Reducing Maternal Intimate Partner Violence After the Birth of a Child

A Randomized Controlled Trial of the Hawaii Healthy Start Home Visitation Program

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Objectives: To estimate whether home visitation beginning after childbirth was associated with changes in average rates of mothers’ intimate partner violence (IPV) victimization and perpetration as well as rates of specific IPV types (physical assault, verbal abuse, sexual assault, and injury) during the 3 years of program implementation and during 3 years of long-term follow-up.

Design: Randomized controlled trial.

Setting: Oahu, Hawaii.

Participants: Six hundred forty-three families with an infant at high risk for child maltreatment born between November 1994 and December 1995.

Intervention: Home visitors provided direct services and linked families to community resources. Home visits were to initially occur weekly and to continue for at least 3 years.

Main Outcome Measures: Women’s self-reports of past-year IPV victimization and perpetration using the Conflict Tactics Scale. Blinded research staff conducted maternal interviews following the child’s birth and annually when children were aged 1 to 3 years and then 7 to 9 years.

Results: During program implementation, intervention mothers as compared with control mothers reported lower rates of IPV victimization (incidence rate ratio [IRR], 0.86; 95% confidence interval [CI], 0.73-1.01) and significantly lower rates of perpetration (IRR, 0.83; 95% CI, 0.72-0.96). Considering specific IPV types, intervention women reported significantly lower rates of physical assault victimization (IRR, 0.85; 95% CI, 0.71-1.00) and perpetration (IRR, 0.82; 95% CI, 0.70-0.96). During long-term follow-up, rates of overall IPV victimization and perpetration decreased, with nonsignificant between-group differences. Verbal abuse victimization rates (IRR, 1.14, 95% CI, 0.97-1.34) may have increased among intervention mothers.

Conclusion: Early-childhood home visitation may be a promising strategy for reducing IPV.

Trial Registration: clinical trials.gov Identifier: NCT00218751.


INTIMATE PARTNER VIOLENCE (IPV) prevalence is disproportionately high in families with children younger than 5 years.1 Both IPV victimization and childhood IPV exposure are associated with adverse health consequences.2-9 Despite growing understanding of the epidemiology and health consequences of IPV, studies testing effective interventions are limited.10-13

Intimate partner violence interventions targeting women with young children are important given the elevated risk of IPV during this period and given the health implications for victims and their children. Early-childhood home visitation, which traditionally focuses on reducing child maltreatment, is one method of delivering intervention services to families. However, families targeted to receive home visiting are frequently also at high risk for IPV.12 The Centers for Disease Control and Prevention recently conducted a systematic review examining the home visitation–family violence relationship and concluded that there was insufficient evidence to determine if early-childhood home visitation reduced IPV.13

Reduction of maternal risk factors for child maltreatment, including IPV, was one of the goals of the Hawaii Healthy Start Program (HSP) early-childhood home visitation program. Duggan et al14-15 have published mixed findings about HSP’s effectiveness during the child’s first 3 years of life in decreasing maternal IPV. In these
INCLUSION CRITERIA

In a small percentage of cases at each follow-up point, the child’s primary caregiver was not the mother or the mother could not be located for an interview; thus, the interview was conducted with an alternate caregiver. Interviews with alternate caregivers were excluded in the current analyses.

OUTCOME AND COVARIATES

Intimate Partner Violence

During each interview, mothers reported their IPV victimization and perpetration over the past year using the Conflict Tactics Scale (CTS). The psychometric properties of the CTS have been well documented.23-25 At baseline, the interview included the 38-item CTS1. All subsequent interviews used the 78-item revised CTS (CTS2), which contains the following categories of questions: verbal aggression/abuse, physical assault, sexual coercion/abuse, and injury. Initial validation of the CTS2 estimated that the internal reliability coefficients for each category of questions were 0.79, 0.86, 0.87, and 0.95, respectively.23 The injury items include acts of physical assault that lead to bodily harm such as “I had a sprain, bruise, or small cut because of a fight with my partner.” Four sexual coercion questions were purposefully omitted during the interviews. Confirmatory factor analyses were run in MPLUS (version 5.21; Muthén & Muthén, Los Angeles, California) to confirm whether the previously identified factor structure was replicated in the current sample.23

Fixed-response choices for each item on the CTSs are categorical, including never, once, twice, 3 to 5 times, 6 to 10 times, 11 to 20 times, and more than 20 times. For our analyses, categorical responses were converted to counts as follows25: 3 to 5 times was coded as 4; 6 to 10, as 8; 11 to 20, as 15; and more than 20 times, as 25. For each woman at each interview, we created the following 5 rates per person-year of new victimization acts: (1) total IPV (all physical assault, sexual abuse, and injury acts); (2) physical assault only; (3) sexual abuse only; (4) injury only; and (5) verbal abuse only. The same 5 rates per year were created for maternal IPV perpetration for each woman at each interview.

Maternal Emotional Health

The Mental Health Index 5-item short form measured anxiety and depressive symptoms, asking women how often in the past month they had experienced specific feelings.26 Response items are on a 6-point scale ranging from all of the time to none of the time. Responses were summed and standardized to a scale of 0 to 100. A cutoff of less than 67 defined poor mental health.27
DATA ANALYSES

For 94% of intervention women and 93% of control women who provided baseline data after randomization, our overall approach was an intention-to-treat analysis whereby women were analyzed using their initial group assignment, irrespective of their actual participation in the intervention. All regression analyses were conducted using Stata 10.1 (StataCorp, College Station, Texas).

Summary statistics were generated for the intervention and control groups to describe maternal baseline characteristics. Group differences in baseline characteristics were tested using Pearson $\chi^2$ tests for nominal variables and $t$ tests for continuous variables. Rates of IPV for both groups at each point and unadjusted incidence rate ratios (IRRs) were calculated.

Analyses were conducted to determine the extent of missingness in covariates and outcomes over time. Individual follow-up interviews were missing for 2 reasons: (1) attrition, ie, mother’s departure from the study; and (2) mother remained in the study through the final interview but missed earlier individual interviews. To reduce bias due to missingness and loss to follow-up, missing data were imputed with 20 imputations using multiple imputation by chained equations. As per the default for multiple imputation by chained equations in Stata, each missing variable was regressed on all other variables. We report results of regression models using imputed data.

A negative binomial regression model, which accounts for overdispersion (variance greater than mean), for cross-sectional panel data was selected because of the skewed distribution of IPV acts. Repeated measures of women at multiple times violates the independence assumption required for regression. To address this nonindependence, we treated each woman’s multiple measures as clustered data. Analyses of IPV acts over time within a woman suggested that there was variation, and thus, a random effect was added to the model to allow a unique intercept for each participant.

Primary analyses compared total rates of IPV victimization and perpetration (in separate models) between intervention and control group women when children were (1) 1 to 3 years of age and separately when they were (2) 7 to 9 years of age. Additional analyses compared the rates of specific IPV types between intervention and control women during the same 2 periods. All models adjusted for nonequivalence, defined as a $P$ value <.20, between the intervention and control groups’ baseline sociodemographic characteristics including past-year alcohol use (dichotomous), maternal mental health (dichotomous), and past-year employment (dichotomous). Child age (continuous) was included to model time. Because of concern that study site might be a confounder, we also adjusted for site (categorical) in all analyses. Models examining total IPV victimization and perpetration controlled for baseline IPV (continuous).

We conducted 2 sensitivity analyses. For all reported analyses, women with no partner were coded as no IPV. However, the first sensitivity analysis was conducted to test whether omitting women who reported no intimate partner in the past year resulted in similar findings compared with our approach of coding these women as having no IPV in the past year. Second, we conducted a sensitivity analysis to test whether the exclusion of outliers, ie, women with greater than 100 IPV events at any interview, resulted in similar findings to regression models including these women.

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was skewed, with the majority of women reporting no IPV over the prior year (Table 2).

During the 3 years of program implementation, intervention group women reported lower unadjusted rates of IPV victimization (21%) and lower rates of IPV perpetration (34%) as compared with the control group women (Table 3). Adjusting for potential confounders, these findings persisted (Table 3) and the intervention group women reported lower rates of maternal IPV victimization (IRR, 0.86; 95% CI, 0.73-1.01) and significantly lower rates of maternal IPV perpetration (IRR, 0.83; 95% CI, 0.72-0.96) compared with control women. Intervention group women reported consistently lower unadjusted rates of maternal victimization and perpetration across all specific IPV types compared with control women. In adjusted analyses, intervention group women showed significantly lower rates of physical assault victimization (IRR, 0.85; 95% CI, 0.71-1.00) and perpetration (IRR, 0.82; 95% CI, 0.70-0.96).

Over long-term follow-up, the unadjusted IRRs showed a 16% decrease in overall maternal IPV victimization and a 2% decrease in maternal perpetration among intervention women compared with control women. After adjusting for potential confounders, there were small decreases in the overall IRRs of maternal IPV victimization (IRR, 0.95; 95% CI, 0.77-1.17) and perpetration (IRR, 0.98; 95% CI, 0.79-1.22). The unadjusted IRRs for the specific types of IPV were mixed. The adjusted IRRs were lower for the intervention vs control group for physical abuse, sexual abuse, and injury but were higher for verbal victimization (IRR, 1.14; 95% CI, 0.97-1.34) and perpetration (IRR, 1.08; 95% CI, 0.92-1.26).

Two sensitivity analyses were conducted. The first omitted women reporting no intimate partner in the past year and the findings were quantitatively and qualitatively similar to results in which these women were coded as having no IPV. The second sensitivity analysis omitted women with more than 100 IPV events at any interview and also yielded similar results to modeling including these women.

When compared with a control group, participation in the Hawaii HSP was associated with significantly re-
Table 1. Baseline Maternal Characteristics by Group

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Control Group (n=270)</th>
<th>Intervention Group (n=373)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤18</td>
<td>65 (24)</td>
<td>78 (21)</td>
<td>.61</td>
</tr>
<tr>
<td>19-25</td>
<td>121 (45)</td>
<td>178 (48)</td>
<td></td>
</tr>
<tr>
<td>≥26</td>
<td>84 (31)</td>
<td>117 (31)</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native Hawaiian or Pacific Islander</td>
<td>88 (33)</td>
<td>127 (34)</td>
<td>.70</td>
</tr>
<tr>
<td>Asian or Filipino</td>
<td>75 (28)</td>
<td>103 (28)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>36 (13)</td>
<td>39 (10)</td>
<td></td>
</tr>
<tr>
<td>No primary ethnicity or other</td>
<td>71 (26)</td>
<td>104 (28)</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>174 (64)</td>
<td>257 (69)</td>
<td>.24</td>
</tr>
<tr>
<td>Mother–father of baby relationship</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No relationship</td>
<td>34 (13)</td>
<td>35 (10)</td>
<td>.43</td>
</tr>
<tr>
<td>Friends/dating</td>
<td>98 (37)</td>
<td>128 (35)</td>
<td></td>
</tr>
<tr>
<td>Living together, not married</td>
<td>78 (29)</td>
<td>108 (29)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>57 (21)</td>
<td>94 (26)</td>
<td></td>
</tr>
<tr>
<td>Problem alcohol use</td>
<td>129 (48)</td>
<td>148 (40)</td>
<td>.04</td>
</tr>
<tr>
<td>Drug abuse</td>
<td>41 (15)</td>
<td>47 (13)</td>
<td>.34</td>
</tr>
<tr>
<td>Poor mental health</td>
<td>136 (50)</td>
<td>159 (43)</td>
<td>.05</td>
</tr>
<tr>
<td>Employed in the past year</td>
<td>119 (44)</td>
<td>194 (52)</td>
<td>.05</td>
</tr>
</tbody>
</table>

- Obtained using Pearson χ² test for nominal variables.
- Measured by self-report of alcohol use and 2 or more positive responses to the 4 CAGE questions.
- Measured by any self-report of illicit drug use.
- Measured using the 5-item Mental Health Index. A cutoff of less than 67 defined poor mental health.

Figure 2. Mean rates (number of acts per 1 person-year) of maternal intimate partner violence (IPV) perpetration by treatment group at each point of follow-up. Follow-up occurred annually from child age 1 to 3 years and then annually when the child was aged 7 to 9 years. The x-axis shows the average child age at each follow-up point. Baseline IPV is not included because the instrument used (Conflict Tactics Scale 1) at this point differed from the instrument used (Conflict Tactics Scale 2) at all other points. converged maternal IPV perpetration for the child’s first 3 years of life. Maternal IPV victimization also decreased during this period. Considering specific types of IPV, maternal perpetration of and victimization from physical assault were significantly reduced among intervention women compared with control women. Sexual violence, verbal abuse, and injury were not significantly associated with group assignment, though low prevalence of sexual abuse and injury may have impacted our ability to detect an association for these IPV types. Over long-term follow-up, overall rates of IPV decreased in both groups, but differences between groups were no longer statistically significant. Verbal abuse may have increased in the intervention group.

Our results first should be contrasted with the Duggan et al conclusion that HSP did not reduce partner psychological abuse (odds ratio, 1.05; 95% CI, 0.81-1.36), physical abuse (odds ratio, 0.83; 95% CI, 0.63-1.09), or injury (odds ratio, 0.81; 95% CI, 0.59-1.10) in the 3 years of program implementation. In those analyses, the 3 specific IPV types were dichotomized as present/absent. In contrast, we considered IPV as a count variable, and analyses tested for a difference in rates between groups. Significant differences in IPV may not have been detected in Duggan et al because dichotomizing an inherently continuous/count variable leads to information loss that decreases power. Using rates also is preferable because the cut point of number of IPV acts where a relationship...
is considered to “have IPV” is arbitrary and generally not evidence based.

To our knowledge, this is the first randomized controlled trial to describe an intervention that decreases rates of female-perpetrated IPV. Published surveys cite that female-perpetrated IPV is a significant public health problem. Some argue that men’s and women’s violence should not be considered equivalent because of different contexts, etiologies, and consequences. Others emphasize that all violence is detrimental and that minor acts of female-perpetrated violence increase risk of severe male-perpetrated violence.

Theoretical debates aside, reducing female-perpetrated IPV likely benefits public health in general and child health specifically. Children exposed to IPV are at increased risk for myriad adverse health consequences; compared with peers, IPV-exposed children incur greater health care costs, are underimmunized, and have worse social/emotional health. Exposure to maternal IPV perpetration may pose unique threats to children’s health. For example, a recent study by McDonald et al found that maternal IPV perpetration predicted child externalizing problems after controlling for male IPV perpetration.

Two issues complicate interpretation of how home visiting might have influenced IPV: (1) program IPV content was minimal; and (2) few families participated in the expected number of home visits. Prior publications about HSP implementation document that home visitors frequently failed to recognize IPV and seldom linked abused women to community resources. The HSP model specified that families should initially receive weekly home visiting and that the intervention should last at least 3 years. Healthy Start Program home visitors struggled to maintain visit frequency and retain families.

Despite these program limitations, 2 important elements of the home visiting program might have contributed to the decrease in IPV: (1) the home visitor–mother relationship and (2) encouragement of self-efficacy. Mothers in the intervention group trusted their home visitor, and this relationship likely provided social support and decreased isolation. Mothers espoused the belief that their home visitor helped them to “set goals and make a plan for reaching them.” When the children were 2 years of age, intervention mothers reported significantly greater parenting efficacy and tended to report less parenting stress; these outcomes parallel the point at which we observed the greatest drop in IPV for the intervention group.

Intimate partner violence interventions for abused and partner-aggressive women similarly focus on promoting interpersonal relationship skills and bolstering self-efficacy. For example, Sullivan and Bybee randomized women leaving an IPV shelter to a control group or to advocacy counseling, which included improving social support and self-efficacy. Women randomized to advocacy counseling demonstrated significant reductions in reabuse.

There was a general decline in overall rates of IPV over time for both groups. However, when the children were 7 to 9 years of age, the intervention group did not report significantly lower rates of IPV victimization or perpetration than the control group. Verbal abuse may have

### Table 3. Average Incidence Rates and Unadjusted and Adjusted IRRs of Maternal IPV During Two 3-Year Periods

<table>
<thead>
<tr>
<th>3 Years of Program Implementation</th>
<th>Long-term Follow-up</th>
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<tbody>
<tr>
<td><strong>Average Incidence Rate of IPV Acts per Person-year</strong></td>
<td><strong>Average Incidence Rate of IPV Acts per Person-year</strong></td>
</tr>
<tr>
<td>Intervnet Group</td>
<td>Control Group</td>
</tr>
<tr>
<td><strong>Maternal victimization</strong></td>
<td></td>
</tr>
<tr>
<td>Physical assault</td>
<td>5.23</td>
</tr>
<tr>
<td>Verbal abuse</td>
<td>18.35</td>
</tr>
<tr>
<td>Sexual violence</td>
<td>1.13</td>
</tr>
<tr>
<td>Injury</td>
<td>1.18</td>
</tr>
<tr>
<td><strong>Maternal perpetration</strong></td>
<td></td>
</tr>
<tr>
<td>Physical assault</td>
<td>4.23</td>
</tr>
<tr>
<td>Verbal abuse</td>
<td>18.39</td>
</tr>
<tr>
<td>Sexual violence</td>
<td>0.33</td>
</tr>
<tr>
<td>Injury</td>
<td>0.54</td>
</tr>
</tbody>
</table>

**Abbreviations:** CI, confidence interval; IPV, intimate partner violence; IRR, incidence rate ratio.

**a** Intimate partner violence rates by group and unadjusted IRRs calculated using nonimputed data. Adjusted analyses used negative binomial regression modeling with a random intercept with imputed data adjusting for child age (continuous term), program site, and maternal mental health (dichotomous), problem alcohol use (dichotomous), and past-year employment (dichotomous) with control group as the referent. Overall IPV rates were also adjusted for baseline IPV (continuous term).

**b** Measured using the Revised Conflict Tactics Scale.

**c** The values for the 3 years of program implementation reflect the first 3 years of the child’s life, during which time the intervention was ongoing. The values for long-term follow-up reflect the program’s impact when the child was approximately 7 to 9 years of age.
increased for the intervention group. The decreasing rates of IPV over time for both is consistent with literature documenting that IPV prevalence is highest for young women. Additional home visits during the child’s school-aged years may promote further reductions in overall IPV rates, though rates of verbal abuse should be carefully monitored.

These results must be interpreted in light of important limitations. Women self-reported their own and their partner’s IPV over the past 12 months; this duration of recall may be prone to error. Although the CTS2 has been widely validated, there is no “gold standard” from which to determine the accuracy of self-reported IPV. Intervention group women may have felt compelled to portray themselves positively and may have underreported IPV. However, interviews were conducted by blinded research assistants who were not involved in delivering the intervention, and intervention women commonly disclosed other equally sensitive information. Despite randomization, baseline differences existed between the groups. Although we accounted for these differences, unmeasured confounders may remain.

Our findings of an association between Hawaii HSP early-childhood home visitation and decreased rates of IPV during the 3 years of program implementation are encouraging but should be interpreted cautiously. A variety of early-childhood home visitation programs serve high-risk families; each of these models differs with regard to program content, home visitor training, and frequency and duration of visits. Future research should determine whether similar decreases occur in other early-childhood home visiting programs and should investigate which elements of the program may lead to reductions.

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Author Contributions: Dr Bair-Merritt had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Fuddy and Duggan. Acquisition of data: McFarlane, Fuddy, and Duggan. Analysis and interpretation of data: Bair-Merritt, Jennings, Chen, Burrell, and Duggan. Drafting of the manuscript: Bair-Merritt, Jennings, and McFarlane. Critical revision of the manuscript for important intellectual content: Bair-Merritt, Jennings, Chen, Burrell, McFarlane, Fuddy, and Duggan. Statistical analysis: Bair-Merritt, Jennings, Chen, and Burrell. Obtained funding: Duggan. Administrative, technical, and material support: Burrell, McFarlane, and Duggan. Study supervision: Duggan.

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REFERENCES


**Announcement**

**Submissions.** The Editors welcome contributions to Picture of the Month. Submissions should describe common problems presenting uncommonly, rather than total zebras. Cases should be of interest to practicing pediatricians, highlighting problems that they are likely to at least occasionally encounter in the office or hospital setting. High-quality clinical images (in either 35-mm slide or electronic format) along with parent or patient permission to use these images must accompany the submission. The entire discussion should comprise no more than 750 words. Articles and photographs accepted for publication will bear the contributor’s name. There is no charge for reproduction and printing of color illustrations. For details regarding electronic submission, please see: http://archpediatrics.com.