A Randomized Trial of the Effect of Dust Control on Children's Blood Lead Levels

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ABSTRACT. *Objective.* **Dust control is recommended as one of the cornerstones of controlling childhood lead exposure; however, the effectiveness of dust control has not been demonstrated for children who have low to mild elevations in blood lead (ie, less than 25 μg/dL). The objective of this study was to determine whether dust control, as performed by families, had an effect on children's blood lead levels and dust lead levels in children's homes.**

Design. **Randomized, controlled trial.**

Setting. **Community-based trial in Rochester, NY.**

Participants. **One hundred four children, 12 to 31 months of age at baseline.**

Intervention. **Families and children were randomized to one of two groups. Families of children in the intervention group received cleaning supplies, information about cleaning areas that are often contaminated with lead, and a cleaning demonstration. Families in the control group received only a brochure about lead poisoning prevention.**

Outcome Measures. **Baseline measurements of lead in blood, house dust, soil, water, and paint were taken from both groups. Seven months after enrollment, a second blood lead assay was obtained, and lead levels in household dust were measured. The main outcome measures were change in blood lead levels and dust lead levels by treatment group.**

Results. **The median blood lead level of children enrolled in the study was 6.7 μg/dL (range, 1.7 to 30.6 μg/dL). There was no significant difference in the change of children's blood lead levels or dust lead levels by treatment group. The median change in blood lead levels among children in the intervention group was −0.05 μg/dL compared with −0.60 μg/dL among those in the control group. There also was no significant difference in the change of dust lead by group assignment, although there was a trend toward a significant difference in the percentage of change in dust lead levels on noncarpeted floors, which was greater among houses in the intervention group.**

Conclusions. **These data suggest that an intervention that consists only of providing cleaning supplies and a brief description of dust control is not effective at reducing blood lead levels among urban children with low to mild elevations in blood lead levels at a 7-month follow-up.** *Pediatrics* **1996;98:35–40;** ***blood lead, lead-contaminated house dust, dust control, children, environmental exposure, randomized trial, prevention.***

ABBREVIATION. CI, confidence interval.

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Lead, a confirmed toxin, is ubiquitous in the urban environment.[1] Multiple sources of lead in and around homes have been shown to contribute to children's lead intake. Currently, the most important sources are believed to include lead-contaminated paint, dust, soil, and water.[1–9] Ingestion of lead-contaminated house dust is thought to be a primary source of childhood lead exposure.[2] Presumably, lead-contaminated house dust originates from deteriorating interior lead-based paint or from lead-contaminated soil that is tracked indoors. Children who live in older houses in poor condition or that have been renovated are at increased risk of exposure to high levels of lead-contaminated house dust.[4,5] Although it is difficult to quantify the relative contributions of various environmental sources of lead to children's intake, lead-contaminated house dust seems to be a major source for urban children.[3–8]

Dust control measures are generally recommended as one of the cornerstones to reduce childhood exposure to lead.[2,10] However, dust control has not been demonstrated to be efficacious for the prevention of lead exposure among children who have low to mild elevations (ie, <20 μg/dL) in blood lead levels. In a randomized trial of the efficacy of a dust control intervention using professional dust control teams, Charney et al[11] found a significant reduction in blood lead levels of children in the experimental group after 12 months. However, that study only included children who had blood lead levels between 30 and 49 μg/dL. Furthermore, the houses of children in both groups received paint stabilization. In another study, involving fewer than 50 children younger than 6 years with low to mildly elevated blood lead levels, Kimbrough et al[12] reported a significant decline in children's blood levels after education about dust control and behavior modification. Because there was no control group, however, it was not clear whether the decline in children's blood lead levels was due to the intervention or the well-recognized decline in blood lead levels associated with the increasing age of the children. It therefore remains unknown whether dust control, as performed by families, will result in lower dust lead levels or lower blood lead levels in urban children.

Thus, although there is some evidence to indicate that dust control may be effective in reducing children's blood lead levels, it is too sparse and does not directly address children with lower blood lead levels.[13] The purpose of this study was to determine the effect of dust control on urban children's blood lead levels. Dust lead levels also were measured to determine whether a dust control intervention, as performed by families, resulted in a significant lowering of lead-contaminated house dust.

METHODS

A prospective, randomized trial was used to investigate the effectiveness of a minimal intervention of dust control for children with low or moderately elevated blood lead levels. Families who participated in the Lead-in-Dust study,[14] a cross-sectional study to assess the relationship of lead-contaminated house dust and urban children's blood lead levels, were invited to participate in a follow-up trial, regardless of their environmental exposure or blood lead levels. Families who agreed to participate were randomly assigned to either the intervention group or the control group by using block randomization.[15] Families in both groups were given a brochure about lead poisoning and its prevention. Baseline samples were collected between August 29, 1993, and November 19, 1993, and follow-up samples were collected between April 11, 1994, and June 28, 1994.

Intervention

For families assigned to the intervention group, at the time of baseline sampling, a trained interviewer emphasized the importance of dust control for reducing children's exposure to lead, provided them with cleaning supplies (durable paper towels, spray bottles, and a detergent specifically developed to clean up lead-contaminated house dust [Ledizolv; Hincor Inc]), and gave a demonstration of how to clean surfaces. Families were instructed to clean the entire house every 3 months, interior window sills and floors near windows once every month, and window wells once each month when they were open. Families also were instructed to clean carpets thoroughly on a weekly basis using a vacuum cleaner, if available. Families in the intervention group were also given a coloring book that described lead poisoning and its prevention.

Venous blood samples were collected by using a meticulous technique to avoid contamination. All blood lead results are the means of two separate laboratory analyses conducted over 3 consecutive days for a precision of plus or minus 0.5 μg/dL (0.024 μmol/L) and a detection limit of 1 μg/dL (0.048 μmol/L). Household dust sampling was conducted to characterize the potential exposure of children to lead from environmental dust. In each housing unit a maximum of 10 (range, 1 to 10) dust samples were collected from the floors, interior window sills, and window wells (troughs) from the principal play area of the child, the child's bedroom, the kitchen, and the entryway floor at baseline and at follow-up. At least seven wipe samples were taken from 85% of the houses. All samples, including carpet dust, were obtained by using a commercial brand of baby wipes (Little Ones; K-Mart); the sampling method has been described elsewhere.[14] At the 7-month follow-up, dust samples were only collected from houses if the children still lived there. Finally, a face-to-face interview was conducted to assess the reported compliance of families who used Ledizolv, the frequency of cleaning, and children's mouthing behaviors.

Laboratory Analyses

Laboratory analyses have been described extensively elsewhere.[14] Briefly, dust samples were first analyzed by flame atomic absorption, followed by graphite furnace if levels were below detection limits of flame atomic absorption. By using flame atomic absorption, the detection limit was 10 μg/sample; for graphite furnace, the detection limit for the wipe was 0.25 μg/sample. Soil samples, which were taken at baseline from the perimeter of the foundation where bare soil was present, were thoroughly mixed and sieved by using a 2-mm mesh sieve and analyzed for lead by using flame atomic absorption spectroscopy. The detection limit for lead in soil samples was 10 μg/g. Drinking water, which also was only measured at baseline, was analyzed by using atomic absorption. For the purpose of statistical analyses, lead measurements below the detection limit (0.001 μg/L) were set to 0.0005 μg/L.

Statistical Analyses

Baseline comparability of the intervention and control groups was evaluated by χ^2 tests, Wilcoxon tests, and t tests, as appropriate. Differences between baseline and follow-up blood lead levels and dust lead levels in the intervention and control groups were tested by Wilcoxon tests. Differences in blood lead and dust lead levels among families who reportedly used Ledizolv compared with those who did not (ie, those in the control group and those in the intervention group who did not use Ledizolv at least once a month on floors or interior window sills) also were tested by Wilcoxon tests. Differences in dust lead loading were calculated only for those specific locations that were measured at both baseline and follow-up. Prespecified baseline and interim period variables (such as remodeling and the month of the test) were investigated as possible predictors of changes in blood lead and dust lead variables, and multiple regression models to predict changes in blood lead levels and dust lead levels were developed. All P values reported are two tailed.

RESULTS

Of the 205 families who participated in the Lead-in-Dust Study, 104 (51%) agreed to participate in the follow-up study. There was no significant difference in the characteristics of families and children who participated by blood lead level, dust lead loading, race, level of education, single-parent household, or income compared with those who declined participation. Of families who chose to participate, 8 (7.7%) of 104 refused or were not available at the time of the follow-up visit, 2 refused second blood tests, 3 had moved outside of the area, 2 had no time, and 1 was lost to follow-up. One additional child's blood sample clotted, and a second blood sample was refused. Thus, 96 (92%) of the 104 children and their houses were tested approximately 7 months after the baseline evaluation. Ninety-five had blood lead results available at both baseline and follow-up, and 80 (83%) of 96 children lived in the same residences at follow-up, and dust samples were taken.

Comparisons of the baseline characteristics of children, families, and their houses are shown (Table 1). There was a significant difference between the treatment groups in the amount of time spent outdoors, and there were marginally significant differences in water lead levels, levels of income, and the percentages of children reported to eat dirt or soil.

The mean change in blood lead levels among the 52 children in the intervention group was −0.47 μg/dL (95% confidence interval [CI], −1.21 to 0.27) compared with 0.42 μg/dL for the 43 children in the control group. This includes one outlier in the control group whose blood lead level increased from 14.6 μg/dL at baseline to 55.8 μg/dL at follow-up. If the outlier is excluded, the mean change in children's blood lead levels in the control group is −0.55 μg/dL (95% CI, −1.61 to 0.51). To include all children in the analyses, we used the median change in blood lead levels and nonparametric tests based on ranks in all of the following analyses.

There was no significant difference in the change in children's blood lead levels by treatment group. The median change in blood lead levels among

TABLE 1. Baseline Comparisons of Children by Group

Characteristic	Intervention Group (n = 57) Mean (±1 SD)	Control Group (n = 47) Mean ±1 SD)	P
Blood lead, μg/dL*	6.6 (3.7, 12.0)	6.8 (3.5, 13.1)	.85
Ferritin, ng/dL*	23.8 (12.3, 45.8)	24.9 (16.1, 38.7)	.65
Age	19.8 (14.5, 25.1)	20.4 (15.0, 25.8)	.54
Time spent outdoors	15.0 (−3.9, 34.0)	19.9 (3.5, 36.4)	.02
Average cleaning	2.9 (2.4, 3.5)	2.9 (2.3, 3.5)	.65
Average across all surfaces	103.0 (36.7, 289.4)	142.4 (34.2, 592.5)	.27
Paint lead, mg/cm²*	7.4 (1.7, 32.9)	7.4 (1.8, 31.4)	.98
Soil lead, μg/g*	1316.7 (254.6, 6810.2)	1028.8 (270.3, 3915.9)	.42
Water lead, mg/L*	0.0008 (0.0003, 0.0020)	0.0011 (0.0004, 0.0033)	.07
Black race, n (%)	26 (46)	21 (45)	.92
Income ≤$15 500, n (%)	35 (65)	21 (48)	.09
High school education or less, n (%)	34 (60)	27 (59)	.92
Single parent household, n (%)	28 (49)	18 (40)	.36
Rental housing, n (%)	42 (74)	28 (60)	.13
Eat dirt or soil, n (%)	21 (38)	10 (21)	.07
Poor/average paint condition, n (%)	28 (49)	28 (60)	.29

* Geometric means.

children in the intervention group was −0.05 μg/dL compared with −0.60 μg/dL among those in the control group (Table 2). The differences in the changes in blood lead levels remained nonsignificant after adjustments were made for baseline characteristics.

Among families who reported using the detergent at least once each month on floors or interior window sills, there also was no significant difference in the change of median blood lead levels compared with families who did not use Ledizolv detergent at least once each month and those in the control group. The median change in blood lead levels was −0.05 (95% CI, −2.6 to 0.65) μg/dL for the 28 children whose families used Ledizolv compared with −0.60 (95% CI, −1.9 to 1.0) μg/dL for the 65 children whose families did not use Ledizolv and who were assigned to the control group (P = .74).

Although there was not a significant difference in the change in median blood lead levels by group assignment, there seemed to be a higher percentage of children with blood lead levels of 20 μg/dL or more in the control group at follow-up compared with the intervention group (Table 3). However, among children with blood lead levels of more than 10 μg/dL, the absolute change in median blood lead levels among children in the intervention group was not significantly different than those of the control group. The absolute change in blood lead levels for the intervention group was −2.9 (interquartile range, −3.3 to 0) μg/dL compared with −0.7 (interquartile range, −4.3 to 5.1) μg/dL in the control group (P = .40).

Among children who did not move, there were no significant differences in the changes in dust lead levels by group. There were higher dust lead levels in window wells of the homes of children in the control group at baseline (which also raised the average dust lead level across the house), but this difference was not statistically significant. There was no significant difference in the absolute change in dust lead levels on floors, window sills, or window wells by group assignment (Table 4). However, there was a trend toward a significant difference in the percentage of change in dust lead levels on noncarpeted floors that was greater among houses in the intervention group (P = .08).

Among children who did not move, the use of Ledizolv was not a significant predictor of the change in dust lead loading averaged over the house by surface (Table 5). However, there was a marginally significant change in dust lead loading on window sills among families who used Ledizolv at least once each month compared with all other families (P = .07). Families who used Ledizolv had lower window well dust lead levels at baseline than those who did not use it (P = .05); this difference was also reflected in dust lead levels averaged over the house. It was not reflected in lower baseline blood lead levels for this subgroup of children. There were overall declines in dust lead levels for carpeted floors, noncarpeted floors, and window sills in both groups. However, these declines were not statistically significant.

In a multivariate regression model to predict changes in blood lead levels, none of the baseline characteristics, including soil lead levels, water lead levels, the month of the test, children's ages, and

TABLE 2. Change in Blood Lead Levels (μg/dL) by Group

Group	Baseline, Median (Interquartile Range)	Follow-up, Median* (Interquartile Range)	Absolute Change, Median† (Interquartile Range)
Intervention group (n = 52)	6.85 (4.35–9.90)	6.20 (3.95–9.45)	−0.05 (−2.00–0.70)
Control group (n = 43)	6.10 (4.20–11.30)	6.20 (3.40–10.40)	−0.60 (−1.90–1.00)

* P = .95.
† P = .50.

TABLE 3. Percentage of Children With Blood Lead Levels Exceeding Various Blood Lead Levels at Baseline and Follow-up by Group

	Intervention Group (n = 52)	Control Group (n = 43)
No. (%) ≥10 μg/dL		
Baseline	13 (25)	12 (28)
Follow-up	11 (21)	12 (28)
No. (%) ≥15 μg/dL		
Baseline	3 (6)	7 (16)
Follow-up	3 (6)	6 (14)
No. (%) ≥20 μg/dL		
Baseline	2 (4)	2 (5)
Follow-up	1 (2)	6 (14)

demographic characteristics, were significantly associated with the absolute change or percentage of change in children's blood lead levels. Finally, there also was no association of the absolute change in dust lead loadings averaged over the house with changes in children's blood lead levels ($r = -.02$; $P = .86$).

DISCUSSION

These data suggest that providing families with dust-cleaning supplies and a brief description about preventing lead exposure does not result in a reduction of children's blood lead levels or lead-contaminated house dust among children with blood lead levels of less than 20 μg/dL during a 7-month period. This is the first randomized trial that has emphasized dust control as the sole intervention. In previously reported randomized trials that included dust control, paint stabilization was also done for housing units in both the control and experimental groups,[9,11] and it is possible that dust control, in the absence of a well-maintained condition of painted surfaces, is not adequate to reduce exposure to lead-contaminated house dust. However, note that the strength of the intervention in this study was weak; the intervention consisted of a 5-minute presentation and provision of cleaning supplies, and some families may not have had access to adequate cleaning equipment (eg, mops, buckets, and vacuum cleaners). A more intensive intervention, conducted over a longer period of time and including the provision of cleaning equipment, perhaps would more likely show an effect on children's blood lead levels.

There is limited evidence that dust control or paint stabilization is associated with a reduction in blood lead levels among children with blood lead levels of less than 25 μg/dL. In fact, in a retrospective study of paint stabilization in Massachusetts, there was a significant increase in mean blood lead levels among children with blood lead levels of less than 20 μg/dL.[16] In another study, Weitzman et al[9] reported a significant decrease in children's blood lead levels after soil abatement, paint stabilization, and interior dust control after an 11-month follow-up among children with blood lead levels of less than 25 μg/dL. Collectively, these studies suggest that lead hazard intervention can effectively reduce blood lead levels among children with low to mild elevations in blood lead, but they also indicate that adequate cleanup after any intervention is required. Further-

TABLE 4. Dust Lead Levels (μg/ft²) Among Children Who Lived in Same Residence at Baseline and Follow-up Visits by Group

Surface	Intervention Group	Control Group	P*
Average across all surfaces			
Baseline†	113.2 (40.6, 315.1)	160.6 (41.0, 629.7)	
Follow-up†	68.0 (18.8, 245.7)	83.5 (22.4, 311.0)	
n	35	28	
Absolute change‡	45 (−336, 1921)	−67 (−4 382, 1 574)	.41
Percent change‡	12.9 (−68.9, 158.2)	−27.3 (−63.8, 57.8)	.43
Noncarpeted floors			
Baseline†	16.6 (7.3, 37.6)	17.7 (3.4, 91.3)	
Follow-up†	7.7 (2.2, 27.3)	9.8 (2.4, 39.8)	
n	39	31	
Absolute change‡	−9.9 (−19.7, −2.3)	−4.5 (−14.9, 1.1)	.19
Percent change‡	−56.3 (−79.1, −26.1)	−31.7 (−67.7, 6.2)	.08
Carpeted floors			
Baseline†	9.9 (4.4, 22.0)	8.7 (3.1, 24.4)	
Follow-up†	3.5 (1.6, 7.6)	4.1 (1.3, 12.8)	
n	32	28	
Absolute change‡	−6.9 (−10.2, −2.5)	−7.8 (−10.9, −0.9)	.72
Percent change‡	−60.1 (−82.9, −30.0)	−46.6 (−80.3, −18.2)	.46
Interior window sills			
Baseline†	156.7 (40.5, 606.9)	195.0 (49.5, 769.0)	
Follow-up†	89.3 (24.2, 328.8)	90.3 (18.9, 431.9)	
n	37	35	
Absolute change‡	−58 (−154, −10)	−57 (−243, 19.4)	.95
Percent change‡	−37.8 (−76.2, −7.6)	−39.4 (−77.2, 45.4)	.82
Window wells			
Baseline†	2,755 (318, 23 880)	5,287 (626, 44 647)	
Follow-up†	3,012 (253, 35 812)	3,808 (412, 35 230)	
n	35	28	
Absolute change‡	261 (−1 027, 5 845)	−153 (−13 653, 5 627)	.40
Percent change‡	16.9 (−71.6, 139.2)	−33.1 (−62.6, 62.5)	.41

* Wilcoxon rank-sum test.
† Geometric mean ± 1 SD.
‡ Median (interquartile range).

TABLE 5. Dust Lead Levels ($\mu g/ft^2$) Among Children Who Lived in Same Residence at Baseline and Follow-up Visits by Use of Ledizolv

Surface	Ledizolv		P*
	Did Not Use	Used	
Average across all surfaces			
Baseline†	160.7 (46.4, 556.2)	82.6 (31.3, 217.9)	
Follow-up†	84.4 (25.3, 281.6)	57.9 (12.9, 259.8)	
n	44	18	
Absolute change‡	27 (−2 004, 1 694)	−7 (−217, 555)	.83
Percent change‡	8.1 (−59.6, 79.2)	−23.1 (−70.2, 80.2)	.70
Noncarpeted floors			
Baseline†	17.0 (4.1, 70.0)	17.0 (8.3, 35.1)	
Follow-up†	8.5 (2.4, 30.1)	9.4 (2.2, 41.1)	
n	49	20	
Absolute change‡	−5.8 (−16.0, −0.1)	−10.2 (−13.9, 2.0)	.78
Percent change‡	−41.6 (−68.1, −2.6)	−61.4 (−81.2, 13.6)	.45
Carpeted floors			
Baseline†	8.9 (3.4, 23.6)	10.1 (4.6, 22.2)	
Follow-up†	3.7 (1.3, 10.3)	4.3 (2.0, 9.0)	
n	41	18	
Absolute change‡	−7.9 (−10.8, −1.5)	−6.4 (−9.2, −2.6)	.76
Percent change‡	−56.9 (−80.5, −19.8)	−55.5 (−71.9, −22.6)	.81
Interior window sills			
Baseline†	180.0 (45.7, 708.2)	158.4 (39.5, 635.6)	
Follow-up†	102.2 (24.0, 435.6)	68.4 (17.4, 269.2)	
n	51	20	
Absolute change‡	−47 (−208, 51)	−72 (−193, −21)	.41
Percent change‡	−30.2 (−66.2, 53.4)	−63.8 (−81.4, −17.3)	.07
Window wells			
Baseline†	6,056 (871, 42 117)	1,108 (112, 10 987)	
Follow-up†	4,442 (564, 34 952)	1,542 (84, 28 216)	
n	44	18	
Absolute change‡	159 (−7 446, 6 044)	32 (−733, 2 369)	.91
Percent change‡	7.7 (−58.3, 80.9)	−14.7 (−71.6, 121.6)	.88

* Wilcoxon rank-sum test.
† Geometric mean ± SD.
‡ Median (interquartile range).

more, it remains unclear whether dust control, soil abatement, or paint stabilization (with adequate cleanup) is most effective.

It has been demonstrated that dust lead levels can be lowered by using various cleaning treatments. Milar and Mushak[17] showed that steam cleaning of carpets, followed by wet cleaning, resulted in a 61% decrease in lead concentration and a 60% decrease in lead loading. Charney et al[11] showed that professional dust control teams reduced the proportion of housing units with dust lead levels greater than 100 $\mu g/ft^2$. In this study we tested whether giving families dust-cleaning supplies and a brief demonstration was associated with a significant decline in dust lead levels; in general there was no significant difference observed. There was, however, a marginally significant difference in the percentage of change in dust lead levels on noncarpeted floors in housing units in the intervention group compared with those in the control group. We did not expect to observe a decline in dust lead levels on window wells, because it is likely that windows remained closed in most houses during the study period.

Dust lead levels were generally lower at follow-up compared with baseline levels in both groups for floors and window sills. However, these differences were not statistically significant. These lower dust lead levels could be due to either a Hawthorne effect[18] or seasonal variation in dust lead levels. Although we did not specifically discuss dust control with families in the control group, they were aware of our interest in children's exposure to lead; extensive dust sampling was done at baseline, and the families were provided with a brochure about lead poisoning and its prevention. These measures may have prompted families to improve their housecleaning, resulting in lower dust lead levels at follow-up. The decline in dust lead levels also may be due to a seasonal variation in dust lead loading, which has been reported to peak in the summer months in one study.[19] Regardless, it is likely that the observed decline in dust lead levels among houses in both groups reduced our ability to demonstrate any effect of dust control.

It is possible that thorough vacuuming of carpeted surfaces, which was recommended to families assigned to the intervention group, may have canceled out any potential benefit of other dust control measures. Since our study was completed, Ewers et al[20] have shown that thorough vacuuming of lead-contaminated carpets may actually increase children's exposure to lead-contaminated house dust. Although carpet dust lead loadings were generally observed to decrease with subsequent cleanings, there were several instances in which dust lead loading increased as much as fourfold after cleaning.[20] Thus, although carpets can clearly act as reservoirs for lead-contaminated house dust, it is not clear that vacuuming reduces children's exposure to lead-contaminated house dust.[14,20]

There are some limitations of this study. First, trials involving children who already have been exposed to lead probably underestimate the effect of any intervention. Blood lead levels are typically used to estimate the total body burden of lead, but it is well recognized that more than 70% of a child's total body burden is stored in bone.[21] Therefore, removing lead from a child's environment may not lower the blood lead to the level of an unexposed child.[22] Second, this study only followed 96 children and did not have adequate power to detect a change with a high degree of confidence. Third, the intervention consisted of providing families with cleaning supplies and a brief overview of dust control. A more intensive intervention, which might include provision of cleaning equipment and home visits specifically to encourage dust control, may have had a more dramatic effect, especially among children with higher blood lead levels. In earlier studies, children with higher blood lead levels have been found to have a greater reduction in blood lead levels after lead hazard interventions than those with lower blood levels,[11,16] and the mean blood lead levels of children in this sample were lower than those in most other studies that have been conducted. Fourth, participation in the Lead-in-Dust study may have altered behaviors among families in the control group, thereby reducing any differences in the change in blood lead, dust lead, or household cleaning. Finally, the wide variability in dust lead loading in urban houses makes it difficult to demonstrate a significant difference in the change of dust lead levels.

This analysis identified several potential problems that should be addressed in future lead hazard intervention studies: seasonal variation in dust lead loading, the possible introduction of a Hawthorne effect by using dust sampling at baseline, an inadequate follow-up period, and redistribution of body lead stores after a lead hazard intervention. These problems could be minimized by following children for at least 12 months to reduce problems with seasonal changes in blood and dust lead levels and by conducting an intervention that attempts to prevent lead exposure in children before they have been exposed to lead-contaminated house dust.

These data suggest that providing urban families with supplies and a brief description of dust control to prevent lead exposure does not have an effect on blood lead levels among children with blood lead levels of less than 25 $\mu g/dL$. We also did not observe a reduction in dust lead levels, with the exception of a marginally significant reduction in dust lead loading on noncarpeted floors. Further research is needed to determine whether more intensive dust control is associated with a significant decline in children's blood lead levels, both as a primary preventive measure and for children with blood lead levels exceeding 10 $\mu g/dL$.

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