **time** | **Control** | **Babybook** |
| 0 | -0.059 | -0.052 |
| 1 | -0.051 | -0.047 |
| 2 | -0.044 | -0.042 |
| 3 | -0.037 | -0.037 |
| 4 | -0.029 | -0.032 |
| 5 | -0.022 | -0.026 |
| 6 | -0.014 | -0.021 |
| 7 | -0.007 | -0.016 |
| 8 | 0.001 | -0.011 |
| 9 | 0.008 | -0.006 |
| 10 | 0.015 | -0.001 |
| 11 | 0.023 | 0.004 |
| 12 | 0.030 | 0.009 |
| 13 | 0.038 | 0.014 |
| 14 | 0.045 | 0.019 |
| 15 | 0.053 | 0.024 |
| 16 | 0.060 | 0.029 |
| 17 | 0.067 | 0.035 |
| 18 | 0.075 | 0.040 |

|  |  |  |
| --- | --- | --- |
| **time** | **control with employment** | **Babybook with employment** |
| 0 | -0.014 | -0.007 |
| 1 | -0.006 | -0.002 |
| 2 | 0.001 | 0.003 |
| 3 | 0.008 | 0.008 |
| 4 | 0.016 | 0.013 |
| 5 | 0.023 | 0.019 |
| 6 | 0.031 | 0.024 |
| 7 | 0.038 | 0.029 |
| 8 | 0.046 | 0.034 |
| 9 | 0.053 | 0.039 |
| 10 | 0.060 | 0.044 |
| 11 | 0.068 | 0.049 |
| 12 | 0.075 | 0.054 |
| 13 | 0.083 | 0.059 |
| 14 | 0.090 | 0.064 |
| 15 | 0.098 | 0.069 |
| 16 | 0.105 | 0.074 |
| 17 | 0.112 | 0.080 |
| 18 | 0.120 | 0.085 |

Table 16 regression with merged group with control variables

Table 17 regression with merged group without control variables

|  |  |  |
| --- | --- | --- |
| **time** | **Control with publicassist** | **Babybook with publicassist** |
| 0 | -0.001 | 0.006 |
| 1 | 0.006 | 0.011 |
| 2 | 0.013 | 0.016 |
| 3 | 0.021 | 0.021 |
| 4 | 0.028 | 0.026 |
| 5 | 0.036 | 0.031 |
| 6 | 0.043 | 0.036 |
| 7 | 0.051 | 0.041 |
| 8 | 0.058 | 0.046 |
| 9 | 0.065 | 0.051 |
| 10 | 0.073 | 0.056 |
| 11 | 0.080 | 0.061 |
| 12 | 0.088 | 0.067 |
| 13 | 0.095 | 0.072 |
| 14 | 0.103 | 0.077 |
| 15 | 0.110 | 0.082 |
| 16 | 0.117 | 0.087 |
| 17 | 0.125 | 0.092 |
| 18 | 0.132 | 0.097 |

Table 18 regression with merged group without control variables

Graph 2 estimates with control variables

Then we do the itt with the original groups, in the model

*Other Injury = 0.296 - 0.146Group1 - 0.115Group2*

In this regression, we can see that group 1, with babybook, has the coefficient of minus 0.146, while group 2, has the coefficient of -0.115, which means that babybook will decrease the injuries more than the control group. We can see from the chart below that the influence of the three groups on the injuries, babybook has the least while no book has the highest.

|  |  |
| --- | --- |
|  | (1) |
|  | Other\_Injury |
| grp1 | -0.146 |
|  | (-1.68) |
|  |  |
| grp2 | -0.115 |
|  | (-1.34) |
|  |  |
| \_cons | 0.296\*\*\* |
|  | (4.14) |
| *N* | 648 |

*t* statistics in parentheses

\* *p* < 0.05, \*\* *p* < 0.01, \*\*\* *p* < 0.001

Table 19 regression with initial groups without control variables

|  |  |
| --- | --- |
|  | **Other Injury** |
| **babybook** | 0.15 |
| **commercial book** | 0.181 |
| **no book** | 0.296 |

Table 20 estimated impact of initial groups

After the ITT analysis, we do the TOT analysis with the model between safety knowledge and both of the treatment and control groups. And we get the estimated regression model that

*Safety Knowledge = 51.86 – 3.225Semester-4.674Group1 - 3.448Group2*

|  |  |
| --- | --- |
|  | (1) |
|  | PannelSafetyKnoledgeAll |
| semester | -3.255\*\*\* |
|  | (-4.33) |
|  |  |
| grp1 | 4.674\* |
|  | (1.75) |
|  |  |
| grp2 | -3.448 |
|  | (-1.41) |
|  |  |
| \_cons | 51.86\*\*\* |
|  | (28.63) |
| *N* | 637 |

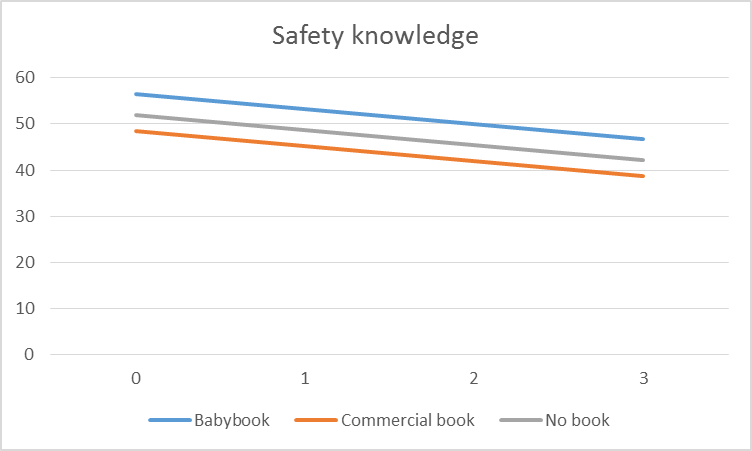
*t* statistics in parentheses

\* *p* < 0.05, \*\* *p* < 0.01, \*\*\* *p* < 0.001

Table 21 regression between safety knowledge and groups

|  |  |  |  |
| --- | --- | --- | --- |
|  | Safety Knowledge | | |
| semester | Babybook | Commercial book | No book |
| 0 | 56.534 | 48.412 | 51.86 |
| 1 | 53.279 | 45.157 | 48.605 |
| 2 | 50.024 | 41.902 | 45.35 |
| 3 | 46.769 | 38.647 | 42.095 |

Table 22 impact on safety knowledge



Graph 3 impact on safety knowledge

And we generate mother’s knowledge about safety based on the answers in the questionnaire, we find that group 1 is positively correlated with safety knowledge and can increase the mother’s safety knowledge by 4.674.

|  |  |
| --- | --- |
|  | (1) |
|  | Other\_Injury |
| semester | 0.314\*\*\* |
|  | (3.73) |
|  |  |
| PannelSafetyKnoledgeAll | -0.00557 |
|  | (-1.19) |
|  |  |
| \_cons | -1.905\*\*\* |
|  | (-5.56) |
| lnalpha |  |
| \_cons | 1.512\*\*\* |
|  | (6.46) |
| *N* | 668 |

*t* statistics in parentheses

\* *p* < 0.05, \*\* *p* < 0.01, \*\*\* *p* < 0.001

Table 22 knowledge impact on injuries

Eventually, we do the regression between safety knowledge and injury, safety knowledge has a negative effect on injury, and decreases it by 0.00557 per unit, but it is not significant, when we changes to passion regression, it is still not significant, which means that the knowledge do not have significant effect on the injuries. There are still many questions in the babybook questionnaire that we haven’t considered in our analysis, maybe some of these factors are also correlated with the mother’s safety knowledge, which leads to the insignificance of our regression result. However, we can found that within the increasing in safety knowledge, the unintentional injuries decreases.

Thus, we can conclude from the itt that the babybook program will increase the mother’s safety knowledge and decrease babies’ injuries, while the knowledge do not have a significant effect on injuries. This may be because there are still so many factors that may affect mother’s safety knowledge, and we don’t take them into our account, which makes the TOT result not significant.

In our group’s opinion, the babybook program has a good effect on lowering the injuries, and so it is worth doing.