GreenCare for Children

Measuring Environmental Hazards in the Childcare Industry:

Pesticides, Lead, and Indoor Air Quality

Survey Brief

COMMUNITY ENVIRONMENTAL COUNCIL,

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The following document is a brief summary of the scope and findings of the GreenCare for Children program. GreenCare began in 2001 as a program of the Community Environmental Council with funding from The California Endowment. Over the period of two years a diverse team of industry, technical, and educational experts collaborated to develop and interpret a comprehensive written survey administered to a random sampling of childcare providers in the Tri-County area.

Our goal was to gauge the potential for exposure to common environmental hazards in the childcare setting. This research is vital because many young children spend much of their time in childcare, and children are uniquely susceptible to environmental contaminants.

The results of the survey were surprising in several ways. First, there is clear evidence that young children are likely to be exposed to known environmental hazards in the childcare setting, including pesticides, arsenic-treated lumber, lead, and common asthma triggers. Second, much of the exposure is preventable. And third, childcare providers hunger for the information to address these issues.

We feel encouraged that with the proper attention to these gaps, we can create a healthier and safer environment for our children.

The full report will be available online by May 30th. To discuss any of the findings with the principal investigator, please contact Phil Boise at pboise.ipm@earthlink.net or at www.greenchildcare.org.

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Executive Summary

Exposure to herbicides (weed killers) before the age of one is linked to a more than four-fold increase in childhood asthma.

Infants, toddlers, and pre-school children (six-weeks to six-years old) are the population most at risk from environmental threats. The environmental hazards we examined in the context of this survey are substances present in the childcare setting that are known or suspected to cause harm. Specifically, we considered pesticides, lead, and indoor air quality factors. These hazards, if encountered during a child's formative years, can impact both the child's present and future health.

The GreenCare for Children program began in 2001 with the goals of promoting environmental risk reduction, stewardship, and parent outreach in the early care and education community through training and incentives. The program was administered by the Community Environmental Council in Santa Barbara, Calif. with support from The California Endowment.

The intent of the principal investigator and the advisory committee was to determine how children may become exposed to a hazardous material in the childcare setting, what training needs exist, how these needs may best be met, and which areas deserve further investigation. Therefore, the first undertaking of the GreenCare for Children program was to survey the study population and gather baseline data.

To collect this information, we developed a written survey under the guidance of Eric Smith, a Professor of Political Science and Environmental Studies at the University of California Santa Barbara (UCSB) and a diverse advisory committee. We sent the survey to 1,150 childcare providers in the study area of San Luis Obispo, Santa Barbara, and Ventura counties. A target of 600 responses from both home-based and center-based childcare programs was required to achieve a 95 percent confidence level. We tabulated data based on 748 returned questionnaires for a 65 percent return rate.

Our Findings

The findings of this study demonstrate that our most vulnerable population is unwittingly exposed to environ mental hazards. They also indicate that most of the threats are preventable; and childcare providers capable of managing these hazards hunger for the training and tools necessary to do so. We wish to emphasize that this study is designed not to criticize, but to support the exceptional work of childcare providers.

Key findings

1. Young children are likely to be exposed to known health hazards in the childcare setting, including pesticides, arsenic treated lumber, lead, and common asthma triggers.

2. Exposure to the majority of these hazards is preventable.

3. Less than three percent of providers have received formal training in pesticide, lead, or indoor air quality management.[1]

4. A full 80 percent of providers are interested in more information about managing these risks (88 percent among the Spanish language community).[2]

In preparing for this survey, we also discovered that no comprehensive program exists in California to address these issues, and no single entity is charged with the responsibility.

If there is a single, overriding goal of childcare providers, it is to care for children in a safe and protected environment. It is this foundation that we drew upon when designing the survey and identifying the target population.

Exposure to herbicides (weed killers) before the age of one is linked to a more than four-fold increase in childhood asthma.

Children and Environmental Hazards

The neurological, endocrine, reproductive, immune, and detoxification systems are immature in young children — research shows that 90 percent of a child's brain development occurs in the first four years of life.[3] Children are virtually built to absorb contaminants; they have the highest skin-to-lung ratio, skin-to-body weight ratio, and hand-to-mouth contact of any age bracket. Their breathing rate is twice that of adults, and their breathing zone is much closer to the ground where contaminants and irritants are likely to settle. Children are extremely vulnerable to exposure to any chemicals present on floors, carpets, grass, or dirt.

The incidence of chronic childhood diseases including asthma, bronchitis, and cancers—such as leukemia—is increasing.[4] Exposure to herbicides (weed killers) before the age of one is linked to a more than four-fold increase in childhood asthma.[5] Asthma alone accounts for 14 million lost school days annually; an estimated $3.2 billion is spent every year to treat asthma in children under 18 years old.[6]

One child in six now suffers from a learning, developmental or behavioral disorder.[7] Studies show that children exposed to pesticides demonstrate an inhibited ability to learn, decreased stamina, problems with gross and fine eye-hand coordination and 30-minute memory, and reduced thyroid hormone levels.[8,9] Young children exposed to environmental hazards may continue to suffer from related health and developmental problems throughout their adult life.

In the pre-school years, besides the home, childcare facilities are where many children spend the majority of their time. Over half of the families in California have children under five years old in childcare for 15 to 35 hours per week. In California, there are more than 900,000 children enrolled in 42,000 licensed childcare facilities. Our study area represents approximately five percent of the state's total—with more than 42,000 children served by 2,155 licensed facilities.

About the GreenCare for Children Program

GreenCare for Children began in 2001 as a program of the Community Environmental Council[10] with funding from The California Endowment,[11] and guidance from childcare providers, public health educators, and representatives of the childcare industry.

Program goals

- Reduce exposure to environmental hazards such as pesticides, lead, and poor indoor air quality
- Promote environmental stewardship such as recycling and resource conservation
- Advance outreach into the parent and childcare community by providing support and incentives

The first major effort of the GreenCare for Children program toward achieving these goals was the creation and administration of a written survey to establish baseline data.

About the Survey

A target of 600 completed questionnaires was required to achieve a 95 percent confidence level. We received 748.

The principal investigator and advisory committee sought to determine how children might become exposed to a hazardous material in the childcare setting, which areas deserve further investigation, what training resources and needs currently exist, and how these needs may best be met.

To collect this information, a written survey was developed under the guidance of Dr. Eric Smith, Professor of Political Science and Environmental Studies at the University of California Santa Barbara (UCSB). The study area included San Luis Obispo, Santa Barbara, and Ventura Counties.

A target of 600 responses (350 home-based childcare programs and 250 center-based programs) was required to achieve a confidence level of 95 percent. Eleven-hundred fifty (1,150) licensed childcare providers in the tri-counties were randomly selected and sent a copy of the survey (680 home, 470 center).* *We emphasize that unlicensed childcare providers were not included in the sample nor in this study.* Additionally, we designed the questionnaire to provide anonymity, so as to obtain the most candid information.

We received 748 completed questionnaires (457 home-, 291 center-based), generating a response rate for the entire sample of 65 percent. By the standards of academic survey research, this was a high response rate. The goal of 95 percent confidence in the survey results was achieved.

The survey assumed childcare providers were obeying current childcare regulations, so questions about smoking and hazardous material storage were not included. Rather, we wanted to determine:

(1) Common routes of exposure to environmental hazards (lead, poor indoor air quality, pesticides) in the childcare setting;

** Licensed care in California is broken into two designations: "family childcare homes" and "childcare centers." Family childcare homes operate from the home of the licensee, may serve between eight ('small') and fourteen ('large') children. The operators of family childcare homes are obligated to receive health and safety training to obtain a license from the California Department of Social Services.*

Childcare centers may serve an unlimited number of children. Some childcare center staff are required to have additional educational requirements beyond health and safety training to obtain a license. Both designations have varied adult-to-child ratios, depending upon the age of the children served.

(2) Existing level of technical training among providers;

(3) Providers' preferred method of receiving information about environmental hazard management; and

(4) How training opportunities might be improved.

The survey comprised 35 questions of various forms, both multiple choice and fill-in. Four particular areas interested us most: hazards associated with indoor air quality, lead, and pesticides, and how providers find information. Because each hazard carries its own unique routes of exposure, we sought information relative to the following fields of inquiry:

Indoor Air Quality

- What is the prevalence of asthma or chronic respiratory illness among staff and children?
- What is the prevalence of common asthma triggers in childcare facilities?

Lead

- What is the prevalence of lead exposure routes in childcare facilities?

Pesticides

- What level of decision making responsibility do providers have for pest management at their facilities?
- What is the prevalence of pesticide exposure routes in and around childcare facilities?
- What pest problems do providers have? How do providers currently manage pests?

Training and Education

- What information pathway do providers prefer to learn about childcare improvement?
- Are providers familiar with existing indoor air quality and lead prevention programs?
- Are providers interested in additional information and training?

Indoor Air Quality

Asthma accounts for 14 million lost school days annually, and is the leading cause of school absenteeism attributed to a chronic condition. An estimated $3.2 billion is spent annually in the U.S. treating asthma in children under 18 years old.[12]

Asthma is an inflammatory condition of the bronchial airways. This inflammation causes airway obstruction, chest tightness, coughing, wheezing, shortness of breath and low blood oxygen. Asthma may be caused by a number of factors. Genetic predisposition and allergies are the strongest risk factors for developing asthma, in addition to childhood exposure to tobacco smoke, dust mites, cats, cockroaches, and chemical irritants.[13]

A recent study shows that exposure to herbicides during the first year of life increases the likelihood of developing asthma by 4.59 times, roughly double the rate caused by other studied factors *(e.g. cockroaches: 2 times; other pesticides: 2.5 times; farm crops/dust/animals: 2 times; attendance of daycare before 4 months: 2.5 times; wood smoke/oil smoke/soot/exhaust: 1.5 times)*.[14] Once developed, asthma cannot be cured, but it can be controlled. This is accomplished by avoiding contact with the allergens, irritants, or conditions that trigger asthmatic episodes, and proper maintenance through monitoring and medication.

An estimated $3.2 billion is spent annually in the U.S. treating asthma in children under 18 years old.

The survey sought first to ascertain the extent of respiratory illness in the childcare setting, and second to identify common asthma triggers in the facility. If the first question revealed that the incidence of respiratory illness was negligible, the following questions would be moot.

To determine the need for asthma related training, providers were asked if they, their staff, or at least one child under their care had asthma or chronic respiratory problems. We also asked about the presence of known and measurable triggers of asthma: wall-to-wall carpeting, warm-blooded pets, and mold/mildew.

In fact, 42 percent of childcare providers indicated that they have children or staff who suffer from persistent respiratory illness and asthma. Further, the data showed that more than a third of all

facilities may inadvertently expose a student or staff member with respiratory illness to common triggers. The figure is significantly higher in childcare centers (57 percent) versus family childcare homes (26 percent) This discrepancy is likely due to the fact that since centers care for more children at a time there is a greater probability that at least one child will suffer from asthma. Our intent was to determine the need for provider training, rather than a per-child incidence of the disease.

Asthma Triggers

Wall-To-Wall Carpeting

Wall-to-wall carpeting proved to be the most widespread of potential asthma triggers, with 74 percent of respondents indicating its presence. Carpeting presents three potential problems. First, it is difficult to clean, which leads to the accumulation of settled dust, chemical residues (such as pesticides applied in the vicinity), and other biological allergens such as fungi or pollen. Second, a lack of frequent washing may lead to conditions conducive to dust mites, which are shown to contribute to lung diseases.[15] Finally, new carpet—plus the adhesives and padding used to install them—emit a variety of volatile organic compounds (VOCs). The American Lung Association (ALA) cautions that these compounds may be associated with "symptoms such as eye, nose, and throat irritation; headaches; skin irritations; shortness of breath or cough; and fatigue."[16]

As a result, the ALA recommends replacing wall-to-wall carpets with area rugs. Because pre-school children spend a great deal of time playing on their hands and knees, this is an important issue for childcare programs.

Pets

A large percentage of family childcare homes (61 percent) reported having warm-blooded pets in the childcare facility. Childcare centers reported less but still a significant amount (39 percent).[17] Warm-blooded pets, such as cats and dogs, have a tremendous effect on respiratory health.[18] According to one study, the asthma rate could drop as much as 40 percent among children under the age of six if exposure to pets and other home allergens were removed.[19]

42 percent of childcare providers indicated that they have children or staff who suffer from persistent respiratory illness and asthma.

Mold & Mildew

Common asthma triggers include irritation or allergic reaction to molds. Molds are generally described as airborne fungi, yeast, or bacteria growing in the presence of moisture. We asked providers whether their facilities had water damage, mildew, or "musty or moldy" smells. Between eight (home-based) and 14 (center-based) percent of reporting parties confirmed the presence of at least one condition. While this percentage is not extremely high, across a population of 42,000 it indicates a potential to contribute to the chronic respiratory illness of children and staff in the facilities.

Technical Resources

84 percent of the respondents were 'very' or 'somewhat' interested in receiving more information about improving indoor air quality.

The survey asked if providers had heard of the indoor air quality training program "Tools for Schools." Tools for Schools is the most widely utilized indoor air quality educational tool in the United States, and is a product of the U.S. Environmental Protection Agency and health organizations such as the American Lung Association. Of the 748 respondents, nine percent had heard of the training program, but less than one percent had reported using it. However, 83 percent of respondents (90 percent for Spanish speakers) were 'very' or 'somewhat' interested in receiving more information about improving indoor air quality.

These findings demonstrate the need for increased training in asthma recognition and asthma trigger management.

Lead threatens children because they absorb so much of the ingested amount — about 50 percent — whereas adults will absorb only 10 to 15 percent.

Lead

Lead is a highly toxic metal that was once widely used in paint and many other materials around the home.[20] Blood lead poisoning in children has been shown to irreversibly stunt a child's mental and physical development. A dose of lead that would have little effect on an adult can significantly impair a small body. Lead threatens children specifically because they absorb so much of the ingested amount—approximately 50 percent—whereas adults will absorb only about 10 to 15 percent.[21]

Based on the advice of survey and technical advisors, the four primary routes of exposure to lead investigated were: paint, food prepared in foreign pottery (where lead was likely used in the glaze), vinyl mini-blinds, and treatments by "cultural healers" who may dispense remedies produced in countries where lead is not well regulated.

Overall, an average of 67 percent of polled childcare providers confirmed the presence of at least one potential route of lead exposure. Considering the severe consequences of lead poisoning in children, we believe further investigation is justified.

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Lead Paint

Lead paint was outlawed in 1978. However, pre-1978 paint still remains on interior and exterior walls in many homes and buildings. Particles of lead can be found in dirt and on interior surfaces from paint chips and renovation materials.

The conditions that may contribute to lead poisoning from paint (pre-1978 construction and peeling paint in areas accessible to children) were present in five percent of childcare centers and in two percent of home-based childcare facilities. Extrapolating this data, it may be estimated that at least 1,600 children in the study area might have access to peeling lead-based paint.[22]

Based on our results, it may be estimated that at least 1,600 children in the study area might have access to peeling lead-based paint.

Pottery

We found little evidence (only one percent of respondents) that the use of foreign-produced pottery was common in our study population. This leads us to conclude that, while this should be a topic of community outreach, it does not justify a high training priority for this project.

Vinyl Mini Blinds

The U.S. Consumer Product Safety Commission (CPSC) reported in 1996 that non-glossy vinyl mini-blinds were a potential source of lead poisoning. Specifically, the CPSC found that the lead used in vinyl mini-blinds deteriorated when exposed to sunlight, forming lead dust on the surface of the blind that exceeded safety standards. Because the sweet taste of lead attracts children, the CPSC

recommended that vinyl mini-blinds be removed from homes where children under six years old might be present.

Sixty-one percent of respondents reported the use of window blinds in their childcare facility. The survey design did not allow detailed information about this potential route of exposure, but further investigation may be warranted.

Cultural Home Remedies

Azarcon *and* greta — *cultural home remedies taken for stomachache or intestinal illness — are almost 100 percent lead, and are poisonous to children and adults at any level.*

Many ethnic communities rely upon cultural healers and remedies for common health ailments. Latin American cultural healers, or *curanderas*, use folk remedies to treat a wide range of illnesses. Several of these remedies commonly have dangerously high levels of lead. For example, *azarcon* and *greta*—remedies taken for stomachache or intestinal illness (*empacho*)—are almost 100 percent lead, and are poisonous to children and adults at any level.[23,24]

While the survey format could not provide detailed information about remedies used at home, we did seek to determine if the use of home remedies was prevalent among our study population. Twelve percent of respondents indicated that they thought parents of children in their care turned to home remedies and cultural healers such as *curanderas*. This alone does not imply home and cultural remedies are a source of lead poisoning, but considering the toxicity of some of these substances, it does warrant further investigation and outreach into the childcare and client communities.

79 percent of respondents were 'very' or 'somewhat' interested in receiving more information about lead poisoning prevention.

Technical Resources

The survey asked if providers had heard of their county's childhood lead-poisoning prevention program. While half responded 'yes', only seven percent had availed themselves of the information and services provided by the program. Overall, 79 percent of respondents has not had their facilities tested for the presence of lead. Childcare centers were more likely than home-based centers to have tested for lead (25 percent and 18 percent, respectively).

Pesticides

The first two fields we investigated — indoor air quality and lead — have existing educational resources that may be modified or enhanced to better serve the childcare industry. However, the field of pesticide use and management in the childcare setting is an area of study not adequately explored*. As "educational institutions" and private residences, childcare providers are exempt from training and reporting requirements mandated of other pesticide applicators.

For this reason, we included extensive questions in the survey to help build the body of data. We first sought to determine which audience might make pesticide applications and decisions: childcare providers themselves or another party such as a site manager, a landscape professional or pest control service.

Next, we explored possible routes of exposure to pesticides in the childcare setting. That is, what feature might a child frequently contact that might also receive pesticide applications?

Finally, the survey collected information about specific pest problems encountered by childcare providers, and the specific pest control practices most commonly used to manage those pests.

Decision Making

We asked providers whether they had a degree of responsibility in the decision making about pest management in their facilities. Eighty three percent said yes.

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** Requests for information about comprehensive environmental hazard studies or risk reduction programs for the childcare setting were directed through the statewide Child Care Planning Council email listservs, the statewide Children and Families Commission email listservs, contacts within the CA Department of Pesticide Regulation, the US EPA, several environmental advocacy groups, and multiple presentations within the regional childcare industry. No applicable studies about pesticide management in the childcare setting were discovered. An excellent pioneer certification model has been implemented through the Indiana Department of Environmental Management, although this program has not developed comprehensive baseline data.*

Routes of Exposure

Landscape Features

A large percentage of respondents noted the presence of landscape features that in general commonly receive pesticide applications: lawns (84 percent), sandboxes (46 percent), neighborhood playgrounds (29 percent), and vegetable gardens (19 percent).

While use of these areas by children does not infer exposure to pesticides, they are features that may receive pesticide applications and so merit careful management and training.

Arsenic Treated Wood

Thirty-four percent of childcare programs in our study area used treated wood for play structures, tables/benches, sand boxes, vegetable gardens, or decks. Historically, the most common wood treatments contain arsenic, a known carcinogen that can leach from the wood surface for many years after installation.

More than 13,000 children in our study area could be exposed to arsenic, a known carcinogen, on a regular basis.

Research indicates that older treated lumber (15 – 20 years old) releases as much arsenic as newer lumber (less than one year old).[25] The U.S. EPA has established an enforceable maximum contaminant level for daily intake of 10 micrograms.[26] At this threshold the EPA acknowledges a one in 300 risk of lung or bladder cancer from arsenic exposure.[27] Sampling conducted by the principal investigator revealed that arsenic-treated lumber[28] installed three years before sampling released arsenic on the wood surface and in the soil below the wall in an estimated residue level of 500 parts per billion, or 50 times the enforceable maximum contaminant level.

This potential exposure is significant. Based on the survey data and the populations of children served in the study area, it may be estimated that more than 13,000 children (3,632 in home-based and 9,550 in center-based) could be exposed to this known carcinogen on a regular basis.[29]

The wood treatment industry has voluntarily phased out production of new arsenic based preservatives as of January 1, 2004. However, current stock continues to be sold, and the potential risk may last for decades

Pest Management Actions

The survey revealed that:

√ Just under half of childcare facilities likely receive pesticide applications[30], while approximately 55 percent avoid the use of pesticides.

√ Pesticide use outdoors is more common than indoors (50 percent to 20 percent).

√ Providers are three times more likely to turn to pesticides than sanitation practices to manage ants or spiders, and are 12 times more likely to spray pesticides than to apply them as a bait (the safer alternative).

√ Ants and spiders were the most common pests encountered indoors or outdoors by a wide margin.

We found that only three percent of providers consider pesticides to be safe to use around children, and that generally pesticides are used because they were convenient and saved providers' time.

Technical Resources

Of the 748 responses, only 27 (3.6 percent) had received some pesticide safety/pest management education. Unfortunately, only three responses (0.4 percent) could be said to describe training that would adequately inform an individual responsible for pest management decisions.

When considered against the finding that 83 percent of childcare providers stated that they had some control over pest management decisions, a significant and unmet training need is revealed.

While 83 percent of childcare providers are at least somewhat responsible for pest management decisions, less than one percent have received training in pest management and pesticide safety.

Training & Information Pathways

While some of the information may paint an alarming picture, we are extremely encouraged that so many of the respondents are interested in developing their technical skills and learning more about how to protect children's health. The data highlighted the dedication that childcare providers have to the children in their care—approximately 80 percent of respondents indicated that they would like to learn more. This number is even higher among Spanish speaking providers (88 percent).*

Approximately 80 percent of respondents indicated that they would like to learn more.

Information Pathways

Providers were asked whether they used any of five sources of communication—attending local meetings, attending childcare conferences, taking early care and education classes, reading childcare newsletters, and using the Web to search for information.

By far the most common sources of information are childcare newsletters (70 percent). Other sources range from attending early childhood education classes (38 percent) to local meetings (22 percent).

Several important differences in opportunities to gain information were revealed in our survey. The largest of these is in the use of newsletters by English- and Spanish-speakers. Whereas 73 percent of English-speakers say they use newsletters, only 49 percent of Spanish-speakers say they do so.

A gap in the opposite direction exists between the rates of attending conferences. Approximately 45 percent of Spanish-speakers, and only 33 percent of English-speakers, say they gained information by attending childcare conferences.

** The Spanish speaking provider population was identified through requests for a Spanish language survey and through individual phone calls to providers who had not returned surveys. Anyone who answered the telephone speaking Spanish, or who was judged by the callers to feel more comfortable speaking Spanish than English was sent a Spanish language survey. Approximately fourteen percent of the survey responses were in Spanish.*

Opportunities to exchange information are also more widespread among institutional childcare providers than among home providers. Staff from childcare centers are more likely than home childcare providers to attend childcare conferences (45 percent vs. 28 percent), to attend early childhood education classes (43 percent vs. 35 percent), and to read childcare newsletters (74 percent vs. 67 percent).

These findings suggest that additional efforts to reach home childcare providers may be in order. In sum, nothing in our survey data suggests that there is a particular communication avenue that has worked better than others for training.

Conclusions and Recommendations

The GreenCare for Children survey provided us with essential information about the ways children may be exposed to asthma triggers, lead, and pesticides in the childcare setting. Thanks to a healthy response from home-based and center-based childcare facilities across three counties — San Luis Obispo, Santa Barbara, and Ventura — we were able to analyze the differences, if present, between geographic, primary language, and facility-based factors.

We have reported here that there are several prevalent, and potentially serious, risks to children who spend time in childcare facilities.

However, **most of these risks are manageable with training**. We found a universal desire for information among the populations questioned. And we believe we have identified the most effective means of delivering that information to the providers.

Based on the results of the survey, we have begun to develop and field-test a curriculum that addresses the information pathways and gaps identified by childcare providers. We hope to be able to bring

this curriculum to a broader audience in the near future. If the problems in these counties are so large, we can reasonably expect similar, serious problems throughout the state and nation.

In an age of two-income families, childcare providers play an important role in the well-being of our children. They are the conduit between the 42,000 children in the study area and the parents who raise them. They can also pass along educational information to the parent community to better protect children.

The GreenCare for Children Program looks forward to working in concert with providers and parents to fill the information gaps and to create a safer environment for our community's children.

End notes

[1] Average of providers receiving formal training in pesticides (0.64%), indoor air quality (0.9%), and lead (7%). See Section VII: 'Environmental Training Programs'

[2] See Section VII: 'Environmental Training Programs'

[3] "O'Bannon and Hamilton Announce Recognition for Child Care Facilities," Indiana Department of Environmental Management News, December 14, 1998.

[4] Preventing Child Exposures to Environmental Hazards: Research and Policy Issues; http://www.cehn.org/cehn symposium.html# envirjustice

[5] F.D. Gilliland, M.T. Salam, Y. Li and B.M. Langholz, "Early Life Risk Factors for Asthma: Findings from the Children's Health Study," ATS 2003-International Conference of the American Thoracic Society, Mini symposium E011, 9:15 am, May 21, 2003.

[6] American Lung Association, Trends in Asthma Morbidity and Mortality, January 2001 (http://www.lungusa.org/data/asthma/ asthmach_1.html).

[7] Wirth, Timothy, President of the United Nations Foundation, "Pollution can affect a child's ability to learn", Santa Barbara News Press commentary, October 13, 2000.

[8] Porter, Warren P., Department of Zoology, University of Wisconsin, www.wisc.edu/zoology/faculty/fac/Por/Por.html

[9] Guillette, E. et al, "An Anthropological Approach to the Evaluation of Preschool Children Exposed to Pesticides In Mexico", Environmental Health Perspective, 106:347-353 (1988).

[10] www.communityenvironmentalcouncil.org

[11] www.calendow.org

[12] American Lung Association: "Asthma in Children Fact Sheet," March 2003

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[13] American Lung Association: https://www.lungprofiler.nexcura.com?Secure?Tools/Treatment/TreatmentWizard

[14] F.D. Gilliland, M.T. Salam, Y. Li and B.M. Langholz, "Early Life Risk Factors for Asthma: Findings from the Children's Health Study," ATS 2003-International Conference of the American Thoracic Society, Mini symposium E011, 9:15 am, May 21, 2003.

[15] American Lung Association, "Top Ten Tips For A Healthy Home" (http://www.lungusa.org/air/air00_tips.html); American Lung Association, "Study Links Dust Mite Allergy to Asthma Severity in Children", (December 1995), http://www.lungusa.org/press/medical/four.html.

[16] American Lung Association, "Your Carpet and Indoor Air Quality", http://www.lungusa.org/air/air00_carpet.html.

[17] These data are from Question 11.

[18] American Lung Association, " Tips on Reducing Asthma and Allergy Symptoms Triggered by Pets" (http://www.lungusa.org/press/envir/air_041201.html).

[19] Bruce P. Lanphear, C. Andrew Aligne, Peggy Auinger, Michael Weitzman, and Robert S. Byrd. "Residential Exposures Associated With Asthma in US Children." Pediatrics, 107 2001): 505-511. See also Tamara Perry and Robert A. Wood, "Exposure to Pets and Atopy-Related Diseases in the First 4 Years of Life." Pediatrics, 110 (2002): a432-a433.

[20] See the U.S. Environmental Protection Agency web page on lead: http://www.epa.gov/opptintr/lead/. See also Centers for Disease Control and Prevention, Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention. Atlanta: CDC, 2002. http://www.cdc.gov/nceh/lead/CaseManagement/caseManage_chap2.htm.

[21] Bearer, C., "How Are Children Different from Adults?" Environmental Health Perspectives, vol. 103, supp. 6, September 1995, pp. 7-12.

End notes

[22] This number is an estimate and is reached by multiplying the percentages given above by the total number of children in the study area served by the respective childcare classification (family/center).

[23] U.S. Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report, Vol. 51, No. 31 (2002): 684-686. See http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5131a3.htm.

[24] California Department of Health Services "Lead in Home Remedies".

[25] "Nationwide Consumer Testing of Backyard Decks and Playsets Shows High Level of Arsenic on Old Wood", Environmental Working Group: www.ewg.org/reports/allhandsondeck/

[26] Federal Register, 66(14), January 22, 2001.

[27] "The Poisonwood Rivals – The Dangers of Touching Arsenic Treated Wood", Environmental Working Group, www.ewg.org/reports/poisonwoodrivals/es.html

[28] Ammonical zinc chromiated arsenic and copper chromiated arsenic. Testing samples taken from six inch square of wood rubbed with moistened baby wipe for one minute, and from soil surface directly below treated wood.

[29] Based upon the total population of children served in the study area (15,790 in home-based and 26,528 in center-based care) multiplied by the percentages obtained by the survey.

[30] More than one-third of those providers who are involved in pest management decisions (83%) use pesticides (34.5%). It is likely that the remaining 17% of providers (who leave pest management decisions to contractors or others) receive pesticide applications. Thus roughly half (34.5% plus 17%) likely receive pesticide applications. Similarly, approximately 55% of those responsible for pest management decisions stated that they do not use pesticides.