PRELIMINARY 12-MONTH REPORT

of the

LEAD PAINT ABATEMENT AND REPAIR AND MAINTENANCE STUDY IN BALTIMORE

Conducted by

KENNEDY KRIEGER RESEARCH INSTITUTE

for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Ben Lim, EPA Task Manager
Technical Programs Branch
Chemical Management Division
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EXECUTIVE SUMMARY

This preliminary report is based on data from 60 (80%) intervention houses and 29 controls that have completed one year of follow-up in the Lead-Based Paint Abatement and Repair & Maintenance (R&M) Study. The research aim is to characterize and compare the short (2-6 mo.) and longer-term (12-24 mo.) effectiveness of three levels of lower cost R&M interventions designed to reduce children's exposure to lead in paint and dust, known sources of high lead exposure in U.S. children. The study population consisted of non-Hispanic black households (mostly renters) residing in Baltimore rowhouses with reported low monthly housing payments (mean $324). At the outset, mean ages of study children ranged from 25 to 33 months across groups, and the GM PbB levels in the three R&M groups and previously abated (PA) controls ranged from 10 to 14.5 μg/dL. The GM PbB in children in the modern urban (MU, post-1979) control houses was 4 μg/dL.

The report presents longitudinal data from five study groups across five campaigns. A number of types of graphical displays are included to facilitate understanding of the changes found in dust lead and children's blood lead. The reader who has a preferred type of data display or limited time is directed to specific tables and figures as follows: data tables- see Tables 5-8; box plots with median traces- see Figures 1-13, 17-19; bargraphs - see Figures 14-16, 20-23; for plots- see Figures 24-28 (blood data only). The main findings are listed below:

- All three levels of R&M intervention were associated with sustained reductions in dust lead (PbD) loadings, lead concentrations (PbD-C), and dust loadings. The degree of reduction in PbD and PbD-C was positively associated with the level of the R&M intervention. Statistically significant differences were found between R&M groups after intervention and at two, six, and twelve months.

- Over time, the MU control group had significantly lower dust lead levels than the other four study groups. Dust lead levels in the PA control group were generally intermediate between the middle (R&M II) and high (R&M III)level of intervention.

- Children with pre-intervention PbBs≥20 μg/dL had statistically significant reductions in PbB to levels <20 μg/dL at twelve months post-intervention. Children with pre-intervention PbBs <20 μg/dL did not have statistically significant PbB changes within or between R&M groups. An increasingly downward, but not statistically significant, trend in PbB was found in children in the high level intervention group (R&M III).

- Children in the MU control group had significantly lower PbBs over time as compared with each of the other four groups.

- Using <u>all five study groups</u> in longitudinal data analysis, children's PbB was significantly related to dust lead.

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1.0 INTRODUCTION

This preliminary report is based on data from eighty percent of the intervention houses that have completed the twelve month campaign of the Lead-Based Paint Abatement and Repair & Maintenance (R&M) Study which is underway at the Kennedy Krieger Research Institute (KKRI) in Baltimore. The R&M study is being conducted according to the Quality Assurance Project Plan approved by EPA in November 1992.[1]

Included in this report are twelve month data from twenty houses in each of the three R&M intervention groups (Levels I-III, n=60 houses), 15 (100%) modern urban (MU) control houses, and 14 (93%) previously and comprehensively abated (PA) control houses. The twelve month data from these 89 houses were collected between March 1994 and May 1995. The level of participant cooperation with home and clinic visits has been high. Consequently, we have sufficient preliminary data to begin to address the following study objectives:

- Describe changes in lead levels in settled house dust for R&M Levels I-III across five campaigns, i.e., pre- and immediate post-intervention, and two months, six months, and twelve months post-intervention.
- Describe changes in environmental variables between baseline and the twelve month campaign for the modern urban and previously abated control houses.
- Fit the study's statistical model for longitudinal data analysis to the dust lead and blood lead data.

An earlier report provided descriptive statistics on baseline environmental, biological, and demographic data for the five study groups (total of 107 houses).[2] At baseline, the study population consisted of non-Hispanic black households with reported low-to-moderate monthly rents and mortgages (mean $324) residing in Baltimore City row houses. Most (81%) households were renters.

The median household size was 4 persons, and the number of study children per household ranged from 1 to 4 children. Mean baseline ages of children ranged from 25 to 33 months across study groups. Accounting for multiple children per household (clustering), geometric mean baseline blood lead concentrations (PbB) were 5, 13, 10, 14.5, and 13 μg/dL for the modern urban, previously abated, and R&M I-III groups, respectively.

At baseline, the three R&M groups were similar with respect to demographic characteristics and lead levels in blood and environmental samples. However, lead levels in settled house dust and children's blood at baseline tended to be highest for the R&M Level III houses (vacant at baseline), lowest for the R&M Level I houses (occupied at baseline), and intermediate for the R&M Level II houses (mix of vacant and occupied houses at baseline).[2] Some of the owners of the vacant R&M III and II houses accepted study families with children with blood lead elevations >20 μg/dL as per their policy. Consequently, unlike R&M I households, R&M Levels II and III had some children with initial baseline blood lead concentrations >20 μg/dL. These children were analyzed separately in this report.

Purpose of R&M Study

The R&M study is designed to characterize and compare the short (2 to 6 month) and longer-term (12 to 24 month) efficacy of comprehensive lead-paint abatement and less costly and potentially more cost-effective Repair and Maintenance (R&M) interventions for reducing lead in settled house dust and children's blood. The investigators plan to extend the follow-up to five years post-intervention. This research is important because residential paints and dusts have been identified as major sources of lead exposure for U.S. children, particularly those living in houses with deteriorated paint and high dust lead levels.[3] Furthermore, there is a dearth of research literature on the outcomes of interventions for children with blood lead concentrations in our primary study range of 10 to 20 $\mu g/dL$.

The R&M approach may provide a practical means of reducing exposure for future generations of children who will continue to occupy housing containing lead-based paint. However, systematic studies of the R&M approach are needed in order to provide a sound scientific basis for prevention policies. EPA funding is anticipated for two years of follow-up testing in each study house to periodically measure lead in settled dust, soil, water, and children's blood. Pre- and immediately post-R&M intervention data provide baseline measurements for the study of short and longer-term changes in lead levels in children's blood and settled house dust.

The overall research goal of the R&M study is to contribute to the scientific basis for a standard of care for lead-painted houses via the conduct of a longitudinal intervention study. Specific study objectives are as follows:

1. Measure and compare the short and longer-term changes of lead in settled house dust and children's blood associated with R&M Levels I-III and previous comprehensive abatement.

2. Characterize the nature of the relationship between lead in children's blood and settled house dust.

3. Evaluate dust collection methodologies for the determination of lead in residential dusts, including wipe and cyclone methods. This objective was addressed in past reports.[4-6]

2.0 STUDY DESIGN AND SAMPLE COLLECTION PROCEDURES

This prospective study has two main components and five groups of study houses (Table 1). The first component is designed to obtain serial measurements of lead in venous blood of children 6 months through 4 years of age at baseline, settled house dust, soil, and drinking water in three groups of 25 R&M houses (total of 75 houses), each receiving one of three levels of R&M intervention

(Levels I-III) (Table 1). The study questionnaire, designed to obtain information on demographics and covariates which could influence lead exposure in the home (e.g., hobbies and child behavior) are done at six month intervals beginning at enrollment.

Occupied study houses (target n=37) were randomly assigned to receive either R&M Level I or R&M Level II interventions. Houses vacant at the time of intervention (target n=38) were randomly assigned to receive R&M Level II or Level III interventions. Since R&M Level II interventions were done in both occupied and vacant houses, the randomization scheme was designed to ensure equal numbers of houses (n=25) at each R&M level. More frequent sampling campaigns were planned for R&M houses during the first year to allow for the estimation of the rate of reaccumulation of lead in dust and an early assessment of the need for further cleanup or repairs.

The second component of the study design is to obtain serial measurements of lead in house dust, soil, drinking water, and venous blood of children (aged 6 months through 4 years at baseline), in two groups of control houses (Table 1). The study questionnaire is administered at six month intervals in both control groups.

One control group is a group of 16 scattered site row houses in older housing neighborhoods which received a comprehensive type of lead-paint abatement performed by pilot abatement projects in Baltimore between May 1988 and February 1991. The two years of planned follow-up will provide an opportunity to measure the efficacy of comprehensive abatement practices at 4-to-6 years post-abatement. Pre- and immediate post-abatement dust lead data are available for these previously abated houses from past studies.

Modern urban houses built after 1979, and presumably free of lead-based paint, constitute the second control group (n=16). These houses are located in modern urban subdivisions in which all houses are of this type.

2.1 Selection Criteria for Houses and Children

<u>The following selection criteria were applied to all groups</u>:

1. House size: approximately 800-1200 square feet.

2. House Condition: Structurally sound without pre-existing conditions that could impede or adversely affect the R&M treatments and the safety of the workers and field staff (e.g. roof leaks or unsafe floor structures).

3. Utilities (heat, electric, and water) were available to facilitate intervention and field sampling.

4. Occupants: Household included at least one child 6 months through 4 years of age who was neither mentally retarded nor physically handicapped with restricted movement; family had no definite and immediate plans to move.

5. House was not excessively furnished. This criterion enabled dust collection in all houses and intervention and cleanup efforts in occupied R&M houses.

<u>The following selection criteria were applied to R&M candidate houses only</u>:

6. House contained lead-based paint (defined in Maryland as $\geq$0.7 mg Pb/cm^2 or $\geq$0.5 percent lead by weight as determined by wet chemical analysis) on at least one surface in a minimum of two rooms or, in the absence of testing, year of construction pre-1941.

7. House dust lead levels prior to intervention exceeded Maryland's interim post-abatement clearance levels (<200 $\mu g/ft^2$, <500 $\mu g/ft^2$ and <800 $\mu g/ft^2$, respectively, for floors, window sills, and window wells) at a minimum of three locations.

8. House had 12 or fewer windows needing R&M work. This was to facilitate the R&M work with limited resources.

<u>Additional criterion applied to previously abated houses</u>:

9. At least two pairs each of pre- and immediately post-abatement dust-wipe lead measurements from the same floor, window sill, and window well surfaces were available from previously collected data. These data provide baseline dust lead levels.

2.2 Repair & Maintenance Interventions

The Repair & Maintenance interventions under study were all financed by the Maryland Department of Housing and Community Development (DHCD) via a special loan program available to property owners. The initial R&M intervention costs were capped by DHCD as follows: Level I: $1,650; Level II: $3,500; Level III: $6,000-$7,000. All R&M work was performed by workers trained in lead paint abatement work according to Maryland regulations. These interventions, described in detail elsewhere,[1] are briefly described below.

R&M Level I interventions included wet scraping of deteriorating lead-based paint on interior surfaces, limited repainting of scraped surfaces, installation of an entryway mat, wet cleaning and vacuuming with a high efficiency particulate air (HEPA) vacuum to the extent possible in an occupied unit, education of occupants and owners, and stabilization of exterior painted surfaces to the extent possible given the budget cap. R&M I interventions were done exclusively in occupied units and generally took a full day to complete.

Two key elements added to R&M Level II interventions were floor treatments to make floors smooth and easily cleanable and in-place window and door treatments to reduce abrasion of lead painted surfaces. Half of the R&M II interventions were performed in vacant units. In the occupied units, floor treatments were limited to rooms and areas where the work was feasible. R&M II work was generally completed within two days. Precautions were taken in the occupied R&M I and II houses to protect children and furnishings from lead exposure during the work phase. These measures included having children out of the house until all work and cleanup was completed and the use of containment measures such as plastic sheeting to protect belongings.

For R&M Level III, the highest level of intervention, additional work included window replacement as the primary window treatment, encapsulation of exterior window and door trim with aluminum coil stock, and more durable floor and stairway treatments (e.g. coverings). All R&M households received cleaning kits for their own wet cleaning efforts which included a bucket, sponge mop, sponges, a replacement sponge mop head, TSP cleaning agent, and the EPA brochure entitled "Lead Poisoning and Your Children."

2.3 Recruitment and Enrollment

The enrollment process entailed a three step process of pre-enrollment, formal enrollment, and ongoing pre-enrollment and enrollment activity as described below.

Extensive home visiting activity (1100 home visits to over 650 modern urban, previously abated, and older occupied dwellings) was performed by field staff as part of pre-enrollment field activities during the spring and summer of 1992. Over 90 percent of households identified as potentially eligible for the study indicated an interest in participating. This early pre-enrollment activity yielded 100 interested and eligible households for formal enrollment.

Formal enrollment refers to the obtaining of signed informed consent statements for study participation from parents or legal guardians for both environmental and biological sampling. Separate consent statements were obtained for each child enrolled in the study using forms approved by the Joint Committee on Clinical Investigation of the Johns Hopkins Medical Institutions.

Between the time of formal enrollment and the initiation of the initial data collection campaign in January of 1993, some enrolled households were lost to the study, primarily due to children aging and the moving of families to other dwellings. In some cases, the losses necessitated ongoing pre-enrollment activity to identify an increased pool of potential study participants. No evidence was found for selection bias when excluded R&M-candidate houses were compared to the R&M study houses.[2]

2.4 Sample Collection Procedures

Venous blood was collected from children at the KKRI Lead Clinic by a pediatric phlebotomist into 3 mL Vacutainers® with EDTA added as an anticoagulant.

Trained field teams collected all environmental samples, including field QC samples (blanks and duplicates). Settled house dust was collected using a modified high volume cyclone sampler originally developed for EPA for the evaluation of pesticide residues in house dust.[7] The modified device, referred to as the R&M cyclone, is described in detail and characterized elsewhere.[4] The device consists of a cast aluminum cyclone attached to a hand held Dirt Devil® vacuum as the air mover for the system. A 100 mL Teflon® microwave digestion liner was used as the sample collection container to eliminate a sample transfer step in the laboratory, thereby reducing the risk of sample loss.

The sampling plan for settled dust included the collection of three composite floor samples per house - one across rooms with windows on the first story, one across rooms with windows on the second story and one from first and second story rooms without windows. Two randomly selected 1-ft^2 (929-cm^2) perimeter floor locations were sampled in each room designated for inclusion in a composite sample. Composite window sill and window well samples were collected separately from all first and second story windows available for sampling at each campaign, respectively. Settled dust was collected as individual samples from horizontal and accessible portions of air ducts, interior and exterior entryways, and the main item of upholstered furnishing.

Soil core samples were collected as separate composites of the top 0.5 inch (1.3 cm) of soil from 3 randomly selected locations at the drip line. Cores were collected into polystyrene liners using a 6-inch (15.2 cm) stainless steel recovery probe.

Drinking water samples were collected as 2-hour fixed-time stagnation samples from the kitchen faucet rather than first draw samples to avoid disrupting families early in the morning. The procedure was to run the cold water for at least two minutes to flush the pipes and then to collect the first flush of water after a 2-hour interval. A list of field sample types is provided below.

<u>Settled-dust (R&M cyclone)</u>
Perimeter floor composite - 1st and 2nd story rooms with windows and rooms without windows
Window sill composite - 1st and 2nd story
Window well composite - 1st and 2nd story
Air duct/upholstery
Interior entryway
Exterior entryway

<u>Soil core</u> Drip-line composite

<u>Drinking water</u> Kitchen faucet

<u>Field QC</u>
Blanks (one per house) and duplicates (every tenth house) for all sample types.

Information on the study children and their households was collected using a structured interview questionnaire. As planned, families were informed by letter of the results of all dust lead and blood lead tests. Dust test results were provided on a qualitative basis with recommendations for priorities for housekeeping. Families with water and soil lead concentrations that exceeded EPA guidance levels were provided with additional recommendations for avoiding lead exposure (e.g. EPA's guidance to run the water to flush the pipes prior to use whenever the water has been in contact with the plumbing for two hours or more). Additionally, separate letters were sent to the parents/guardians with the results of the blood lead tests so that they could be shared with the child's primary care provider. All blood lead results were reported to the Maryland Childhood Lead Registry as required by Maryland law.

3.0 LABORATORY ANALYSIS PROCEDURES

Interior and exterior settled dust, exterior soil, water, and venous blood samples were analyzed at the Kennedy Krieger Institute's Trace Metal Laboratory using established analytical methods. Microwave digestion was used for dust, soil, and water samples (modified SW 846 Methods 3015 and 3051). Analysis of dust and soil digestates was performed using Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP) (SW 846 Method 6010) and/or Graphite Furnace Atomic Absorption Spectrometry (GFAA) (SW 846 Method 7421). Analysis of drinking water was by GFAA (SW 846 Method 7421). Blood was analyzed by GFAA using matrix matched standards.[8] The table below summarizes the procedures.

Summary of Laboratory Procedures

Sample Type	Pre-Preparation Summary	Preparation Summary	Analysis Summary
Dust	Post-field drying and gravimetrics	Digest using 1:1 HNO_3: H_2O with microwave heating	ICP/GFAA*
Soil	Sample drying and homogenization	Digest using 1:1 HNO_3: H_2O with microwave heating	GFAA
Drinking Water	none	Digest using 1:1 HNO_3: H_2O with microwave heating	GFAA
Blood	Stabilized in EDTA	Addition of matrix modifier/triton X-100 solution	GFAA

* Samples with lead concentrations below the limit of quantitation of the ICP instrument were analyzed by GFAA.

4.0 DATA PROCESSING AND STATISTICAL ANALYSIS PROCEDURES

4.1 Data Processing

Sources of data include the field collection forms, the questionnaire, and the laboratory data packages. Raw data of all types were transferred to the Data Manager who uploaded the data to a VAXStation 3100 computer and prepared the data for later analysis. Below is a summary of the data processing steps employed for the three sources of data.

- The field data set consists of all data recorded on the field collection forms for settled dust, soil, and drinking water samples as well as room and window inventory data. A data entry firm keypunched and verified (double entry) data from the field forms into ASCII data files. These raw data files were transferred to the Data Management team for management, storage, and later analysis. Field data forms were checked for completeness and accuracy by both the Outreach Coordinator and Data Manager prior to data entry. Data were re-verified by laboratory staff after data entry.

- Laboratory data were electronically stored for each laboratory instrument as follows: Mettler Balance: gravimetric data (tared and loaded weights for cyclone-dust and soil samples) ICP: lead measurements for cyclone-dust samples. Graphite Furnace-AAS: lead content of drinking water, soil, blood, and low lead concentration cyclone dust samples. Electronically stored laboratory data from the Mettler, ICP, and GFAA instruments were moved to Paradox (v.4.0) by laboratory staff for tracking of samples. The data were re-verified by laboratory staff after data entry. Paradox data were then converted to ASCII files by the Data Management team for uploading to the VAXStation. A SAS program read in the laboratory data for environmental and blood samples and created SAS datasets for data analysis.

- Questionnaire data forms were keypunched and verified (double entry) by the data entry firm into ASCII data files. These raw data files were verified in-house and transferred to the Data Manager. A SAS program read in the raw data and created SAS datasets for data analysis.

4.2 Data Summary

This preliminary report includes data through the twelve month campaign for 60 R&M houses and 29 control houses as follows:

R&M Level I:	20 (80%)	of 25 planned houses
R&M Level II:	20 (80%)	of 25 planned houses
R&M Level III:	20 (80%)	of 25 planned houses
Modern Urban:	15 (100%)	of 15 planned houses
Previously Abated:	14 (93%)	of 15 planned houses.

Environmental dust data from four surface types (perimeter floor, window sill, window well, and interior entryway) included in each of the first five data collection campaigns (pre-R&M, post-R&M, two months, six months, and twelve months post-R&M) are included in this report as well as data collected less frequently (i.e., airduct dust, upholstery dust, soil, and water). Tables 2 and 3 display the types and numbers of 12-month campaign samples planned, collected, and analyzed for lead by study group for the 89 houses included in this report.

Some of the original study families moved or voluntarily withdrew from the study between the initial and twelve month data collection campaigns. Table 4 reports the frequency of family and child moves, and reoccupancies by new study families, by study group. Approximately 21 percent (13/60) of the original families in the 60 R&M houses moved prior to the twelve month campaign. By the twelve month campaign, all of these study families were replaced by the next family that moved into the house. Despite our success in gaining the participation of these new families, they had fewer eligible children than the original families. By the twelve month campaign, the study also gained 15 children who were newborns that became of age (≥6 months) for blood lead testing.

One R&M II house was vacant at the time of the twelve month sampling. None of the houses included in this report are known to have had any major renovations or repairs during the first year of follow-up. One R&M I house had its front and back doors replaced due to break-ins that damaged the original doors, and in another house the wallpaper was removed by the occupants from the first floor rooms by a steam process.

Children in most of the occupied R&M I and II houses experienced an extended time interval of 6 to 10 months between the initial PbB and the completion of the R&M work. This interval was due to the time taken by collaborating property owners to provide a completed R&M loan application and the time required for loan processing, loan approval, and loan closing. The actual R&M work contributed relatively little to the actual time intervals between the initial and subsequent campaigns. An effort is currently underway, with the permission of study families, to obtain any additional PbB data that might be available from these children's medical records for the period between the initial study PbB and the start of the R&M work that could serve as new baseline study values closer to the times of the interventions. This effort was not needed for children who moved into the vacant R&M II and III houses after the R&M work was completed.

4.3 Quality Control

At the time of this report, the performance audit which consists of a review of the laboratory QC charts has been an ongoing activity of the QC Officer. QC samples include instrument QC samples (initial and continuing calibration verification samples, initial and continuing calibration blanks, standard reference materials, spikes and spike duplicates), method blanks, and field QC samples (field blanks, field duplicates). The data quality objectives related to laboratory and field performance continue to be met. The QC Officer has also completed the system audit of the laboratory and field procedures. No significant deficiencies have been noted. Since the data audit is ongoing and the twelve month campaign has not been completed, this report is termed preliminary and partial in nature.

The ongoing data review has recently revealed occasional inconsistencies over time in the measurement of various window components in some of the study houses. The measurement of window components can be a problem due to the multiple window types encountered; selection of the appropriate dimensions to characterize the component requires considerable judgement by the field teams. Shortly after field work commenced, the protocol for window measurement was greatly expanded and was training conducted to reduce potential measurement problems. Some problems remain however. At this time, the principal investigator and the QC Officer are in the process of personally inspecting and remeasuring all windows identified with discrepancies in measurements in any campaign. As a result of these remeasurements, it is expected that some lead and dust loadings and statistical analyses based upon these measures in the six- and twelve-month preliminary reports will be revised slightly.

4.4 Statistical Analysis

In order to compare the same houses over time, we restricted the longitudinal data analysis to the 60 R&M houses and 29 control houses for which data were available from the twelve month campaign as of May 1995.

For data analysis purposes, lead values less than the instrument detection limit (IDL) were coded as the IDL/√2.[9] For lead values less than the limit of quantitation (LOQ) but greater than the IDL, the observed value was used in the data analysis.

One child in a previously abated house had a blood lead increase to a concentration of 53 µg/dL at the 12 month campaign and was provided with chelation therapy. This child is an outlier in this study and was excluded from the statistical data analysis. The mother reported that the affected child has more frequent hand-to-mouth activity than the siblings who did not experience similar blood lead increases. Inspection of the house revealed exterior surfaces with deteriorated lead paint which had been stabilized, but not removed, as part of the original abatement work 4 to 5 years ago. Also, lead in paint and dust was identified in the basement which had not been treated at the time of abatement since the basement was not a finished living area. The property owner plans to make additional repairs.

Descriptive statistics

SAS® PROC UNIVARIATE indicated that the environmental and blood lead distributions were skewed. As expected, use of the log transformation reduced the amount of skewness and produced histograms and boxplots which were approximately normal (see boxplot Figures 1 to 13). Descriptive statistics for blood and environmental variables were produced after transforming the data using the natural logarithm (ln).

SAS® PROC UNIVARIATE was used to produce descriptive statistics for all sample types with one observation per house. Since multiple observations were available per house for settled dust from window sills, and window wells, floors in rooms with windows, as well as for children's blood, additional analysis was performed using SAS® PROC MIXED with house as a random effect to address the issue of clustering (i.e. multiple observations per house). Geometric mean (GM) values, standard errors, and 95% confidence intervals were obtained using the following PROC MIXED models fitted separately for each study group (R&M Levels I-III, modern urban, previously abated), surface type (floors in rooms with windows, window sill, window well), and matrix (dust, blood):

$$\ln(PbD) = \beta_0 + \ln(E) \quad (Eq.1)$$

$$\ln(PbD\text{-}C) = \beta_0 + \ln(E) \quad (Eq.2)$$

$$\ln(DL) = \beta_0 + \ln(E) \quad (Eq.3)$$

$$\ln(PbB) = \beta_0 + \ln(E) \quad (Eq.4)$$

where, PbD = dust lead loading ($\mu g/ft^2$); PbD-C = dust lead concentration ($\mu g/g$); DL = dust loading (mg/ft^2); PbB = blood lead concentration ($\mu g/dL$); $\beta_0 = \ln(\alpha)$; α = a constant; ln(E) is normally distributed.

Side-by-side boxplots

Side-by-side boxplot figures with median traces are presented in this report as a means of displaying lead levels across campaigns within and across study groups. For this preliminary report, the boxplots across time for the environmental data are limited to the 89 houses with data available at the twelve month campaign. Boxplots were generated using S-Plus® software[10] (see section 5.1 for a description of boxplot components). The descriptive statistics presented in this report include "extreme values" that are indicated by the symbol '*' in the boxplot displays.

Statistical method for analysis of longitudinal data

Statistical methods for the analysis of longitudinal data have developed rapidly over the last decade. These methods, which are natural extensions of multiple regression and analysis of variance, are extremely flexible. Current longitudinal methods allow for the inclusion of random and fixed effects, longitudinal (time dependent) covariates and constant covariates, as well as discrete and continuous covariates, all in a multiple regression context. In this study, for example, we have the following types of covariates:

(1) type of house - fixed effect, discrete
(2) house - random effect, discrete
(3) dust lead - fixed time dependent continuous covariate
(4) child - random effect, discrete
(5) R&M Level - fixed effect, discrete
(6) time - fixed time dependent continuous covariate
(7) age of child - fixed time dependent covariate
(8) season - fixed discrete covariate

The response variable modeled was dust lead reading or blood lead concentration (transformed using logarithms). These response variables as well as their associated time dependent covariates will be observed at times described in Table 1.

For the dust lead measurements let Y_i denote the vector of responses over time for the ith house i.e. $_I$ is an nix vector of the form $Y_i = (y_{i1}, y_{i2}, \ldots, y_{in_i})^T$ where y_{ij} is the response for the ith house at time t_j and "T" stands for the transpose operation. Then the general form of the model is:

$$Y_i = X_i\beta + Z_i b_i + \epsilon_i$$

where X_i is an $n_i xp$ matrix of covariate values for the fixed effects, β is a px1 vector of parameters for the fixed effects, Z_i is an $n_i xq$ matrix of covariate values for the random effects, b_i is a qx1 vector of random effect parameters and ϵ_i is an $n_i x1$ vector representing random error. We have N such models, one for each house.

Estimates of the parameters in the overall model are obtained using the methods outlined in published papers.[11-17] The essential feature of these methods is the use of weighted least squares with a "working" estimate of the covariance matrix followed by iteration with an updated estimate of the covariance matrix until convergence. The estimate of the variance-covariance matrix of the fixed effects is robust, in the sense that it is consistent, regardless of the form of the "working" estimate of the covariance matrix. The model for blood lead readings will be similar with the above model specified for each child.

Our primary interest in this study is in the parameters of the model which represent the effect of R&M interventions on dust lead and blood lead. The fact that this model allows estimation of these parameters in the presence of heterogeneity between houses and temporal correlation, and produces variance estimates which are robust is extremely important. Should it be necessary we can, in this framework, also consider response variables which are discrete.

The general nature of the model makes it ideal for a study of this type where there is the potential for unbalance. Since the model is house or child specific, depending on whether dust lead or blood lead is being modelled, we do not require that the number of observations through time be equal. Thus, should a child move or otherwise be eliminated from the study the house data can be analyzed while the data for that child can be included up to the point of departure. Should another child be entered into the study at that house his or her blood lead readings can be included in the blood lead analysis for the remainder of the study, thus providing partial information for that child. The common residence of the children is included in the house covariate which allows for correlation structure between these observations.

Age-related effects in the analysis of blood lead responses need to take into account the fact that blood lead is not linearly related to age since it tends to increase between six months and two years and decrease slowly among children over two years of age. This is done by the use of linear and quadratic terms for age in the model. The presence of several children in a house, which introduces another source of correlation, (i.e. between children in the same house) is accounted for by using house as a random effect which introduces the required correlation.

SAS PROC MIXED AND GEE[18] software were used for longitudinal data analysis.

<u>Specifications of longitudinal models for dust</u>

In the analysis of the preliminary twelve month dust data, we have fit the statistical model proposed in the QAPjP to the data. The results of the compositing self study indicated that an overall measure of lead exposure could be considered with little loss of information. This was true for both dust lead concentrations and lead loadings. These results suggest that the readings from multiple sample sites in a house might be combined to produce an overall measure to use as a covariate in the model relating environmental lead levels to blood lead levels. Consequently, we have explored the use of factor analysis as a method for combining individual sample results. The results indicate that:

- One factor, the first, accounts for (79% to 83%) of the variability of environmental dust lead when all five groups are analyzed together. The findings were similar when the three R&M groups were analyzed separately.

- The second factor measures the difference between the floor lead readings and window sill and window well lead readings and accounts for (12% to 14%) of the variability when all five groups are analyzed together. The findings again were similar when the three R&M groups were analyzed separately.

Thus far, the percentages of the variability of the dust readings accounted for by the factor loadings have remained stable over study groups and campaigns (see below).

Five Study Groups:

Dust Measure	Initial Campaign		Six Month Campaign		Twelve Month Campaign	
	factor1	factor2	factor1	factor2	factor1	factor2
Pb Loading	.81	.14	.83	.12	.83	.12
Pb Conc.	.82	.12	.81	.14	.79	.14
Dust Loading	.61	.22	.67	.18	.69	.17

R&M Groups Only:

Dust Measure	Initial Campaign		Six Month Campaign		Twelve Month Campaign	
	factor1	factor2	factor1	factor2	factor1	factor2
Pb Loading	.80	.15	.79	.15	.79	.15
Pb Conc.	.73	.19	.74	.18	.75	.17
Dust Loading	.69	.17	.70	.16	.70	.16

Given the stability of the factors over time, we feel comfortable using them as the variable to measure environmental lead levels. The first factor was used as the dependent variable in the longitudinal data analysis of dust changes.

The following models were fit to the dust data:

$$\ln(factor1)_{ijkl} = \beta_0 + \beta_1 * season_{ij} + \beta_2 * level_{ik} + \beta_3 * campaign_l(level_{ik}) + b_i * house_i + \epsilon_{ijkl}$$

$$\ln(factor1)_{ijkl} = \beta_0 + \beta_1 * season_{ij} + \beta_2 * level_{ik} + \beta_3 * level_k(campaign_{il}) + b_i * house_i + \epsilon_{ijkl}$$

where,
I refers to house, j to season, k to R&M Level, l to campaign, level(campaign)= campaign nested within R&M level to compare dust levels over time within R&M groups, and campaign(level)= R&M level nested within campaign to compare R&M groups at each campaign over

time. Following standard practice regression coefficients corresponding to "fixed effects" are denoted by Greek letters while regression coefficients corresponding to "random effects" are denoted by ordinary letters (e.g. b).

SAS PROC MIXED has been used for the analysis thus far since a log transformation of lead values is indicated as previously mentioned.

Specifications of longitudinal models for blood lead

In order to address the study objectives with regard to blood lead changes, we fit two main types of models to the data. The first model, hereinafter referred to as the exposure model, was used to characterize the relationship between blood lead and dust lead. In this model, the two dust lead factors were included as dependent variables along with demographic and behavioral variables. The second model, hereinafter referred to as the comparison model, was used to investigate blood lead levels across groups and within groups over time. The two models are as follows:

Exposure Model

$$
\begin{aligned}
ln(PbB)_{iklm} = \; & \beta_0 + \beta_1 * factor1_{iklm} + \beta_2 * factor2_{iklm} \\
& + \beta_3 * age_{iklm} + \beta_4 * age^2_{iklm} + \beta_5 * season_{iklm} \\
& + \beta_6 * gender_{ikl\cdot} + \beta_7 * mouthing_{iklm} \\
& + \beta_8 * campaign_l + \beta_9 * factor1 * campaign_l \\
& + \beta_{10} * factor2 * campaign_l \\
& + b_i * house_i + b_{m(I)} * child_{m(I)} + e_{iklm}
\end{aligned}
$$

The initial campaign blood and dust lead values for children who moved into the vacant R&M II and III houses after intervention were excluded from the exposure model. Their initial PbB values at the time of move-in reflect body burdens associated with exposures in their past living environments and not their new home environments.

Comparison Models

$$
\begin{aligned}
ln(PbB)_{iklm} = {} & \beta_0 + \beta_1{*}age_{iklm} + \beta_2{*}age^2_{iklm} + \beta_3{*}season_{iklm} \\
& + \beta_4{*}gender_{iklm} + \beta_5{*}mouthing_{iklm} \\
& + \beta_6{*}group_k + \beta_7{*}campaign_l \\
& + \beta_8{*}group_k(campaign_l) \\
& + b_i{*}house_i + b_{m(I)}{*}child_{m(I)} + \epsilon_{iklm}
\end{aligned}
$$

$$
\begin{aligned}
ln(PbB)_{iklm} = {} & \beta_0 + \beta_1{*}age_{iklm} + \beta_2{*}age^2_{iklm} + \beta_3{*}season_{iklm} \\
& + \beta_4{*}gender_{iklm} + \beta_5{*}mouthing_{iklm} \\
& + \beta_6{*}group_k + \beta_7{*}campaign_l \\
& + \beta_8{*}campaign_l(group_k) \\
& + b_1{*}house_i + b_2{*}child_{m(I)} + \epsilon_{iklm}
\end{aligned}
$$

where,
I refers to house, k to group, l to campaign, m to child within house, group(campaign)= campaign nested within study group to compare blood levels over time within groups, and campaign(group)= group nested within campaign to compare groups at each campaign over time. Following standard practice regression coefficients corresponding to "fixed effects" are denoted by Greek letters while regression coefficients corresponding to "random effects" are denoted by ordinary letters (e.g. b). The comparison models were fit using all blood lead data and then separately for children with PbB levels <20µg/dL and ≥20µg/dL.

5.0 RESULTS

5.1 Side-by-Side Boxplots with Median Traces

In order to graphically display changes over time in environmental and blood data this report provides a series of boxplot displays with median trace lines connecting the median values across time. These descriptive displays do not take into account season or any other potential covariates.

In a boxplot display, 50 percent of the data is contained in the box shown in the figure; the bottom of the box is the lower quartile and the top of the box is the third quartile, the horizontal line inside the box represents the sample median. The vertical lines extending from the box represent the expected lower and upper range of the data based on the variability of the central portion of the data. The fences are 1.5 interquartile ranges from the upper and lower edges of the box. Extreme values are indicated by an asterisk.[19] The widths of the boxes in any given side-by-side boxplot are proportional to the number of observations.

Dust Data Boxplots

Figures 1-12 are boxplot displays presented by study group for each of the main surface types (floors in rooms with windows, window sills, window wells, interior entryways) showing the distributions of dust lead loadings, dust lead concentrations, and dust loadings, respectively, across campaigns. These displays allow for comparisons both within and across groups over time.

The median traces for lead loadings across most surface types in R&M Level I-III houses show a pattern of reduced levels at post-intervention, most pronounced for R&M III, followed by increases at two months to levels that remained below pre-intervention levels. At six and twelve months, the median lead loadings tended to remain relatively stable; R&M I and II houses had unchanged or moderately increased levels across surface types and R&M III houses had unchanged or moderately decreased levels (Figures 1-4). Deviations from this pattern include: (a) interior entryways in R&M I houses which did not have reduced levels at post-intervention and floors in R&M I houses which did not show a pattern of rebound at two months and (b) floors and entryways in R&M II houses which had decreased levels at post-intervention but no increases at two months (Figures 1 and 4).

For dust lead concentrations, the median traces reveal a downward trend at post-intervention and at two months across sample types that is most pronounced in R&M III and R&M II houses compared with R&M I houses. At six and twelve months, the lead concentrations tend to remain relatively stable in R&M I houses and show unchanged or moderately decreased levels across surface types in R&M Level II and III houses (Figures 5-8).

The median traces for dust loadings in the three R&M groups show patterns similar to those described above for the lead loadings (Figures 9-12).

In the modern urban and previously abated control houses the median traces for dust show a pattern of relatively stable lead loadings, lead concentrations, and dust loadings over time with a slight downward trend at six and twelve months for lead loadings and dust loadings (Figures 1-12).

Blood Data Boxplots with Median Traces

Figure 13 provides boxplot displays of the unadjusted blood lead concentrations (µg/dL) over time by study group for the subset of children with initial PbB <20 µg/dL. The outlier in the PA group at twelve months with a PbB of 53 µg/dL is excluded from Figure 13 and the statistical data analysis for reasons explained in section 4.4. The median traces for all five study groups indicate modest or little change over time.

5.2 Descriptive Statistics - Twelve Month Campaign

Settled Dust

Descriptive statistics for settled dust at the twelve month campaign are displayed as follows:

- Bar graphs of GM dust lead loadings (PbD, $\mu g/ft^2$), dust lead concentrations (PbD-C, $\mu g/g$), and dust loadings (DL, mg/ft^2) by study group and surface type (Figures 14 to 16).
- Boxplot displays of PbD, PbD-C and DL distributions by study group and surface type (Figures 17-19).
- Descriptive statistics (geo. mean, n, min, max, sd) for the twelve month PbD, PbD-C, DL respectively, for the five study groups and seven surface types (interior entryways, floors in rooms with and without windows, window sills, window wells, upholstery and air ducts) are presented in Appendix A, Tables a-c). Sample sizes for upholstery and air duct data are limited for reasons provided in Table 2. The geometric means and 95% confidence intervals for floors in rooms with windows, window sills, and window wells are the values produced by an analysis that takes into account clustering (section 4.4).

Geometric mean (GM) lead loadings across all groups and surface types at the twelve month campaign were <603 $\mu g/ft^2$, except for air ducts in all groups (range of GMs 856 $\mu g/ft^2$ (MU) to 18073 $\mu g/ft^2$(R&M I)) and window wells in R&M I (19412 $\mu g/ft^2$), R&M II (1,761 $\mu g/ft^2$), and previously abated houses (1172 $\mu g/ft^2$)(Appendix A, Table b). For R&M Levels I-III, respectively, the GM PbD values were 112, 79, and 36 $\mu g/ft^2$ for floors in rooms with windows; 603, 201, and 23 $\mu g/ft^2$ for window sills and 19412, 1761, and 268 $\mu g/ft^2$ for window wells.

GM dust lead concentrations across all groups and surface types at twelve months were <4000 $\mu g/g$ (ppm), equivalent to <0.40%, except for window sills (7754 $\mu g/g$) and window wells (22963 $\mu g/g$) in R&M I houses (Appendix A, Table a).

At the twelve month campaign, GM dust loadings across surface types were <340 mg/ft^2 except for window wells in MU, PA, and R&M I and R&M II groups (range 456 to 841 mg/ft^2) and air ducts (range

8474 to 15184 mg/ft^2)(Appendix A Table c).

Modern urban houses continued to have the lowest lead loadings at the twelve month campaign. GM values across surface types were all <217 μg/ft^2 except for air ducts. For floors, windows sills, and window wells at twelve months, R&M I houses had significantly higher GM PbD values (112, 603, and 19412 μg/ft^2, respectively) compared to R&M III houses (36, 23, and 268 μg/ft^2, respectively); GM values in R&M II houses were intermediate (79, 201, and 1761 μg/ft^2, respectively).

At twelve months, modern urban houses continued to have the lowest GM PbD-C levels across surface types (<440 μg/g). The GM PbD-C values for interior entryways and interior floors across the other four study groups (R&M I-III and PA) were not statistically different from each other (Appendix A, Table a). For windows sills and window wells, R&M I houses had significantly higher GM PbD-C values (7754 and 22963 μg/g, respectively) compared to R&M III houses (796 and 1130 μg/g, respectively), with R&M II houses intermediate (2941 and 3862 μg/g, respectively).

Study groups were most similar to each other in terms of dust loadings. However, dust loadings tended to be highest in R&M I houses, lowest in R&M III houses and intermediate in R&M II houses. For windows sills and window wells, R&M I houses had significantly higher GM dust loading values (78 and 841 mg/ft^2, respectively) compared to R&M III houses (29 and 237 mg/ft^2, respectively), with R&M II houses intermediate (68 and 456 mg/ft^2, respectively) (Appendix A Table c).

<u>Dust Lead Correlations between Surface Types</u>

Statistically significant correlations ($p<.05$) were found between the dust lead levels from most of the surfaces types at the twelve month campaign. Tables d-f in Appendix A display the correlation matrices for dust load loadings, lead concentrations, and dust loadings, respectively. The highest correlation coefficients were for window sills and window wells (.73 for PbD and .67 for PbD-C).

Overall Summary Measures of Dust Data

Summary measures of the dust data for each house were calculated based on the weighted average of the readings across the four surface types common to all campaigns, i.e., floors, entryways, window sills, and window wells. The weighting factor for lead loadings and dust loadings was the surface area sampled. For lead concentrations the weighting factor was the sample mass.

Figure 20 displays the overall geometric mean PbD, PBD-C and DL values at the twelve month campaign by study group. Figures 21-23 display the GM values for the three overall dust measurements by study group for each of the five data collection campaigns through the twelve month campaign. Descriptive statistics (GM, range) for the overall PbD, PbD-C, and DL readings respectively by campaign are displayed in Tables 5-7. Based on these summary measures, overall GM lead loadings were approximately 35 times higher in R&M I houses as compared with R&M III houses. This difference is due to order of magnitude higher lead concentrations and several fold higher dust loadings in R&M I houses relative to R&M III houses.

Drip-Line Soil

Drip-line soil samples were not collected at the twelve month campaign. Therefore, this report provides preliminary six month data on lead concentrations of drip-line soil (PbS) by study group (Appendix A Table g). These data are limited due to the fact that most study houses have no drip-line soil. The PbS levels in modern urban houses remained similar to the initial levels (six month GM=73 μg/g, range 34 to 229 μg/g versus initial GM=63 μg/g, range 29 to 154 μg/g). Across previously abated and R&M houses individual PbS values ranged from 182 to 7845 μg/g at six months compared to the range of 233 to 15968 μg/g observed at pre-intervention/baseline.

Drinking Water

Drinking water samples also were not collected at the twelve month campaign. Water lead concentrations (PbW) at six months were unchanged from their geometric mean baseline levels of ≤4 μg/L (ppb) across groups. The range of values also remained the same - less than the instrumental limit of detection (<LOQ) to 40 μg/L (Appendix A Table h).

Blood Lead

For children with PbB <20μg/dL at the initial campaign, Table 8 provides descriptive statistics on PbB levels by campaign. The unadjusted GM blood lead concentrations for this subgroup at the twelve month campaign were 8 to 12 μg/dL for children in R&M groups I-III and the previously abated houses, whereas the GM PbB value in children in the modern urban houses was 3 μg/dL. The median ages across the five groups at the twelve month campaign for these children ranged from 36 to 43 months.

Figures 24-28 are "hair clip" line plots for children in each of the five study groups. These figures display each study child's blood lead concentrations across time starting with the initial campaign. As seen in Figures 24-26, R&M II and III had most of the children with initial PbBs ≥20 μg/dL. Children with baseline PbBs ≥20 μg/dL experienced reductions in their PbB levels over time, while those that had baseline levels of <20 μg/dL tended to remain at levels <20 μg/dL over time.

Correlation between blood lead and dust lead

At twelve months a pattern of statistically significant and moderate correlations was found between children's blood lead concentrations and dust lead loadings and concentrations across the various surface types (Tables 9 and 10). The Pearson correlation coefficients for ln(blood lead) and ln(dust lead loading) ranged from .22 (window sills and wells), to .32 (floors) and .48 (upholstered furnishings) using the youngest child per house (unadjusted for clustering) (max n=79). The Pearson correlation coefficients for ln(blood lead) and ln(dust lead concentration) ranged from .22 (window sills) to .45 (floors) to .60 (upholstered furnishings) using the youngest child per house (unadjusted for clustering) (max n=79).

5.3 Longitudinal Data Analysis

Dust Lead

The longitudinal models described in section 4.4 were fit to the data for lead loadings, lead concentrations, and dust loadings from the three R&M groups and all five study groups. Fitting the models to the data from the three R&M groups allowed for investigation of changes across all five campaigns (initial, post-intervention, and two, six, and twelve month), two of which (post-intervention and two month) were not common to the control groups. The three campaigns common to all study groups were included in the five group models.

In these models the dependent variable was factor1 obtained from the factor analysis, a factor that accounted for most of the variability of environmental dust lead. For each dust variable (PbD, PbD-C, DL), the model was fit to the data with campaign nested within study groups in order to examine trends over time within study groups, and with study group nested within campaign in order to compare study groups at each campaign.

The main findings of the longitudinal analysis of the dust data after controlling for season are listed below. In the presence of other covariates (campaign, group), season was a significant fixed effect in the lead loading and dust loading models but not in the lead concentration models.

The PROC MIXED output is displayed in Appendix B. The printouts have the following codes for campaign and group: 00=pre-intervention, PI=post-intervention, 02=two months, 06=six months and 12=twelve month, IN=initial campaign (5 group model), 1=R&M I, 2=R&M II, 3=R&M III). Interpretation of the estimates obtained by SAS PROC MIXED obey the usual rules of interpretation of regression coefficients, i.e., the coefficient of a covariate is the expected change in the response variable associated with a unit change in the covariate in the presence of the other covariates. When the covariate is a dummy variable, a unit change in the covariate corresponds to the expected difference between the response at the level of the covariate compared to the omitted level. If the effect is a nested effect, e.g., level nested within campaign the coefficient represents the comparison of that level versus the omitted level for a fixed campaign and this allows the determination of differences between levels of intervention.

Dust Lead loadings:

R&M group comparisons across time

- Despite higher baseline levels, lead loadings were significantly lower ($p<.01$) in R&M III and R&M II houses as compared with R&M I houses at immediately post-intervention, two months (R&M III only), six months, and twelve months. At each campaign, PbD was lowest in R&M III, highest in R&M I, and intermediate in R&M II.

Changes over time within R&M groups

- For all three R&M groups, post-intervention lead loadings were significantly lower than their pre-intervention levels. For R&M II and III houses, PbD levels at two months, six months, and twelve months were significantly higher than their corresponding post-intervention levels. In R&M I houses PbD levels over time were not significantly different from their immediate post-intervention levels.

Lead concentrations:

R&M group comparisons

- Pre-intervention dust lead concentrations (PbD-C) were not significantly different across the three R&M groups. PbD-C levels were significantly lower (generally $p<.01$) in R&M II and III as compared with R&M I at immediately post-intervention, two months, six months and twelve months. At each campaign PbD-C was lowest in R&M III, highest in R&M I, and intermediate in R&M II.

Changes over time within R&M groups

- For R&M II and III (but not R&M I), lead concentrations were significantly reduced ($p<.01$) at immediately post-intervention. For both R&M I and II houses, PbD-C levels at two months, six months and twelve months were significantly lower than their corresponding levels at immediately post-intervention. In R&M III, only the twelve month level was significantly lower ($p<.01$) than the post-intervention level.

Dust loadings:

R&M group comparisons

- At pre-intervention, dust loadings (DL) were significantly higher in R&M II and III houses as compared with R&M I houses. At each point in time post-intervention the estimates for R&M II and III were negative relative to R&M I; however, none of differences reached statistical significance. R&M II houses had intermediate DL levels at each follow-up campaign.

Changes over time within R&M groups

- In all three R&M groups, dust loadings were significantly reduced ($p<.01$) at immediately post-intervention. None of the follow-up levels were significantly different from their post-intervention levels although the levels tended to be higher at follow-up (positive coefficients).

Control houses:

- Dust lead loadings in the modern urban (MU) houses were significantly lower ($p<.01$) than those in the three R&M groups and the previously abated (PA) houses at baseline, six month and twelve months. PbD levels tended to decrease over time in MU and PA houses; however, none of the changes were statistically significant.

- Dust lead concentrations at baseline, six month and twelve months were significantly lower in MU houses as compared with each of the other four groups. At six and twelve months, lead concentrations in MU and PA houses were not significantly different from their baseline levels.

- Dust loadings at baseline were significantly lower in modern urban houses as compared with each of the R&M groups but not the previously abated group. At follow-up, none of the study groups had dust loadings that were statistically different from those in the modern urban study houses.

Blood Lead

The exposure and comparison models described in section 4.4 were fit to the blood lead data for children in the three R&M study groups and for children in all five study groups. Fitting the models to data from the three R&M groups allowed for investigation of changes across all four PbB testing campaigns (initial, two month, six month and twelve month). The three campaigns (initial, six month, twelve month) common to all five study groups were included in the five group models.

The main findings of the comparison models for investigating PbB changes within and between groups are listed below. The PROC MIXED output is displayed in Appendix C with the following codes: (campaigns)0=pre-intervention/initial, 2=two month, 6=six month and 12=twelve month, L1=R&M Level I, L2=R&M II, L3=R&M III.)

R&M group comparisons

- For children with initial PbB <20 µg/dL, no statistically significant blood lead differences were found between the three R&M groups at baseline and two, six and twelve months post-intervention controlling for age and season. R&M I children tended to have lower PbB levels at each campaign, including baseline, relative to R&M III children.

Changes over time within R&M groups

- For children with initial PbB <20 µg/dL in each of the three R&M groups, no statistically significant changes in PbB were found at the two, six and twelve month campaigns controlling for age and season. However, a consistently downward but nonsignificant trend in blood lead was found in children in R&M III houses. (The coefficients at two, six, and twelve months were negative and increased in magnitude over time.)

Control Houses: Changes within groups and group comparisons

- For children with initial PbB <20 μg/dL in the previously abated control houses, no statistically significant PbB changes were found at the six and twelve month campaigns controlling for age and season.

- Controlling for age and season, children in modern urban houses had PbB levels that were lower and statistically different from those of children in each of the other four study groups at the initial, six and twelve month campaigns. Modern urban children had a small but statistically significant increase in blood lead concentration over baseline at the six month campaign only.

PbB changes in children with baseline PbB ≥20 μg/dL

- For the small numbers of children with initial PbB ≥20 μg/dL, a downward trend in blood lead concentration was found at the two, six and twelve month campaigns. These changes were statistically significant ($p<.05$) at twelve months in R&M II, R&M III and PA groups, controlling for age and season.

Exposure Model

The main findings of the exposure models for investigating the relationship between blood lead and dust lead are listed below (see Appendix C for the PROC MIXED output):

- Age, age^2, and season (summer vs nonsummer) were significant contributors to the 3 and 5 group models; gender and hand-to-mouth activity (high vs low) were not. Blood lead tended to be higher in males and significantly higher in males in the 5 group model with dust loadings only.

- Controlling for age and other covariates (campaign, group, dust factors) included in the various blood lead models, the seasonal change in children's PbB was estimated to be +1.3 μg/dL in summer relative to winter.

- Using all five study groups, dust lead loadings and concentrations (factor1 and factor2) and dust loadings (factor2 only), were significantly related to children's PbB after adjusting for age, season, campaign and the inclusion of random effects for houses and multiple children per house.

- Using the three R&M groups, dust lead loadings and concentrations (factor1 and factor2) and dust loadings (factor1), were not significantly related to children's PbB after adjusting for age, season, campaign and the inclusion of random effects for houses and multiple children per house. Factor2 was a significant factor in the PbB model with dust loading factors.

- The interactions of factor1 and factor2 with campaign were not statistically significant for lead concentration factors and dust loading factors. For lead loading, the interaction of factor2 and campaign was only marginally significant. For these reason, the exposure models were rerun without these interaction terms.

6.0 DISCUSSION

To date, this study has met its enrollment goals and has completed nearly all of the planned data collection across the first four sampling campaigns. Laboratory performance and data quality objectives continue to be met. The study also continues to benefit from a high level of family cooperation with both blood lead and environmental sampling well into the twelve month campaign. Through the twelve month campaign approximately 20 percent of the original families in the 60 R&M houses included in this report moved. In every case, we successfully enrolled the next family to occupy the house, assuring that at minimum we can continue to do the environmental sampling. Most new families also had eligible children who were enrolled in the blood lead testing component of the study.

Dust Lead

All three levels of R&M intervention under investigation were found to be associated with overall reductions in interior dust lead loadings, lead concentrations, and dust loadings that were sustained for twelve months below pre-treatment levels. Moreover, the degree of reduction in lead exposure was positively associated with the level of the R&M intervention, and statistically significant differences were found between R&M groups over time.

After intervention and at two, six, and twelve months, lead loadings and lead concentrations were lowest in R&M III houses, intermediate in R&M II houses, and highest in R&M I houses. A similar but nonstatistically significant pattern was observed for dust loadings over time post-intervention (Figures 21-23).

At the outset, R&M II and III houses had significantly higher lead loadings and dust loadings as compared with R&M I houses despite random assignment of houses to intervention groups as explained in section 2.0. Since lead concentrations at the outset were similar, the R&M group differences in lead loadings were due to higher dust loadings which in turn may be attributed to the fact that half of the R&M II and all of the R&M III houses were vacant at the outset. Lead dust has been shown to reaccumulate in vacant houses.[20]

Reaccumulation of lead-containing dust in R&M houses was greatest during the first two months post-intervention as compared to the relatively stable period from two months to twelve months (Figures 1-8 and 21-23). This early reaccumulation in R&M II and III houses may be due to a combination of reaccumulation of lead in dust after intervention and prior to occupancy as well as the potential importation of lead containing dust into the house during move-in by study families.

At the twelve month campaign, overall weighted averages of the dust lead loadings (based on floor, window sill, window well, and interior entryway samples) were 26-fold higher in R&M I houses as compared with R&M III houses, and 5-fold higher in R&M I houses as compared with R&M II houses (Table 5). These substantial differences in lead exposure are attributable mainly to differences in lead concentrations and secondarily to differences in dust loadings (Figure 20). This was also true with regard to the observed 2.7-fold difference in overall PbD levels between R&M III and the modern urban houses at twelve months (Figure 20).

Differences in overall dust lead concentrations between R&M groups following intervention were expected since R&M III interventions addressed lead paint sources to a greater degree (e.g. by window replacement) than either R&M I or R&M II interventions. Despite this, it is interesting to note that dust lead concentrations in R&M I and II houses at two months, six months, and twelve months were significantly lower than their corresponding levels immediately post-intervention. This was also the case with R&M III houses at the twelve month campaign. These findings may be due to a reduced rate of input of lead into dust from high lead-content paint sources during the one-year period of follow-up. Given a reduced rate of high lead input, housekeeping by families might then further remove some of the remaining reservoir of highly concentrated lead dust. Such dust may have accumulated in R&M houses during the last fifty years or more since the time they were built. A rise in the lead concentration ($\mu g/g$) of settled house dust in future campaigns might signal the presence of new lead paint hazards and the need for further remediation activities.

The patterns observed in dust loadings and concentrations across R&M groups (highest in R&M I, lowest in R&M III) may be due to the degree to which smooth and easily cleanable surfaces were provided as part of the interventions. The provision of smooth and easily cleanable surfaces has been shown to be an important element of effective residential lead paint abatement.[21] In this study, surface conditions would have influenced the effectiveness of the post-R&M cleanup by contractors as well as the housekeeping of the resident families.

One year following intervention, R&M III was the only R&M group to have dust lead loadings on a geometric mean basis that were less than the current EPA guidance levels of 100 $\mu g/ft^2$ (floors), 500 $\mu g/ft^2$ (window sills), and 800 $\mu g/ft^2$ (window wells). The twelve month GM PbD levels in the R&M groups for floors, window sills and window wells, respectively were 112, 603, and 19412 $\mu g/ft^2$ for R&M I; 79, 201, and 1761 $\mu g/ft^2$ for R&M II; and 36, 23, and 268 $\mu g/ft^2$ for R&M III. It should be noted that although the R&M cyclone has been shown to produce higher estimates of dust lead loadings compared to wipes across a range of surface types and conditions, the cyclone tends to yield lower PbD estimates on smooth surfaces with low lead loadings ($<\sim100$ $\mu g/ft^2$) as compared with wipe sampling.[6]

Control groups

The modern urban and previously abated control houses were characterized by the relative stability of lead loadings, lead concentration and dust loadings over time (Tables 5-7). The downward trend found in dust loadings and lead loadings in these houses may be attributable in some part to (a) families becoming more aware of the importance of lead dust control as a result of their study participation and (b) the fact that dust was removed from their homes by the process of environmental sampling. This applies to the intervention groups as well. Moreover, this study was not designed to assess the specific effects of education on the study outcomes across groups (e.g. study has no education only control group) but rather to investigate the effectiveness of the R&M interventions as a whole which included the provision of information to all families as explained in section 2.0.

The modern urban study houses are all located in housing subdivisions built after 1978 and were presumed to be free of lead-based paint. This presumption is supported by the consistently low overall interior dust lead concentrations (GM $\leq$300 $\mu g/g$ (ppm), equivalent to 0.03%) and low soil lead concentrations (GM$\leq$75 $\mu g/g$). At each campaign in which they were tested, the modern urban houses had significantly lower lead loadings and concentrations as compared with each of the other study groups. Dust loadings in the modern urban houses were significantly lower than those in the other study groups at the initial campaign only.

In the previously abated group, geometric mean lead loadings and concentrations tended to be bracketed by the levels found in R&M II and III houses at the six and twelve month campaigns. The latter campaigns were conducted approximately four to five years after the houses had been abated. As was illustrated by the case in which a child's blood lead rose to 53 µg/dL during follow-up, the previously abated houses were comprehensively but not fully abated of lead paint. Some interior (basement) surfaces that had not been treated originally due to resource limitations and some exterior surfaces that had been stabilized as part of the original abatement were found to be in deteriorated condition and a likely source of this child's exposure along with deteriorated exterior paint observed on neighboring houses. This case also points to the need for ongoing inspection and maintenance of houses that receive any type of interim control or partial abatement intervention and the need for long-term follow-up of study houses to assess long-term effectiveness of the R&M interventions.

Soil and Drinking Water

Due to low concentrations, drinking water was not found to be an important source of lead exposure in study children. The geometric mean water lead concentrations across study groups were all ≤4 µg/L (ppb) at the initial and six month campaigns. Only a small number of readings exceeded the EPA drinking water standard of 15 µg/L. The maximum reading was 44 µg/L.

Soil lead data were limited due to the absence of drip-line soil at most study houses except for the modern urban houses. Soil lead concentrations ranged from 30 to 16,000 µg/g across houses at the initial and six month campaigns. GM levels ranged from 700 to 730 µg/g in R&M I and II houses at the six month campaign (Appendix A, Table g). The low levels (GMs of 63 to 73 µg/g) measured in the drip-line soil next to the modern urban houses over time suggest that replacement sod or soil might have been used at these houses at, or since, the time of construction.

Blood lead

The majority of U.S. children with elevated blood lead levels as defined by the U.S. CDC (≥10 μg/dL), have levels in the range of 10 to 20 μg/dL.[22] Little is known about PbB changes associated with lead paint hazard remediation interventions in the homes of children with this low-to-moderate level of lead toxicity. Most of the children in the three R&M groups had baseline PbBs in the range of 5 to 20 μg/dL. They were recruited from households residing in, or moving into, eligible study houses identified from lists provided by collaborating property owners who manage low-income rental property in minority neighborhoods in Baltimore City. Children in these types of neighborhoods are at known high risk of lead poisoning.

All study children are African Americans living in low-to-moderate income housing. At the outset, their geometric mean (GM) ages across the five study groups ranged from 25 months to 33 months. Their baseline GM PbB values across groups ranged from 10 to 14.5 μg/dL. It can be noted here that in U.S. non-Hispanic black children from low-income families living in central cities (populations ≥1 million, 1988-1991), the GM PbB was recently estimated at 9.7 μg/dL.[22]

The R&M study's maximum baseline PbB was in a child who moved into a vacant R&M Level III house with a PbB reading of 42 μg/dL. As anticipated, the largest numbers of children with baseline PbBs >20μg/dL were in the R&M II and III groups. This was due the fact that one of the housing organizations had a policy of renting its improved properties to families with lead poisoned children.

Children in the three R&M groups with PbB <20 μg/dL at the outset tended to remain in that range throughout the twelve month period of follow-up. After controlling for age and season, an increasingly downward trend in PbB level was noted across the two, six, and twelve month campaigns in the R&M III group, the group that also had the lowest house dust lead levels over time.

Furthermore, no statistically significant PbB changes were found in any of the R&M groups in children with baseline PbB <20 μg/dL. One could hypothesize that the R&M interventions prevented an increase in blood lead that study children might have experienced otherwise in the absence of the R&M interventions. For ethical reasons, the study design did not include a non-intervention control group against which to test this hypothesis.

R&M children with pre-intervention PbBs ≥20 μg/dL did experience statistically significant reductions in blood lead over time to levels below 20 μg/dL at twelve months. Swindell et. al. recently reported that blood lead levels also declined up to one year post-abatement in children with baseline PbBs ≥20 μg/dL among moderately lead poisoned children in central Massachusetts.[23] Their study was based on a retrospective record review and did not include the collection of environmental lead data pre- and post-abatement. Our finding of an absence of a blood lead rise in children with initial PbBs <20 μg/dL differ from those of Swindell et. al. who reported an overall <u>rise</u> in PbB from 16.8 μg/dL to 19.3 μg/dL at up to one year post-abatement in children with pre-abatement PbB <20 μg/dL.[23]

A noteworthy finding in the R&M study is the absence of statistically significant increases in children's PbB measured at two months post-intervention, especially in the R&M I and II houses that were occupied at the time of treatment. This finding, together with the dust lead data, provides some evidence that the precautions used in R&M houses were successful in preventing significant short-term increases in children's PbB that have been attributed to improper abatement practices in past studies.[24,25] Precautions included having children out of the house while R&M work was in progress, and the use of work practices to minimize, contain, and cleanup lead dust.

Control groups

The findings for children with PbBs <20 µg/dL and ≥20 µg/dL in the previously abated group were similar to those described above for children in the R&M groups. In contrast to this group and the three R&M groups, the GM PbBs across time (range:3-4 µg/dL) in children living in the modern urban study houses were similar to the national GM of 3.6 µg/dL reported for U.S. children aged 12 to 60 months.[22] The GM estimated for all U.S. non-Hispanic black children in this age range was 5.6 µg/dL.[22] Unlike the other four study groups, nearly all of the modern urban houses were occupied by owner occupants. Also, as reported previously, the mean monthly mortgage/rent payment was higher ($406) in this group as compared with the other groups (range of means:$288 to $330).[2]

Additionally, all but one of the PbB readings in the modern urban group across time were below the CDC's level of concern (10 µg/dL). One child had a PbB increase from 3 to 10 µg/dL at the six month campaign which may have contributed to the significant PbB rise found between the initial and six month campaigns in this group. The PbB levels in children in the modern urban group were significantly lower than those in the children in each of the other four study groups at the initial, six and twelve month campaigns. This finding is the only statistically significant difference in PbB found in the R&M study to date among children who had an initial PbB <20 µg/dL.

Exposure Model

Using data from all five study groups, the exposure models (longitudinal data analysis) indicated that the blood lead levels of study children were significantly related to their house dust lead loadings and lead concentrations after controlling for significant fixed effects, i.e., age, (age^2), and season. The quadratic term indicates a nonlinear relationship between blood lead and children's age. The absence of a statistically significant relationship between dust lead and blood lead in the three R&M

group exposure model was likely due to the narrower range of dust lead levels over time post-intervention as compared with pre-intervention and the absence of the low-lead modern urban houses from the analysis. Other studies, including the recent study in Rochester,[26] have found a relationship between lead in children's blood and settled dust in their homes.

Based on the various longitudinal data analyses performed, the seasonal change in children's blood lead levels was estimated to be +1.3 μg/dL in summer relative to winter. Others have reported seasonal trends in children's blood lead levels for different years and populations which vary in the estimated magnitude of the seasonal difference (unpublished review, PL Reagan, July 1992).

Considerations in interpretation of PbB findings

A number of factors that can mediate a child's blood lead response to an intervention, including age, degree of hand-to-mouth activity, total cumulative body lead burden, the timing of the PbB measurements, and neighborhood housing characteristics need to be considered in the interpretation of blood lead findings from this or any other intervention study. For this study, these factors are of particular relevance with regard to the following blood lead findings:

- The lack of statistically significant PbB changes within and across R&M groups in children with baseline PbB <20 μg/dL despite significant differences in house dust lead levels between R&M groups.
- The consistently downward, but not statistically significant, trend in PbB over time post-intervention in the R&M III group.
- The significantly lower PbBs in modern urban children relative to all other groups, in particular R&M III where dust lead exposures were most similar to those in modern urban houses.

At enrollment, the mean ages of the children in the R&M and previously abated groups were in the range of 25 to 33 months. On average, these children were past the age range at which blood lead levels tend to peak (i.e., 18-24 months of age).[27] Given their reported housing histories, it is likely that the R&M study children spent most or all of their young lives prior to enrollment in low-income housing with potentially high lead dust and paint exposures. For the modern urban group, the blood lead and housing history data suggest that the children were at lower risk of high lead exposure prior to enrollment compared to the other groups. Most children in the modern urban group were residents of the same house since birth.

Assuming that children in the R&M and previously abated houses had chronically elevated PbBs prior to enrollment, additional time beyond twelve months post-intervention may be needed to measure significant PbB changes in R&M children for the reasons mentioned briefly below. Lead in blood reflects a mixture of recent exposure and body stores of lead. Most (approximately 70%) of the lead in children is stored in bone.[28] The half-life of lead in human adult cortical bone is estimated to be 20 years.[29] Skeletal lead can be an ongoing internal source of lead measured in blood even after external exposure and children's lead ingestion are reduced following lead remediation interventions. Unfortunately, the bone lead concentrations of study children are unknown and the kinetics of lead mobilization from bone is not well understood in children. This makes it difficult to estimate the magnitude and duration of bone lead's contribution to children's blood lead measured in the post-intervention phase of this study.

In an earlier study in Baltimore, children with GM PbBs of 63 µg/dL prior to receiving inpatient chelation therapy were monitored after discharge to "lead free" public housing and housing abated according to local ordinances in effect prior to 1982. These children had post-discharge GM PbBs at one month that changed very little prior to 24 to 30 months post-discharge.[30] This earlier study highlights the need to continue the investigation of PbB changes in the R&M Study at the eighteen and twenty-four month campaigns.

At the twelve month campaign, most study children were 36 to 48 months of age, an age range in which the frequency of children engaging in mouthing behavior is likely to be less compared to younger children. Since hand-to-mouth activity is recognized as a a major route of entry of lead into pre-school children,[27] less frequent hand-to-mouth activity over time might account in part for the lack of statistically significant blood lead changes within and between R&M groups in children with baseline PbB <20 µg/dL, despite the differences in dust lead exposure between and within groups over time. To date, hand-to-mouth activity has not been found to be a significant covariate in the blood lead exposure models. This may be due in part to the more or less truncated PbB distribution and relatively small sample sizes.

The small number of children with initial PbB ≥20 µg/dL at the outset may have had higher blood lead levels due to more frequent hand-to-mouth activity. Therefore, they may have had a relatively greater contribution to their blood lead from their current exposure versus bone lead compared to the children with PbB <20 µg/dL. Thus, their PbB levels may have been more responsive to the reduction in lead exposure associated with the R&M interventions as compared to children with lower baseline PbB levels.

Neighborhood housing characteristics may have contributed to the observed PbB differences between the modern urban group and the other four study groups. By design, the modern urban study houses were all located in housing subdivisions built after 1978 and presumably free of lead-based paint. As mentioned above, this presumption is supported by the very low dust and soil lead concentrations found in the modern urban study houses. In addition to having low exposures to lead in their own house dust and soil (up to more than two orders of magnitude lower than those in the other study groups), children in the modern urban houses also have fewer opportunities to be exposed to high lead sources in, or originating from, neighboring houses by virtue of the fact that they are located in subdivisions with similar low lead housing.

On the other hand, children in each of the other study groups, including the previously abated group, share a common characteristic of being located in neighborhoods with older lead-painted rowhousing built before 1940 and in generally poor condition. These neighborhoods, and the blocks in which the R&M houses are located, often have abandoned and boarded housing as well. Compared to the modern urban group, children in the R&M and previously abated groups have had more opportunities for exposure to high lead sources in paint and dust from surrounding houses. Neighboring houses can be sources of lead particles and paint chips which can be tracked or blown inside study houses. This was the rationale for including walk-off mats at the main entryways in R&M houses. Neighboring houses can also be sites where children are directly exposed to lead during visits and outside play activities.

The study sample sizes of 20 to 26 children per group across campaigns limits the degree to which small proportional changes over time in PbB can be detected with high statistical power. The group differences in PbB between the modern urban group and each of the other four study groups were found to be statistically significant (differences on the ln scale of approximately 0.8 or ratio of approximately 2:1), whereas the smaller log differences in blood lead levels over time in the R&M III group were not large enough to be statistically significant (alpha $\leq .05$) in this study.

In closing, it should be emphasized that by their nature, the three R&M interventions under investigation are interim control or partial abatement approaches to reducing lead hazards in housing. As such they are not expected to be long-lasting or permanent. A major study objective remains the determination of the longevity of the R&M interventions. To date, dust lead loadings at specific sites in individual study houses (particularly R&M I houses) have reaccumulated to levels close to pre-intervention levels. However, none of the R&M interventions in individual houses through the twelve month campaign have failed on a wholesale basis, whereby all or most of the interior dust lead samples have had lead levels at or above pre-intervention levels. If wholesale failures do occur, we will use contingency funds to make additional repairs and reclean houses as needed.

Lastly, it is recognized that the findings reported herein are preliminary in nature and that the results can change as more data from the twelve month and subsequent campaigns become available. We anticipate that data from the twelve month campaign in R&M houses will be complete and available for inclusion in the eighteen month preliminary report scheduled for February of 1996. Future campaigns will allow us to investigate the longer-term changes in lead in settled house dust and children's blood and move towards the overall research goal of contributing to the scientific basis for a standard of care for lead-painted houses. Also, it is hoped that future campaigns will provide sufficient longitudinal data on children born into study houses to allow for a separate analysis of a subgroup which has the potential to increase our understanding of the role of R&M intervention in the primary prevention of lead poisoning in children.

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Table 1: Data collection plan*

Study Group	Pre-R&M/ Initial	Post-R&M	2 Month	6 Month	12 Month	18 Month	24 Month
R&M I	B D S W Q	- D S - -	B D - - -	B D S W Q	B D - - Q	B D S W Q	B D - - Q
R&M II	B D S W Q	- D S - -	B D - - -	B D S W Q	B D - - Q	B D S W Q	B D - - Q
R&M III	B D S - Q	- D S W -	B D - - -	B D S W Q	B D - - Q	B D S W Q	B D - - Q
Previously Abated	B D S W Q	n/a	- - - - -	B D S W Q	B D - - Q	B D S W Q	B D - - Q
Modern Urban	B D S W Q	n/a	- - - - -	B D S W Q	B D - - Q	B D S W Q	B D - - Q

* B=Blood; D=Dust; S=Soil; W=Water; Q=Questionnaire

Table 2: Types and numbers of 12-month campaign samples collected and analyzed for lead (not including field QC)

SAMPLE TYPE	Planned per House	Collected in 89 Study Houses	Chemically Analyzed for Lead	Not Collected in the 89 Houses
SETTLED DUST:				
Perimeter Floor Composite-- rooms with windows	2[a]	182[b]	182	0
Perimeter Floor Composite-- rooms without windows	1	45	45	44[c]
Window Sill Composite	2	177	177	1[d]
Window Well Composite	2	174	174	4[e]
Interior Entryway	1	89	89	0
Exterior Entryway	0	0	0	0[f]
Air Duct/	1[g]	53	53	1[h]
Upholstery		35	35	
Total Dust per Dwelling	9			
TOTAL DUST		755	755	50
Soil Core - drip line	0	0	0	0[f]
Drinking Water[i]	0	0	0	0[f]
Venous Blood - Ages 6 to 60 mos.	1 per child	109	109	5[i]
TOTAL	10+	864	864	55

[a] One composite sample was obtained per story.
[b] Includes 4 samples collected from basements used as living spaces in 3 R&M I houses and 1 Modern Urban house.
[c] 44 houses did not have rooms without windows.
[d] Sills on one story were inaccessible in 1 R&M I house.
[e] Wells on one story were inaccessible in 2 R&M I houses and on both stories in 1 R&M I house, for a total of 4 samples not collected, primarily due to plastic being sealed over the windows in winter.
[f] This sample type was not part of the 12-month campaign.
[g] Upholstery sample was collected if air duct sample could not be obtained.
[h] Air duct & upholstery were inaccessible/not present in 1 R&M II house.
[I] 3 Modern Urban children had moved at the time of blood collection, and 2 Modern Urban children were missed by the Primary Care Physician.

Table 3: Types and numbers of 12-month campaign samples collected by study group (not including field QC)

SAMPLE TYPE	Collected in 15 Modern Urban Houses	Collected in 14 Previously Abated Houses	Collected in 20 R&M I Houses	Collected in 20 R&M II Houses	Collected in 20 R&M III Houses
SETTLED DUST: Perimeter Floor Composite--rooms with windows	31	28	43	40	40
Perimeter Floor Composite--rooms without windows	4	6	15	11	9
Window Sill Composite	30	28	39	40	40
Window Well Composite	30	28	36	40	40
Interior Entryway	15	14	20	20	20
Exterior Entryway	0	0	0	0	0
Air Duct	11	5	8	14	15
Upholstery	4	9	12	5	5
TOTAL DUST	125	118	173	170	169
Soil Core - drip line	0	0	0	0	0
Drinking Water	0	0	0	0	0
Venous Blood - ages 6 to 60 mos.	14	24	21	26	24

Table 4: Frequency of family moves and reoccupancies between the initial and the twelve month campaigns among the 60 R&M houses included in this preliminary report and the control houses.

STUDY GROUP	Moved		Replaced	
	No. Families	No. Children[a]	No. Families	No. Children
R&M I (20 houses)	6	12	6	1
R&M II (20 houses)	3	5	3	2
R&M III (20 houses)	4	6	4	6
Modern Urban (15 houses)[b]	1	3	1	0
Previously Abated (15 houses)[b]	1	1	0	0
Total	15	27	14	9

[a] Includes children who moved although family did not.
[b] One extra house was included for a total of 16 houses. Of these one household withdrew from the study before the 6 month campaign leaving 15 houses.

Table 5: Overall dust lead loadings[a] ($\mu g/ft^2$) for houses completing the 12-month campaign

Study Group (n)	Pre-Intervention/ Initial Campaign			Post-Intervention/ R&M Campaign			Two Month Campaign			Six Month Campaign			Twelve Month Campaign		
	min	**GM**	max	min	**GM**	max	min	**GM**	max	min	**GM**	max	min	**GM**	max
Modern Urban (15)	10	**90**	540		N/A			N/A		6	**70**	750	10	**60**	260
Previously Abated (14)	120	**890**	5420		N/A			N/A		50	**470**	2970	100	**630**	5300
R&M Level I (20)	1440	**16200**	70700	280	**1490**	13100	560	**3420**	11200	950	**4020**	19100	590	**4140**	22600
R&M Level II (20)[b]	3100	**23800**	124000	3	**300**	4910	160	**1440**	13560	40	**1230**	14000	40	**840**	24900
R&M Level III (20)[b]	3260	**39300**	127000	7	**90**	3760	40	**220**	1140	10	**180**	1610	30	**160**	3050

[a] Based on weighted averages of floor, entryway, window sill, and window well samples within houses.
[b] Eighteen houses were tested in the two month campaign.

Table 6: Overall dust lead concentrations[a] ($\mu g/g$) for houses completing the 12-month campaign

Study Group (n)	Pre-Intervention/ Initial Campaign			Post-Intervention/ R&M Campaign			Two Month Campaign			Six Month Campaign			Twelve Month Campaign		
	min	GM	max	min	GM	max	min	GM	max	min	GM	max	min	GM	max
Modern Urban (15)	90	260	510		N/A			N/A		100	300	830	150	300	1500
Previously Abated (14)	430	2360	16400		N/A			N/A		180	1900	18000	500	2800	15600
R&M Level I (20)	3300	20500	106000	730	8300	66500	3800	13400	34900	2400	12700	50900	2300	12900	54400
R&M Level II (20)[b]	1240	13900	65000	480	6000	38400	700	6200	53300	500	4700	45500	300	3400	36900
R&M Level III (20)[b]	1440	16800	64800	830	2800	47100	500	1500	6700	360	1400	12600	200	1100	16300

[a] Based on weighted averages of floor, entryway, window sill, and window well samples within houses.
[b] Eighteen houses were tested in the two month campaign.

Table 7: Overall dust loadings[a] (mg/ft^2) for houses completing the 12-month campaign

Study Group (n)	Pre-Intervention/ Initial Campaign			Post-Intervention/ R&M Campaign			Two Month Campaign			Six Month Campaign			Twelve Month Campaign		
	min	**GM**	max	min	**GM**	max	min	**GM**	max	min	**GM**	max	min	**GM**	max
Modern Urban (15)	50	**330**	1690		N/A			N/A		60	**240**	2950	90	**200**	680
Previously Abated (14)	160	**380**	1340		N/A			N/A		100	**250**	830	50	**220**	620
R&M Level I (20)	300	**790**	3360	50	**180**	1530	100	**260**	490	140	**320**	1330	100	**320**	1340
R&M Level II (20)[b]	350	**1710**	7920	10	**50**	260	100	**230**	1090	50	**260**	1230	40	**250**	930
R&M Level III (20)[b]	970	**2340**	6570	10	**30**	710	70	**140**	640	30	**130**	300	40	**140**	320

[a] Based on weighted averages of floor, entryway, window sill, and window well samples within houses.
[b] Eighteen houses tested included in the two month campaign.

Table 8: Descriptive Statistics for Blood Lead Concentrations (PbB $\mu g/dL$) for Children with Initial PbB < 20 $\mu g/dL$

		CAMPAIGN			
STUDY GROUP		INITIAL	2 MONTH	6 MONTH	12 MONTH
R&M Level I	GM range (n)	8 2 to 16 (24)	8 1 to 16 (22)	9 2 to 17 (19)	8 2 to 20 (15)
R&M Level II	GM range (n)	10 3 to 19 (20)	10 4 to 20 (15)	12 5 to 21 (16)	10 5 to 18 (15)
R&M Level III	GM range (n)	11 2 to 19 (19)	11 3 to 25 (16)	10 3 to 23 (18)	10 6 to 16 (14)
Previously Abated*	GM range (n)	12 6 to 18 (18)	N/A	13 5 to 32 (17)	12 7 to 21 (16)
Modern Urban	GM range (n)	3 1 to 6 (18)	N/A	4 2 to 10 (16)	3 2 to 6 (14)

* Excludes child requiring chelation therapy during follow-up.

Table 9: Twelve month campaign correlations of ln(lead loading), ln(lead concentration), and ln(dust loading) with ln(blood μg/dL) for the youngest child per household.

Pearson correlation coefficients / Prob > |R| under Ho: Rho=0 / Number of observations

		Surface Type						
DUST VARIABLE		Floor	Window Sill	Window Well	Interior Entryway	Floors - Rms w/o Windows	Air Duct	Upholstery
ln (lead loading) μg/ft²	r p n	.32 < .01 79	.22 .05 79	.22 .05 78	.15 NS 79	.30 .05 41	.31 .03 50	.49 < .01 29
ln (lead conc) μg/g	r p n	.45 < .01 79	.22 .05 79	.29 .01 78	.31 < .01 79	.36 .02 41	.37 < .01 50	.61 < .01 29
ln (dust loading) mg/ft²	r p n	.01 NS 79	.13 NS 79	- .06 NS 78	- .003 NS 79	.01 NS 41	.12 NS 50	.19 NS 29

NS = Non-significant p-value > .05

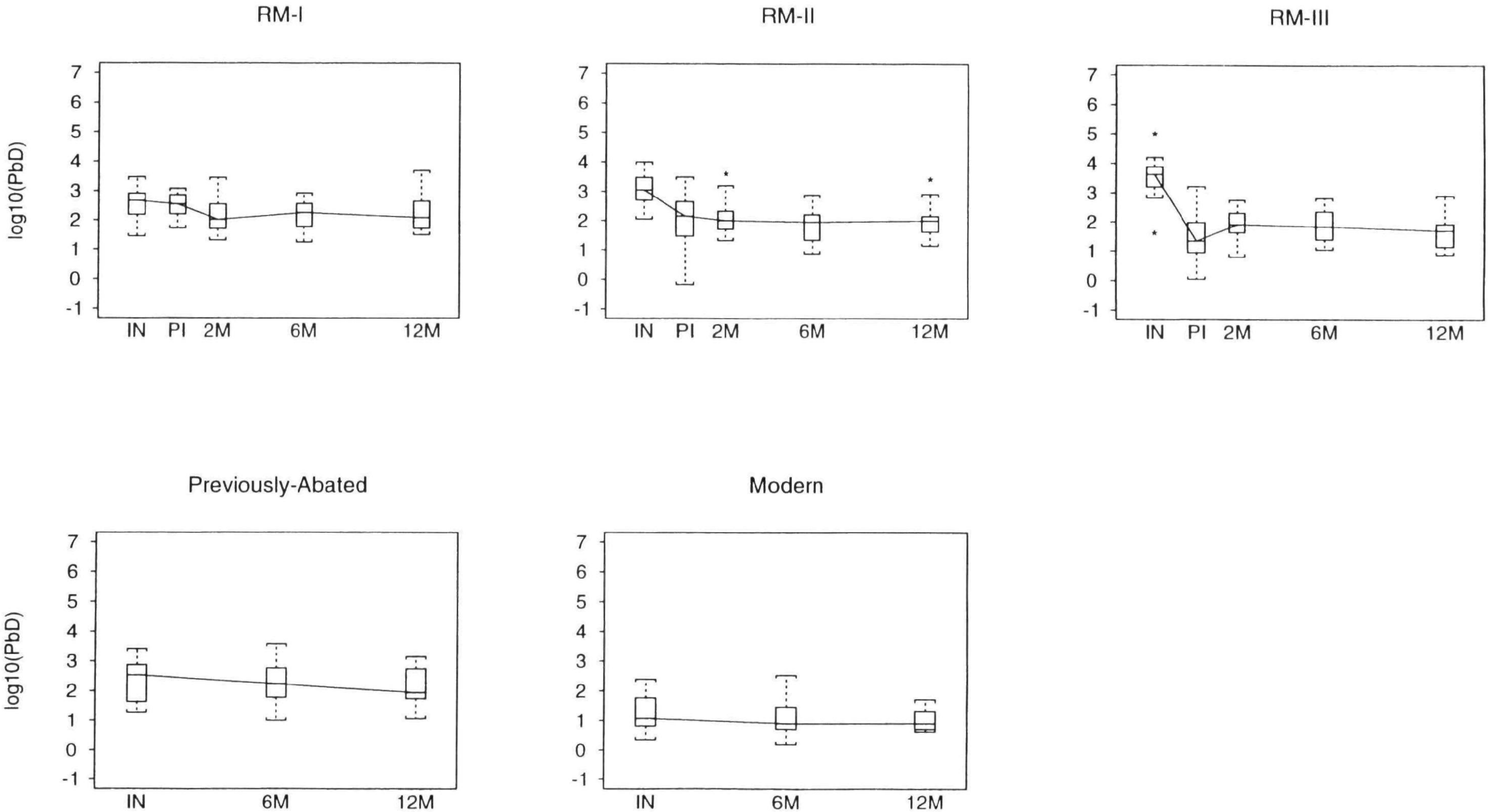
Table 10: Twelve month campaign correlations of ln(lead loading), ln(lead concentration), and ln(dust loading) with ln(blood $\mu g/dL$) for all children.

Pearson correlation coefficients / Prob > |R| under Ho: Rho=0 / Number of observations

		Surface Type						
DUST VARIABLE		Floor	Window Sill	Window Well	Interior Entryway	Floors -Rms w/o Windows	Air Duct	Upholstery
ln (lead loading) $\mu g/ft^2$	r	.34	.22	.22	.11	.36	.39	.30
	p	< .01	.02	.02	NS	.01	< .01	.04
	n	109	109	107	109	55	62	47
ln (lead conc) $\mu g/g$	r	.45	.23	.27	.34	.37	.46	.50
	p	< .01	.02	.01	< .01	< .01	< .01	< .01
	n	109	109	107	109	55	62	47
ln (dust loading) mg/ft^2	r	< .01	.10	- .04	- .01	.02	.14	.09
	p	NS	NS	NS	NS	NS	NS	NS
	n	109	109	107	109	55	62	47

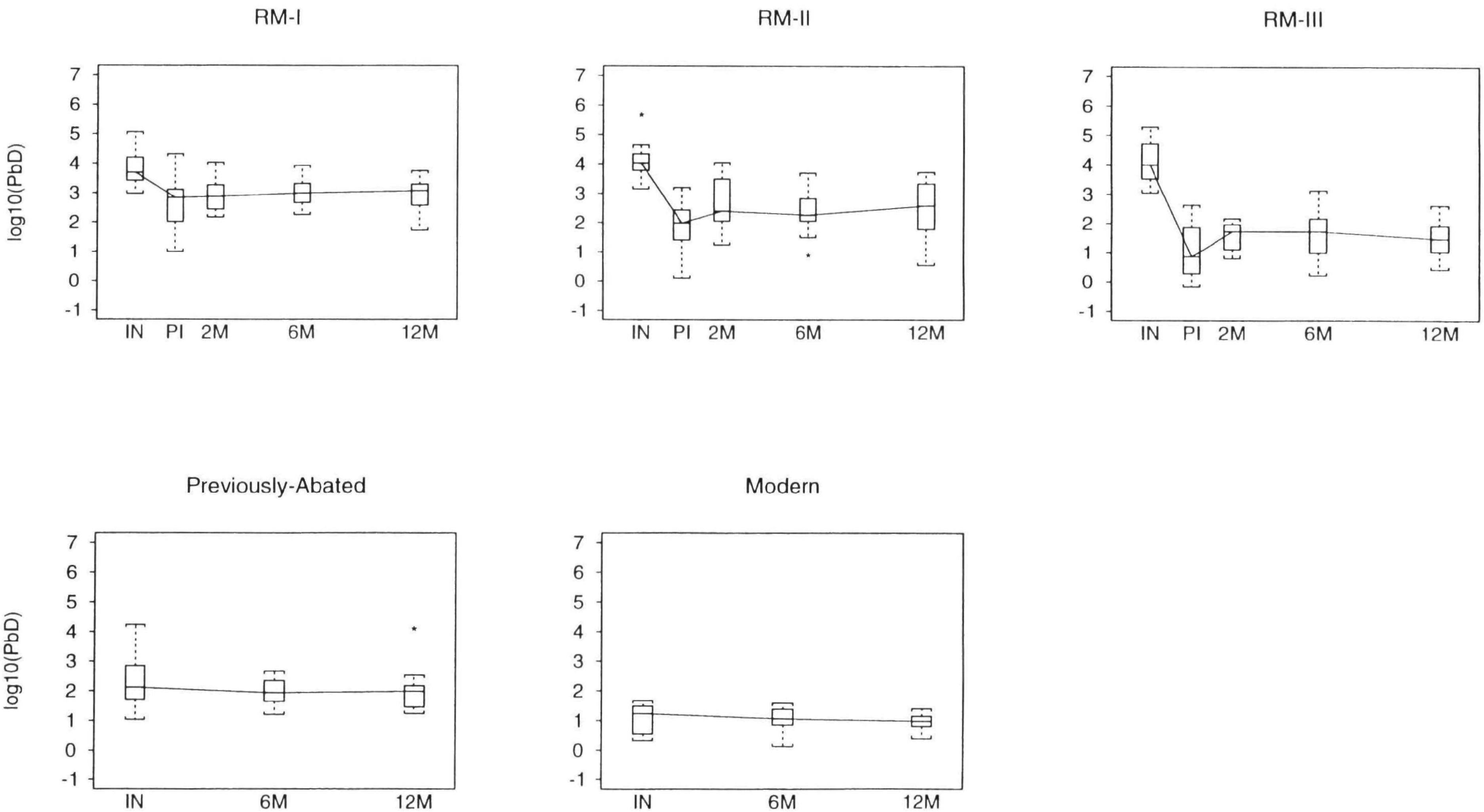
NS = Non-significant p-value>.05

Figure 1   Dust Lead Loadings (ug/ft^2) across Campaigns for Floor Surfaces



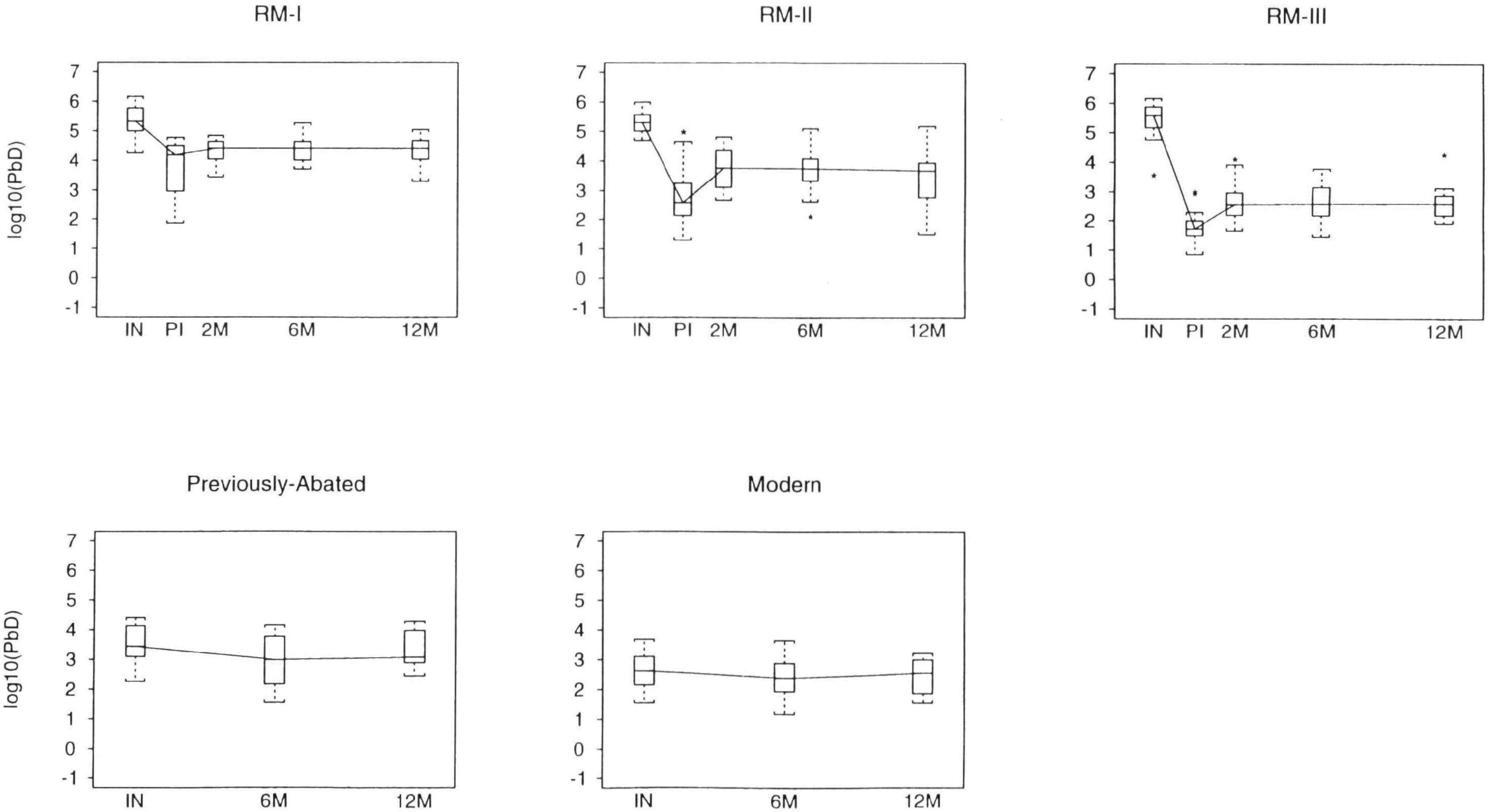
data based on the 89 houses completing the twelve month campaign

Figure 2 Dust Lead Loadings (ug/ft^2) across Campaigns for Window Sill Surfaces



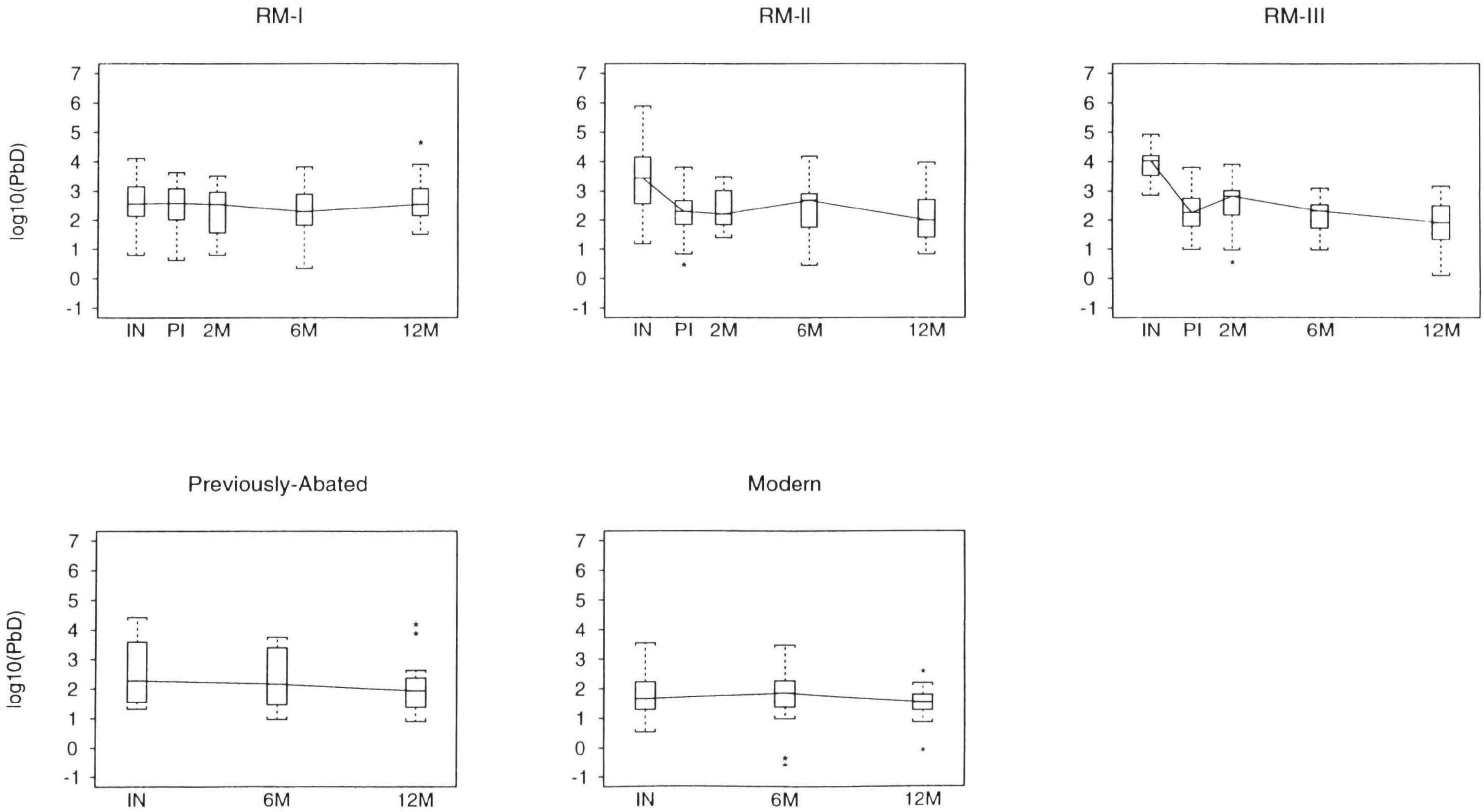
data based on the 89 houses completing the twelve month campaign

Figure 3 Dust Lead Loadings (ug/ft^2) across Campaigns for Window Well Surfaces



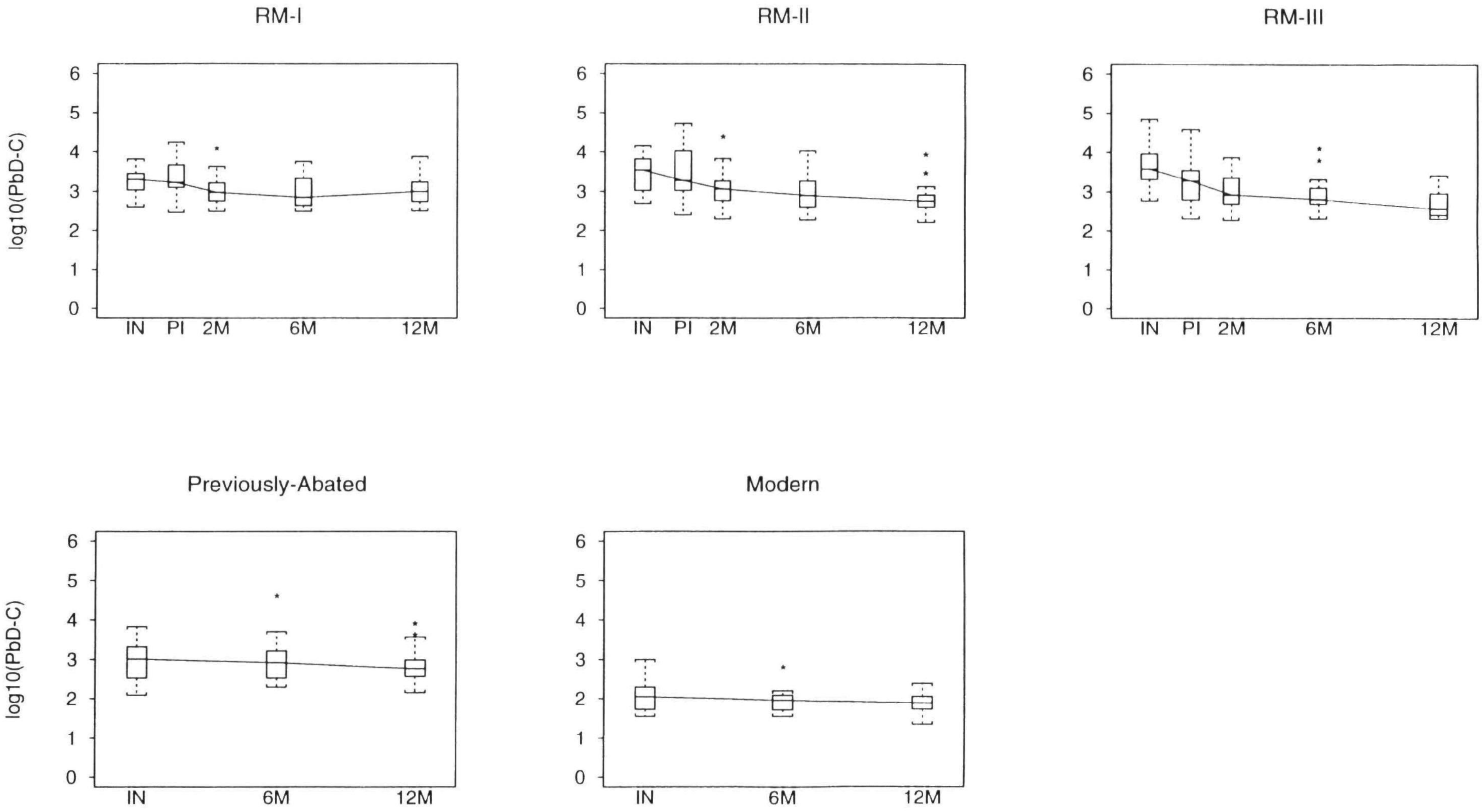
data based on the 89 houses completing the twelve month campaign

Figure 4 Dust Lead Loadings (ug/ft^2) across Campaigns for Interior Entryway Surfaces



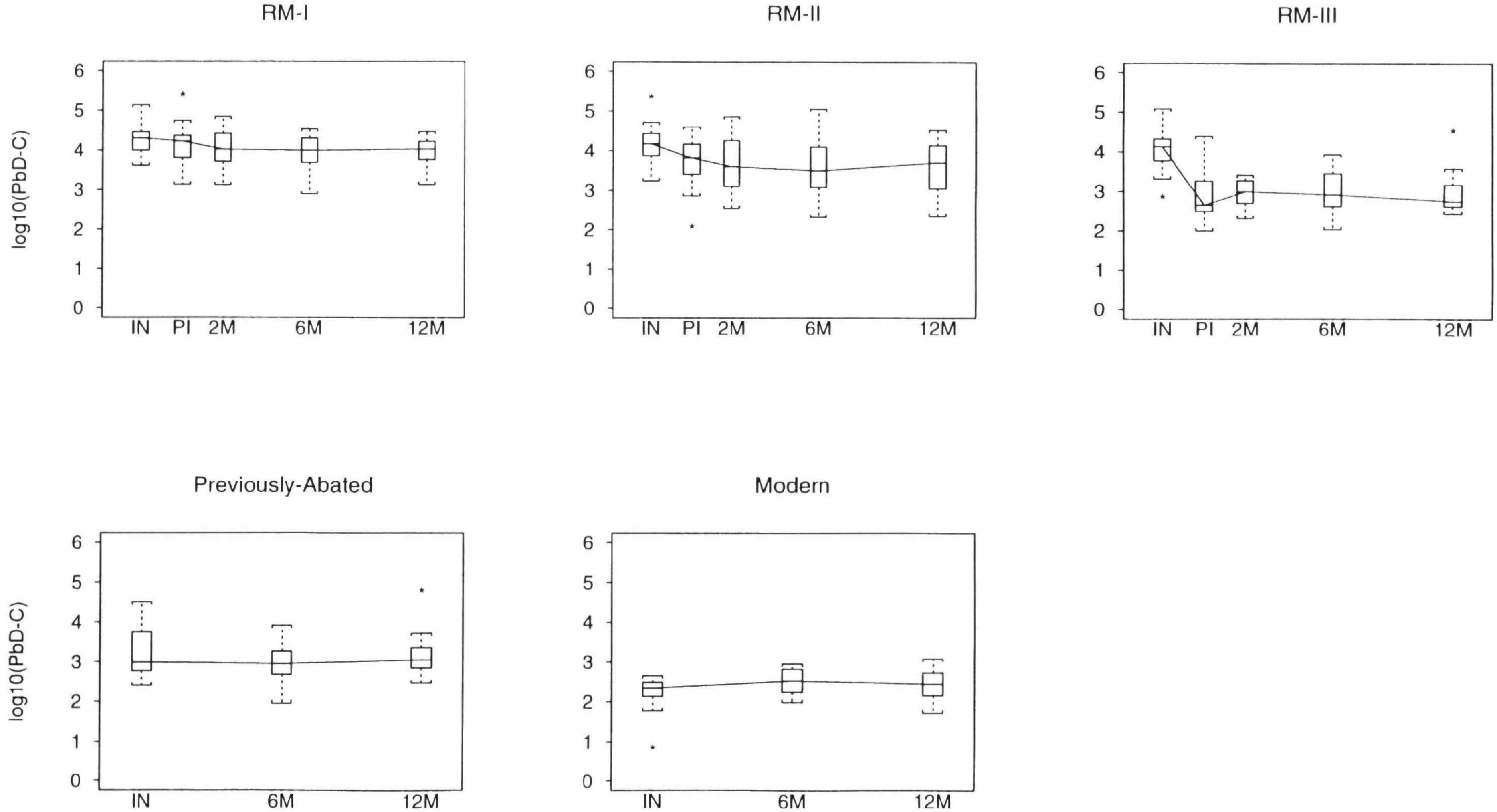
data based on the 89 houses completing the twelve month campaign

Figure 5 Dust Lead Concentrations (ug/g) across Campaigns for Floor Surfaces



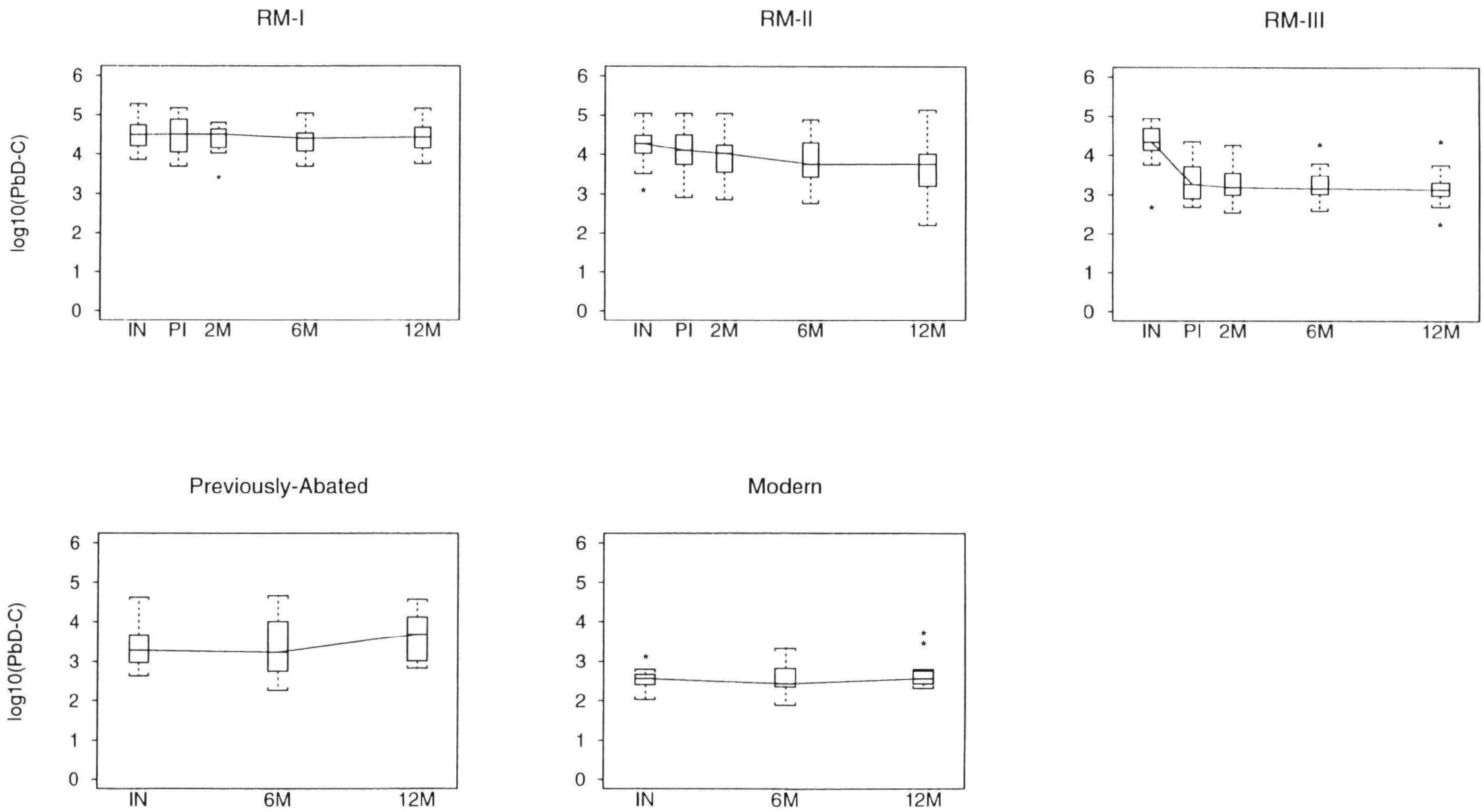
data based on the 89 houses completing the twelve month campaign

Figure 6 Dust Lead Concentrations (ug/g) across Campaigns for Window Sill Surfaces



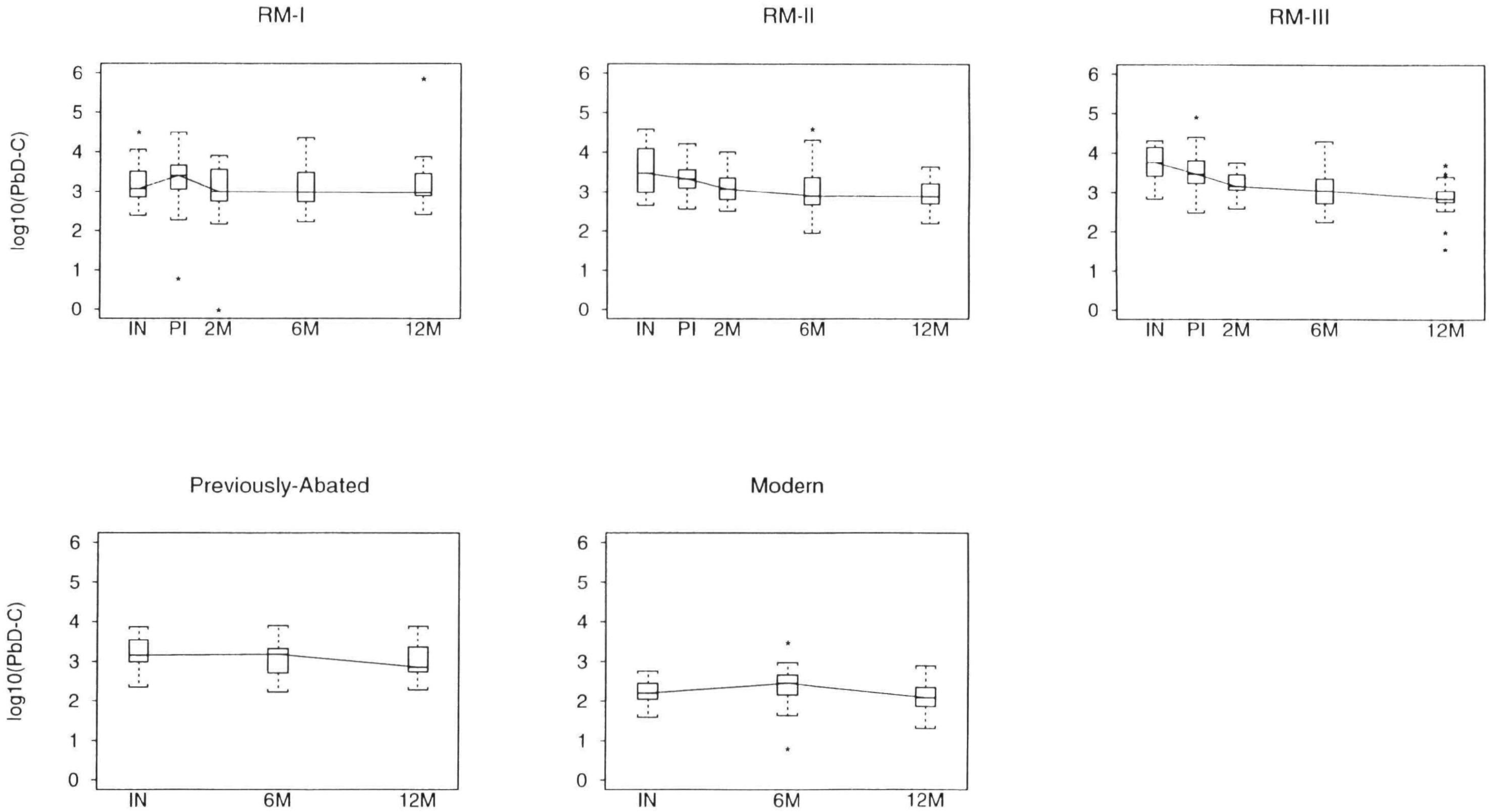
data based on the 89 houses completing the twelve month campaign

Figure 7 Dust Lead Concentrations (ug/g) across Campaigns for Window Well Surfaces



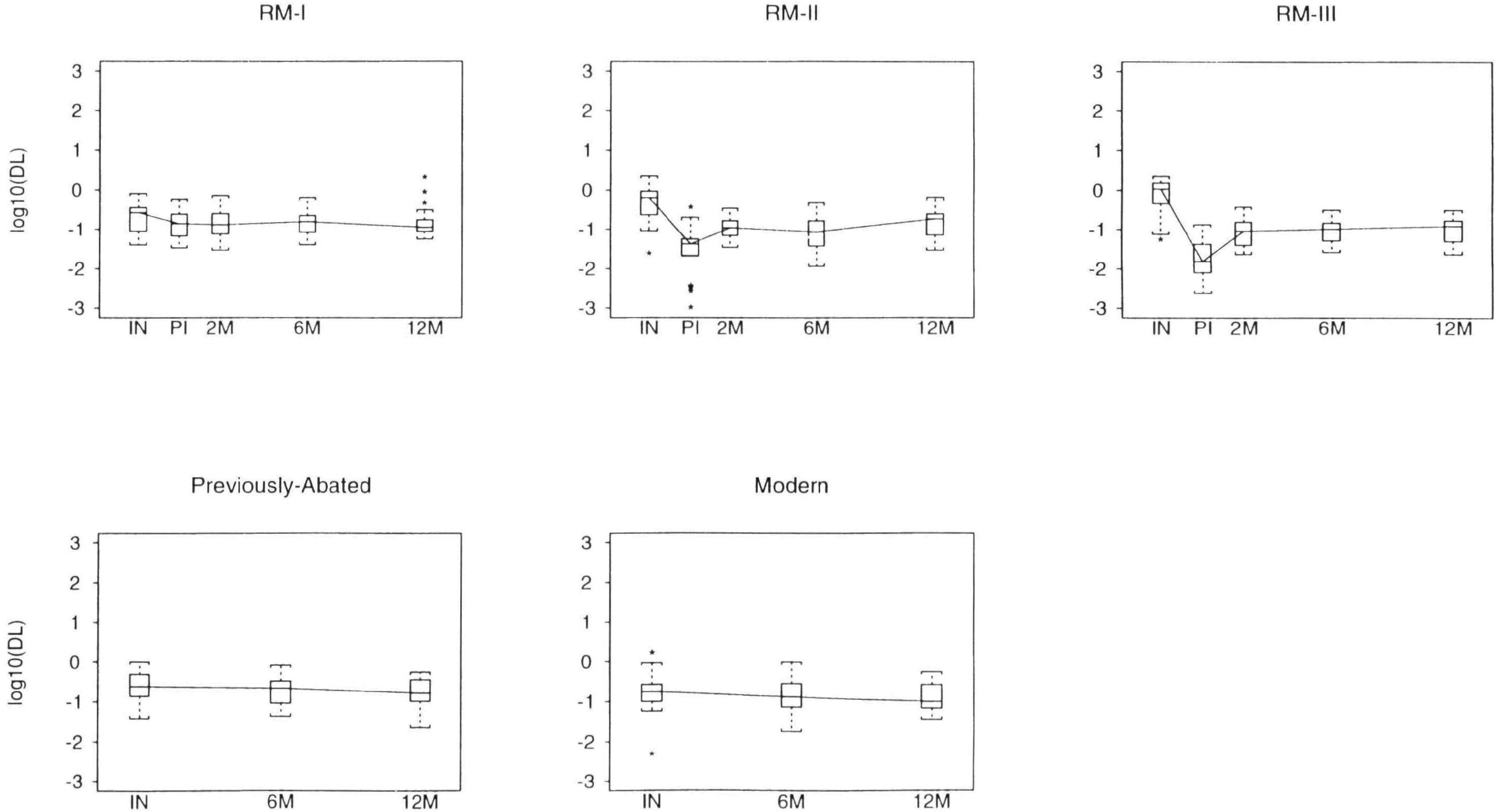
data based on the 89 houses completing the twelve month campaign

Figure 8 Dust Lead Concentrations (ug/g) across Campaigns for Interior Entryway Surfaces



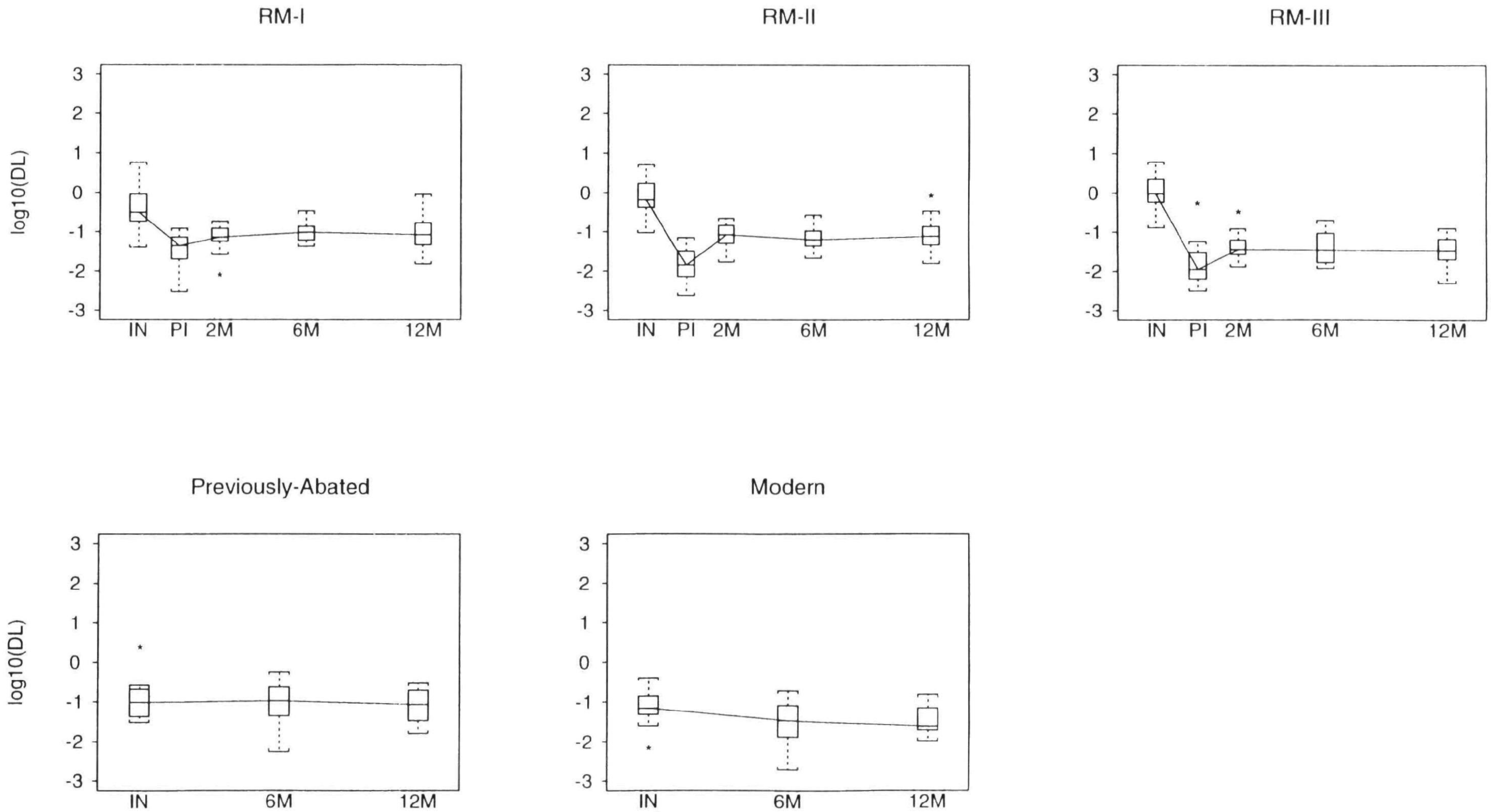
data based on the 89 houses completing the twelve month campaign

Figure 9 Dust Loadings (mg/ft^2) across Campaigns for Floor Surfaces



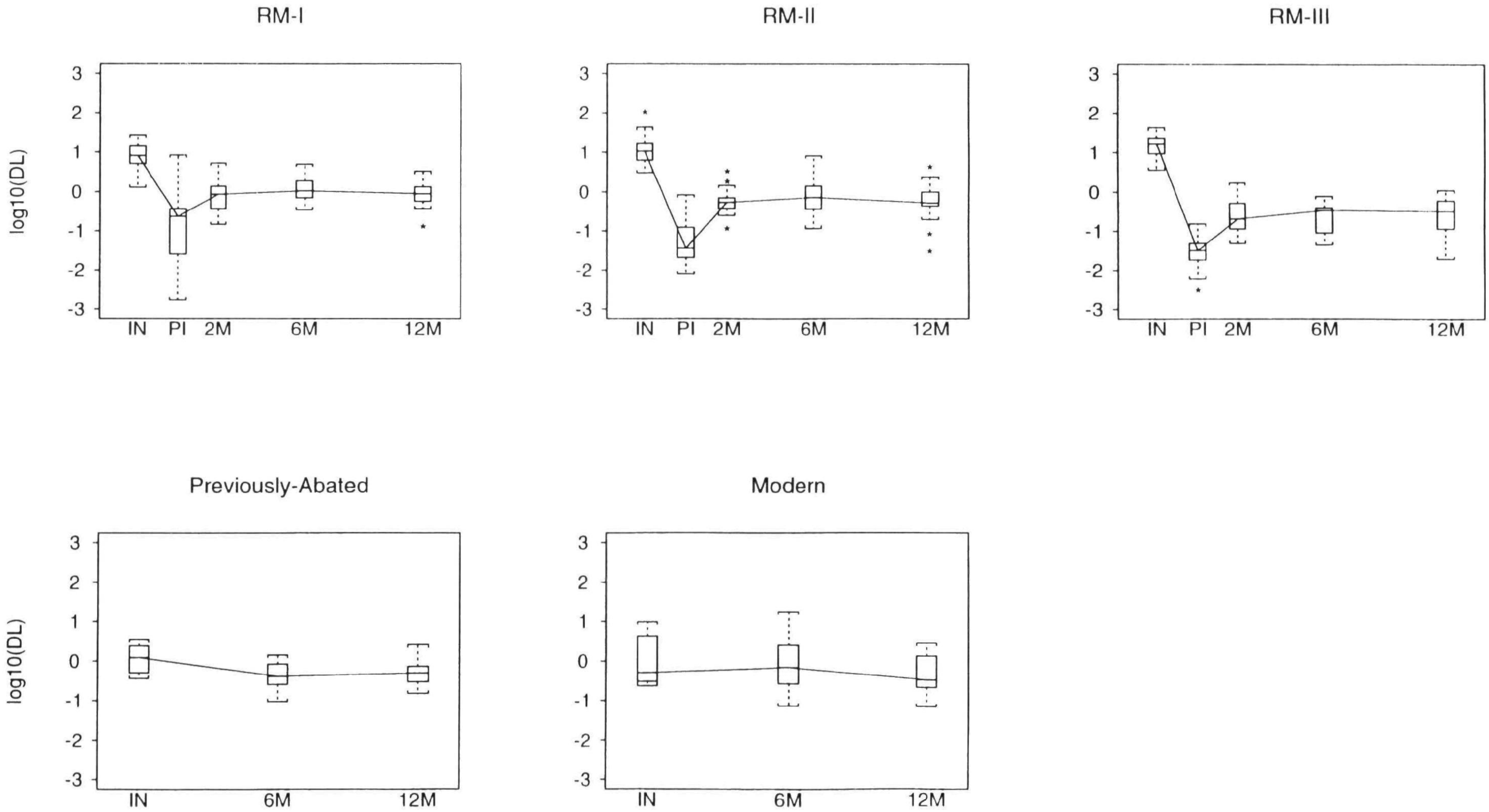
data based on the 89 houses completing the twelve month campaign

Figure 10 Dust Loadings (mg/ft^2) across Campaigns for Window Sill Surfaces



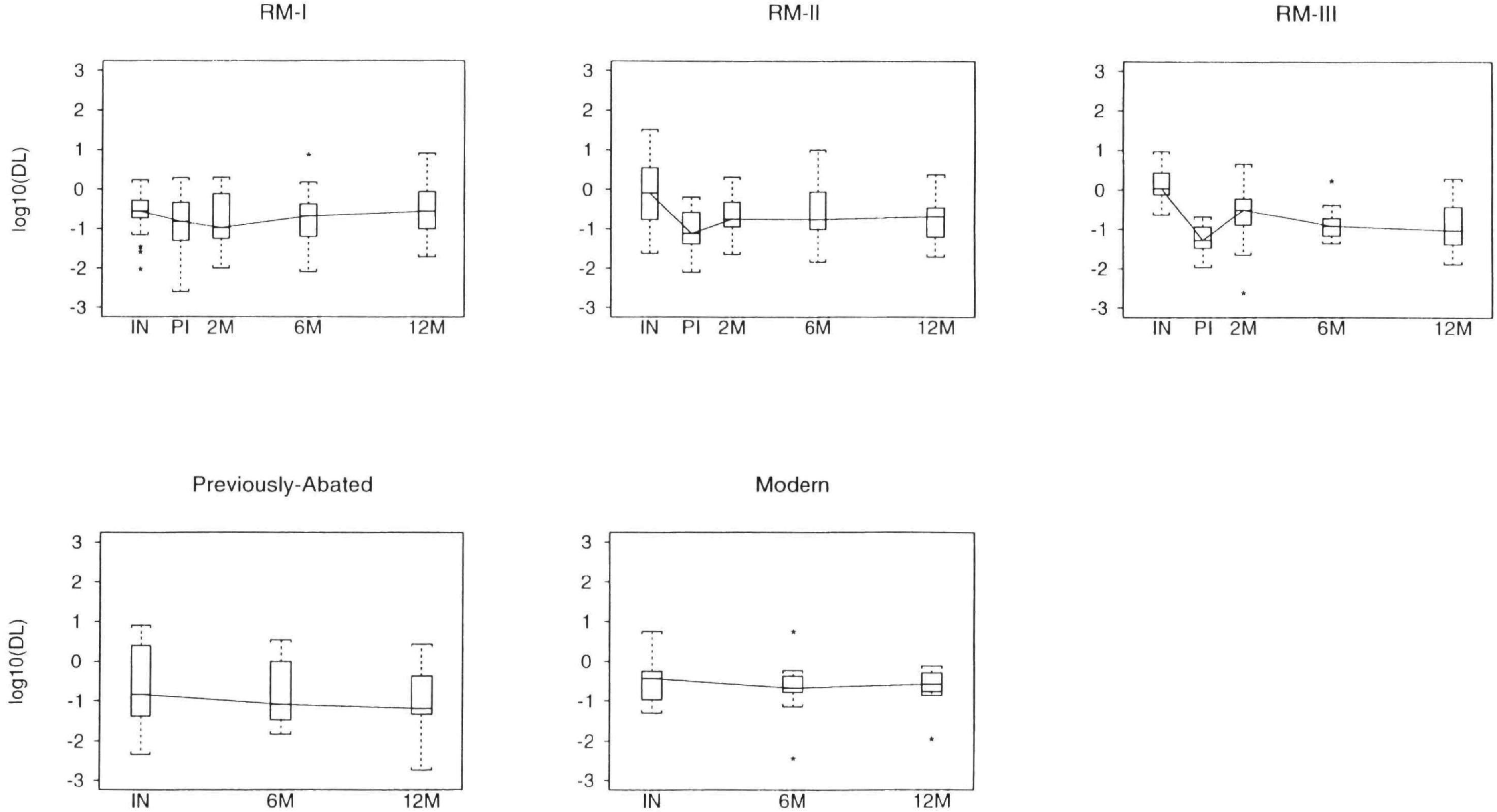
data based on the 89 houses completing the twelve month campaign

Figure 11 Dust Loadings (mg/ft^2) across Campaigns for Window Well Surfaces



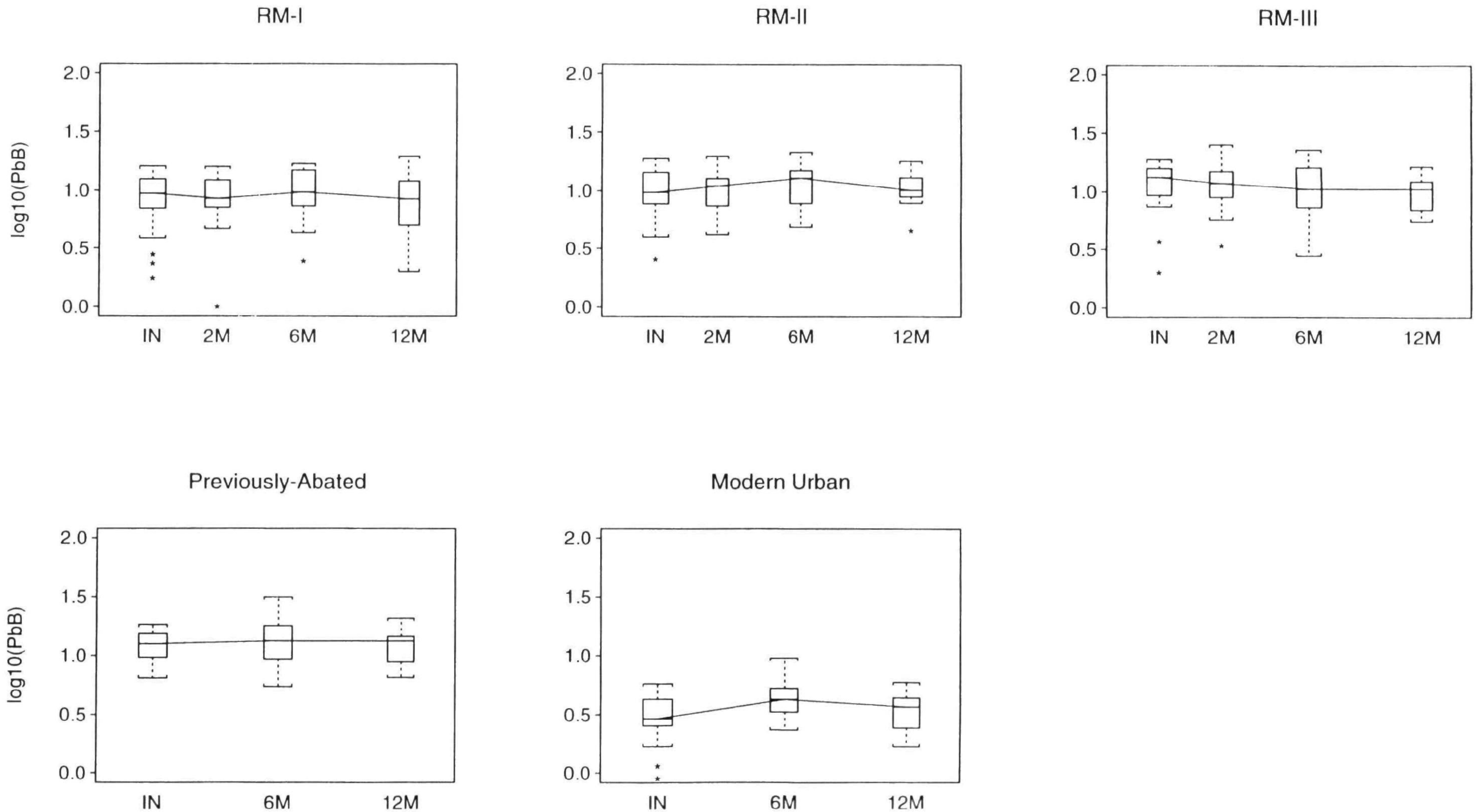
data based on the 89 houses completing the twelve month campaign

Figure 12 Dust Loadings (mg/ft^2) across Campaigns for Interior Entryway Surfaces



data based on the 89 houses completing the twelve month campaign

Figure 13 Blood Lead Concentrations for Children with Initial Blood Pb < 20 ug/dL



data based on the 89 houses completing the twelve month campaign

Figure 14: Dust Lead Loadings

R & M Study - Partial 12 Month Campaign

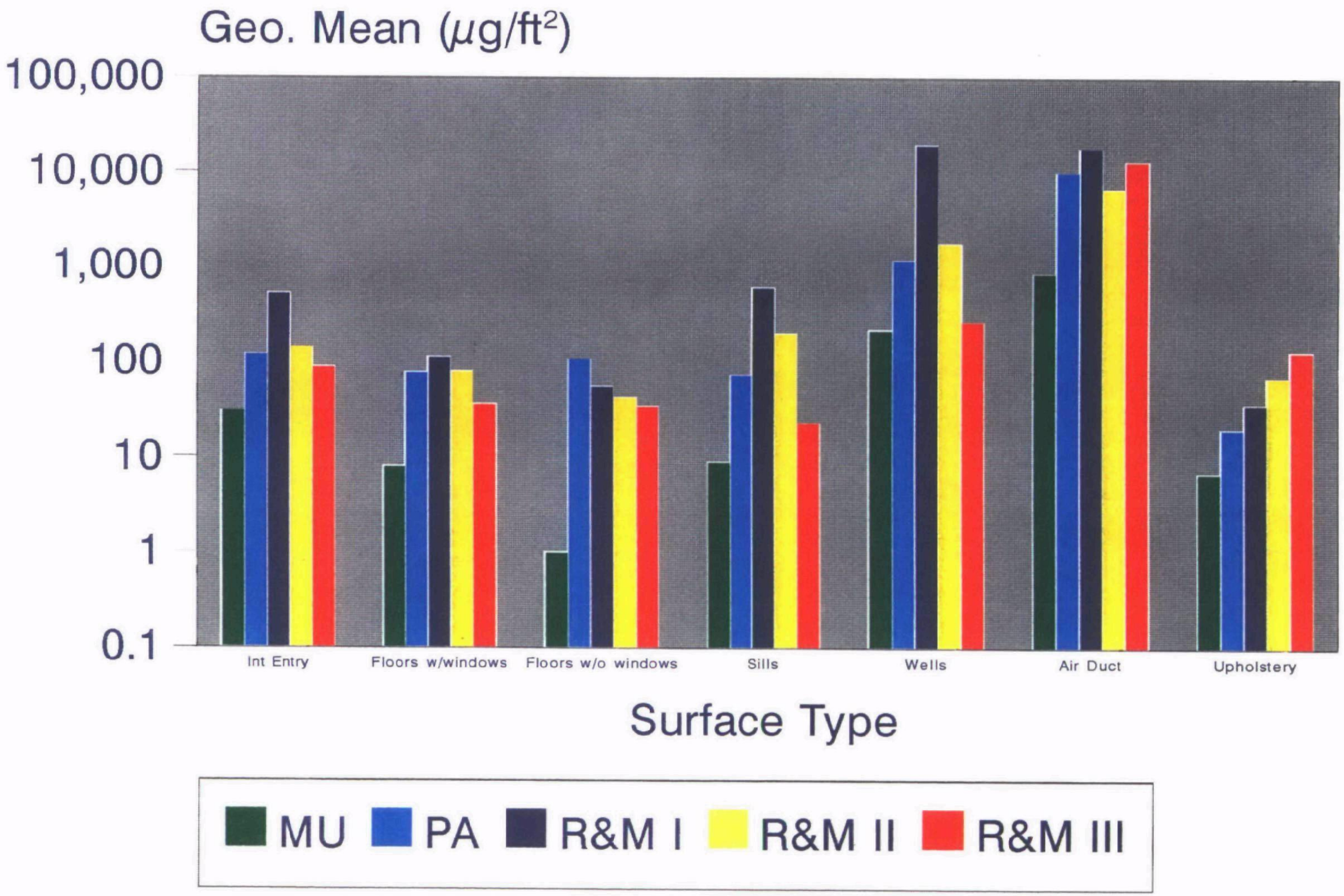


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Figure 15: Dust Lead Concentrations
R & M Study - Partial 12 Month Campaign

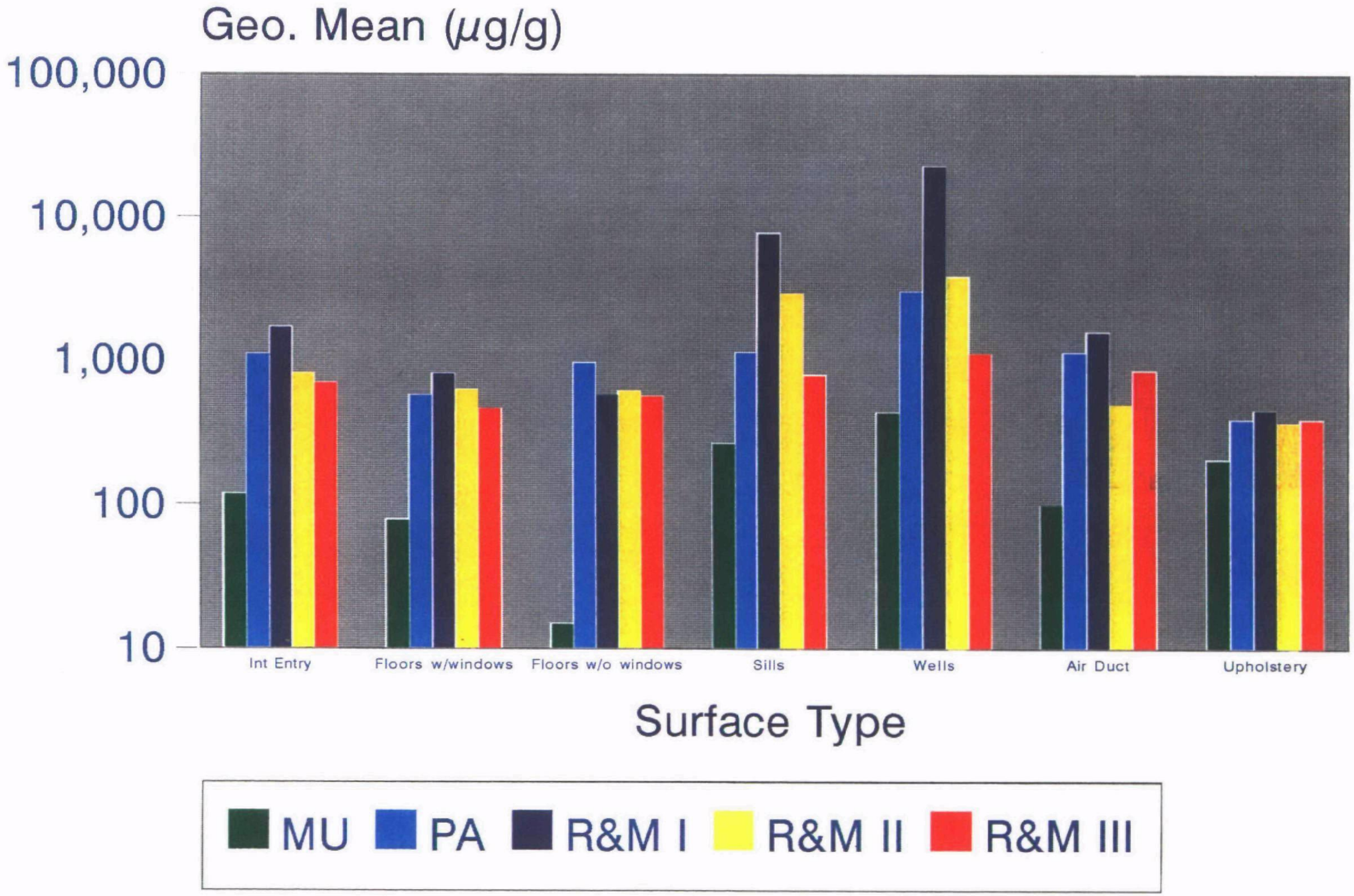

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Figure 16: Dust Loadings
R & M Study - Partial 12 Month Campaign

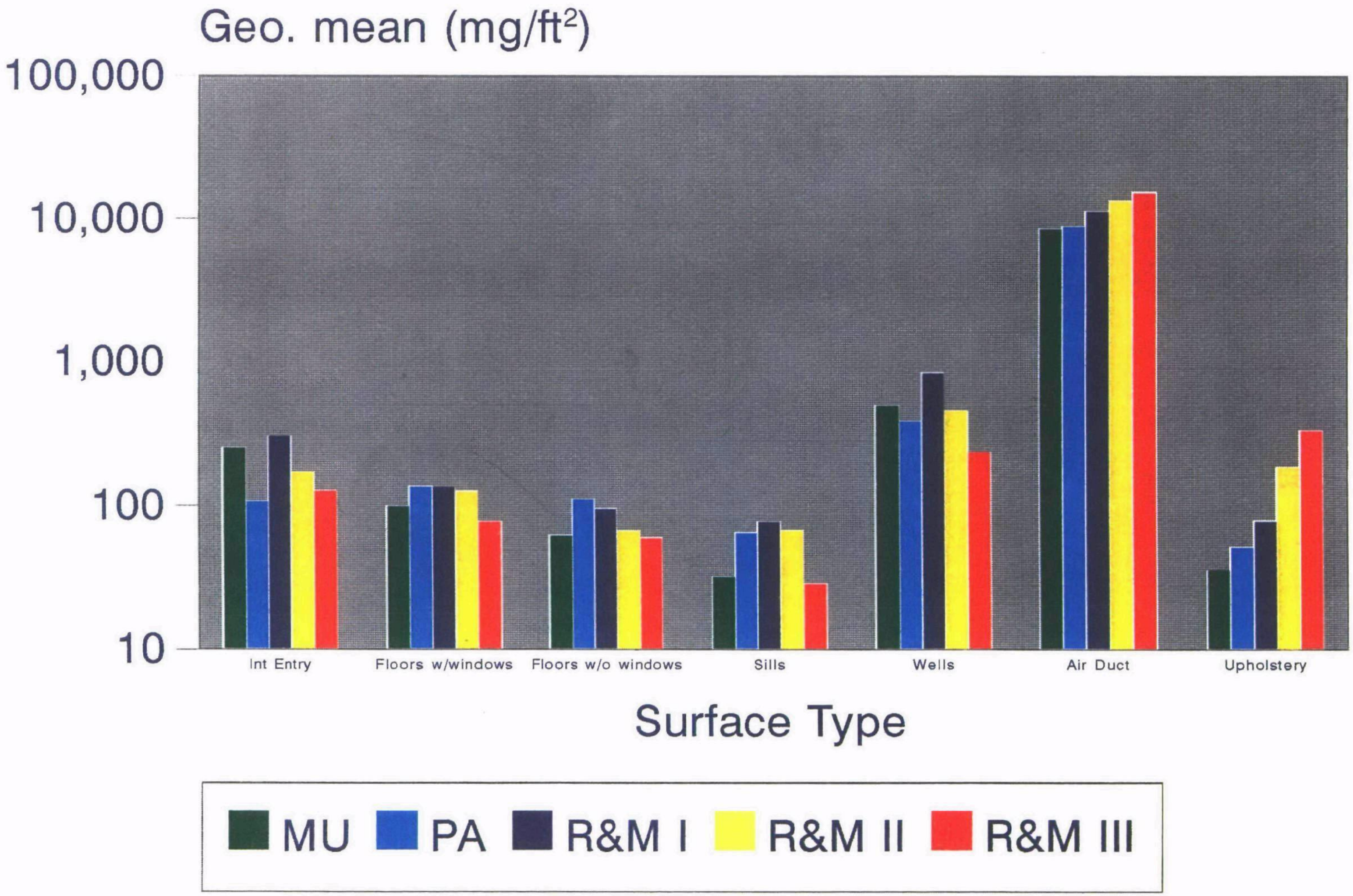

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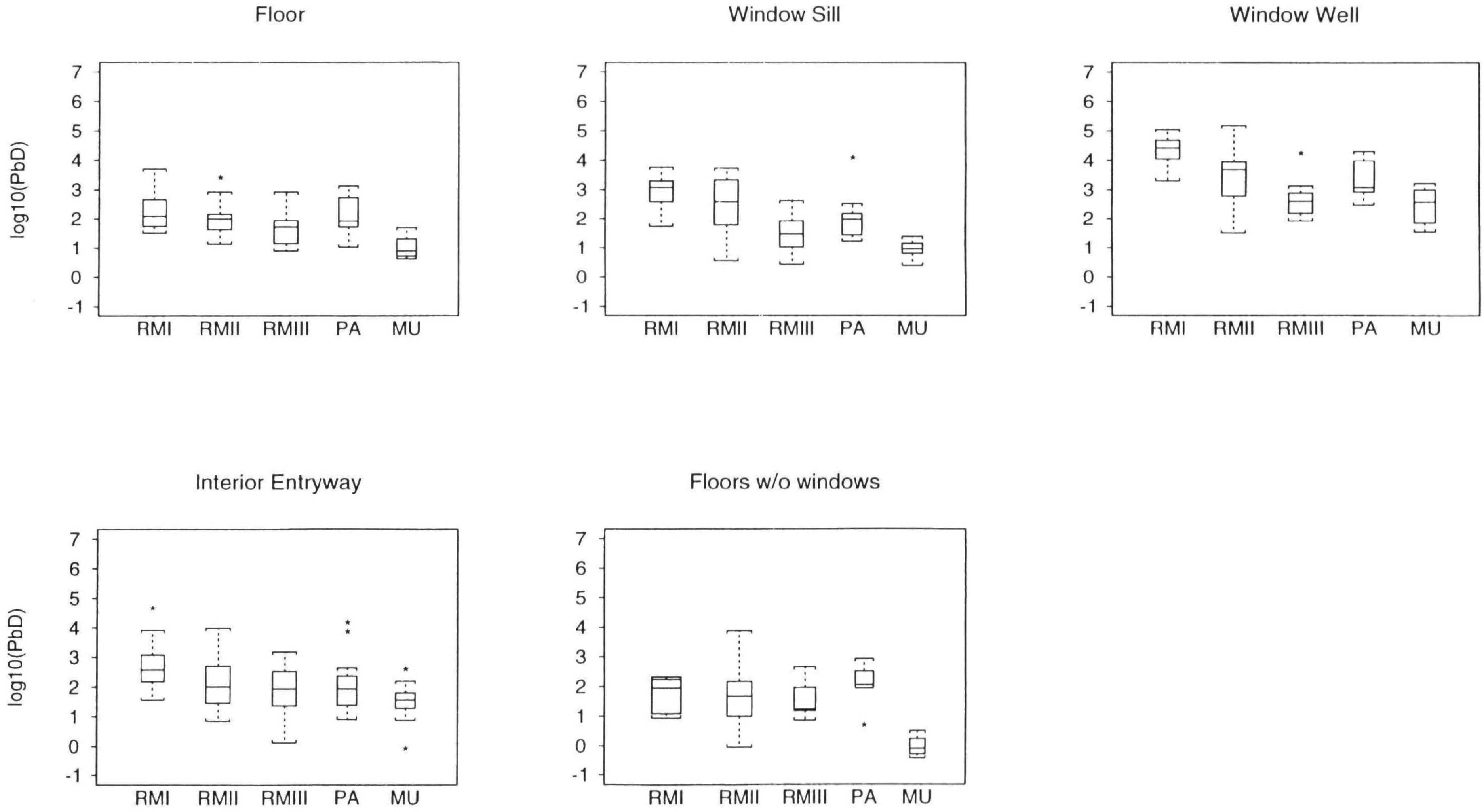
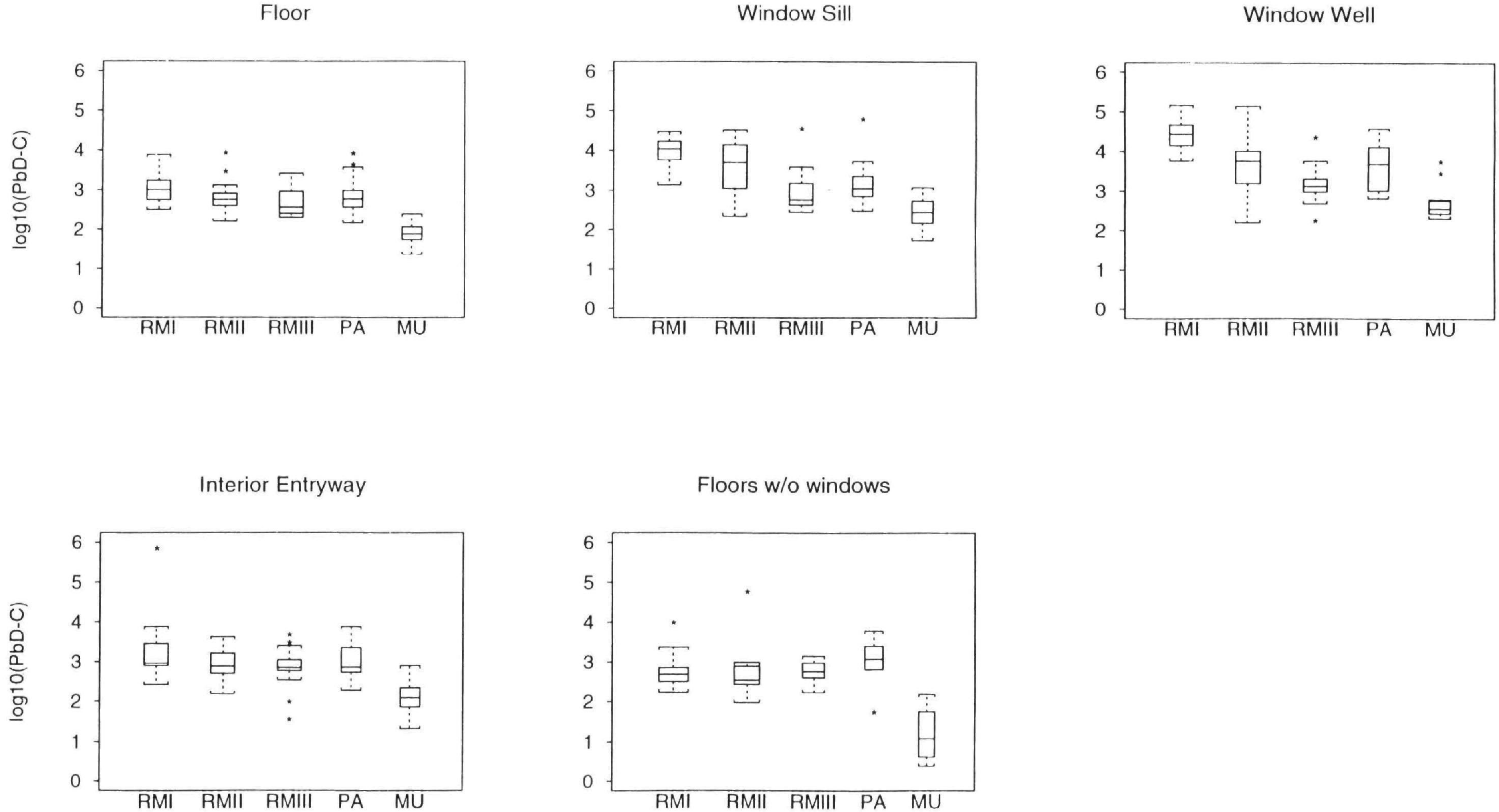
Figure 17 Dust Lead Loadings (ug/ft^2) across Groups at the 12 Month Campaign



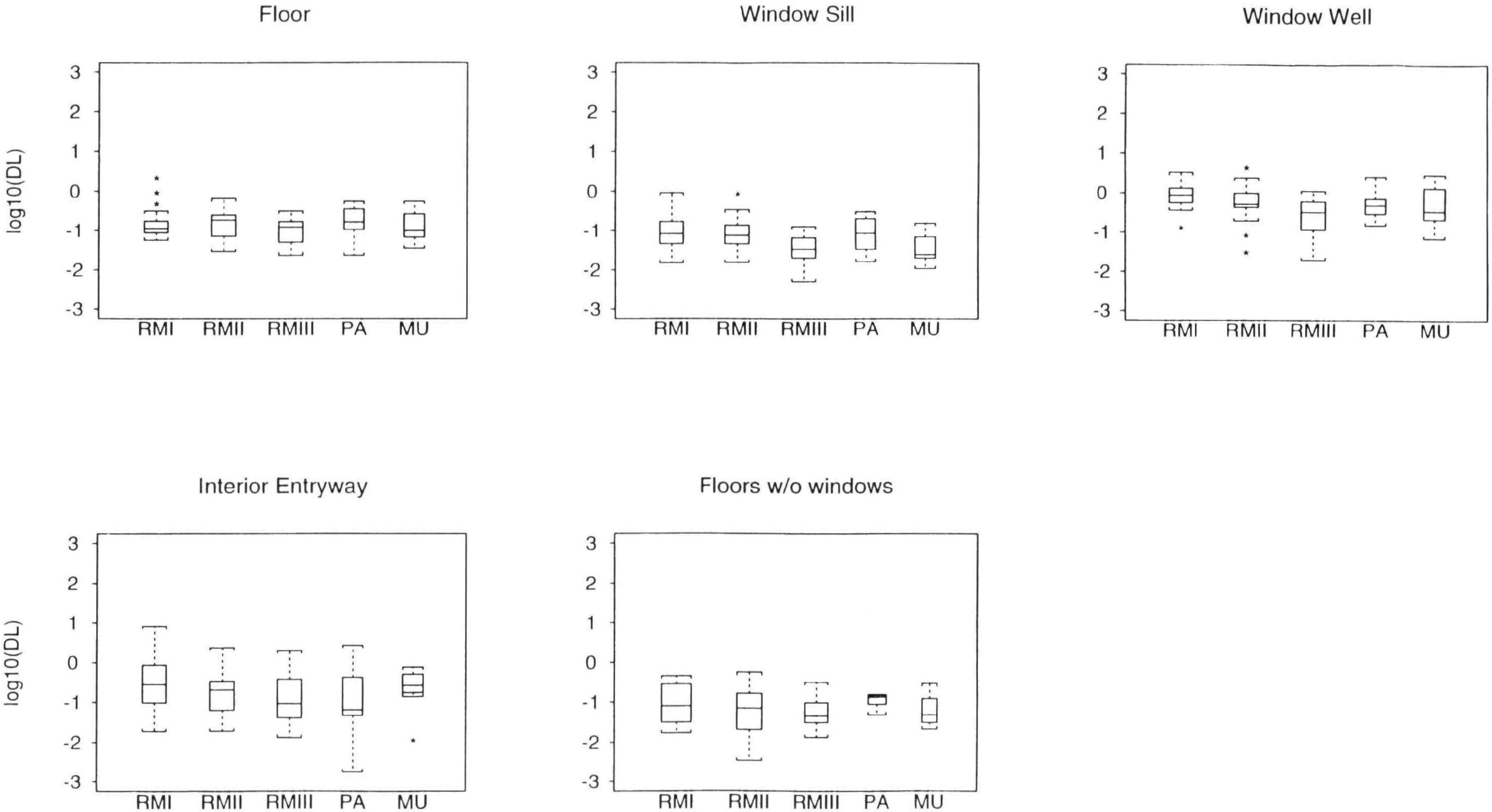
data based on the 89 houses completing the twelve month campaign

Figure 18 Dust Lead Concentrations (ug/g) across Groups at the 12 Month Campaign



data based on the 89 houses completing the twelve month campaign

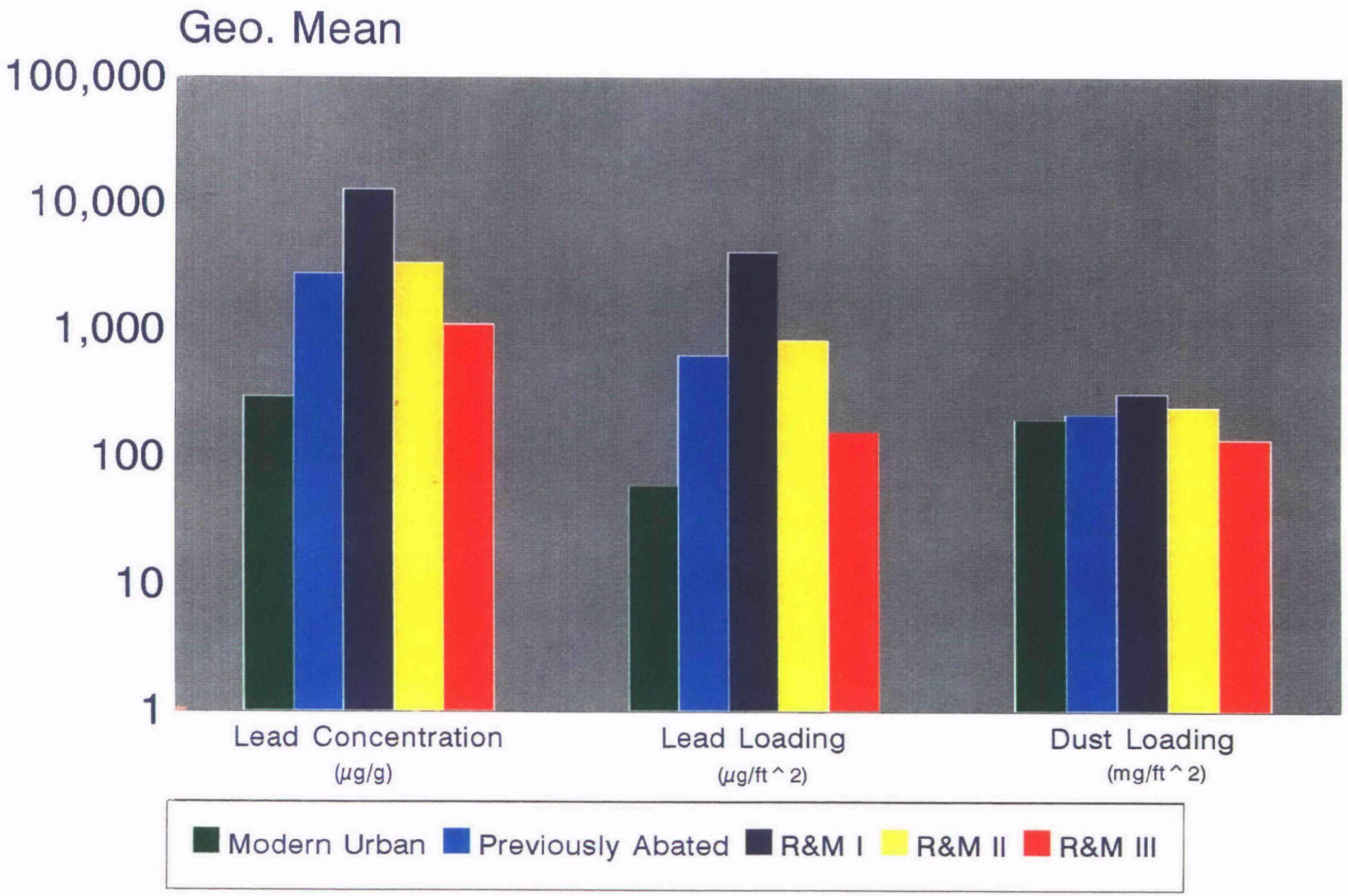
Figure 19 Dust Loadings (mg/ft^2) across Groups at the 12 Month Campaign



data based on the 89 houses completing the twelve month campaign

Figure 20: Overall lead levels and dust loadings by group*

R & M Study - Partial 12-Month Campaign



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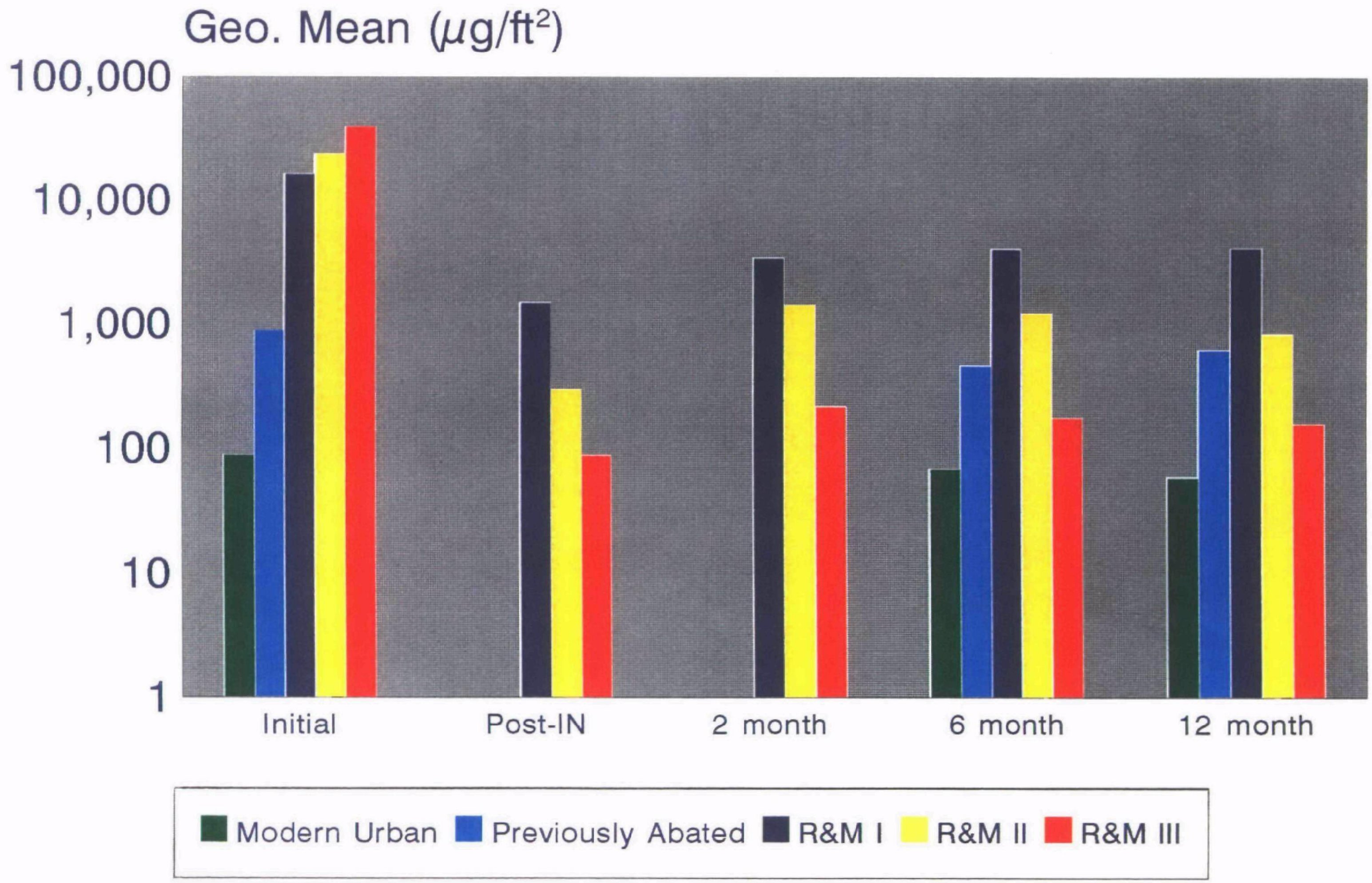
* Summary measures are based on weighted averages of floors, entryways, window sills, and window wells within houses

Figure 21: Overall dust lead loadings by group*

R & M Study - Partial 12 Month Campaign



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* Summary measures are based on weighted averages of floors, entryways, window sills, and window wells within houses

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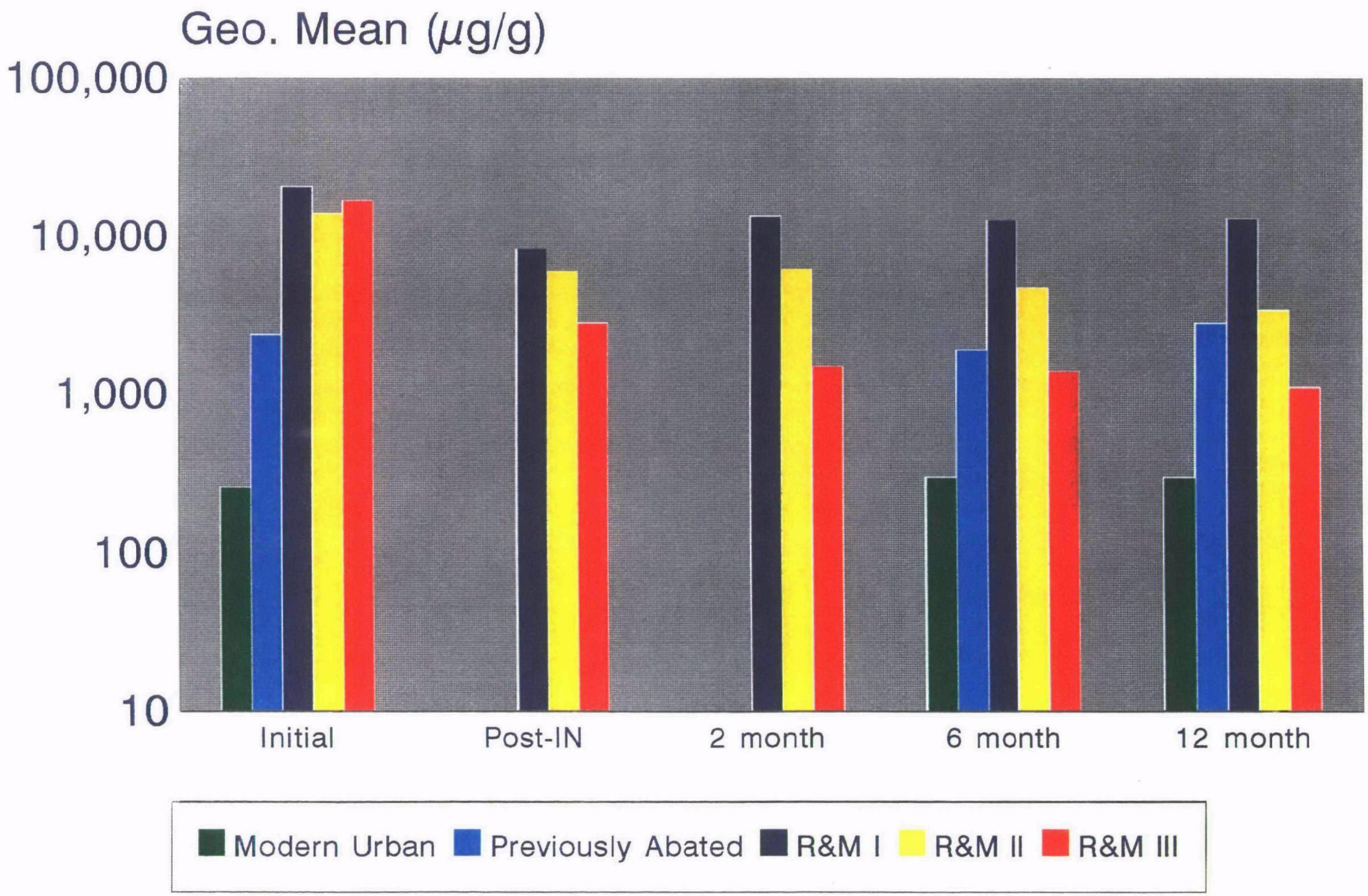
Figure 22: Overall dust lead concentrations by group*
R & M Study - Partial 12 Month Campaign



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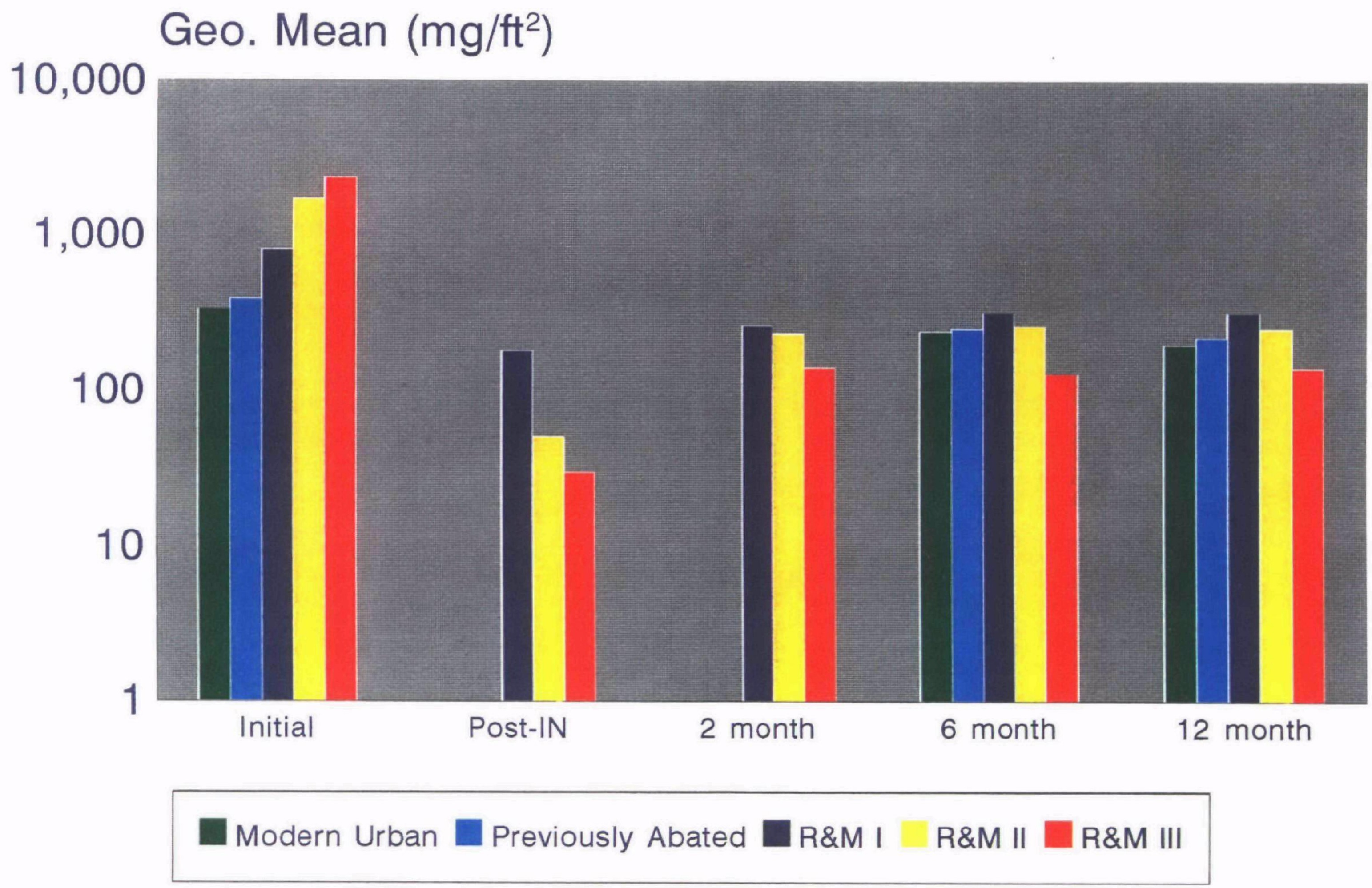
* Summary measures are based on weighted averages of floors, entryways, window sills, and window wells within houses

Figure 23: Overall dust loadings by group*

R & M Study - Partial 12 Month Campaign



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* Summary measures are based on weighted averages of floors, entryways, window sills, and window wells within houses

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Figure 24: R & M Study - Preliminary 12 Month Report (7/95)
Children's Blood Lead Levels Across Time - R&M I
for children with 12-month values

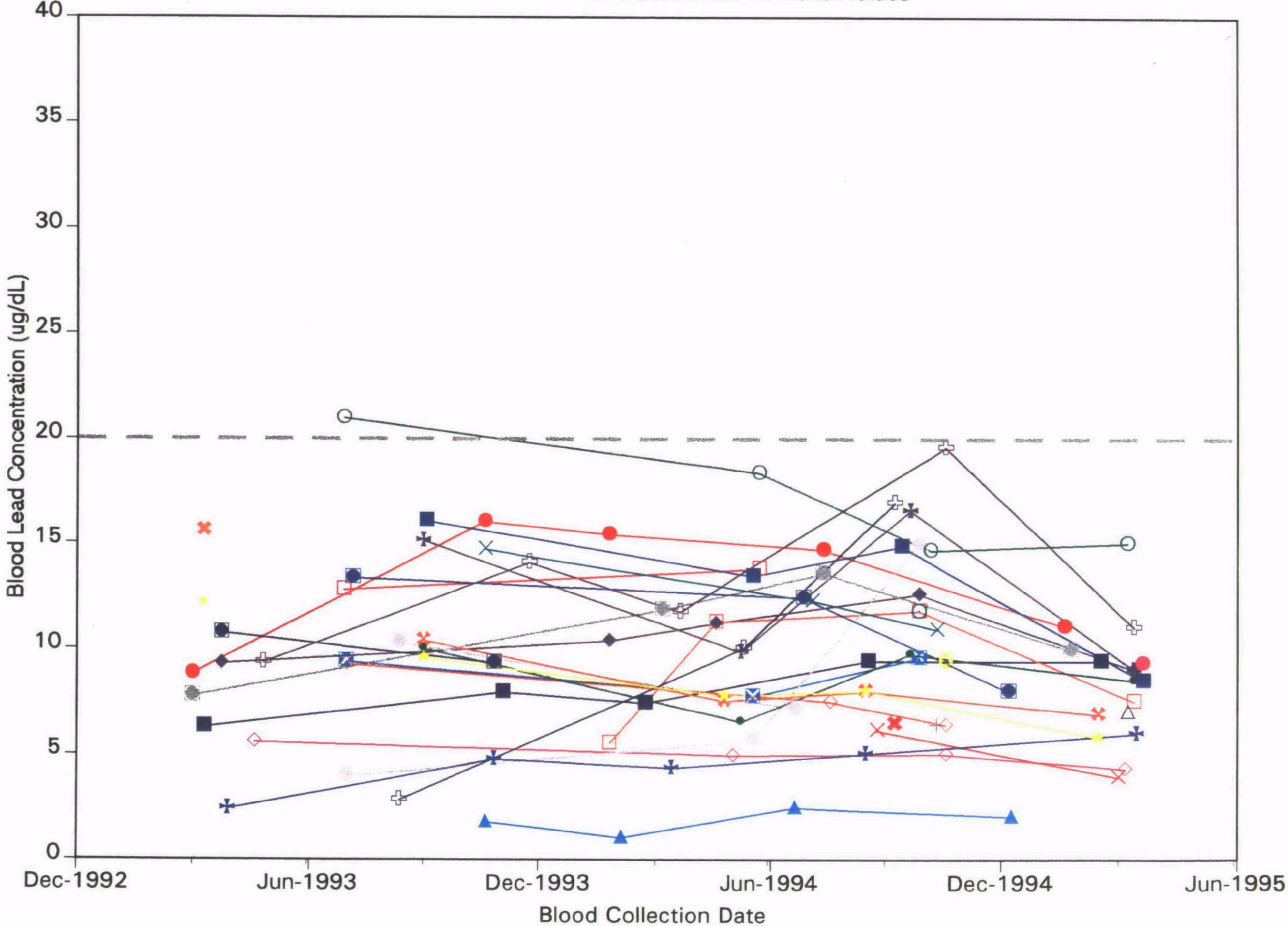

Figure 25: R & M Study - Preliminary 12 Month Report (7/95)
Children's Blood Lead Levels Across Time - R&M II
for children with 12-month values

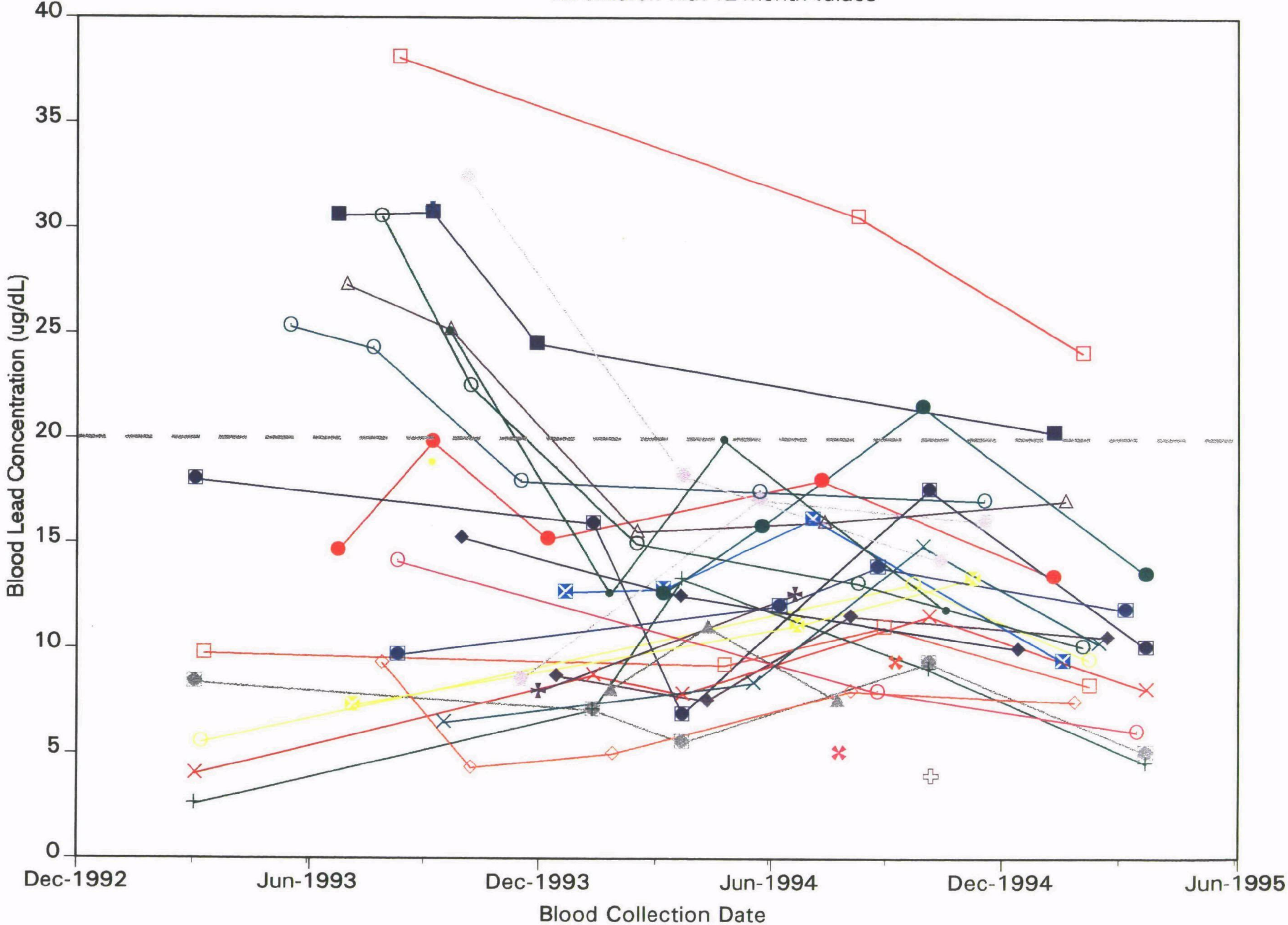

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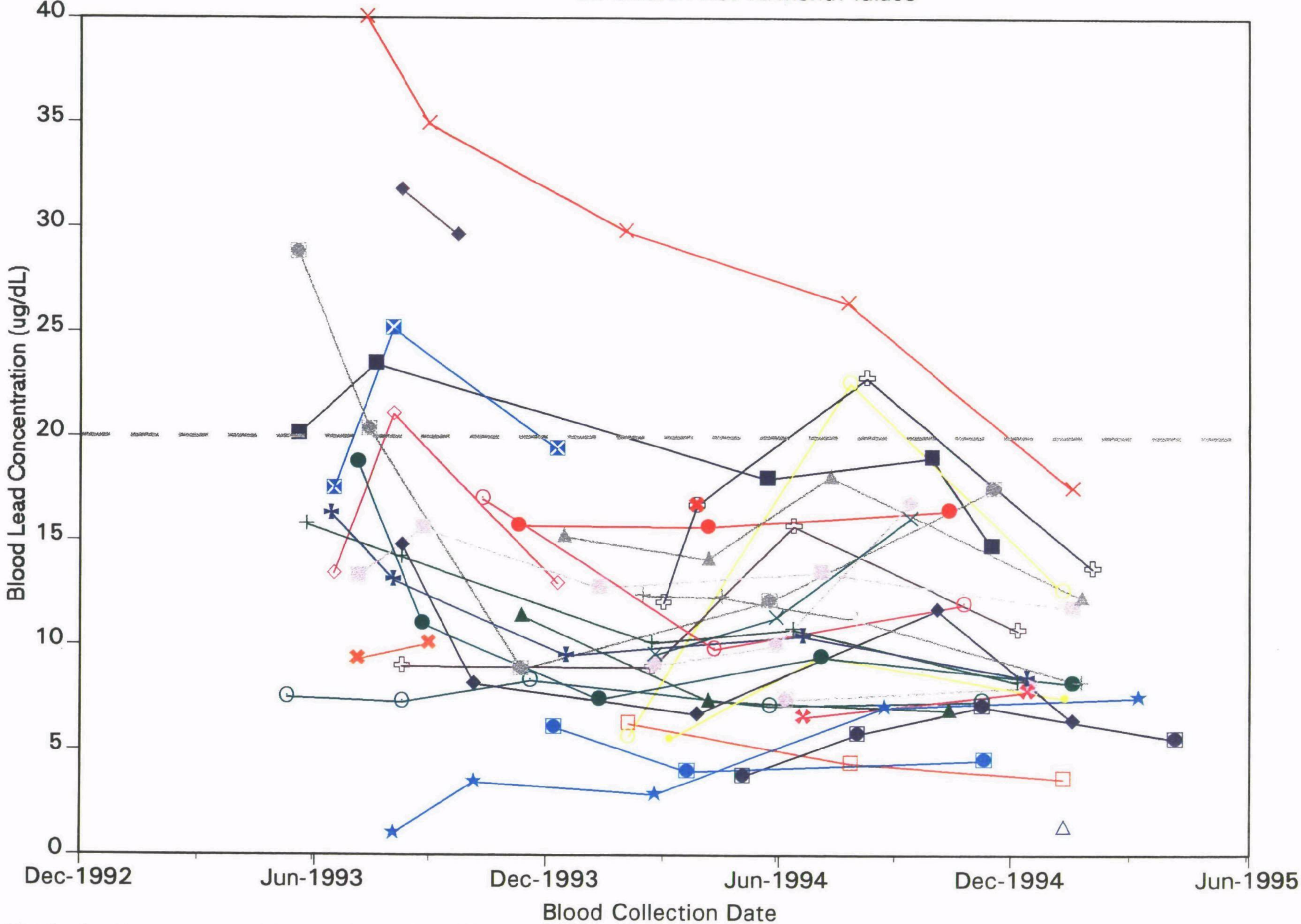
Figure 26: R & M Study - Preliminary 12 Month Report (7/95)
Children's Blood Lead Levels Across Time - R&M III
for children with 12-month values



*The blood lead value that appears as 40 is actually a value of 43 ug/dL.

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Figure 27: R & M Study - Preliminary 12 Month Report (7/95)
Children's Blood Lead Levels Across Time - Modern Urban
for children with 12-month values

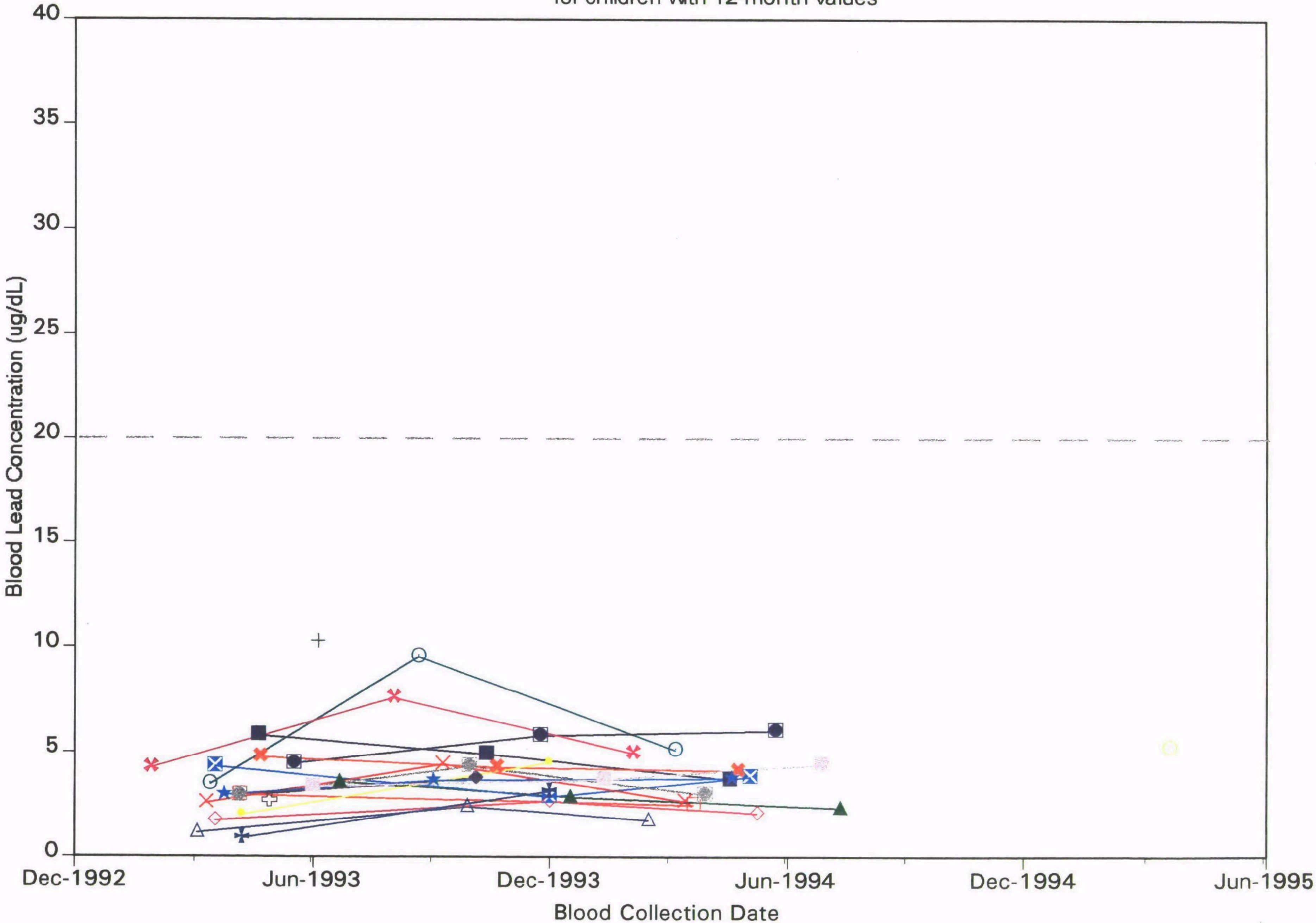

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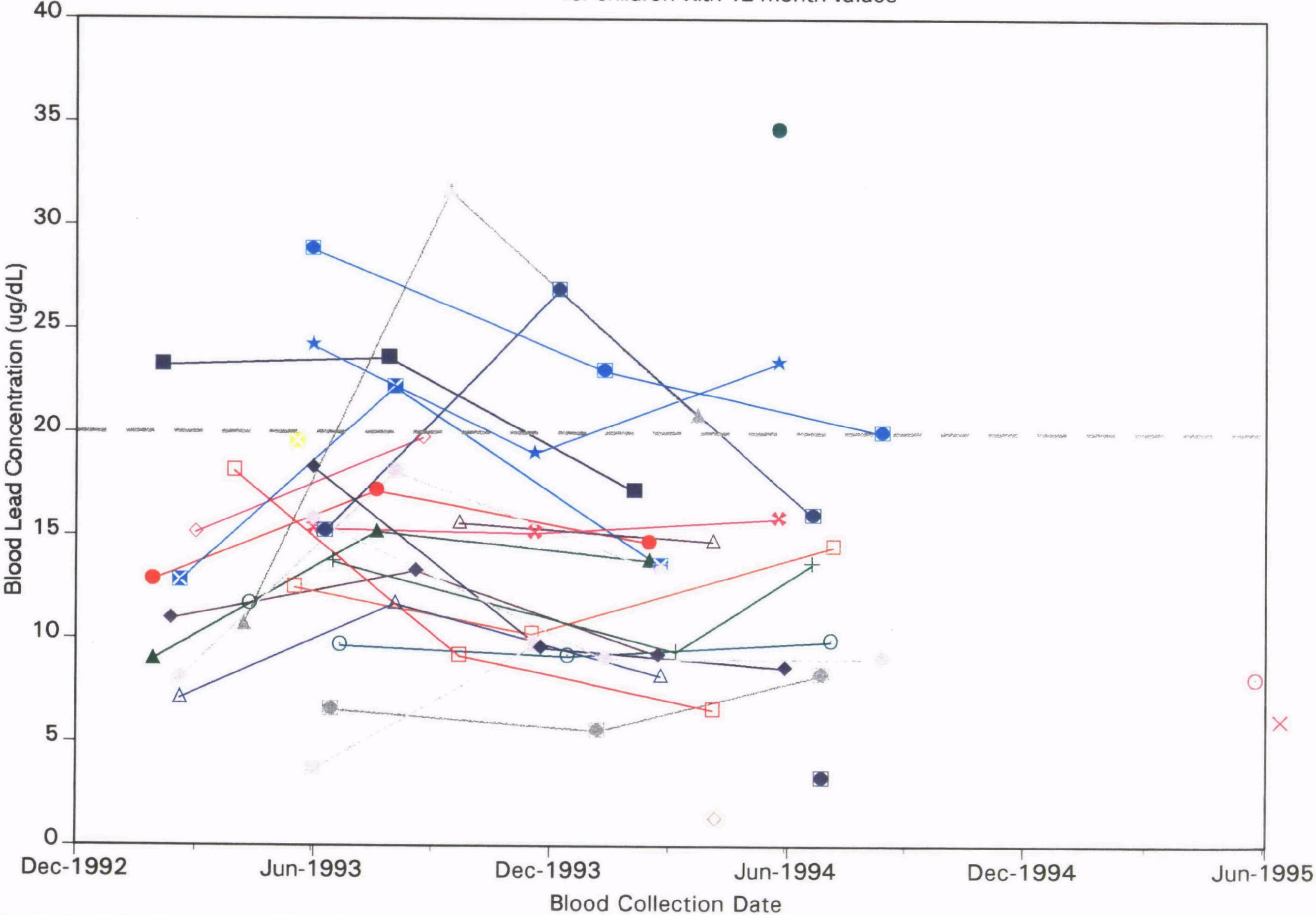
Figure 28: R & M Study - Preliminary 12 Month Report (7/95)
Children's Blood Lead Levels Across Time - Previously Abated
for children with 12-month values



*The child with blood lead value of 53 ug/dL is excluded from analysis.

APPENDIX A

Descriptive Statistics

Table a: Descriptive Statistics for 12 Month Campaign Dust Lead Concentrations (µg/g) by Surface Type and Group

Surface	Study Group	N	Minimum	Maximum	Geometric Mean	std(ln)	Lower 95% CI	Upper 95% CI
Air Duct	Modern Urban	11	18	4,464	101	1.585	35	293
	Pre-Abated	5	167	5,841	1,138	1.632	150	8,628
	RM-I	8	332	24,150	1,592	1.371	506	5,009
	RM-II	14	52	5,594	500	1.360	228	1,096
	RM-III	15	168	5,226	859	0.876	529	1,395
Floor	Modern Urban	31	13	1,085	79	0.796	58	108
	Pre-Abated	28	11	8,894	570	1.332	319	1,018
	RM-I	43	205	11,977	819	1.000	579	1,159
	RM-II	40	85	8,714	627	0.977	421	935
	RM-III	40	67	19,604	465	1.084	299	724
Floor w/o windows	Modern Urban	4	2	152	15	1.758	1	252
	Pre-Abated	6	56	6,190	966	1.636	174	5,377
	RM-I	15	175	9,674	575	1.012	328	1,006
	RM-II	11	96	58,840	615	1.647	204	1,860
	RM-III	9	169	1,419	565	0.727	323	988
Interior Entrance	Modern Urban	15	21	777	119	0.961	70	203
	Pre-Abated	14	196	7,741	1,106	1.108	583	2,096
	RM-I	20	262	704,065	1,695	1.692	768	3,741
	RM-II	20	155	4,251	819	0.814	559	1,198
	RM-III	20	37	4,887	701	1.078	423	1,160
Sill	Modern Urban	30	31	1,742	267	0.968	171	416
	Pre-Abated	28	193	132,312	1,138	1.388	608	2,129
	RM-I	39	626	41,979	7,754	1.072	5,110	11,767
	RM-II	40	192	39,009	2,941	1.470	1,707	5,067
	RM-III	40	172	52,598	796	1.209	505	1,255
Upholstery	Modern Urban	4	89	461	206	0.679	70	606
	Pre-Abated	9	215	770	394	0.485	271	571
	RM-I	12	91	2,195	457	0.808	274	764
	RM-II	5	225	473	374	0.299	258	542
	RM-III	5	202	973	392	0.592	188	817
Well	Modern Urban	30	91	8,734	438	0.909	297	647
	Pre-Abated	28	274	45,214	3,031	1.650	1,341	6,852
	RM-I	36	4,012	493,006	22,963	1.020	16,041	32,872
	RM-II	40	65	151,924	3,862	1.618	1,931	7,723
	RM-III	40	3	29,576	1,130	1.347	711	1,797

Values for floors, window sills, and window wells account for multiple samples from a house
Pre-Abated=Previously Abated

Table b: Descriptive Statistics for 12 Month Campaign Dust Lead Loadings ($\mu g/ft^2$) by Surface Type and Group

Surface	Study Group	N	Minimum	Maximum	Geometric Mean	std(ln)	Lower 95% CI	Upper 95% CI
Air Duct	Modern Urban	11	112	14,428	856	1.760	262	2,794
	Pre-Abated	5	326	180,703	10,020	2.394	513	195,779
	RM-I	8	245	3,755,278	18,073	3.357	1,092	299,134
	RM-II	14	15	413,541	6,675	2.876	1,268	35,126
	RM-III	15	144	874,350	13,040	2.077	4,127	41,199
Floor	Modern Urban	31	< 1	107	8	1.138	5	13
	Pre-Abated	28	< 1	2,424	77	2.006	32	186
	RM-I	43	13	23,466	112	1.488	69	181
	RM-II	40	8	4,416	79	1.342	45	139
	RM-III	40	2	1,304	36	1.466	20	65
Floor w/o windows	Modern Urban	4	< 1	3	1	0.901	0	4
	Pre-Abated	6	5	856	108	1.724	18	662
	RM-I	15	8	204	55	1.240	28	109
	RM-II	11	1	7,580	42	2.300	9	195
	RM-III	9	7	444	34	1.425	11	101
Interior Entrance	Modern Urban	15	1	391	30	1.383	14	64
	Pre-Abated	14	8	15,204	119	2.260	32	440
	RM-I	20	35	45,201	514	1.840	217	1,216
	RM-II	20	7	9,574	141	1.931	57	349
	RM-III	20	1	1,452	89	1.847	38	212
Sill	Modern Urban	30	2	36	9	0.809	6	12
	Pre-Abated	28	4	24,481	74	1.770	33	166
	RM-I	39	5	7,523	603	1.770	307	1,185
	RM-II	40	1	9,921	201	2.339	78	520
	RM-III	40	1	617	23	1.510	13	41
Upholstery	Modern Urban	4	1	24	7	1.318	1	61
	Pre-Abated	9	6	82	20	0.982	10	43
	RM-I	12	1	158	36	1.453	14	90
	RM-II	5	13	824	70	1.552	10	483
	RM-III	5	7	744	131	1.897	12	1,380
Well	Modern Urban	30	9	2,410	217	1.470	108	439
	Pre-Abated	28	52	22,872	1,172	1.887	504	2,723
	RM-I	36	485	367,432	19,412	1.320	11,947	31,542
	RM-II	40	6	163,334	1,761	2.375	641	4,840
	RM-III	40	2	30,614	268	1.618	157	459

Values for floors, window sills, and window wells account for multiple samples from a house
Pre-Abated=Previously Abated

Table c: Descriptive Statistics for the 12 Month Campaign Dust Loadings (mg/ft²) by Surface Type and Group:

Surface	Study Group	N	Minimum	Maximum	Geometric Mean	std(ln)	Lower 95% CI	Upper 95% CI
Air Duct	Modern Urban	11	1,222	176,990	8,474	1.560	2,972	24,161
	Pre-Abated	5	1,951	34,803	8,807	1.090	2,274	34,107
	RM-I	8	354	155,499	11,353	2.172	1,846	69,803
	RM-II	14	283	103,878	13,349	2.046	4,096	43,505
	RM-III	15	94	167,309	15,184	1.808	5,579	41,331
Floor	Modern Urban	31	6	675	100	1.072	62	161
	Pre-Abated	28	18	749	135	1.141	82	220
	RM-I	43	14	8,924	134	1.094	90	201
	RM-II	40	19	981	126	0.986	87	184
	RM-III	40	17	617	78	0.968	56	107
Floor w/o windows	Modern Urban	4	21	292	62	1.110	11	361
	Pre-Abated	6	49	156	112	0.451	70	180
	RM-I	15	17	459	96	1.172	50	183
	RM-II	11	3	562	67	1.510	24	186
	RM-III	9	13	313	60	1.005	28	129
Interior Entrance	Modern Urban	15	11	760	250	1.026	141	441
	Pre-Abated	14	2	2,669	108	1.835	37	311
	RM-I	20	19	8,077	303	1.486	151	608
	RM-II	20	19	2,330	172	1.356	91	325
	RM-III	20	13	1,941	127	1.350	68	240
Sill	Modern Urban	30	8	354	32	0.949	21	50
	Pre-Abated	28	8	518	65	1.169	40	106
	RM-I	39	5	1,901	78	1.209	49	124
	RM-II	40	4	1,742	68	1.234	43	109
	RM-III	40	< 1	264	29	1.257	18	46
Upholstery	Modern Urban	4	14	87	36	0.791	10	128
	Pre-Abated	9	12	214	52	0.937	25	107
	RM-I	12	11	407	79	1.108	39	159
	RM-II	5	56	1,854	188	1.398	33	1,067
	RM-III	5	36	2,704	334	1.601	46	2,439
Well	Modern Urban	30	28	3,441	497	1.265	261	945
	Pre-Abated	28	33	5,496	387	1.041	253	590
	RM-I	36	76	10,988	841	0.955	587	1,205
	RM-II	40	12	7,097	456	1.316	272	765
	RM-III	40	9	1,592	237	1.245	145	388

Values for floors, window sills, and window wells account for multiple samples from a house
Pre-Abated=Previously Abated

Table d: Pearson correlation coefficients between log transformed dust lead loadings ($\mu g/ft^2$) at the twelve month campaign

	Window Sills	Window Wells	Interior Entryway	Floors - Rms w/o Windows	Air Ducts	Upholstery
Floors	.49** (89)	.49** (88)	.38** (89)	.46** (45)	.16 (53)	.28 (35)
Window Sills	-	.73** (88)	.39** (89)	.27 (45)	.25 (53)	.04 (35)
Window Wells	-	-	.40** (88)	.17 (44)	.26 (52)	.07 (35)
Interior Entryway	-	-	-	.29* (45)	.15 (53)	.16 (35)
Floors - Rms w/o Windows	-	-	-	-	-.11 (28)	.17 (17)
Air Ducts						

* $p < .05$; ** $p < .01$

▪ Air Duct or Upholstery Samples were collected, not both.

Table e: Pearson correlation coefficients between log transformed dust lead concentrations at the twelve month campaign

	Window Sills	Window Wells	Interior Entryway	Floors - Rms w/o Windows	Air Ducts	Upholstery
Floors	.51** (89)	.54** (88)	.54** (89)	.55** (45)	.47** (53)	.30 (35)
Window Sills	-	.67** (88)	.47** (89)	.46** (45)	.42** (53)	.30 (35)
Window Wells	-	-	.51** (88)	.30 (44)	.33 (52)	.31 (35)
Interior Entryway	-	-	-	.48** (45)	.34 (53)	.38 (35)
Floors - Rms w/o Windows	-	-	-	-	.37 (28)	.43 (17)
Air Ducts	-	-	-	-	-	-[a]

* p < .05; ** p < .01

[a] Air Duct or Upholstery Samples were collected, not both.

Table f: Pearson correlation coefficients between log transformed dust loadings (mg/ft^2) at the twelve month campaign

	Window Sills	Window Wells	Interior Entryway	Floors - Rms w/o Windows	Air Ducts	Upholstery
Floors	.08 (89)	.14 (88)	.08 (89)	.27 (45)	- .10 (53)	.04 (35)
Window Sills	-	.66** (88)	.56** (89)	.04 (45)	.05 (53)	- .14 (35)
Window Wells	-	-	29 (88)	.18 (44)	- 07 (52)	- .23 (35)
Interior Entryway	-	-	-	- .01 (45)	- .04 (53)	- .12 (35)
Floors - Rms w/o Windows	-	-	-	-	- .35 (28)	- .15 (17)
Air Ducts	-	-	-	-	-	-[a]

* $p < .05$; ** $p < .01$

[a] Air Duct or Upholstery Samples were collected, not both

Table g: Descriptive statistics on soil lead concentrations ($\mu g/g$) from the preliminary six month campaign report

Matrix	Study Group	N	Minimum	Maximum	Geometric Mean	std(ln)	Lower 95% CI	Upper 95% CI
Soil	Modern Urban	13	34	229	73	0.489	54	98
	Prev'ly Abated	3	304	7,845	1,521	1.625	27	86,150
	RM-I	10	182	4,530	730	1.000	357	1,494
	RM-II	9	428	2,608	708	0.599	447	1,121

		35						

Table h: Descriptive statistics on water lead concentrations ($\mu g/L$) from the preliminary six month campaign report

Matrix	Study Group	N	Minimum	Maximum	Geometric Mean	std(ln)	Lower 95% CI	Upper 95% CI
Water	Modern Urban	15	0	40	4	1.316	2	8
	Prev'ly Abated	14	0	32	1	1.448	1	3
	RM-I	17	0	11	2	0.964	1	4
	RM-II	19	0	18	3	1.047	2	4
	RM-III	17	0	30	3	1.161	1	5

		82						

APPENDIX B

Longitudinal data analysis output for dust lead

DUST LEAD LOADINGS WITHIN COMPLETE R_M HOUSES AS AN OUTCOME OF ENVIRONMENTAL FACTORS: 07/17/95
12-month campaign all data model: factor1 = level + season + campaign(level) + random_house

The MIXED Procedure
Class Level Information

Class	Levels	Values
DID	60	310 316 343 347 348 353 355 357 358 359 366 372 373 381 386 403 406 409 418 419 302 312 335 338 345 350 354 365 370 374 376 377 384 385 391 397 407 412 416 420 306 309 317 320 323 325 326 328 332 336 383 389 390 402 405 411 413 415 417 404
LEVEL	3	3 2 1
CAMPAIGN	5	00 02 06 12 PI

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.52166498	0.09194687	0.02427637	3.79	0.0002
Residual	1.00000000	0.17625655	0.01687193	10.45	0.0000

The MIXED Procedure
Model Fitting Information for FACTOR1

Description	Value
Observations	293.0000
Variance Estimate	0.1763
Standard Deviation Estimate	0.4198
REML Log Likelihood	-215.239
Akaike's Information Criterion	-217.239
Schwartz's Bayesian Criterion	-220.855
-2 REML Log Likelihood	430.4771
Null Model LRT Chi-Square	44.3687
Null Model LRT DF	1.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	0.21071261	0.12117595	218	1.74	0.0835	0.05	-0.0281	0.4495
SPRING	-0.05365035	0.07966301	218	-0.67	0.5014	0.05	-0.2107	0.1034
SUMMER	-0.15434789	0.07064688	218	-2.18	0.0300	0.05	-0.2936	-0.0151
FALL	-0.00393296	0.08553026	218	-0.05	0.9634	0.05	-0.1725	0.1646
LEVEL 3	-1.57870478	0.16707386	218	-9.45	0.0000	0.05	-1.9080	-1.2494
LEVEL 2	-0.79301191	0.16524626	218	-4.80	0.0000	0.05	-1.1187	-0.4673
LEVEL 1	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(LEVEL) 00 3	3.05571972	0.13688774	218	22.32	0.0000	0.05	2.7859	3.3255
CAMPAIGN(LEVEL) 02 3	0.70179258	0.13823696	218	5.08	0.0000	0.05	0.4293	0.9742
CAMPAIGN(LEVEL) 06 3	0.57870463	0.13526552	218	4.28	0.0000	0.05	0.3121	0.8453
CAMPAIGN(LEVEL) 12 3	0.47188651	0.13338638	218	3.54	0.0005	0.05	0.2090	0.7348
CAMPAIGN(LEVEL) PI 3	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(LEVEL) 00 2	2.03467544	0.13359146	218	15.23	0.0000	0.05	1.7714	2.2980
CAMPAIGN(LEVEL) 02 2	0.60115318	0.13780818	218	4.36	0.0000	0.05	0.3295	0.8728
CAMPAIGN(LEVEL) 06 2	0.41829973	0.13331476	218	3.14	0.0019	0.05	0.1555	0.6811
CAMPAIGN(LEVEL) 12 2	0.42521529	0.13336752	218	3.19	0.0016	0.05	0.1624	0.6881
CAMPAIGN(LEVEL) PI 2	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(LEVEL) 00 1	0.93998960	0.13534171	218	6.95	0.0000	0.05	0.6732	1.2067
CAMPAIGN(LEVEL) 02 1	0.06323570	0.13992696	218	0.45	0.6518	0.05	-0.2125	0.3390
CAMPAIGN(LEVEL) 06 1	0.17211068	0.13372528	218	1.29	0.1994	0.05	-0.0914	0.4357
CAMPAIGN(LEVEL) 12 1	0.14439255	0.13503716	218	1.07	0.2861	0.05	-0.1218	0.4105
CAMPAIGN(LEVEL) PI 1	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
SPRING	1	218	0.45	0.5014
SUMMER	1	218	4.77	0.0300
FALL	1	218	0.00	0.9634
LEVEL	2	218	30.48	0.0000
CAMPAIGN(LEVEL)	12	218	78.00	0.0000

DUST LEAD LOADINGS WITHIN COMPLETE R_M HOUSES AS AN OUTCOME OF ENVIRONMENTAL FACTORS: 07/17/95
12-month campaign all data model: factor1 = campaign + season + level(campaign) + random_house

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.52166498	0.09194687	0.02427637	3.79	0.0002
Residual	1.00000000	0.17625655	0.01687193	10.45	0.0000

The MIXED Procedure
Model Fitting Information for FACTOR1

Description	Value
Observations	293.0000
Variance Estimate	0.1763
Standard Deviation Estimate	0.4198
REML Log Likelihood	-215.239
Akaike's Information Criterion	-217.239
Schwartz's Bayesian Criterion	-220.855
-2 REML Log Likelihood	430.4771
Null Model LRT Chi-Square	44.3687
Null Model LRT DF	1.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	0.21071261	0.12117595	218	1.74	0.0835	0.05	-0.0281	0.4495
SPRING	-0.05365035	0.07966301	218	-0.67	0.5014	0.05	-0.2107	0.1034
SUMMER	-0.15434789	0.07064688	218	-2.18	0.0300	0.05	-0.2936	-0.0151
FALL	-0.00393296	0.08553026	218	-0.05	0.9634	0.05	-0.1725	0.1646
CAMPAIGN 00	0.93998960	0.13534171	218	6.95	0.0000	0.05	0.6732	1.2067
CAMPAIGN 02	0.06323570	0.13992696	218	0.45	0.6518	0.05	-0.2125	0.3390
CAMPAIGN 06	0.17211068	0.13372528	218	1.29	0.1994	0.05	-0.0914	0.4357
CAMPAIGN 12	0.14439255	0.13503716	218	1.07	0.2861	0.05	-0.1218	0.4105
CAMPAIGN PI	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 00	0.53702534	0.16628366	218	3.23	0.0014	0.05	0.2093	0.8648
LEVEL(CAMPAIGN) 2 00	0.30167393	0.16559959	218	1.82	0.0699	0.05	-0.0247	0.6281
LEVEL(CAMPAIGN) 1 00	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 02	-0.94014791	0.17149305	218	-5.48	0.0000	0.05	-1.2781	-0.6022
LEVEL(CAMPAIGN) 2 02	-0.25509443	0.16909995	218	-1.51	0.1329	0.05	-0.5884	0.0782
LEVEL(CAMPAIGN) 1 02	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 06	-1.17211083	0.16424355	218	-7.14	0.0000	0.05	-1.4958	-0.8484
LEVEL(CAMPAIGN) 2 06	-0.54682286	0.16376917	218	-3.34	0.0010	0.05	-0.8696	-0.2240
LEVEL(CAMPAIGN) 1 06	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 12	-1.25121082	0.16609913	218	-7.53	0.0000	0.05	-1.5786	-0.9238
LEVEL(CAMPAIGN) 2 12	-0.51218917	0.16548192	218	-3.10	0.0022	0.05	-0.8383	-0.1860
LEVEL(CAMPAIGN) 1 12	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 PI	-1.57870478	0.16707386	218	-9.45	0.0000	0.05	-1.9080	-1.2494
LEVEL(CAMPAIGN) 2 PI	-0.79301191	0.16524626	218	-4.80	0.0000	0.05	-1.1187	-0.4673
LEVEL(CAMPAIGN) 1 PI	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
SPRING	1	218	0.45	0.5014
SUMMER	1	218	4.77	0.0300
FALL	1	218	0.00	0.9634
CAMPAIGN	4	218	199.07	0.0000
LEVEL(CAMPAIGN)	10	218	20.67	0.0000

DUST LEAD CONCENTRATION WITHIN COMPLETE R_M HOUSES AS AN OUTCOME OF ENVIRONMENTAL FACTORS: 07/17/95
12-month campaign all data model: factor1 = level + season + campaign(level) + random_house

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	1.49789517	0.30631481	0.06542666	4.68	0.0000
Residual	1.00000000	0.20449683	0.01958334	10.44	0.0000

The MIXED Procedure
Model Fitting Information for FACTOR1

Description	Value
Observations	293.0000
Variance Estimate	0.2045
Standard Deviation Estimate	0.4522
REML Log Likelihood	-259.876
Akaike's Information Criterion	-261.876
Schwartz's Bayesian Criterion	-265.493
-2 REML Log Likelihood	519.7517
Null Model LRT Chi-Square	132.5278
Null Model LRT DF	1.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	0.79154396	0.16450453	218	4.81	0.0000	0.05	0.4673	1.1158
SPRING	0.01012971	0.08789402	218	0.12	0.9084	0.05	-0.1631	0.1834
SUMMER	0.03712852	0.07678562	218	0.48	0.6292	0.05	-0.1142	0.1885
FALL	0.18065916	0.09400117	218	1.92	0.0559	0.05	-0.0046	0.3659
LEVEL 3	-1.67197043	0.22894525	218	-7.30	0.0000	0.05	-2.1232	-1.2207
LEVEL 2	-0.49669126	0.22731269	218	-2.19	0.0300	0.05	-0.9447	-0.0487
LEVEL 1	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(LEVEL) 00 3	1.69044516	0.14764545	218	11.45	0.0000	0.05	1.3994	1.9814
CAMPAIGN(LEVEL) 02 3	-0.11563154	0.14910152	218	-0.78	0.4389	0.05	-0.4095	0.1782
CAMPAIGN(LEVEL) 06 3	-0.21343092	0.14582414	218	-1.46	0.1447	0.05	-0.5008	0.0740
CAMPAIGN(LEVEL) 12 3	-0.43154675	0.14370749	218	-3.00	0.0030	0.05	-0.7148	-0.1483
CAMPAIGN(LEVEL) PI 3	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(LEVEL) 00 2	0.38176648	0.14392992	218	2.65	0.0086	0.05	0.0981	0.6654
CAMPAIGN(LEVEL) 02 2	-0.42809703	0.14866878	218	-2.88	0.0044	0.05	-0.7211	-0.1351
CAMPAIGN(LEVEL) 06 2	-0.61411477	0.14363061	218	-4.28	0.0000	0.05	-0.8972	-0.3310
CAMPAIGN(LEVEL) 12 2	-0.75782173	0.14369051	218	-5.27	0.0000	0.05	-1.0410	-0.4746
CAMPAIGN(LEVEL) PI 2	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(LEVEL) 00 1	-0.02383807	0.14593333	218	-0.16	0.8704	0.05	-0.3115	0.2638
CAMPAIGN(LEVEL) 02 1	-0.37532179	0.15104645	218	-2.48	0.0137	0.05	-0.6730	-0.0776
CAMPAIGN(LEVEL) 06 1	-0.50021153	0.14407048	218	-3.47	0.0006	0.05	-0.7842	-0.2163
CAMPAIGN(LEVEL) 12 1	-0.40423858	0.14554370	218	-2.78	0.0060	0.05	-0.6911	-0.1174
CAMPAIGN(LEVEL) PI 1	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
SPRING	1	218	0.01	0.9084
SUMMER	1	218	0.23	0.6292
FALL	1	218	3.69	0.0559
LEVEL	2	218	21.67	0.0000
CAMPAIGN(LEVEL)	12	218	31.03	0.0000

DUST LEAD CONCENTRATION WITHIN COMPLETE R_M HOUSES AS AN OUTCOME OF ENVIRONMENTAL FACTORS: 07/17/95
12-month campaign all data model: factor1 = campaign + season + level(campaign) + random_house

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	1.49789517	0.30631481	0.06542666	4.68	0.0000
Residual	1.00000000	0.20449683	0.01958334	10.44	0.0000

The MIXED Procedure
Model Fitting Information for FACTOR1

Description	Value
Observations	293.0000
Variance Estimate	0.2045
Standard Deviation Estimate	0.4522
REML Log Likelihood	-259.876
Akaike's Information Criterion	-261.876
Schwartz's Bayesian Criterion	-265.493
-2 REML Log Likelihood	519.7517
Null Model LRT Chi-Square	132.5278
Null Model LRT DF	1.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	0.79154396	0.16450453	218	4.81	0.0000	0.05	0.4673	1.1158
SPRING	0.01012971	0.08789402	218	0.12	0.9084	0.05	-0.1631	0.1834
SUMMER	0.03712852	0.07678562	218	0.48	0.6292	0.05	-0.1142	0.1885
FALL	0.18065916	0.09400117	218	1.92	0.0559	0.05	-0.0046	0.3659
CAMPAIGN 00	-0.02383807	0.14593333	218	-0.16	0.8704	0.05	-0.3115	0.2638
CAMPAIGN 02	-0.37532179	0.15104645	218	-2.48	0.0137	0.05	-0.6730	-0.0776
CAMPAIGN 06	-0.50021153	0.14407048	218	-3.47	0.0006	0.05	-0.7842	-0.2163
CAMPAIGN 12	-0.40423858	0.14554370	218	-2.78	0.0060	0.05	-0.6911	-0.1174
CAMPAIGN PI	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 00	0.04231281	0.22822452	218	0.19	0.8531	0.05	-0.4075	0.4921
LEVEL(CAMPAIGN) 2 00	-0.09108671	0.22762099	218	-0.40	0.6894	0.05	-0.5397	0.3575
LEVEL(CAMPAIGN) 1 00	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 02	-1.41228018	0.23276139	218	-6.07	0.0000	0.05	-1.8710	-0.9535
LEVEL(CAMPAIGN) 2 02	-0.54946649	0.23068327	218	-2.38	0.0181	0.05	-1.0041	-0.0948
LEVEL(CAMPAIGN) 1 02	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 06	-1.38518981	0.22641807	218	-6.12	0.0000	0.05	-1.8314	-0.9389
LEVEL(CAMPAIGN) 2 06	-0.61059450	0.22601142	218	-2.70	0.0074	0.05	-1.0560	-0.1651
LEVEL(CAMPAIGN) 1 06	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 12	-1.69927860	0.22805884	218	-7.45	0.0000	0.05	-2.1488	-1.2498
LEVEL(CAMPAIGN) 2 12	-0.85027441	0.22750959	218	-3.74	0.0002	0.05	-1.2987	-0.4019
LEVEL(CAMPAIGN) 1 12	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 PI	-1.67197043	0.22894525	218	-7.30	0.0000	0.05	-2.1232	-1.2207
LEVEL(CAMPAIGN) 2 PI	-0.49669126	0.22731269	218	-2.19	0.0300	0.05	-0.9447	-0.0487
LEVEL(CAMPAIGN) 1 PI	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
SPRING	1	218	0.01	0.9084
SUMMER	1	218	0.23	0.6292
FALL	1	218	3.69	0.0559
CAMPAIGN	4	218	67.22	0.0000
LEVEL(CAMPAIGN)	10	218	14.63	0.0000

DUST LOADINGS WITHIN COMPLETE R_M HOUSES AS AN OUTCOME OF ENVIRONMENTAL FACTORS: 07/17/95
12-month campaign all data model: factor1 = level + season + campaign(level) + random_house

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.02848508	0.01173763	0.01986539	0.59	0.5546
Residual	1.00000000	0.41206246	0.03944356	10.45	0.0000

The MIXED Procedure
Model Fitting Information for FACTOR1

Description	Value
Observations	293.0000
Variance Estimate	0.4121
Standard Deviation Estimate	0.6419
REML Log Likelihood	-299.850
Akaike's Information Criterion	-301.850
Schwartz's Bayesian Criterion	-305.466
-2 REML Log Likelihood	599.6990
Null Model LRT Chi-Square	0.3884
Null Model LRT DF	1.0000
Null Model LRT P-Value	0.5331

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	-0.17237997	0.15458120	218	-1.12	0.2660	0.05	-0.4770	0.1323
SPRING	-0.23095597	0.11266415	218	-2.05	0.0416	0.05	-0.4530	-0.0089
SUMMER	-0.24665377	0.10469955	218	-2.36	0.0194	0.05	-0.4530	-0.0403
FALL	-0.28858532	0.12244765	218	-2.36	0.0193	0.05	-0.5299	-0.0473
LEVEL 3	-0.10243114	0.21105977	218	-0.49	0.6279	0.05	-0.5184	0.3135
LEVEL 2	-0.10783173	0.20823255	218	-0.52	0.6051	0.05	-0.5182	0.3026
LEVEL 1	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(LEVEL) 00 3	2.47313079	0.20846672	218	11.86	0.0000	0.05	2.0623	2.8840
CAMPAIGN(LEVEL) 02 3	0.13786048	0.21046377	218	0.66	0.5131	0.05	-0.2769	0.5527
CAMPAIGN(LEVEL) 06 3	0.03977628	0.20629882	218	0.19	0.8473	0.05	-0.3668	0.4464
CAMPAIGN(LEVEL) 12 3	0.08857254	0.20381395	218	0.43	0.6643	0.05	-0.3131	0.4903
CAMPAIGN(LEVEL) PI 3	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(LEVEL) 00 2	2.00774854	0.20411718	218	9.84	0.0000	0.05	1.6055	2.4100
CAMPAIGN(LEVEL) 02 2	0.17599146	0.20970352	218	0.84	0.4023	0.05	-0.2373	0.5893
CAMPAIGN(LEVEL) 06 2	0.12030923	0.20370511	218	0.59	0.5554	0.05	-0.2812	0.5218
CAMPAIGN(LEVEL) 12 2	0.18485027	0.20377294	218	0.91	0.3653	0.05	-0.2168	0.5865
CAMPAIGN(LEVEL) PI 2	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(LEVEL) 00 1	0.83066936	0.20630818	218	4.03	0.0001	0.05	0.4241	1.2373
CAMPAIGN(LEVEL) 02 1	0.09064261	0.21254020	218	0.43	0.6702	0.05	-0.3283	0.5095
CAMPAIGN(LEVEL) 06 1	0.10539994	0.20433152	218	0.52	0.6065	0.05	-0.2973	0.5081
CAMPAIGN(LEVEL) 12 1	0.07875213	0.20606596	218	0.38	0.7027	0.05	-0.3274	0.4849
CAMPAIGN(LEVEL) PI 1	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
SPRING	1	218	4.20	0.0416
SUMMER	1	218	5.55	0.0194
FALL	1	218	5.55	0.0193
LEVEL	2	218	2.80	0.0630
CAMPAIGN(LEVEL)	12	218	30.48	0.0000

DUST LOADINGS WITHIN COMPLETE R_M HOUSES AS AN OUTCOME OF ENVIRONMENTAL FACTORS: 07/17/95
12-month campaign all data model: factor1 = campaign + season + level(campaign) + random_house

The MIXED Procedure

Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > !Z!
DID	0.02848508	0.01173763	0.01986539	0.59	0.5546
Residual	1.00000000	0.41206246	0.03944356	10.45	0.0000

The MIXED Procedure
Model Fitting Information for FACTOR1

Description	Value
Observations	293.0000
Variance Estimate	0.4121
Standard Deviation Estimate	0.6419
REML Log Likelihood	-299.850
Akaike's Information Criterion	-301.850
Schwartz's Bayesian Criterion	-305.466
-2 REML Log Likelihood	599.6990
Null Model LRT Chi-Square	0.3884
Null Model LRT DF	1.0000
Null Model LRT P-Value	0.5331

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > !T!	Alpha	Lower	Upper
INTERCEPT	-0.17237997	0.15458120	218	-1.12	0.2660	0.05	-0.4770	0.1323
SPRING	-0.23095597	0.11266415	218	-2.05	0.0416	0.05	-0.4530	-0.0089
SUMMER	-0.24665377	0.10469955	218	-2.36	0.0194	0.05	-0.4530	-0.0403
FALL	-0.28858532	0.12244765	218	-2.36	0.0193	0.05	-0.5299	-0.0473
CAMPAIGN 00	0.83066936	0.20630818	218	4.03	0.0001	0.05	0.4241	1.2373
CAMPAIGN 02	0.09064261	0.21254020	218	0.43	0.6702	0.05	-0.3283	0.5095
CAMPAIGN 06	0.10539994	0.20433152	218	0.52	0.6065	0.05	-0.2973	0.5081
CAMPAIGN 12	0.07875213	0.20606596	218	0.38	0.7027	0.05	-0.3274	0.4849
CAMPAIGN PI	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 00	1.54003029	0.20991871	218	7.34	0.0000	0.05	1.1263	1.9538
LEVEL(CAMPAIGN) 2 00	1.06924744	0.20881251	218	5.12	0.0000	0.05	0.6577	1.4808
LEVEL(CAMPAIGN) 1 00	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 02	-0.05521327	0.21872343	218	-0.25	0.8009	0.05	-0.4863	0.3759
LEVEL(CAMPAIGN) 2 02	-0.02248289	0.21459388	218	-0.10	0.9167	0.05	-0.4454	0.4005
LEVEL(CAMPAIGN) 1 02	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 06	-0.16805480	0.20669036	218	-0.81	0.4171	0.05	-0.5754	0.2393
LEVEL(CAMPAIGN) 2 06	-0.09292245	0.20586405	218	-0.45	0.6522	0.05	-0.4987	0.3128
LEVEL(CAMPAIGN) 1 06	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 12	-0.09261073	0.20962813	218	-0.44	0.6591	0.05	-0.5058	0.3205
LEVEL(CAMPAIGN) 2 12	-0.00173360	0.20865833	218	-0.01	0.9934	0.05	-0.4130	0.4095
LEVEL(CAMPAIGN) 1 12	0.00000000	.	.	.	.	.	.	.
LEVEL(CAMPAIGN) 3 PI	-0.10243114	0.21105977	218	-0.49	0.6279	0.05	-0.5184	0.3135
LEVEL(CAMPAIGN) 2 PI	-0.10783173	0.20823255	218	-0.52	0.6051	0.05	-0.5182	0.3026
LEVEL(CAMPAIGN) 1 PI	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
SPRING	1	218	4.20	0.0416
SUMMER	1	218	5.55	0.0194
FALL	1	218	5.55	0.0193
CAMPAIGN	4	218	78.49	0.0000
LEVEL(CAMPAIGN)	10	218	5.83	0.0000

The MIXED Procedure

Class Level Information

Class	Levels	Values
DID	89	102 103 104 105 106 110 111 112 120 121 127 131 135 136 306 309 317 320 323 325 326 328 332 336 383 389 390 402 404 405 411 413 415 417 302 312 335 338 345 350 354 365 370 374 376 377 384 385 391 397 407 412 416 420 310 316 343 347 348 353 355 357 358 359 366 372 373 381 386 403 406 409 418 419 204 205 207 209 210 212 214 215 217 223 224 227 233 234 235
GROUP	5	Abated Level1 Level2 Level3 Modern
CAMPAIGN	3	06 12 IN

DUST LEAD LOADINGS WITHIN HOUSE AS AN OUTCOME OF ENVIRONMENTAL FACTORS: 07/17/95

12-month campaign all data model: factor1 = season + group + campaign(group) + random_house

The MIXED Procedure

Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.80897052	0.09396472	0.02098848	4.48	0.0000
Residual	1.00000000	0.11615345	0.01284375	9.04	0.0000

The MIXED Procedure

Model Fitting Information for FACTOR1

Description	Value
Observations	265.0000
Variance Estimate	0.1162
Standard Deviation Estimate	0.3408
REML Log Likelihood	-162.465
Akaike's Information Criterion	-164.465
Schwartz's Bayesian Criterion	-167.975
-2 REML Log Likelihood	324.9307
Null Model LRT Chi-Square	45.0299
Null Model LRT DF	1.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure

Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	-1.05314514	0.12262196	163	-8.59	0.0000	0.05	-1.2953	-0.8110
SPRING	-0.05772997	0.06871415	163	-0.84	0.4021	0.05	-0.1934	0.0780
SUMMER	-0.10581868	0.06197884	163	-1.71	0.0897	0.05	-0.2282	0.0166
FALL	-0.08705832	0.08076030	163	-1.08	0.2826	0.05	-0.2465	0.0724
GROUP Abated	1.03232696	0.17077146	163	6.05	0.0000	0.05	0.6951	1.3695
GROUP Level1	2.21960088	0.15908373	163	13.95	0.0000	0.05	1.9055	2.5337
GROUP Level2	2.49893493	0.15779129	163	15.84	0.0000	0.05	2.1874	2.8105
GROUP Level3	2.72239565	0.15759853	163	17.27	0.0000	0.05	2.4112	3.0336
GROUP Modern	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Abated	-0.19014737	0.14028701	163	-1.36	0.1772	0.05	-0.4672	0.0869
CAMPAIGN(GROUP) 12 Abated	-0.17750863	0.12925200	163	-1.37	0.1715	0.05	-0.4327	0.0777
CAMPAIGN(GROUP) IN Abated	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Level1	-0.71012419	0.11081962	163	-6.41	0.0000	0.05	-0.9290	-0.4913
CAMPAIGN(GROUP) 12 Level1	-0.72935979	0.11175151	163	-6.53	0.0000	0.05	-0.9500	-0.5087
CAMPAIGN(GROUP) IN Level1	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Level2	-1.49895219	0.10867341	163	-13.79	0.0000	0.05	-1.7135	-1.2844
CAMPAIGN(GROUP) 12 Level2	-1.49883812	0.10811371	163	-13.86	0.0000	0.05	-1.7123	-1.2854
CAMPAIGN(GROUP) IN Level2	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Level3	-2.29129807	0.10899821	163	-21.02	0.0000	0.05	-2.5065	-2.0761
CAMPAIGN(GROUP) 12 Level3	-2.40480584	0.10980518	163	-21.90	0.0000	0.05	-2.6216	-2.1880
CAMPAIGN(GROUP) IN Level3	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Modern	-0.07346004	0.13623480	163	-0.54	0.5905	0.05	-0.3425	0.1956
CAMPAIGN(GROUP) 12 Modern	-0.21028855	0.12496062	163	-1.68	0.0943	0.05	-0.4570	0.0365
CAMPAIGN(GROUP) IN Modern	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure

Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
SPRING	1	163	0.71	0.4021
SUMMER	1	163	2.91	0.0897
FALL	1	163	1.16	0.2826
GROUP	4	163	61.47	0.0000
CAMPAIGN(GROUP)	10	163	92.23	0.0000

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > !Z!
DID	0.80897052	0.09396472	0.02098848	4.48	0.0000
Residual	1.00000000	0.11615345	0.01284375	9.04	0.0000

The MIXED Procedure
Model Fitting Information for FACTOR1

Description	Value
Observations	265.0000
Variance Estimate	0.1162
Standard Deviation Estimate	0.3408
REML Log Likelihood	-162.465
Akaike's Information Criterion	-164.465
Schwartz's Bayesian Criterion	-167.975
-2 REML Log Likelihood	324.9307
Null Model LRT Chi-Square	45.0299
Null Model LRT DF	1.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > !T!	Alpha	Lower	Upper
INTERCEPT	-1.05314514	0.12262196	163	-8.59	0.0000	0.05	-1.2953	-0.8110
SPRING	-0.05772997	0.06871415	163	-0.84	0.4021	0.05	-0.1934	0.0780
SUMMER	-0.10581868	0.06197884	163	-1.71	0.0897	0.05	-0.2282	0.0166
FALL	-0.08705832	0.08076030	163	-1.08	0.2826	0.05	-0.2465	0.0724
CAMPAIGN 06	-0.07346004	0.13623480	163	-0.54	0.5905	0.05	-0.3425	0.1956
CAMPAIGN 12	-0.21028855	0.12496062	163	-1.68	0.0943	0.05	-0.4570	0.0365
CAMPAIGN IN	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) Abated 06	0.91563962	0.17051242	163	5.37	0.0000	0.05	0.5789	1.2523
GROUP(CAMPAIGN) Level1 06	1.58293672	0.15925483	163	9.94	0.0000	0.05	1.2685	1.8974
GROUP(CAMPAIGN) Level2 06	1.07344278	0.15925483	163	6.74	0.0000	0.05	0.7590	1.3879
GROUP(CAMPAIGN) Level3 06	0.50455762	0.15883916	163	3.18	0.0018	0.05	0.1909	0.8182
GROUP(CAMPAIGN) Modern 06	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) Abated 12	1.06510688	0.17047779	163	6.25	0.0000	0.05	0.7285	1.4017
GROUP(CAMPAIGN) Level1 12	1.70052964	0.16010886	163	10.62	0.0000	0.05	1.3844	2.0167
GROUP(CAMPAIGN) Level2 12	1.21038536	0.15953155	163	7.59	0.0000	0.05	0.8954	1.5254
GROUP(CAMPAIGN) Level3 12	0.52787836	0.15837732	163	3.33	0.0011	0.05	0.2151	0.8406
GROUP(CAMPAIGN) Modern 12	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) Abated IN	1.03232696	0.17077146	163	6.05	0.0000	0.05	0.6951	1.3695
GROUP(CAMPAIGN) Level1 IN	2.21960088	0.15908373	163	13.95	0.0000	0.05	1.9055	2.5337
GROUP(CAMPAIGN) Level2 IN	2.49893493	0.15779129	163	15.84	0.0000	0.05	2.1874	2.8105
GROUP(CAMPAIGN) Level3 IN	2.72239565	0.15759853	163	17.27	0.0000	0.05	2.4112	3.0336
GROUP(CAMPAIGN) Modern IN	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
SPRING	1	163	0.71	0.4021
SUMMER	1	163	2.91	0.0897
FALL	1	163	1.16	0.2826
CAMPAIGN	2	163	210.76	0.0000
GROUP(CAMPAIGN)	12	163	49.20	0.0000

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	1.44284416	0.16851088	0.03246000	5.19	0.0000
Residual	1.00000000	0.11679077	0.01293660	9.03	0.0000

The MIXED Procedure
Model Fitting Information for FACTOR1

Description	Value
Observations	265.0000
Variance Estimate	0.1168
Standard Deviation Estimate	0.3417
REML Log Likelihood	-181.573
Akaike's Information Criterion	-183.573
Schwartz's Bayesian Criterion	-187.083
-2 REML Log Likelihood	363.1463
Null Model LRT Chi-Square	81.9813
Null Model LRT DF	1.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	-1.54143049	0.14186450	163	-10.87	0.0000	0.05	-1.8216	-1.2613
SPRING	0.02539044	0.07124566	163	0.36	0.7220	0.05	-0.1153	0.1661
SUMMER	0.05558741	0.06271464	163	0.89	0.3767	0.05	-0.0683	0.1794
FALL	0.07776581	0.08294464	163	0.94	0.3499	0.05	-0.0860	0.2416
GROUP Abated	1.33661492	0.19888784	163	6.72	0.0000	0.05	0.9439	1.7293
GROUP Level1	2.53300167	0.18468302	163	13.72	0.0000	0.05	2.1683	2.8977
GROUP Level2	2.48788625	0.18352396	163	13.56	0.0000	0.05	2.1255	2.8503
GROUP Level3	2.60867180	0.18336602	163	14.23	0.0000	0.05	2.2466	2.9708
GROUP Modern	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Abated	-0.15247858	0.14092658	163	-1.08	0.2809	0.05	-0.4308	0.1258
CAMPAIGN(GROUP) 12 Abated	0.03286790	0.12962777	163	0.25	0.8002	0.05	-0.2231	0.2888
CAMPAIGN(GROUP) IN Abated	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Level1	-0.37402960	0.11125439	163	-3.36	0.0010	0.05	-0.5937	-0.1543
CAMPAIGN(GROUP) 12 Level1	-0.28932540	0.11227454	163	-2.58	0.0109	0.05	-0.5110	-0.0676
CAMPAIGN(GROUP) IN Level1	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Level2	-0.77923434	0.10899098	163	-7.15	0.0000	0.05	-0.9945	-0.5640
CAMPAIGN(GROUP) 12 Level2	-0.89675944	0.10841849	163	-8.27	0.0000	0.05	-1.1108	-0.6827
CAMPAIGN(GROUP) IN Level2	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Level3	-1.45873074	0.10933164	163	-13.34	0.0000	0.05	-1.6746	-1.2428
CAMPAIGN(GROUP) 12 Level3	-1.65968050	0.11019498	163	-15.06	0.0000	0.05	-1.8773	-1.4421
CAMPAIGN(GROUP) IN Level3	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Modern	0.02241664	0.13686564	163	0.16	0.8701	0.05	-0.2478	0.2927
CAMPAIGN(GROUP) 12 Modern	0.04948173	0.12533191	163	0.39	0.6935	0.05	-0.1980	0.2970
CAMPAIGN(GROUP) IN Modern	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
SPRING	1	163	0.13	0.7220
SUMMER	1	163	0.79	0.3767
FALL	1	163	0.88	0.3499
GROUP	4	163	59.63	0.0000
CAMPAIGN(GROUP)	10	163	36.27	0.0000

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	1.44284416	0.16851088	0.03246000	5.19	0.0000
Residual	1.00000000	0.11679077	0.01293660	9.03	0.0000

The MIXED Procedure
Model Fitting Information for FACTOR1

Description	Value
Observations	265.0000
Variance Estimate	0.1168
Standard Deviation Estimate	0.3417
REML Log Likelihood	-181.573
Akaike's Information Criterion	-183.573
Schwartz's Bayesian Criterion	-187.083
-2 REML Log Likelihood	363.1463
Null Model LRT Chi-Square	81.9813
Null Model LRT DF	1.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	-1.54143049	0.14186450	163	-10.87	0.0000	0.05	-1.8216	-1.2613
SPRING	0.02539044	0.07124566	163	0.36	0.7220	0.05	-0.1153	0.1661
SUMMER	0.05558741	0.06271464	163	0.89	0.3767	0.05	-0.0683	0.1794
FALL	0.07776581	0.08294464	163	0.94	0.3499	0.05	-0.0860	0.2416
CAMPAIGN 06	0.02241664	0.13686564	163	0.16	0.8701	0.05	-0.2478	0.2927
CAMPAIGN 12	0.04948173	0.12533191	163	0.39	0.6935	0.05	-0.1980	0.2970
CAMPAIGN IN	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) Abated 06	1.16171970	0.19864512	163	5.85	0.0000	0.05	0.7695	1.5540
GROUP(CAMPAIGN) Level1 06	2.13655543	0.18485584	163	11.56	0.0000	0.05	1.7715	2.5016
GROUP(CAMPAIGN) Level2 06	1.68623527	0.18485584	163	9.12	0.0000	0.05	1.3212	2.0513
GROUP(CAMPAIGN) Level3 06	1.12752442	0.18446740	163	6.11	0.0000	0.05	0.7633	1.4918
GROUP(CAMPAIGN) Modern 06	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) Abated 12	1.32000108	0.19861562	163	6.65	0.0000	0.05	0.9278	1.7122
GROUP(CAMPAIGN) Level1 12	2.19419454	0.18566652	163	11.82	0.0000	0.05	1.8276	2.5608
GROUP(CAMPAIGN) Level2 12	1.54164508	0.18510615	163	8.33	0.0000	0.05	1.1761	1.9072
GROUP(CAMPAIGN) Level3 12	0.89950957	0.18403946	163	4.89	0.0000	0.05	0.5361	1.2629
GROUP(CAMPAIGN) Modern 12	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) Abated IN	1.33661492	0.19888784	163	6.72	0.0000	0.05	0.9439	1.7293
GROUP(CAMPAIGN) Level1 IN	2.53300167	0.18468302	163	13.72	0.0000	0.05	2.1683	2.8977
GROUP(CAMPAIGN) Level2 IN	2.48788625	0.18352396	163	13.56	0.0000	0.05	2.1255	2.8503
GROUP(CAMPAIGN) Level3 IN	2.60867180	0.18336602	163	14.23	0.0000	0.05	2.2466	2.9708
GROUP(CAMPAIGN) Modern IN	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
SPRING	1	163	0.13	0.7220
SUMMER	1	163	0.79	0.3767
FALL	1	163	0.88	0.3499
CAMPAIGN	2	163	65.30	0.0000
GROUP(CAMPAIGN)	12	163	34.72	0.0000

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.07308933	0.03213037	0.03218445	1.00	0.3181
Residual	1.00000000	0.43960407	0.04852215	9.06	0.0000

The MIXED Procedure
Model Fitting Information for FACTOR1

Description	Value
Observations	265.0000
Variance Estimate	0.4396
Standard Deviation Estimate	0.6630
REML Log Likelihood	-283.905
Akaike's Information Criterion	-285.905
Schwartz's Bayesian Criterion	-289.414
-2 REML Log Likelihood	567.8100
Null Model LRT Chi-Square	1.1004
Null Model LRT DF	1.0000
Null Model LRT P-Value	0.2942

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	-0.06361615	0.18551362	163	-0.34	0.7321	0.05	-0.4299	0.3027
SPRING	-0.26336293	0.11670888	163	-2.26	0.0254	0.05	-0.4938	-0.0329
SUMMER	-0.26787536	0.11564992	163	-2.32	0.0218	0.05	-0.4962	-0.0395
FALL	-0.39004848	0.14246430	163	-2.74	0.0069	0.05	-0.6714	-0.1087
GROUP Abated	0.12970839	0.25606076	163	0.51	0.6132	0.05	-0.3759	0.6353
GROUP Level1	0.62413482	0.24012806	163	2.60	0.0102	0.05	0.1500	1.0983
GROUP Level2	1.65035420	0.23736687	163	6.95	0.0000	0.05	1.1816	2.1191
GROUP Level3	2.08996275	0.23681208	163	8.83	0.0000	0.05	1.6223	2.5576
GROUP Modern	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Abated	-0.05159171	0.27075516	163	-0.19	0.8491	0.05	-0.5862	0.4830
CAMPAIGN(GROUP) 12 Abated	-0.23083312	0.25130120	163	-0.92	0.3597	0.05	-0.7271	0.2654
CAMPAIGN(GROUP) IN Abated	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Level1	-0.69699967	0.21461631	163	-3.25	0.0014	0.05	-1.1208	-0.2732
CAMPAIGN(GROUP) 12 Level1	-0.73166898	0.21584130	163	-3.39	0.0009	0.05	-1.1579	-0.3055
CAMPAIGN(GROUP) IN Level1	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Level2	-1.81109843	0.21124969	163	-8.57	0.0000	0.05	-2.2282	-1.3940
CAMPAIGN(GROUP) 12 Level2	-1.75627120	0.21025838	163	-8.35	0.0000	0.05	-2.1715	-1.3411
CAMPAIGN(GROUP) IN Level2	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Level3	-2.31890512	0.21176967	163	-10.95	0.0000	0.05	-2.7371	-1.9007
CAMPAIGN(GROUP) 12 Level3	-2.27389472	0.21299118	163	-10.68	0.0000	0.05	-2.6945	-1.8533
CAMPAIGN(GROUP) IN Level3	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 06 Modern	0.08782490	0.26283695	163	0.33	0.7387	0.05	-0.4312	0.6068
CAMPAIGN(GROUP) 12 Modern	-0.18976017	0.24290377	163	-0.78	0.4358	0.05	-0.6694	0.2899
CAMPAIGN(GROUP) IN Modern	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
SPRING	1	163	5.09	0.0254
SUMMER	1	163	5.37	0.0218
FALL	1	163	7.50	0.0069
GROUP	4	163	6.61	0.0001
CAMPAIGN(GROUP)	10	163	26.80	0.0000

R&M Study   Preliminary 12-Month Report
DUST LOADINGS WITHIN AN R_M HOUSE AS AN OUTCOME OF ENVIRONMENTAL FACTORS: 07/17/95
12-month campaign all data model: factor1 = season + campaign + group(campaign) + random_house

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.07308933	0.03213037	0.03218445	1.00	0.3181
Residual	1.00000000	0.43960407	0.04852215	9.06	0.0000

The MIXED Procedure
Model Fitting Information for FACTOR1

Description	Value
Observations	265.0000
Variance Estimate	0.4396
Standard Deviation Estimate	0.6630
REML Log Likelihood	-283.905
Akaike's Information Criterion	-285.905
Schwartz's Bayesian Criterion	-289.414
-2 REML Log Likelihood	567.8100
Null Model LRT Chi-Square	1.1004
Null Model LRT DF	1.0000
Null Model LRT P-Value	0.2942

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	-0.06361615	0.18551362	163	-0.34	0.7321	0.05	-0.4299	0.3027
SPRING	-0.26336293	0.11670888	163	-2.26	0.0254	0.05	-0.4938	-0.0329
SUMMER	-0.26787536	0.11564992	163	-2.32	0.0218	0.05	-0.4962	-0.0395
FALL	-0.39004848	0.14246430	163	-2.74	0.0069	0.05	-0.6714	-0.1087
CAMPAIGN 06	0.08782490	0.26283695	163	0.33	0.7387	0.05	-0.4312	0.6068
CAMPAIGN 12	-0.18976017	0.24290377	163	-0.78	0.4358	0.05	-0.6694	0.2899
CAMPAIGN IN	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) Abated 06	-0.00970822	0.25559433	163	-0.04	0.9697	0.05	-0.5144	0.4950
GROUP(CAMPAIGN) Level1 06	-0.16068975	0.24034132	163	-0.67	0.5047	0.05	-0.6353	0.3139
GROUP(CAMPAIGN) Level2 06	-0.24856913	0.24034132	163	-1.03	0.3026	0.05	-0.7232	0.2260
GROUP(CAMPAIGN) Level3 06	-0.31676727	0.23959103	163	-1.32	0.1880	0.05	-0.7899	0.1563
GROUP(CAMPAIGN) Modern 06	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) Abated 12	0.08863544	0.25550685	163	0.35	0.7291	0.05	-0.4159	0.5932
GROUP(CAMPAIGN) Level1 12	0.08222601	0.24177361	163	0.34	0.7342	0.05	-0.3952	0.5596
GROUP(CAMPAIGN) Level2 12	0.08384317	0.24093726	163	0.35	0.7283	0.05	-0.3919	0.5596
GROUP(CAMPAIGN) Level3 12	0.00582820	0.23872095	163	0.02	0.9806	0.05	-0.4656	0.4772
GROUP(CAMPAIGN) Modern 12	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) Abated IN	0.12970839	0.25606076	163	0.51	0.6132	0.05	-0.3759	0.6353
GROUP(CAMPAIGN) Level1 IN	0.62413482	0.24012806	163	2.60	0.0102	0.05	0.1500	1.0983
GROUP(CAMPAIGN) Level2 IN	1.65035420	0.23736687	163	6.95	0.0000	0.05	1.1816	2.1191
GROUP(CAMPAIGN) Level3 IN	2.08996275	0.23681208	163	8.83	0.0000	0.05	1.6223	2.5576
GROUP(CAMPAIGN) Modern IN	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
SPRING	1	163	5.09	0.0254
SUMMER	1	163	5.37	0.0218
FALL	1	163	7.50	0.0069
CAMPAIGN	2	163	58.99	0.0000
GROUP(CAMPAIGN)	12	163	10.74	0.0000

APPENDIX C

Longitudinal data analysis output for blood lead

R&M Study - Preliminary 12-Month
CHILD BLOOD AS AN OUTCOME OF GROUP AND CAMPAIGN: 07/21/95
COMPARISON MODEL - 3 R&M Groups, Initial PbB < 20 µg/dL

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.85205541	0.07286326	0.05414210	1.35	0.1784
CHILDNUM(DID)	0.96599689	0.08260693	0.04623754	1.79	0.0740
Residual	1.00000000	0.08551470	0.01020211	8.38	0.0000

The MIXED Procedure
Model Fitting Information for LNBLOOD

Description	Value
Observations	216.0000
Variance Estimate	0.0855
Standard Deviation Estimate	0.2924
REML Log Likelihood	-127.523
Akaike's Information Criterion	-130.523
Schwartz's Bayesian Criterion	-135.471
-2 REML Log Likelihood	255.0463
Null Model LRT Chi-Square	92.5209
Null Model LRT DF	2.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	1.64501827	0.22727941	139	7.24	0.0000	0.05	1.1956	2.0944
AGE	0.03230535	0.00901870	139	3.58	0.0005	0.05	0.0145	0.0501
AGESQ	-0.00034535	0.00011024	139	-3.13	0.0021	0.05	-0.0006	-0.0001
SUMMER	0.21044428	0.05149566	139	4.09	0.0001	0.05	0.1086	0.3123
MALE	0.06101732	0.10689932	139	0.57	0.5691	0.05	-0.1503	0.2724
GROUP L1	-0.22873767	0.15750261	139	-1.45	0.1487	0.05	-0.5401	0.0827
GROUP L2	-0.02765123	0.16968811	139	-0.16	0.8708	0.05	-0.3632	0.3079
GROUP L3	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 12 L1	-0.11238864	0.11601262	139	-0.97	0.3343	0.05	-0.3418	0.1170
CAMPAIGN(GROUP) 6 L1	0.09320553	0.10094505	139	0.92	0.3574	0.05	-0.1064	0.2928
CAMPAIGN(GROUP) 2 L1	0.00011891	0.09336397	139	0.00	0.9990	0.05	-0.1845	0.1847
CAMPAIGN(GROUP) 0 L1	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 12 L2	0.08397407	0.11341595	139	0.74	0.4603	0.05	-0.1403	0.3082
CAMPAIGN(GROUP) 6 L2	0.07399752	0.10589662	139	0.70	0.4859	0.05	-0.1354	0.2834
CAMPAIGN(GROUP) 2 L2	0.05035725	0.10518037	139	0.48	0.6329	0.05	-0.1576	0.2583
CAMPAIGN(GROUP) 0 L2	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 12 L3	-0.12363470	0.11155345	139	-1.11	0.2696	0.05	-0.3442	0.0969
CAMPAIGN(GROUP) 6 L3	-0.09071779	0.09824989	139	-0.92	0.3574	0.05	-0.2850	0.1035
CAMPAIGN(GROUP) 2 L3	-0.03502872	0.10107311	139	-0.35	0.7294	0.05	-0.2349	0.1648
CAMPAIGN(GROUP) 0 L3	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
AGE	1	139	12.83	0.0005
AGESQ	1	139	9.81	0.0021
SUMMER	1	139	16.70	0.0001
MALE	1	139	0.33	0.5691
GROUP	2	139	1.79	0.1712
CAMPAIGN(GROUP)	9	139	0.72	0.6922

R&M Study - Preliminary 12-Month
CHILD BLOOD AS AN OUTCOME OF GROUP AND CAMPAIGN: 07/21/95
COMPARISON MODEL - 3 R&M Groups, Initial PbB < 20 µg/dL

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.85205541	0.07286326	0.05414210	1.35	0.1784
CHILDNUM(DID)	0.96599689	0.08260693	0.04623754	1.79	0.0740
Residual	1.00000000	0.08551470	0.01020211	8.38	0.0000

The MIXED Procedure
Model Fitting Information for LNBLOOD

Description	Value
Observations	216.0000
Variance Estimate	0.0855
Standard Deviation Estimate	0.2924
REML Log Likelihood	-127.523
Akaike's Information Criterion	-130.523
Schwartz's Bayesian Criterion	-135.471
-2 REML Log Likelihood	255.0463
Null Model LRT Chi-Square	92.5209
Null Model LRT DF	2.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	1.64501827	0.22727941	139	7.24	0.0000	0.05	1.1956	2.0944
AGE	0.03230535	0.00901870	139	3.58	0.0005	0.05	0.0145	0.0501
AGESQ	-0.00034535	0.00011024	139	-3.13	0.0021	0.05	-0.0006	-0.0001
SUMMER	0.21044428	0.05149566	139	4.09	0.0001	0.05	0.1086	0.3123
MALE	0.06101732	0.10689932	139	0.57	0.5691	0.05	-0.1503	0.2724
CAMPAIGN 12	-0.12363470	0.11155345	139	-1.11	0.2696	0.05	-0.3442	0.0969
CAMPAIGN 6	-0.09071779	0.09824989	139	-0.92	0.3574	0.05	-0.2850	0.1035
CAMPAIGN 2	-0.03502872	0.10107311	139	-0.35	0.7294	0.05	-0.2349	0.1648
CAMPAIGN 0	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) L1 12	-0.21749161	0.17169710	139	-1.27	0.2074	0.05	-0.5570	0.1220
GROUP(CAMPAIGN) L2 12	0.17995755	0.17870556	139	1.01	0.3157	0.05	-0.1734	0.5333
GROUP(CAMPAIGN) L3 12	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) L1 6	-0.04481435	0.16234649	139	-0.28	0.7829	0.05	-0.3658	0.2762
GROUP(CAMPAIGN) L2 6	0.13706408	0.17455214	139	0.79	0.4337	0.05	-0.2081	0.4822
GROUP(CAMPAIGN) L3 6	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) L1 2	-0.19359004	0.16287630	139	-1.19	0.2366	0.05	-0.5156	0.1284
GROUP(CAMPAIGN) L2 2	0.05773474	0.17839586	139	0.32	0.7467	0.05	-0.2950	0.4105
GROUP(CAMPAIGN) L3 2	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) L1 0	-0.22873767	0.15750261	139	-1.45	0.1487	0.05	-0.5401	0.0827
GROUP(CAMPAIGN) L2 0	-0.02765123	0.16968811	139	-0.16	0.8708	0.05	-0.3632	0.3079
GROUP(CAMPAIGN) L3 0	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
AGE	1	139	12.83	0.0005
AGESQ	1	139	9.81	0.0021
SUMMER	1	139	16.70	0.0001
MALE	1	139	0.33	0.5691
CAMPAIGN	3	139	0.48	0.6936
GROUP(CAMPAIGN)	8	139	1.05	0.4025

R&M Study - Preliminary 12-Month Report
CHILD BLOOD AS AN OUTCOME OF CAMPAIGN AND GROUP: 07/18/95
COMPARISON MODEL - 5 STUDY GROUPS, INITIAL PbB <20 µg/dL
Excluding Child 120-3

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.04259006	0.00389418	0.05408292	0.07	0.9426
CHILDNUM(DID)	1.16521862	0.10654064	0.05590865	1.91	0.0567
Residual	1.00000000	0.09143404	0.01056290	8.66	0.0000

The MIXED Procedure
Model Fitting Information for LNBLOOD

Description	Value
Observations	258.0000
Variance Estimate	0.0914
Standard Deviation Estimate	0.3024
REML Log Likelihood	-156.727
Akaike's Information Criterion	-159.727
Schwartz's Bayesian Criterion	-164.935
-2 REML Log Likelihood	313.4532
Null Model LRT Chi-Square	63.3846
Null Model LRT DF	2.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	0.50079743	0.19908714	146	2.52	0.0130	0.05	0.1073	0.8943
AGE	0.02793169	0.00823559	146	3.39	0.0009	0.05	0.0117	0.0442
AGESQ	-0.00030776	0.00010332	146	-2.98	0.0034	0.05	-0.0005	-0.0001
SUMMER	0.23637030	0.05080301	146	4.65	0.0000	0.05	0.1360	0.3368
MOUTH	0.02567014	0.05899198	146	0.44	0.6641	0.05	-0.0909	0.1423
MALE	-0.02425782	0.08174074	146	-0.30	0.7671	0.05	-0.1858	0.1373
GROUP Abated	1.37964782	0.15533753	146	8.88	0.0000	0.05	1.0726	1.6866
GROUP Level1	1.02492547	0.14587305	146	7.03	0.0000	0.05	0.7366	1.3132
GROUP Level2	1.23246481	0.15147403	146	8.14	0.0000	0.05	0.9331	1.5318
GROUP Level3	1.30079046	0.15235511	146	8.54	0.0000	0.05	0.9997	1.6019
GROUP Modern	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 12 Abated	-0.07624198	0.11563578	146	-0.66	0.5107	0.05	-0.3048	0.1523
CAMPAIGN(GROUP) 6 Abated	0.03998553	0.10970510	146	0.36	0.7160	0.05	-0.1768	0.2568
CAMPAIGN(GROUP) 0 Abated	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 12 Level1	-0.07493976	0.11728104	146	-0.64	0.5238	0.05	-0.3067	0.1568
CAMPAIGN(GROUP) 6 Level1	0.12636933	0.10309675	146	1.23	0.2223	0.05	-0.0774	0.3301
CAMPAIGN(GROUP) 0 Level1	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 12 Level2	0.09055015	0.11521128	146	0.79	0.4332	0.05	-0.1371	0.3182
CAMPAIGN(GROUP) 6 Level2	0.06079373	0.10894878	146	0.56	0.5777	0.05	-0.1545	0.2761
CAMPAIGN(GROUP) 0 Level2	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 12 Level3	-0.12328829	0.11595457	146	-1.06	0.2894	0.05	-0.3525	0.1059
CAMPAIGN(GROUP) 6 Level3	-0.08705515	0.10211355	146	-0.85	0.3953	0.05	-0.2889	0.1148
CAMPAIGN(GROUP) 0 Level3	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 12 Modern	0.01684491	0.11635452	146	0.14	0.8851	0.05	-0.2131	0.2468
CAMPAIGN(GROUP) 6 Modern	0.29389836	0.10802618	146	2.72	0.0073	0.05	0.0804	0.5074
CAMPAIGN(GROUP) 0 Modern	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
AGE	1	146	11.50	0.0009
AGESQ	1	146	8.87	0.0034
SUMMER	1	146	21.65	0.0000
MOUTH	1	146	0.19	0.6641
MALE	1	146	0.09	0.7671
GROUP	4	146	29.87	0.0000
CAMPAIGN(GROUP)	10	146	1.61	0.1085

R&M Study - Preliminary 12-Month Report
CHILD BLOOD AS AN OUTCOME OF CAMPAIGN AND GROUP: 07/18/95
COMPARISON MODEL - 5 STUDY GROUPS, INITIAL PbB <20 µg/dL
Excluding Child 120-3

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.04259006	0.00389418	0.05408292	0.07	0.9426
CHILDNUM(DID)	1.16521862	0.10654064	0.05590865	1.91	0.0567
Residual	1.00000000	0.09143404	0.01056290	8.66	0.0000

The MIXED Procedure
Model Fitting Information for LNBLOOD

Description	Value
Observations	258.0000
Variance Estimate	0.0914
Standard Deviation Estimate	0.3024
REML Log Likelihood	-156.727
Akaike's Information Criterion	-159.727
Schwartz's Bayesian Criterion	-164.935
-2 REML Log Likelihood	313.4532
Null Model LRT Chi-Square	63.3846
Null Model LRT DF	2.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	0.50079743	0.19908714	146	2.52	0.0130	0.05	0.1073	0.8943
AGE	0.02793169	0.00823559	146	3.39	0.0009	0.05	0.0117	0.0442
AGESQ	-0.00030776	0.00010332	146	-2.98	0.0034	0.05	-0.0005	-0.0001
SUMMER	0.23637030	0.05080301	146	4.65	0.0000	0.05	0.1360	0.3368
MOUTH	0.02567014	0.05899198	146	0.44	0.6641	0.05	-0.0909	0.1423
MALE	-0.02425782	0.08174074	146	-0.30	0.7671	0.05	-0.1858	0.1373
CAMPAIGN 12	0.01684491	0.11635452	146	0.14	0.8851	0.05	-0.2131	0.2468
CAMPAIGN 6	0.29389836	0.10802618	146	2.72	0.0073	0.05	0.0804	0.5074
CAMPAIGN 0	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) Abated 12	1.28656093	0.16572324	146	7.76	0.0000	0.05	0.9590	1.6141
GROUP(CAMPAIGN) Level1 12	0.93314079	0.16217733	146	5.75	0.0000	0.05	0.6126	1.2537
GROUP(CAMPAIGN) Level2 12	1.30617006	0.16271769	146	8.03	0.0000	0.05	0.9846	1.6278
GROUP(CAMPAIGN) Level3 12	1.16065726	0.16588817	146	7.00	0.0000	0.05	0.8328	1.4885
GROUP(CAMPAIGN) Modern 12	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) Abated 6	1.12573499	0.15928529	146	7.07	0.0000	0.05	0.8109	1.4405
GROUP(CAMPAIGN) Level1 6	0.85739644	0.15272310	146	5.61	0.0000	0.05	0.5556	1.1592
GROUP(CAMPAIGN) Level2 6	0.99936019	0.15874806	146	6.30	0.0000	0.05	0.6856	1.3131
GROUP(CAMPAIGN) Level3 6	0.91983696	0.15796763	146	5.82	0.0000	0.05	0.6076	1.2320
GROUP(CAMPAIGN) Modern 6	0.00000000	.	.	.	.	.	.	.
GROUP(CAMPAIGN) Abated 0	1.37964782	0.15533753	146	8.88	0.0000	0.05	1.0726	1.6866
GROUP(CAMPAIGN) Level1 0	1.02492547	0.14587305	146	7.03	0.0000	0.05	0.7366	1.3132
GROUP(CAMPAIGN) Level2 0	1.23246481	0.15147403	146	8.14	0.0000	0.05	0.9331	1.5318
GROUP(CAMPAIGN) Level3 0	1.30079046	0.15235511	146	8.54	0.0000	0.05	0.9997	1.6019
GROUP(CAMPAIGN) Modern 0	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
AGE	1	146	11.50	0.0009
AGESQ	1	146	8.87	0.0034
SUMMER	1	146	21.65	0.0000
MOUTH	1	146	0.19	0.6641
MALE	1	146	0.09	0.7671
CAMPAIGN	2	146	3.21	0.0434
GROUP(CAMPAIGN)	12	146	10.97	0.0000

R&M Study - Preliminary 12-Month Report
CHILD BLOOD AS AN OUTCOME OF CAMPAIGN AND GROUP: 07/21/95
COMPARISON MODEL - 5 R&M Groups, Initial PbB Lead >= 20 μg/dL
Excluding Child 120-3

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.00000000	0.00000000	.	.	.
CHILDNUM(DID)	1.10267685	0.02667178	0.01892920	1.41	0.1588
Residual	1.00000000	0.02418821	0.00885830	2.73	0.0063

The MIXED Procedure
Model Fitting Information for LNBLOOD

Description	Value
Observations	42.0000
Variance Estimate	0.0242
Standard Deviation Estimate	0.1555
REML Log Likelihood	-14.0979
Akaike's Information Criterion	-17.0979
Schwartz's Bayesian Criterion	-18.9262
-2 REML Log Likelihood	28.1958
Null Model LRT Chi-Square	4.2254
Null Model LRT DF	2.0000
Null Model LRT P-Value	0.1209

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	3.32192091	0.40476213	14	8.21	0.0000	0.05	2.4538	4.1900
AGE	-0.00396229	0.02344561	14	-0.17	0.8682	0.05	-0.0542	0.0463
AGESQ	0.00010886	0.00029944	14	0.36	0.7216	0.05	-0.0005	0.0008
SUMMER	0.17840855	0.08458966	14	2.11	0.0534	0.05	-0.0030	0.3598
MOUTH	-0.16715983	0.12202463	14	-1.37	0.1923	0.05	-0.4289	0.0946
MALE	0.12980143	0.13033147	14	1.00	0.3362	0.05	-0.1497	0.4093
GROUP Abated	0.00657403	0.19694529	14	0.03	0.9738	0.05	-0.4158	0.4290
GROUP Level1	-0.25847934	0.31804706	14	-0.81	0.4300	0.05	-0.9406	0.4237
GROUP Level2	0.01256838	0.14383319	14	0.09	0.9316	0.05	-0.2959	0.3211
GROUP Level3	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 12 Abated	-0.42713657	0.15132765	14	-2.82	0.0136	0.05	-0.7517	-0.1026
CAMPAIGN(GROUP) 6 Abated	-0.29740206	0.13639076	14	-2.18	0.0468	0.05	-0.5899	-0.0049
CAMPAIGN(GROUP) 0 Abated	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 12 Level1	-0.27732451	0.30801683	14	-0.90	0.3832	0.05	-0.9380	0.3833
CAMPAIGN(GROUP) 6 Level1	-0.19704254	0.29229920	14	-0.67	0.5112	0.05	-0.8240	0.4299
CAMPAIGN(GROUP) 0 Level1	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 12 Level2	-0.66198479	0.11149930	14	-5.94	0.0000	0.05	-0.9011	-0.4228
CAMPAIGN(GROUP) 6 Level2	-0.39811222	0.10745245	14	-3.71	0.0024	0.05	-0.6286	-0.1676
CAMPAIGN(GROUP) 0 Level2	0.00000000	.	.	.	.	.	.	.
CAMPAIGN(GROUP) 12 Level3	-0.49295156	0.14726691	14	-3.35	0.0048	0.05	-0.8088	-0.1771
CAMPAIGN(GROUP) 6 Level3	-0.27348742	0.13468986	14	-2.03	0.0617	0.05	-0.5624	0.0154
CAMPAIGN(GROUP) 0 Level3	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
AGE	1	14	0.03	0.8682
AGESQ	1	14	0.13	0.7216
SUMMER	1	14	4.45	0.0534
MOUTH	1	14	1.88	0.1923
MALE	1	14	0.99	0.3362
GROUP	3	14	0.36	0.7835
CAMPAIGN(GROUP)	8	14	6.06	0.0018

R&M Study - Preliminary 12-Month Report
CHILD BLOOD AS AN OUTCOME OF DUST LEAD LOADINGS WITHIN A HOUSE: 07/18/95
EXPOSURE MODEL - 5 STUDY GROUPS
Excluding Initial Campaign
Excluding Child 120-3

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	1.28375240	0.12646785	0.05124132	2.47	0.0136
CHILDNUM(DID)	1.42763103	0.14064194	0.04261544	3.30	0.0010
Residual	1.00000000	0.09851421	0.01131555	8.71	0.0000

The MIXED Procedure
Model Fitting Information for LNBLOOD

Description	Value
Observations	298.0000
Variance Estimate	0.0985
Standard Deviation Estimate	0.3139
REML Log Likelihood	-222.940
Akaike's Information Criterion	-225.940
Schwartz's Bayesian Criterion	-231.445
-2 REML Log Likelihood	445.8798
Null Model LRT Chi-Square	123.6121
Null Model LRT DF	2.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	1.52270520	0.14555515	290	10.46	0.0000	0.05	1.2362	1.8092
FACTOR1	0.21944775	0.05373446	290	4.08	0.0001	0.05	0.1137	0.3252
FACTOR2	0.09866321	0.03409240	290	2.89	0.0041	0.05	0.0316	0.1658
AGE	0.02683210	0.00785970	290	3.41	0.0007	0.05	0.0114	0.0423
AGESQ	-0.00028313	0.00010549	290	-2.68	0.0077	0.05	-0.0005	-0.0001
SUMMER	0.27630658	0.05158814	290	5.36	0.0000	0.05	0.1748	0.3778
CAMPAIGN 12	0.11875049	0.06826404	290	1.74	0.0830	0.05	-0.0156	0.2531
CAMPAIGN 6	0.20315084	0.06053807	290	3.36	0.0009	0.05	0.0840	0.3223
CAMPAIGN 0	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
FACTOR1	1	290	16.68	0.0001
FACTOR2	1	290	8.38	0.0041
AGE	1	290	11.65	0.0007
AGESQ	1	290	7.20	0.0077
SUMMER	1	290	28.69	0.0000
CAMPAIGN	2	290	6.20	0.0023

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	1.03540303	0.10133702	0.04785436	2.12	0.0342
CHILDNUM(DID)	1.49613331	0.14642964	0.04298802	3.41	0.0007
Residual	1.00000000	0.09787205	0.01123861	8.71	0.0000

The MIXED Procedure
Model Fitting Information for LNBLOOD

Description	Value
Observations	298.0000
Variance Estimate	0.0979
Standard Deviation Estimate	0.3128
REML Log Likelihood	-219.668
Akaike's Information Criterion	-222.668
Schwartz's Bayesian Criterion	-228.172
-2 REML Log Likelihood	439.3351
Null Model LRT Chi-Square	118.6309
Null Model LRT DF	2.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	1.50731275	0.14385447	290	10.48	0.0000	0.05	1.2242	1.7904
FACTOR1	0.23402683	0.04599675	290	5.09	0.0000	0.05	0.1435	0.3246
FACTOR2	0.09405059	0.03037429	290	3.10	0.0022	0.05	0.0343	0.1538
AGE	0.02926403	0.00784485	290	3.73	0.0002	0.05	0.0138	0.0447
AGESQ	-0.00031463	0.00010522	290	-2.99	0.0030	0.05	-0.0005	-0.0001
SUMMER	0.24116023	0.04979517	290	4.84	0.0000	0.05	0.1432	0.3392
CAMPAIGN 12	0.09721856	0.06544177	290	1.49	0.1385	0.05	-0.0316	0.2260
CAMPAIGN 6	0.16523515	0.05548312	290	2.98	0.0031	0.05	0.0560	0.2744
CAMPAIGN 0	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
FACTOR1	1	290	25.89	0.0000
FACTOR2	1	290	9.59	0.0022
AGE	1	290	13.92	0.0002
AGESQ	1	290	8.94	0.0030
SUMMER	1	290	23.46	0.0000
CAMPAIGN	2	290	4.76	0.0092

R&M Study - Preliminary 12-Month Report
CHILD BLOOD AS AN OUTCOME OF DUST LOADINGS WITHIN A HOUSE: 07/18/95
EXPOSURE MODEL - 5 STUDY GROUPS
Excluding Initial Campaign
Excluding Child 120-3

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	2.08521083	0.19587611	0.06245621	3.14	0.0017
CHILDNUM(DID)	1.56930768	0.14741429	0.04482045	3.29	0.0010
Residual	1.00000000	0.09393588	0.01066665	8.81	0.0000

The MIXED Procedure
Model Fitting Information for LNBLOOD

Description	Value
Observations	298.0000
Variance Estimate	0.0939
Standard Deviation Estimate	0.3065
REML Log Likelihood	-229.720
Akaike's Information Criterion	-232.720
Schwartz's Bayesian Criterion	-238.225
-2 REML Log Likelihood	459.4406
Null Model LRT Chi-Square	170.0766
Null Model LRT DF	2.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	1.56679839	0.14923971	290	10.50	0.0000	0.05	1.2731	1.8605
FACTOR1	-0.02335899	0.07296066	290	-0.32	0.7491	0.05	-0.1670	0.1202
FACTOR2	0.10909206	0.04120194	290	2.65	0.0085	0.05	0.0280	0.1902
AGE	0.02442296	0.00786114	290	3.11	0.0021	0.05	0.0090	0.0399
AGESQ	-0.00026090	0.00010527	290	-2.48	0.0138	0.05	-0.0005	-0.0001
SUMMER	0.20622855	0.05049457	290	4.08	0.0001	0.05	0.1068	0.3056
CAMPAIGN 12	0.03415141	0.07221552	290	0.47	0.6366	0.05	-0.1080	0.1763
CAMPAIGN 6	0.12365619	0.06438353	290	1.92	0.0558	0.05	-0.0031	0.2504
CAMPAIGN 0	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
FACTOR1	1	290	0.10	0.7491
FACTOR2	1	290	7.01	0.0085
AGE	1	290	9.65	0.0021
AGESQ	1	290	6.14	0.0138
SUMMER	1	290	16.68	0.0001
CAMPAIGN	2	290	3.12	0.0456

CHILD BLOOD AS AN OUTCOME OF DUST LEAD LOADINGS WITHIN A HOUSE: 07/18/95
EXPOSURE MODEL - 3 R&M GROUPS
Excluding initial campaign observations for vacant houses
Excluding Child 120-3

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.00000000	0.00000000	.	.	.
CHILDNUM(DID)	1.99151207	0.17645345	0.03217351	5.48	0.0000
Residual	1.00000000	0.08860275	0.01018259	8.70	0.0000

The MIXED Procedure
Model Fitting Information for LNBLOOD

Description	Value
Observations	251.0000
Variance Estimate	0.0886
Standard Deviation Estimate	0.2977
REML Log Likelihood	-159.293
Akaike's Information Criterion	-162.293
Schwartz's Bayesian Criterion	-167.526
-2 REML Log Likelihood	318.5859
Null Model LRT Chi-Square	104.5399
Null Model LRT DF	2.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	1.60601235	0.16597611	149	9.68	0.0000	0.05	1.2780	1.9340
FACTOR1	-0.01703229	0.05615890	149	-0.30	0.7621	0.05	-0.1280	0.0939
FACTOR2	-0.00001820	0.03461233	149	-0.00	0.9996	0.05	-0.0684	0.0684
AGE	0.03289107	0.00808884	149	4.07	0.0001	0.05	0.0169	0.0489
AGESQ	-0.00035615	0.00010730	149	-3.32	0.0011	0.05	-0.0006	-0.0001
SUMMER	0.21936204	0.04813242	149	4.56	0.0000	0.05	0.1243	0.3145
CAMPAIGN 0	-0.01882390	0.10149030	149	-0.19	0.8531	0.05	-0.2194	0.1817
CAMPAIGN 2	0.06013966	0.06212353	149	0.97	0.3346	0.05	-0.0626	0.1829
CAMPAIGN 6	0.05093620	0.05434423	149	0.94	0.3501	0.05	-0.0564	0.1583
CAMPAIGN 12	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
FACTOR1	1	149	0.09	0.7621
FACTOR2	1	149	0.00	0.9996
AGE	1	149	16.53	0.0001
AGESQ	1	149	11.02	0.0011
SUMMER	1	149	20.77	0.0000
CAMPAIGN	3	149	0.65	0.5815

R&M Study - Preliminary 12-Month Report
CHILD BLOOD AS AN OUTCOME OF DUST LEAD CONCENTRATIONS WITHIN A HOUSE: 07/18/95
EXPOSURE MODEL - 3 R&M GROUPS
Excluding initial campaign observations for vacant houses
Excluding Child 120-3

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.00000000	0.00000000	.	.	.
CHILDNUM(DID)	1.98825144	0.17627361	0.03227193	5.46	0.0000
Residual	1.00000000	0.08865760	0.01020893	8.68	0.0000

The MIXED Procedure
Model Fitting Information for LNBLOOD

Description	Value
Observations	251.0000
Variance Estimate	0.0887
Standard Deviation Estimate	0.2978
REML Log Likelihood	-159.529
Akaike's Information Criterion	-162.529
Schwartz's Bayesian Criterion	-167.763
-2 REML Log Likelihood	319.0589
Null Model LRT Chi-Square	103.6870
Null Model LRT DF	2.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	1.61016168	0.16746488	149	9.61	0.0000	0.05	1.2792	1.9411
FACTOR1	-0.01022023	0.04934901	149	-0.21	0.8362	0.05	-0.1077	0.0873
FACTOR2	0.00402246	0.03168466	149	0.13	0.8991	0.05	-0.0586	0.0666
AGE	0.03278622	0.00809707	149	4.05	0.0001	0.05	0.0168	0.0488
AGESQ	-0.00035444	0.00010755	149	-3.30	0.0012	0.05	-0.0006	-0.0001
SUMMER	0.22052014	0.04728677	149	4.66	0.0000	0.05	0.1271	0.3140
CAMPAIGN 0	-0.03074231	0.09171529	149	-0.34	0.7380	0.05	-0.2120	0.1505
CAMPAIGN 2	0.05906940	0.06491925	149	0.91	0.3643	0.05	-0.0692	0.1874
CAMPAIGN 6	0.05019800	0.05555614	149	0.90	0.3677	0.05	-0.0596	0.1600
CAMPAIGN 12	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
FACTOR1	1	149	0.04	0.8362
FACTOR2	1	149	0.02	0.8991
AGE	1	149	16.40	0.0001
AGESQ	1	149	10.86	0.0012
SUMMER	1	149	21.75	0.0000
CAMPAIGN	3	149	0.87	0.4577

R&M Study - Preliminary 12-Month Report
CHILD BLOOD AS AN OUTCOME OF DUST LOADINGS WITHIN A HOUSE: 07/18/95
EXPOSURE MODEL - 3 R&M GROUPS
Excluding initial campaign observations for vacant houses
Excluding Child 120-3

The MIXED Procedure
Covariance Parameter Estimates (REML)

Cov Parm	Ratio	Estimate	Std Error	Z	Pr > |Z|
DID	0.00000000	0.00000000	.	.	.
CHILDNUM(DID)	2.15588581	0.17826129	0.03177693	5.61	0.0000
Residual	1.00000000	0.08268587	0.00949693	8.71	0.0000

The MIXED Procedure
Model Fitting Information for LNBLOOD

Description	Value
Observations	251.0000
Variance Estimate	0.0827
Standard Deviation Estimate	0.2876
REML Log Likelihood	-153.603
Akaike's Information Criterion	-156.603
Schwartz's Bayesian Criterion	-161.836
-2 REML Log Likelihood	307.2051
Null Model LRT Chi-Square	113.9592
Null Model LRT DF	2.0000
Null Model LRT P-Value	0.0000

The MIXED Procedure
Solution for Fixed Effects

Parameter	Estimate	Std Error	DDF	T	Pr > |T|	Alpha	Lower	Upper
INTERCEPT	1.65881354	0.16363744	149	10.14	0.0000	0.05	1.3355	1.9822
FACTOR1	-0.06292760	0.07467186	149	-0.84	0.4007	0.05	-0.2105	0.0846
FACTOR2	0.10428400	0.03415829	149	3.05	0.0027	0.05	0.0368	0.1718
AGE	0.03033036	0.00791841	149	3.83	0.0002	0.05	0.0147	0.0460
AGESQ	-0.00032941	0.00010444	149	-3.15	0.0019	0.05	-0.0005	-0.0001
SUMMER	0.20778324	0.04607974	149	4.51	0.0000	0.05	0.1167	0.2988
CAMPAIGN 0	-0.07107343	0.10952151	149	-0.65	0.5174	0.05	-0.2875	0.1453
CAMPAIGN 2	0.03901309	0.06015643	149	0.65	0.5176	0.05	-0.0799	0.1579
CAMPAIGN 6	0.03189224	0.05295620	149	0.60	0.5479	0.05	-0.0727	0.1365
CAMPAIGN 12	0.00000000	.	.	.	.	.	.	.

The MIXED Procedure
Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
FACTOR1	1	149	0.71	0.4007
FACTOR2	1	149	9.32	0.0027
AGE	1	149	14.67	0.0002
AGESQ	1	149	9.95	0.0019
SUMMER	1	149	20.33	0.0000
CAMPAIGN	3	149	0.50	0.6794