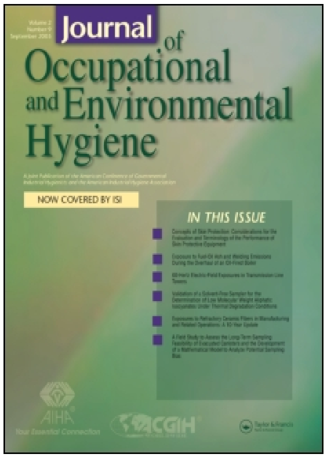

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Selecting a Lead Hazard Control Strategy Based on Dust Lead Loading and Housing Condition: II. Application of Housing Assessment Tool (HAT) Modeling Results

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Selecting a Lead Hazard Control Strategy Based on Dust Lead Loading and Housing Condition: II. Application of Housing Assessment Tool (HAT) Modeling Results

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In Part I in this issue, modeling was used to identify a Housing Assessment Tool (HAT) that can be used to predict relative intervention effectiveness for a range of intervention intensities and baseline dust lead loadings in occupied dwellings. The HAT predicts one year post-intervention floor and windowsill loadings and the probability that these loadings will exceed current federal lead hazard standards. This article illustrates the field application of the HAT, helping practitioners determine the minimum intervention intensity needed to reach "acceptable" one year post-intervention levels, with acceptability defined based on specific project needs, local needs, regulations, and resource constraints. The HAT is used to classify a dwelling's baseline condition as good or poor. If the average number of interior non-intact painted surfaces per room is ≥2, then the dwelling is rated as poor. If exterior windows/doors are deteriorated and the average number of exterior non-intact painted surfaces per building side is ≥5, then the dwelling is rated as poor. If neither of these conditions is true, then the dwelling's HAT rating is good. The HAT rating is then combined with baseline average floor loading to help select the treatment intensity. For example, if the baseline floor loading is 100 $\mu g/ft^2$ (1,075 $\mu g/m^2$) and the HAT rating is poor, the probability that the one-year floor loading exceeds the federal standard of 40 $\mu g/ft^2$ (430 $\mu g/m^2$) is 27% for a high-intensity strategy (i.e., window lead abatement with other treatments) but is 54% for a lower-intensity strategy (i.e., cleaning and spot painting). If the HAT rating is good, the probability that the one-year floor loading exceeds 40 $\mu g/ft^2$ is approximately the same for low- and high-intensity strategies (18% for window lead abatement with other treatments compared with 16% for cleaning and spot painting). Lead hazard control practitioners can use this information to make empirically based judgments about the treatment intensity needed to ensure that one year post-intervention loadings remain below federal standards.

Keywords dust lead loading, housing condition, intervention strategy, lead hazard control, risk assessment

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INTRODUCTION

EPA's Residential Lead-Based Paint Hazard Reduction Act of 1992 (also known as "Title X")[(1)] and the *HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*[(2)] detailed the requirements for the proper conduct of lead-based paint activities. Risk assessors are trained both to identify lead-based paint (LBP) hazards and to make lead hazard control (LHC) treatment recommendations. In most states, individuals planning to address residential lead hazards have the option either to abate the lead permanently or to use interim controls to manage and control the lead hazard on an ongoing basis. However, more empirical evidence is needed to support specific recommendations to be made under a given set of conditions. Risk assessors and other LHC practitioners may simply offer a range of intervention options to the property owner, property manager, or rehab specialist without providing information on the likely long-term effectiveness of those treatments.

Lead hazard control intervention options range in intensity from professional cleaning to lead abatement in the entire dwelling, i.e., removal of the building LBP component(s), the LBP on the component, or near-permanent enclosure of LBP hazards. Previous studies have demonstrated that when proper work site containment and cleaning are done, both low- and high-intensity interventions can reduce and maintain low dust lead loadings for at least two years.[(3,4)] In the National Evaluation of the U.S. Department of Housing and

Urban Development (HUD) Lead Hazard Control Program (Evaluation), dwellings with six-year data were found to have post-intervention geometric mean (GM) dust lead loadings on floors and windowsills that did not significantly change from one to six years post-intervention for intervention intensities ranging from professional cleaning with spot painting to lead abatement in the entire dwelling.[5] However, lower intensity interventions are less likely to be effective in poorly maintained properties.[6]

In the companion article (Part I in this issue), data from the Evaluation was used in statistical models to identify a simple visual assessment of the interior and exterior housing condition, referred to as a Housing Assessment Tool (HAT), that can predict intervention effectiveness for a range of intervention intensities and baseline dust lead loadings in occupied dwellings. The HAT supplements building condition and baseline dust lead loading information gleaned from the risk assessments or paint inspections.

This article describes the field application of the HAT. It illustrates how risk assessors and other LHC practitioners can use the HAT to determine the minimum intervention intensity needed to lower dust lead loadings to below federal standards one year after intervention. The predicted one-year dust lead loadings and the probability that those loadings will exceed current federal lead hazard standards can be estimated.[7] Each practitioner defines what is "acceptable" based on the specific project, as well as local needs, regulations, and resource constraints. To the authors' knowledge, no other studies have presented practical procedures for using building assessment data to determine treatment options.

METHODS

Using the HAT, a dwelling would be given a rating of poor if *either* of the following baseline conditions was present:

- Interior: On the average, two or more non-intact (i.e., 0.5 ft^2 or more of deteriorated paint on large surfaces, or 1% or more of the total surface area of small building components) interior painted components per room were observed; *or*
- Exterior: There was window/door deterioration and the average number of non-intact exterior painted surfaces per side of the exterior structure was ≥ 5.

If neither of these conditions was present, then the dwelling would receive a good HAT rating.

The above HAT was used in regression models (described in Part I) to predict one-year floor and sill dust lead loadings based on HAT building condition ratings (good or poor), interior intervention strategy and a baseline dust lead loading. The models were used to predict one-year loadings at a range of baseline floor and sill dust lead loading values (10, 20, 40, and 100 $\mu g/ft^2$ for floors and 125, 250, 500, and 1,000 $\mu g/ft^2$ for sills). These baseline values were selected because of their relevance to the current and past federal dust lead loading standards. The effects of exterior and site/soil work at each of the baseline loading values were also included in the models. Type III F-tests were used to test for significant differences in one-year dust lead loadings between interior strategies for each HAT rating and baseline dust lead loading.

The four interior LBP strategies were taken from strategy codes assigned in the Evaluation and included cleaning/spot painting (Interior Strategy 02), complete paint stabilization (03), complete paint stabilization plus window treatments (04), and window lead abatement plus other treatments (Strategy 05). Strategy 01 (no lead work) was not included because all dwellings had some interior work done. Strategy 06 (complete lead abatement) was not included because baseline dust lead loadings were much lower in the dwellings that were fully abated than in dwellings treated with other strategies. Exterior treatment strategies ranged from no exterior work to all LBP removed. Site/soil treatments (i.e., treatment of soil, fences, or outbuildings) ranged from no site/soil work to complete soil removal or enclosure with asphalt or concrete. For this article, exterior and site/soil work were each simply classified as having been performed or not, regardless of intensity.

Logistic regression modeling was employed to predict the probability that one year post-intervention loadings will fail to meet current federal dust hazard standards (40 $\mu g/ft^2$ for floors and 250 $\mu g/ft^2$ for sills). The only difference from the Part I models was that the dependent variable in the logistic models was the probability that one year post-intervention loadings fail to meet current federal dust hazard standards (40 $\mu g/ft^2$ for floors and 250 $\mu g/ft^2$ for sills) instead of log-transformed one-year dust lead loading.

Finally, this article provides guidance concerning how practitioners can use the predictions of one-year dust lead loading and associated probabilities of hazard standard failures to identify the most feasible intervention strategy.

RESULTS

Using the HAT, 65% of the 1,417 Evaluation dwellings had a HAT rating of poor, including 48% of the 170 dwellings that had cleaning/spot painting (Strategy 02), 54% of the 267 that had complete repainting (03), 73% of the 271 that had complete repainting plus window treatments (04), and 71% of the 709 that had window lead abatement plus other treatments (05).

Table I shows, for each of the four interior intervention strategies, the one-year floor and sill dust lead loadings predicted using the HAT, including the effects of exterior and site/soil work, considering different ranges of floor and sill baseline dust lead loading values. Table I also shows significant differences in predicted one-year loadings between strategies for each HAT rating and baseline dust lead loading.

TABLE I. Predicted One-Year Post-Intervention Floor and Sill Dust Lead Loadings and Effects of Exterior and Site/Soil Work

			HAT Rating = Good[A]					HAT Rating = Poor[A]				HAT Rating of Good or Poor
	Baseline Dust Lead Loading		Predicted One-Year Dust Lead Loading (μg/ft^2) by Interior Strategy (with Some Exterior Work but No Site/Soil Work)[B]				Percentage Increase in One-Year Dust if Exterior Work Not Done[C] (%)	Predicted One-Year Dust Lead (μg/ft^2) by Interior Strategy (with Some Exterior Work but No Site/Soil Work)[B]				Percentage Decrease in One-Year Dust if Site/Soil Work Done[D] (%)
Surface	(μg/ft^2)	(μg/m^2)	**02**	**03**	**04**	**05**		**02**	**03**	**04**	**05**	
Floor	10	108	5	6	7	7	42	10	9	13	10	16
	20	215	6	6	8	8	57	16	13	16 *(05)*	12 *(04)*	20
	40	431	8	7	11	10	75	26 *(03, 05)*	17 *(02)*	21 *(05)*	15 *(02, 04)*	24
	100	1076	11	9	14	12	100	46 *(03, 05)*	25 *(02)*	29 *(05)*	18 *(02, 04)*	29
Sill	125	1345	77 *(04, 05)*	70 *(04, 05)*	45 *(02, 03)*	35 *(02, 03)*	44	81 *(05)*	96 *(05)*	109 *(05)*	51 *(02, 03, 04)*	—
	250	2691	113 *(04, 05)*	82 *(05)*	60 *(02, 05)*	39 *(02, 03, 04)*	52	119 *(05)*	114 *(05)*	126 *(05)*	56 *(02, 03, 04)*	—
	500	5382	167 *(03, 04, 05)*	95 *(02, 05)*	81 *(02, 05)*	44 *(02, 03, 04)*	60	174 *(05)*	136 *(05)*	144 *(05)*	61 *(02, 03, 04)*	—
	1,000	10,764	247 *(03, 04, 05)*	111 *(02, 05)*	109 *(02, 05)*	49 *(02, 03, 04)*	69	257 *(05)*	161 *(05)*	167 *(05)*	67 *(02, 03, 04)*	—

[A] HAT rating = poor if the average number of non-intact interior paint components exceeds two *or* if exterior window/doors are deteriorated and there were five or more exterior components with non-intact paint. Otherwise, the HAT rating = good.

[B] *Italicized* strategy numbers shown in parentheses indicate strategies that yielded predicted one-year loadings that were significantly different from that of the strategy heading for that column.

[C] The effect of having no exterior work done is shown only for HAT rating = good because exterior work did not have a significant effect on predicted one-year floor dust loadings when HAT rating = poor.

[D] Site/soil work did not have a significant effect on predicted one-year sill dust lead loadings.

Floors

Table I shows that if the HAT rating was good, and exterior work but no site/soil work was done, all intervention strategies yielded predicted one-year loadings that are below the current EPA floor standard of 40 μg/ft^2, even with baseline dust lead loadings as high as 100 μg/ft^2. None of the intervention strategies resulted in significantly lower one-year floor dust lead loadings than another strategy when the HAT rating was good. This result indicates that if a house is rated in good condition based on the HAT, risk assessors could recommend a low-intensity, low-cost intervention and keep predicted one-year loadings low, even at a baseline floor dust loading of 100 μg/ft^2.

If the HAT rating was poor and the baseline dust lead loadings were 10 to 20 μg/ft^2, then the predicted one-year loadings were similar across strategies. However, within each interior strategy, the predicted one-year loadings increased as baseline loadings increased. For Strategy 02, the predicted one-year loading exceeded 40 μg/ft^2 when the baseline loading was 100 μg/ft^2, indicating that a low-intensity strategy may not be appropriate under these conditions.

The intermediate strategies (e.g., 03 or 04) did not always follow the expectation that high-intensity strategies would yield lower predicted one-year dust lead loadings than low-intensity strategies; however, the differences between specific strategies were not significant. For example, regardless of baseline loading level or HAT ratings, predicted one-year loadings for complete repainting (03) were not significantly different than those for complete repainting plus window treatments (04) (each p-value >0.05).

Exterior work was not associated with predicted one-year floor loading when the HAT rating was poor (p=0.255); however, when the HAT rating was good, exterior work had a greater effect at higher rather than lower baseline loadings. For example, if the HAT rating was good, then at baseline loadings of 10 and 40 μg/ft^2, the predicted one-year loading for each strategy is expected to be 42% and 75% higher, respectively, if no exterior work was done.

Regardless of HAT rating, site/soil work lowered predicted one-year dust loadings by a greater percentage at higher baseline loadings.

Table II shows the predicted probability of one year post-intervention floor loadings failing to meet the current federal dust hazard standard for HAT ratings of good and poor and different interior strategies.

Windowsills

Table I shows that if the HAT rating was good, and exterior work was done, all four interior intervention strategies yielded predicted one-year sill loadings below the current EPA sill standard of 250 μg/ft^2. For example, if the baseline sill dust lead loading was 500 μg/ft^2, exterior work was conducted, and a dwelling was treated with complete repainting (Strategy 03), the predicted one-year loading was 95 μg/ft^2 if the HAT rating was good and 136 μg/ft^2 if the HAT rating was poor.

For all baseline loading values and both HAT ratings, higher intervention strategies were associated with lower sill loadings for all baseline loading values and HAT ratings, although the differences were not always significant. Although there were HAT differences on sills, the effects were relatively greater on floors.

At a baseline sill loading of 500 μg/ft^2, if exterior work was not done and the HAT rating was good, then the one-year sill loading is expected to be 60% higher than if exterior work was conducted. For cleaning/spot painting (Strategy 02), lack of exterior work could raise the predicted one-year sill loading from 167 to 267 μg/ft^2.

When the HAT rating was good, exterior work had a greater effect at higher baseline floor loadings. Exterior work was not associated with one-year sill loading when the HAT condition was poor (p = 0.989).

TABLE II. Predicted Probability (%) that One Year Post-Intervention Dust Lead Loadings Will Fail to Meet Federal Standards.[A]

	Baseline Dust Lead Loading		HAT = Good Interior Strategy[B] (%)				HAT = Poor Interior Strategy[B] (%)			
Surface	**(μg/ft^2)**	**(μg/m^2)**	**02**	**03**	**04**	**05**	**02**	**03**	**04**	**05**
Floor	10	108	5	7	8	8	15	13	19	15
	20	215	8	8	12	11	25	19	24	18
	40	431	11	10	15	14	37	25	31	22
	100	1,076	16	13	22	18	54	36	40	27
Sill	125	1,345	21	19	12	9	22	26	29	14
	250	2,691	30	22	17	10	31	30	32	15
	500	5,382	39	26	22	12	40	34	35	17
	1,000	10,764	50	29	29	13	51	38	39	18

[A] 40 μg/ft^2 for floors; 250 μg/ft^2 sills.
[B] When exterior work but no site/soil work is done.

Regardless of HAT condition, site/soil work did not have an effect on predicted one-year sill loading ($p = 0.424$).

Table II shows the probability that predicted one year post-intervention loadings will fail the current federal dust hazard standard for windowsills (250 μg/ft^2) for HAT ratings of good and poor and different interior strategies. For the lowest level strategy (02), the probability of failure was about the same for HAT ratings of good and poor. However, for Strategies 03, 04, and 05, the probability of failure was higher for a HAT rating of poor than for a HAT rating of good.

Application of the HAT

Risk assessors could follow these steps in using the HAT results shown in Tables I and II:

1. Conduct a visual assessment and assign a HAT rating of good or poor, depending on the number of exterior and interior deteriorations found.
2. Conduct dust wipe sampling. Based on dust wipe test results, calculate the baseline arithmetic mean dwelling floor and sill dust lead loadings.
3. Apply the field data from Steps 1 and 2 to Tables I and II to determine the predicted one-year floor and sill loadings and the probability that these one-year loadings would fail current federal standards.
4. Rank different treatment strategies by determining which will produce higher predicted one-year dust lead loadings. Determine which (if any) of the predicted one-year outcomes is acceptable, and decide, together with the owner, if reductions in floor and sill dust lead resulting from exterior and site/soil work are worth the effort and cost.

For example, if a given home had less than an average of two non-intact interior painted surfaces per room; fewer than two windows/exterior doors boarded up, broken, or missing; and less than an average of five non-intact exterior painted surfaces per building side, the risk assessor would assign a HAT rating of good to this home. If the average baseline floor loading in this home was 17 μg/ft^2 (i.e., between 10 and 20 μg/ft^2), Table I shows that predicted one-year loadings would range from 5 to 8 μg/ft^2. This outcome means that there would be no significant difference in one-year loadings regardless of the treatment strategy selected.

Table II shows that 5% to 12% of the homes with this set of data would fail the current floor standard of 40 μg/ft^2 at one year post-intervention. Predicted one-year floor loadings would be between 42-57% higher if no exterior treatments were conducted and 16-20% lower if site/soil work was conducted. For an average sill loading of 280 μg/ft^2 (i.e., between 250 and 500 μg/ft^2), Table I shows that predicted one-year sill loadings for window lead abatement interventions (39–44 μg/ft^2) would be significantly lower than those for cleaning/spot painting interventions (113–167 μg/ft^2).

Based on Table II, between 30–39% of homes would fail the current sill standard of 250 μg/ft^2 at the lower-intensity strategy and 10–12% at the higher-intensity strategy. At an average job, sill dust lead loadings would be between 52–60% higher if no exterior work was conducted, while there would be no significant effect of doing site/soil work. Based on these findings, strategy selection could be based on the windowsill outcomes because predicted one-year floor loadings are similar regardless of treatment intensity. Cleaning/spot painting (02) would be excluded if a 30% sill dust lead hazard rate at one year post-intervention was deemed unacceptable. One-year sill dust lead loadings would be significantly lower if window lead abatement (05) was chosen. However, the risk assessor and the client could instead select a medium intensity treatment such as complete repainting plus window treatments (Strategy 04) if the average predicted one-year loadings (between 60–81 μg/ft^2) and less than a 22% one-year failure rate were deemed acceptable. In this example, the exterior work effects were substantial. Although the effects of soil work on floor dust lead loading were small (1–2 μg/ft^2 on floors), lead-contaminated soil affects children's blood lead levels so soil work may still be warranted.[8,9] Finally, some owners may choose treatments that they believe would last longer than the one-year time period that could be analyzed with the data available.

DISCUSSION

In Tables I and II, the HAT model findings are presented as ranges of results to allow the LHC practitioner to have both empirical evidence and flexibility in making specific treatment recommendations. The determination of which strategies are effective or "acceptable" is a local decision based on local needs, regulations, and resource constraints. The determination of acceptable treatments will in some cases be a predetermined measure of what is effective over a given time period. For example, a program or risk assessor may decide that a 25% one year post-intervention failure rate on a surface is not acceptable and may select a higher-intensity intervention. In other cases, the decision may be based on an examination of effectiveness versus cost. LHC intervention costs can vary significantly.[10] In the Evaluation, the average costs for 1994–1997 were \$730 per dwelling for cleaning/spot painting (Strategy 02), \$4,730 for complete repainting (03), \$6,370 for complete repainting plus window treatments (04), and \$7,150 for window lead abatement plus other treatments (05). The average costs per building were \$3,920 and \$2,200 for exterior and site/soil interventions, respectively. Inflation would likely have increased these costs by 38% from 1995 to 2007.[11]

When the HAT rating is good, higher intensity strategies are always associated with lower one-year sill loadings although the differences are not always significant. When the HAT rating is poor, Interior Strategy 05 performs significantly better on windowsills than the other strategies, but the differences between the other strategies are not significant. Window treatments are increasingly intensive as the strategy level increases, but strategies 02 to 04 leave lead paint intact on windows, while Strategy 05 abates lead paint on windows.

When the HAT rating was good or baseline floor dust lead loadings were low, all the strategies performed equally at one year post-intervention. However, when the HAT rating was poor and baseline floor loadings were high, one-year floor loadings were lower for more intensive strategies.

Although HAT selection was based on prediction of one-year dust lead loadings, in the Evaluation, loadings actually remained fairly constant between one and three years post-intervention, so the results presented in this article may be valid to three years post-intervention (Table IV in Part I). Some owners and risk assessors may decide that even longer-term treatments are most desirable, given projections about the future life of the building.

The HAT needs to be validated using other independent data sets in different regions of the United States and also should be field tested to determine if practitioners are able to use it and find it helpful in the decision-making involved in preventing childhood lead poisoning in examined homes. The prevalence of residential lead-based paint hazards is approximately twice as great in the northeastern and midwestern United States, compared with the southern and western states.[12] Additional limitations are discussed in Part I.

CONCLUSIONS

The HAT is a simple, easy-to-use method that can be used to (1) categorize homes, (2) estimate one year post-intervention loadings, and (3) make recommendations about effective treatment strategies. The empirical evidence provided in this article concerning the effects of various lead treatments on one-year post-intervention dust lead loadings for buildings in good and poor condition can be used by lead risk assessors and LHC programs to make better-informed lead treatment recommendations and identify which LHC treatment options are likely to be most effective over a one-year period and longer.

The HAT is especially useful to LHC practitioners who are concerned that certain low-intensity treatments will not work in deteriorated dwellings over the long term. It also could be a useful program-planning tool for communities that already have some baseline data about their housing stock condition and dust lead loadings. The HAT is advantageous because the visual assessments and dust sampling can be easily performed at one home visit.

REFERENCES

1. "Lead; Requirements for Lead-Based Paint Activities in Target Housing and Child-Occupied Facilities," *Code of Federal Regulations Title 40*, Part 745. 1996.
2. **U.S. Department of Housing and Urban Development (HUD):** *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* (1539-LBP). Washington, D.C.: HUD, 1995.
3. **Farfel, M., and J. Chisolm Jr.:** Health and environmental outcomes of traditional and modified practices for abatement of residential lead-based paint. *Am. J. Publ. Health 81(10)*:1342–1345 (1990).
4. **U.S. Environmental Protective Agency (USEPA):** *Lead-Based Paint Abatement and Repair and Maintenance Study in Baltimore: Findings Based on Two Years of Follow-Up* (Report No. 747-R-97-005). Washington, D.C.: EPA, 1997.
5. **Wilson, J., T. Pivetz, P. Ashley, et al.:** Evaluation of HUD-funded lead hazard control treatments at six years post-intervention. *Environ. Res. 102(2)*:237–248 (2006).
6. **Dixon, S., J. Wilson, C.S. Clark, W. Galke, P. Succop, and M. Chen:** Effectiveness of lead-hazard control interventions on dust lead loadings: Findings from the evaluation of the HUD Lead-Based Paint Hazard Control Grant Program. *Environ. Res. 98(3)*:303–314 (2005).
7. "Lead; Identification of Dangerous Levels," *Code of Federal Regulations Title 40*, Part 745. 2001. p. 1211.
8. **Lanphear, B., T. Matte, J. Rogers, et al.:** The contribution of lead-contaminated house dust and residential soil to children's blood lead levels: A pooled analysis of 12 epidemiologic studies. Environ. Res. *79(1)*:51–68 (1998).
9. **Clark, S., R. Bornschein, P. Succop, S. Roda, and B. Peace:** Urban lead exposures of children in Cincinnati, Ohio. *Chem. Spec. Bioavial. 3*:163–171 (1991).
10. "Evaluation of the HUD Lead-Based Paint Hazard Control Grant Program: Final Report." [Online] Available at http://www.hud.gov/offices/lead/reports/fifthrpt.pdf (Accessed April 11, 2007).
11. "Consumer Price Index." [Online] Available at ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt (Accessed January 8, 2008).
12. **Jacobs, D.E., R.L. Clickner, J. Zhou, et al.:** The prevalence of lead-based paint hazards in U.S. housing. *Environ. Health Perspect. 110*:A599–A606 (2002).