2007 Integrated Pest Management Survey of California School Districts

Prepared for the California Department of Pesticide Regulation
by the Institute for Social Research at California State University, Sacramento

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Executive Summary

Purpose

The Pest Management Analysis and Planning program in the California Department of Pesticide Regulation (DPR) conducted a survey of all public school districts in California in April 2007. The purpose of the survey was to: (1) measure compliance with requirements of the Healthy Schools Act (HSA), (2) measure adoption of integrated pest management (IPM) policies, programs, and practices, (3) relate demographic and geographic factors to survey responses, (4) identify barriers to IPM adoption, (5) document changes over time relative to prior surveys conducted in 2001, 2002, and 2004, and (6) analyze change in responses by those districts which responded in both 2004 and 2007 survey years. In addition, survey results and analyses will be used to guide future IPM training efforts conducted by DPR.

Background

The HSA, enacted in January of 2001, aims to reduce exposure of children to pesticides in schools through the voluntary adoption of IPM and least-toxic methods of pest control. The law defines IPM as a means of preventing and suppressing pest problems using a combination of monitoring and record keeping, establishing pest thresholds, and non-chemical methods of pest management. Chemical controls that pose the least possible hazard to human health and the environment are used only after careful monitoring and pre-established thresholds and treatments indicate their use is necessary.

The law requires school districts to:

- Keep a registry of parents and guardians interested in notification of pesticide applications;
- Notify parents and guardians of specific pesticides applied in schools;
- Post signs on school grounds if pesticides are applied; and
- Keep records of pesticide applications for four years.

The DPR is required by the HSA to provide training to school district staff to facilitate the adoption of effective IPM programs and practices at school sites. This training effort began with a pilot workshop in June 2002, with 22 additional workshops reaching 613 school districts, held through June of 2007. The workshops accommodate up to 40 participants each.

The 2001 survey, which preceded initiation of DPR's IPM training program, served as a baseline for all subsequent surveys (Tootelian 2001).[1] Analysis of survey responses aided DPR's IPM training efforts and led to improvements in the 2002 survey (Geiger and Tootelian, 2003).[2] The 2004 and 2007 surveys were modified further for clarity and to collect additional information.[3]

This report describes results and findings of statistical analyses performed by scientists from the Institute for Social Research (ISR) at California State University, Sacramento. The report examines three groups of data:

- Responses of the 505 districts that completed the 2007 survey;
- Trends in responses of all districts across survey years; and
- A panel analysis of 344 matched districts that responded to both the 2004 and 2007 surveys.

Compliance with Requirements of the HSA

Many changes indicate important progress in meeting the goals of the HSA. Compliance with specific HSA requirements increased

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[1] Tootelian, D.H. (2001). 2001 Integrated Pest Management Survey of California School Districts. Sacramento, CA, California Department of Pesticide Regulation.

[2] Geiger, C.A. and D.H. Tootelian (2003). 2002 Integrated Pest Management Survey of California School Districts. Sacramento, CA, California Department of Pesticide Regulation.

[3] Barnes, C.W. and S. Sutherland (2005). 2004 Integrated Pest Management Survey of California School Districts. Sacramento, CA, California Department of Pesticide Regulation.

significantly between 2002 and 2007 with most of the change occurring between 2002 and 2004. HSA scale scores, which measure the level of HSA compliance, increased significantly between 2002 and 2004, but did not change between 2004 and 2007 (Table 4.11). As of 2007, almost all school districts post warning signs (95%) and provide written notification of pesticide use (91%). Eighty percent keep a registry and 74% keep pesticide use records up to four years (Table 4.11).

HSA compliance is greatest in mid-sized cities and their urban fringe, in larger school districts and in those with more experienced IPM coordinators (Table 3.3). More compliant districts also are more likely to have adopted an IPM program and make greater use of IPM information resources (Table 3.5).

IPM Policies and Practices

There was no significant change in adopting voluntary IPM policies and practices. Some record keeping and pest monitoring activities increased while others decreased between surveys. As a result, overall scores on the IPM policies and practices scale did not change between 2004 and 2007. The 2004 mean was 14.7, the 2007 mean, 14.3 (See Figure 4.4 and Table 4.12).

The proportion of districts using four record keeping and pest monitoring activities peaked in 2004, then declined slightly in 2007 (Table 4.12). These policies and practices and their 2007 values included:

- A written list of approved pesticide products (61%).
- A written policy requiring the use of least toxic practices (52%).
- A written policy requiring monitoring of pest levels (24%).
- Keeping records of pest monitoring results (22%) .

In contrast, an increasing number of districts kept records of pest sightings, increasing from 15% to 30% over the course of the four surveys.

Higher IPM scale scores in 2007 were characteristic of districts that had more students, had adopted an IPM program, utilized more IPM information resources, had more pest control contracts, or were located on California's north coast (Table 3.5).

IPM Program Adoption

Most districts adopted an IPM program early on: roughly 70% of respondents in 2002, 2004 and 2007 said that their district had an IPM program and fewer said that their district lacked such a program (down from 23% in 2002 to 18% in 2004 and 2007) (Table 4.2).

Respondents increasingly felt that adopting an IPM program resulted in more effective pest management (up from 41% in 2002 to 49% in 2004 to 62% in 2007). However, there was no change or agreement on the IPM program's impact on the long term cost of pest management (Table 4.2).

Five variables are significant in predicting IPM program adoption; schools with the following characteristics were more likely to adopt an IPM program (Table 3.2):

- Districts in large or small towns
- The urban fringes of mid-sized cities
- Rural areas outside Metropolitan Statistical Areas (MSAs)
- Those with more than 200 students
- Those with more experienced IPM coordinators.

Ant and Weed Management Practices

Ant and weed management practices have become more IPM-compatible. The percent of districts using only pesticides not exempt from the HSA has declined from 10% in 2002 to 1% in 2007 while the percent using only HSA exempt pesticides has increased from 0% to 8% (Table 4.10).

There has been a marked increase in the use of non-exempt ant sprays using a non-aerosol application method (up from 21% in 2001 to 37% in 2007). There has also been increased use of ant baits (from 37% in 2001 to 69% in 2004 and 2007), soapy water sprays (from 14% to 51%), caulking (19% to 69%) and improved sanitation (63% to 88%) (Table 4.13). The later four methods are all considered compatible with IPM.

School districts have also increased their use of more IPM-compatible weed management practices. Means on the weed management scale increased significantly between 2004 and 2007 (from 69.5 to 80.8) (Table 4.14). Use of more IPM-compatible methods of managing weeds increased significantly – specifically, spot treatment with herbicides (80% in 2007), use of mulches (60%), physical controls (94%), irrigation management (50%) and turf selection (26%).

The only district characteristic or action/perception affecting weed management practices was region: districts in the north Central Valley used fewer IPM-compatible weed management practices (Table 3.5).

Pesticide Use

Because respondents could indicate their district's specific pesticide use over the last three surveys, it was possible to create a pesticide use scale for 2002, 2004 and 2007. Over the six-year period, districts seemed to converge on a middle ground, using both exempt and non-exempt pesticides (Figure 4.2 and Table 4.10). There was a significant decline in districts using only non-exempt pesticides and a similar decline in those using no pesticides at all. At the same time, districts using only exempt pesticides, or a combination of both exempt and non-exempt pesticides and practices, increased.

Region, number of students and district type significantly affected 2007 levels of pesticide use (Table 3.3). Central Valley districts were more likely to use non-exempt pesticides while elementary and smaller districts were less likely to do so. In addition, the more pest control contracts a district has, the more likely they were to use pesticides (Table 3.5).

All district characteristics significantly affected changes in pesticide use between survey years (Table 5.17). Districts were divided into those whose pesticide practices stayed "good" or improved to "good" between 2004 and 2007 (this is referred to as a positive change) and those whose pesticide practices were in the middle or improved to the middle (referred to as a neutral change). "Good" practices were defined as use of only exempt pesticides or no pesticides and "middle" practices as use of both non-exempt and exempt pesticides (Appendix Table 5.5). A larger percent of rural areas had a positive change than other population areas (31.6%). Urban areas, including large and small towns, had a neutral change (93-94%). Positive changes were also more characteristic of remote, north coastal and mountainous areas in California (25.3%), less characteristic of urban/coastal areas (12.6%) and least true of the central and northern valley (2.5%). Elementary schools districts were much more apt to have a positive change (20.7%). Smaller districts, as measured by both number of schools and number of students, had higher percentages of positive changes, while districts with greater cost per student had higher percentages of positive changes (Table 5.17).

IPM Information Resources

Awareness and use of nearly all IPM information resources increased regularly and significantly from 2002 through 2007. In particular, there was significantly increased involvement in presentations on school IPM and DPR's training workshops between 2004 and 2007. Use of information provided by licensed pest control businesses significantly decreased during the same period (Table 4.8).

Use of IPM information resources was greatest in larger school districts, in those located in middle sized cities, and in districts with more experienced IPM coordinators. Elementary school districts were less likely to use IPM information resources (Table 3.2). In addition, districts that had adopted an IPM program and taken part in DPR's training made greater use of IPM information resources. Districts that perceived more barriers to adopting IPM practices were less apt to use IPM information resources (Table 3.6).

Barriers to Using IPM Practices

Overall, respondents did not see budget restrictions, understaffing, age and condition of school facilities, inadequate staff training, and other issues as significant barriers to using IPM practices in either 2004 or 2007. Means of 12.6 in both years are at the lower end of a scale that varies from 8 to 24, where a higher score reflects a perception of increased barriers to IPM practices (Table 4.6).

Answers to specific questions about School IPM policies and practices

DPR provided the ISR with a set of specific questions it hoped could be answered by the analysis contained in this 2007 report. For ease

of locating the answers to these questions, this section outlines the questions, provides a brief response, and notes the appropriate section of the full report for more in-depth information.

Do trained districts behave differently than untrained ones and do they change differently over time?

Yes, participation in DPR's training program is highly correlated with the resource use scale which measures district use of eight different IPM information resources; this might be expected since the training program is one of the information resources. Although it appears that training has no direct impact on the five policies and practices measures -- the HSA, IPM, ant, weed and pesticide use scales – it does have an effect on these measures through its effect on resource use (Table 3.4). Districts that use more information resources are more compliant with the HSA, have adopted more IPM policies and practices, have more IPM-compatible ant and weed management practices, and are more likely to use a mixture of non-exempt and exempt pesticides.

Districts trained between the two surveys were more apt to perceive more barriers to adopting IPM policies and practices in 2007 than they had in 2004 (53% vs. 33 – 35% for those never trained or trained before 2004) (Table 5.20). Conversely, untrained districts or those trained before 2004 were more apt to perceive fewer barriers in 2007 than they had in 2004 (51-53% vs. 37% for those trained between survey years). More recent training seemed to make respondents more aware of potential barriers to adopting IPM policies and practices.

What effect does the use of contracted pest management services have on IPM policies and practices?

The number of contracts is significantly associated with higher scores on the IPM policies scale, a greater likelihood of using non-exempt pesticides, and lower scores on the Weed scale (Table 3.4). In other words, districts with more pest control contracts are more likely to have policies requiring use of least-toxic pest management practices and the monitoring of pest levels and to do more pest monitoring and record keeping – yet, they are more apt to use non-exempt pesticides and use less IPM-compatible weed management practices.

A change in the number of contracts was not significantly associated with changes in any IPM policies and practices measures, resource awareness and use or perceived barriers (Tables 5.18 to 5.20, 5.22 to 5.24). A change in the nature of contracts held (none in either year, 2004 only, 2007 only, contracts in both years) was significantly related to a change in the IPM scale (Table 5.24). Districts which began contracting in 2007 had declining scores on the IPM scale (-7.5) while those that had contracts only in 2004 increased their IPM scale score (3.04). Districts that did not change their contracting status also did not change their IPM policies and practices (mean differences of -0.83 for those without contracts in both years and 0.41 for those with contracts in both years). Similarly, districts with no contracts in either year or that had contracts only in 2004 were more apt to refrain from using pesticides in both years or improved to that position in 2007 (37% and 44% respectively) (Table 5.24).

Do training and contracting in combination have a different effect on IPM policies and practices?

Training and contracting do not interact but exert independent effects on some IPM policies and practices (Table 3.10). Neither attending training nor having contracts has a significant direct effect on compliance with the HSA or the perception of barriers to the adoption of IPM practices. In contrast, both significantly affect the IPM policies and practices scale. Districts that have not been trained and that do not have pest management contracts have the lowest score on this scale (10.2) while those that have been trained and engage in contracting have the highest scores (15.3). Contracting alone affects both the ant and weed scales, while training alone affects awareness and use of resources. Districts without pest management contracts have more IPM-compatible ant and weed management practices, whether they've been trained or not. Districts that have been trained have greater awareness and use of IPM information resources, whether they engage in contracting or not.

Do perceived barriers to IPM adoption actually affect the adoption of IPM policies and practices?

No, perceived barriers to IPM practices had no effect on any IPM policies and practices (Tables 3.4 and 3.5). The barrier scale's only contribution was its significant relationship with the use of IPM information resources (Table 3.6). Respondents in districts with greater use

of IPM information resources perceived more barriers to adopting IPM policies and practices.

How do regions vary in their IPM policies and practices?
Relative to Los Angeles and its surrounding area, the Sierra and Central Valley use less IPM-compatible practices to manage ants and the Central and North Central Valley use less IPM-compatible practices to manage weeds. The Central Valley is significantly more likely to use non-exempt pesticides (Table 3.3). The North Coast has adopted significantly more IPM policies and practices (Table 3.5). The Bay Area has fewer pest control contracts (Table 3.2).

How do rural and urban districts vary in their IPM policies and practices?
Mid-sized cities and their urban fringe are more compliant with the HSA than larger cities and their urban fringe (Table 3.3). Urban fringes of a mid-sized city, large or small towns, and rural areas are more apt to have adopted an IPM program (Table 3.2).

Does the perceived effectiveness of different IPM practices affect the adoption of these practices?
As designed, the questionnaire does not permit a direct answer to this question because respondents did not rate the effectiveness of an ant or weed management practice they didn't use. However, it is possible to compare districts that use either exempt or non-exempt practices only with those that use both exempt and non-exempt practices to see if they differ in the perceived effectiveness of different practices.

When this is done with ant management practices, there are significant differences between these groups in perceived effectiveness of two exempt practices and one non-exempt practice. Districts using only exempt practices have more faith in the effectiveness of exempt insecticidal sprays and soapy water sprays than districts that use both exempt and non-exempt practices (87% vs. 71% seeing exempt insecticidal sprays as effective and 80% vs. 62% seeing soapy water sprays as effective) (Table 3.8).

All weed management practices—exempt and non-exempt--were judged to be effective by most respondents, irrespective of their district's overall use of exempt and non-exempt practices (Table 3.9).

Does experience as an IPM coordinator affect a school district's degree of adherence to good IPM policies and practices?
Yes, years of experience as an IPM coordinator was significantly related to a district's HSA score and the perceived barriers to adopting IPM practices (Tables 3.5 and 3.7). The longer a respondent had served as IPM coordinator, the greater the district's adherence to the requirements of the HSA and the fewer the perceived barriers to adopting IPM practices. Experience was also positively related to resource use, adoption of an IPM program, and ant scores (Tables 3.2 and 3.3).

Do the respondents make pest management decisions?
Roughly six in ten respondents perform all of the pest management responsibilities except setting pest management policies (42%), and using pest management practices (51%). Almost 70% direct others to use pest management practices. In 2007, significantly more respondents used pest management practices (51% vs. 32% in 2004) and significantly fewer kept records of all pest management practices (58% vs. 68% in 2004) (Table 4.4).

Chapter I: Introduction

The Pest Management Analysis and Planning program in the California Department of Pesticide Regulation (DPR) conducted a survey of all public school districts in California in April 2007. The purpose of the survey was to: (1) measure compliance with requirements of the Healthy Schools Act (HSA), (2) measure adoption of integrated pest management (IPM) policies, programs, and practices and relate demographic and geographic factors to survey responses, (3) identify barriers to IPM adoption, (4) examine changes over time relative to prior surveys conducted in 2001, 2002, and 2004, and (5) analyze change in responses by those districts which responded in both 2004 and 2007 survey years. In addition, survey results and analyses will be used to guide future IPM training efforts conducted by DPR.

The HSA of 2000 went into effect in 2001 and requires school districts to provide information about pesticide use and aims to reduce exposure of children to pesticides in schools through the voluntary adoption of IPM and least-toxic methods of pest control. The law defines IPM as a means of preventing and suppressing pest problems using a combination of monitoring and record keeping, establishing pest thresholds, and non-chemical methods of pest management. Chemical controls that pose the least possible hazard to human health and the environment are used only after careful monitoring and pre-established thresholds and treatments indicate their use is necessary.

The law requires school districts to:

- Keep a registry of parents and guardians interested in notification of pesticide applications;
- Notify parents and guardians of specific pesticides applied in schools;
- Post signs on school grounds if pesticides are applied; and
- Keep records of pesticide applications for four years.

The DPR is required by the HSA to provide training to school district staff to facilitate the adoption of effective IPM programs and practices at school sites. This training effort began with a pilot workshop in June 2001, with 22 additional workshops reaching 613 school districts, held through June of 2007. The workshops accommodate up to 40 participants each and are offered to IPM coordinators statewide.

The 2001 survey, which preceded initiation of DPR's training, served as a baseline for all subsequent surveys (Tootelian 2001).[4] Analysis of survey responses aided DPR's IPM training efforts and led to improvements in the 2002 survey (Geiger and Tootelian, 2003).[5] The 2004 and 2007 surveys were modified further for clarity and to collect additional information.[6] This report describes the 2007 survey results and findings of statistical analyses performed by scientists from the Institute for Social Research at California State University, Sacramento.

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[4] Tootelian, D.H. (2001). 2001 Integrated Pest Management Survey of California School Districts. Sacramento, CA, California Department of Pesticide Regulation.

[5] Geiger, C.A. and D.H. Tootelian (2003). 2002 Integrated Pest Management Survey of California School Districts. Sacramento, CA, California Department of Pesticide Regulation.

[6] Barnes, C.W. and S. Sutherland (2005). 2004 Integrated Pest Management Survey of California School Districts. Sacramento, CA, California Department of Pesticide Regulation.

Chapter II: Methodology

Data Collection

Following passage of the HSA in 2000, the Pest Management and Planning Program of the DPR offered training in IPM practices and initiated a survey to track IPM policies and practices in California school districts. Surveys of California's elementary, high school and unified school districts have been completed in 2001, 2002, 2004 and 2007. In April 2007, the California State University, Sacramento Institute for Social Research (ISR) mailed a total of 974 questionnaires to IPM coordinators identified in DPR's database, representing virtually all school districts in California. Follow-up mailings via regular mail and e-mail occurred in June and August respectively to improve the survey's response rate. (See Table 2.1) The training database was later paired with California Department of Education (CDE) information on the demographic and enrollment characteristics of California school districts for use in the analysis.

Questionnaire. The survey's purpose is to measure the progress in compliance with HSA requirements and in the voluntary adoption of IPM in schools. The survey focuses on the control of ants and weeds because, in prior years, these were the most widely reported pest problems in California schools.

The 2007 survey was divided into four sections:

- General Pest Management Practices
- Ant Management Inside School Buildings
- Weed Management
- Respondent Information

The first section, General Pest Management Practices, determined the type of exempt or non-exempt pesticides used in each school district, the types of pest control contracts entered into by the school district, the adoption of IPM policies or an IPM program, compliance with HSA requirements, the districts' recordkeeping and pest monitoring/detection activities, the respondent's assessment of the IPM program's effectiveness and cost, and the significance of eight possible barriers to using IPM practices in a school district.

The next two sections focused on ant and weed management since these are common pest problems for many California schools. The second section, Ant Management Inside School Buildings, determined whether a district did anything to manage ants *inside* school buildings within the last 12 months and, if yes, identified which specific practices were used and sought an evaluation of their estimated effectiveness. Respondents were also asked to describe how their district decided when treatment was necessary and which one practice they used most frequently.

The third section, Weed Management, asked whether a district did anything to manage weeds within the last 12 months, and, if yes, identified which specific practices were used and sought an evaluation of their estimated effectiveness. Respondents were also asked to describe how their district decided when either broadcast or spot treatment with herbicides was necessary and which one practice they used most frequently to manage weeds in athletic fields and playgrounds. Finally, respondents were asked to indicate the location where their district typically had the most trouble with weeds.

The last section, Respondent Information, determined the respondents' pest management responsibilities and, if they were the IPM coordinator for their district, the length of time they had served in this capacity. Respondents were asked to rate their district on aspects of its pest management and to describe their awareness and use of information resources on pest management in schools.

The 2004 survey retained seven questions from the 2001 and 2002 surveys (questions 1, 4, 10, 13, 14, 15 and 19), and seven introduced in 2002 (questions 2, 3, 5, 6, 7, 23 and 24). Questions 9, 11, 12, 16, 17 and 18 were revised and/or reformatted questions from the earlier surveys, while questions 8, 20, 21 and 22, describing the respondent's role as designated IPM coordinator, were new in 2004.

The 2007 survey replaced question 1 from the earlier surveys. The eliminated question asked respondents to indicate how frequently their school district received inquiries from the community concerning pest management issues. The question did not prove to be useful in the previous analyses. It was concluded that respondents may not have access to full information on the number of inquiries, particularly in larger school districts. The new question 1 sought to identify school districts that do not use pesticides, or use only exempt pesticides. These districts do not have to comply with the pesticide posting, notification, and recordkeeping provisions of the HSA. They need to be identified so that their responses do not affect the scale measuring HSA compliance.

Two other question responses were slightly modified. The seventh response to question 4 was broadened to incorporate all pest management practices (such as soapy water spray and caulking). The earlier version referred only to records being kept of "pest treatments used." Finally, responses to question 7 were shortened by incorporating "the long term cost of pest management" into the question itself. (See the Appendix for a copy of the questionnaire.)

Summary measures. To more efficiently understand school districts' general IPM policies and practices, their degree of compliance with HSA requirements, and the degree to which they follow IPM ant and weed practices, four scales were constructed that summarized responses to sets of individual questions. The four scales were constructed in both the 2004 and 2007 datasets, allowing comparisons over time on these measurements. The HSA compliance scale summarizes responses to four parts of question 3 (questions 3d through g). The IPM program scale summarizes responses to questions 3a, 3c and parts 1, 2 and 4 through 6 of question 4. The ant management scale summarizes responses to 15 items contained in three survey questions (questions 10, 12, and 13), while the weed management scale summarizes responses to 11 items in three questions (questions 15, 17 and 18). Two other scales developed for analysis of the 2004 data were the information resource awareness and use scales, measuring the districts' exposure to information on IPM (question 24).

Finally, four new summary measures were developed for the 2007 report. The new scales summarize a district's pesticide use (question 1), the number and nature of contracts with pest control businesses (question 2), and the importance of resource-based barriers to adopting IPM practices (question 8). Scale construction details for each of these resources are described later in this chapter.

School district variables. It seemed reasonable to test whether compliance with the HSA and adoption of the IPM practices would be related to the geographic location, population size, and other characteristics of California school districts, such as the type of pests found in buildings and landscaping across California's diverse ecosystems. Pressure to comply with the HSA may be greater in elementary school districts where children commonly play outside. High school students typically spend less time outside.

Understanding factors that contribute to the variability in HSA compliance and adoption of IPM practices can assist DPR in prioritizing training workshop locations and adjusting workshop topics covered to the needs of particular types of districts.

Seven school district characteristics were considered. Six were obtained from the CDE for use in the analysis.[7] These included:

- A description of the population area in which the district is located
- The region (see Figure 2.1)
- District type (elementary, high school or unified)
- Number of schools in the district
- Average daily attendance (ADA, ranging from under 200 to 10,000 or more)

[7] The CDE maintains a downloadable file called PUBSCHLS.DBF which contains a list of California public schools and districts (www.cde.ca.gov/ds/si/ds/fspubschls.asp). The file also includes basic information about the schools and districts. Four variables from the 2005/2006 file were used for this study: 1) the location of a school relative to categories of populous areas; 2) county, which was used to construct regions within the state; 3) district type; and 4) the number of schools in a district.
Data regarding the two remaining district characteristics used in this study (ADA and cost per ADA for 2005/2006) were obtained from another online CDE resource (www.cde.ca.gov/ds/fd/ec/).

- Cost per ADA (ranging from under $6,000 to $10,000 or more).

The CDE classifies each school within a district relative to eight population area categories. This information is obtained from the U.S. Census Bureau. Some districts contain schools in more than one population area category. Of these "multiple area" districts, a majority (141 districts) have more than 75% of their schools concentrated in one type of area. For this study, a modified version of this variable was created so that these "multiple area" districts can be described in terms of the majority of schools in a given district. Districts were assigned the population area category in which more than 50% of its schools are located. For districts with schools evenly distributed across two or three types of areas, precedence was given to the larger or more urban area. Two of the eight area categories (large towns and small towns) were combined into one category. The resulting population area variable has seven categories:

Urban categories include:

1) Large city: an incorporated city with a population greater than or equal to 250,000.
2) Urban fringes of a large city: urban areas within a Consolidated Metropolitan Statistical Area (CMSA) or Metropolitan Statistical Area (MSA).
3) Mid-sized city: the central city of a CMSA or MSA with a population less than 250,000, but greater than 25,000.
4) Urban fringes of a mid-sized city: urban areas within a CMSA or MSA.
5) Small or large towns: incorporated places with a population greater than 2,500 (small towns) or 25,000 (large towns) located outside a CMSA or MSA.

Rural categories include:

6) Rural, inside MSA: any area within the CMSA or MSA of a large or mid-sized city and defined as rural by the Census Bureau. This includes farmland and towns of less than 2,500.
7) Rural, outside MSA: any area outside a CMSA or MSA and defined as rural by the Census Bureau.

Figure 2.1 Map of Counties Included in School IPM Survey Regions

Urban school districts might be expected to be more involved in IPM due to their greater visibility and the more formalized bureaucracy in large school districts. Small town and rural districts may lack the diversity of funding sources available to large urban districts—with multiple programs for children with special needs—and may have higher overhead costs per child, leaving them with fewer resources for school IPM and adoption of IPM practices. It is, therefore, important to include not only region and population size, but also the district type, number of schools and students in the district, ADA, and costs per ADA as variables that may be related to the adoption of IPM practices.

A seventh variable, whether anyone in the district had received IPM training offered by DPR, was obtained from DPR's database. School districts that had participated in the training would be expected to be more committed to adopting an IPM program, following the IPM practices and complying with the requirements of the HSA.

Response rates. A majority (52%) of California's 974 schools districts completed the survey on IPM policies and practices (Table 2.1). Response rates were higher in large and mid-sized cities (56% and 59%) and their urban fringes (53% and 56%), and lower in rural areas (45% to 49%) and towns (50%). Response rates were highest in the South Eastern region (62%) and, despite their largely rural character, the North and Central Coastal regions (60%). The Sierra, North Central and Bay Area had the lowest response rates (40%, 43% and 46% respectively).

Elementary school districts had the lowest response rates (49%) among district types, while unified and high school districts were above average (56% and 57% respectively). Response rates increased regularly with the number of schools in the district, from a low of 46% for districts with only three or four schools to a high of 65% for districts with 20 or more schools. Response rates also increased with average daily attendance (ADA), although, with more size categories, the relationship is not as linear. With the exception of the districts in the highest expenditures per ADA, school districts that spent less per ADA had higher response rates than those that spent more.

Finally, as expected, response rates were higher in districts that had received DPR's IPM training (58%) than they were in districts that had not (41%).

Representativeness of the sample. Survey respondents constitute a sample that is intended to represent the population of all California school districts in terms of their demographic characteristics, pest management policies and practices, and level of compliance with the HSA. If the sample closely mirrors the population's demographic characteristics, it is assumed that it would accurately reflect the population's pest management policies and practices and level of compliance with HSA. If the sample differs from the population's known characteristics (population area, region, district type, number of schools in district, ADA and cost per ADA), it is assumed that the sample's pest management behaviors will differ accordingly—if the demographic variables on which they differ are significantly related to these behaviors.

Despite the variability in response rates, responding districts closely resembled the population of school districts in California. Larger districts, as measured by the number of schools in the district, are slightly over-represented in the sample (35% vs. 29% of the population). Districts with larger average daily attendance figures are also slightly over-represented (34% compared to 28% of the population) (Table 2.2).

The sample contains more respondents from larger school districts (35% with 10 or more schools vs. 29% of the population) and fewer from the smaller school districts (44% with one to four schools vs. 49% of the population). A little more than a third of the sample (38%) has an average ADA of less than a thousand, compared with 43% of the population of school districts, while 20% of the sample represents districts with more than 10,000 ADA, compared with 16% of the population. In spite of the over representation of larger and more urban, unified school districts, the sample is very similar to the population in terms of cost per ADA, differing by one percentage point or less from the population's distribution across cost categories.

When chi square goodness of fit tests are applied to the difference between sample and population characteristics, the sample differs significantly from the population on three

variables: size (measured by both ADA and number of schools) and receipt of IPM training. School districts with more schools and higher ADA and those that have participated in the training workshops are over represented in the sample. *If* larger or IPM-trained school districts are, for example, more compliant with HSA requirements and *if* they utilize better pest management practices than smaller or elementary districts that have not been trained, the sample will overstate these behaviors for the population as a whole.

Whether this overstatement is substantively important is a matter of judgment. Chi square is notably sensitive to sample size; in a large sample of 505 districts, differences of 4 to 5 percentage points are statistically significant. The importance of these differences depends upon the research goals. If the focus is on understanding what types of districts have complied with the HSA, have adopted an IPM program and IPM policies and practices, and follow IPM ant and weed management procedures, then slightly overstating the incidence of these behaviors is probably not important. If, instead, it is important to precisely predict what percentage of school districts comply with the HSA and have adopted these policies and practices, then the data could be weighted so that responses from responding districts reflect the same distribution of district characteristics as the population.

With the focus on understanding rather than predicting, it is enough to remember the nature of the bias in responding districts so that this can be taken into account in understanding the results.

Data Analysis

The 2007 report examines three groups of data – the 2007 respondents (505 districts), trend responses to selected questions that were asked in two, three or four survey years (the number of districts varying by question and year), and the panel of 344 matched districts that responded to both the 2004 and 2007 surveys. Measurement, data collection and data analysis methodologies are described in Chapter II.

District characteristics were available for the last two survey years (2004 and 2007). This information was used in a multivariate analysis of the 2007 results described in Chapter III. This analysis proceeded in three stages: 1) assessing the relationship between district characteristics and district actions and perceptions on the one hand and IPM policies and practices on the other; 2) assessing the relationship between district actions/ perceptions and IPM policies and practices; 3) assessing the relationship between a combination of district characteristics and district actions/perceptions and IPM policies and practices. Chapter IV summarizes the trends in responses to questions appearing in multiple years without regard for district characteristics which were not available for the earlier surveys. In Chapter V's panel analysis – where district characteristics are unchanging -- the focus is on changes in district actions/perceptions and the relationship of these changes to the 2007 measures of IPM policies and practices and changes in those measures between 2004 and 2007. However, the impact of district characteristics on changes in district actions/perceptions and changes in IPM policies and practices is explored.

Statistical measures used in the analysis. In addition to descriptive statistics (percentages, means, standard deviations), the analysis employs two measures of association (chi square and Pearson's correlation coefficients), a measure of difference between the means on a dependent variable for each category of an independent variable (Analysis of Variance) and two types of regression (linear and logistic) to understand variable relationships in the data. All of the analysis was conducted using Statistical Packages for the Social Sciences (SPSS). Appendix Table 2.1 shows the SPSS procedure syntax for each type of test used in the analysis. The following provides a brief description of each measure and how it was used.

In most instances in this report, chi square is used to test for independence in the distribution of two categorical variables. If the null hypothesis of independence is rejected, it is concluded that the two variables are associated. In only one instance – evaluating the representativeness of the sample – chi square is used to test for the goodness of fit between the sample and school district population on district characteristics.

Pearson's correlation measures the relationship between two interval variables (for example, ADA and cost per ADA). Analysis of Variance (ANOVA) measures whether the means of an

interval variable vary significantly between the values of a categorical variable (for example, whether means on the ant management scale vary between districts that have received IPM training and those that haven't).

Linear regression uses a least squares method to measure the relative contributions of a series of interval and categorical independent variables[8] to an interval dependent variable (e.g., scores on the ant or weed management scales). Regression coefficients are selected that result in the smallest sums of squared distances between the observed and predicted values of the dependent variable.

Tables summarizing linear regression analysis results show the Adjusted R square for the model and the standardized coefficient for each variable included in the model. The adjusted R square is reported because it takes into account the number of variables in the model and the number of observations the model is based on. This allows for models with different numbers of variables to be compared.

Similarly, standardized coefficients are reported so that the relative strength of independent variables measured on different scales can be compared. The unstandardized coefficient shows the estimated change in the dependent variable for a one-unit change in the independent variable, holding all other independent variables constant. The standardized coefficient shows the normalized change in the dependent variable for a one standard deviation change in the independent variable. This has the effect of measuring the independent variables on the same scale, with a mean of 0 and a standard deviation of 1. In this standardized framework, there is no constant.

The analysis includes several categorical independent and dependent variables. A set of "dummy" variables was created so that these variables can be mathematically treated as interval variables for correlations and in linear and logistic regressions. Each dummy variable has a value of 0 (not in the specified category) or 1 (in the specified category). Tables that use these dummy variables show the labels for the category with a value of 1. A reference category for each categorical variable is omitted from the regression models and noted in a footnote to the table. All significant differences involving other values of that variable are with respect to the reference category.

Logistic regression measures the relative contributions of a series of interval and categorical independent variables to a categorical dependent variable (e.g., the adoption of an IPM program or not). In logistic regression, variables are selected using the maximum-likelihood method. Coefficients are selected that make the observed results most likely. Interpreting coefficients in logistic regression is not as straightforward as it is for linear regression. Since the coefficients are standardized, their relative size and their associated significance level indicate which variables are most important in predicting the dependent variable. But their contribution to a dichotomous dependent variable indicating the presence or absence of a characteristic cannot be described by the degree of change in such a variable. Instead, the increase in the odds of an outcome attributed to a given independent variable is used to describe the relative contribution of each independent variable in the model. This increase in the odds is summarized in the Exp(B) column of a table.

Models in the current study are being used to understand the importance of relationships between a set of independent variables and the dependent variable, rather than used to predict the probability that a given type of district would, for example, have adopted an IPM program. Therefore, the measures of interest are the size and direction of the coefficients (B), their associated significance levels, and the increase in the odds when there is a one-unit increase in the independent variable (Exp(B)).

The Cox and Snell R square statistic is similar in intent to R square in linear regression. It can be interpreted as the proportion of variation in the outcome variable that is explained by the logistic regression model. These values are typically smaller than the R square in linear regression.

The likelihood ratio chi square is used to determine whether a given variable improves the R square sufficiently that it should be included in the model.

Model construction. The linear and logistic regression models presented in this report were

[8] Categorical variables are transformed into numeric variables using "dummy" coding procedures.

created in a three step process. In the first step, the independent district characteristics (population area and region of the state, district type, ADA and cost per ADA, and length of time as an IPM coordinator) were evaluated for their effect on district actions and perceptions (adoption of an IPM program, did the district attend training, number of pest control contracts, and scores on the resource use and barriers scales), and then district characteristics were evaluated for their effect on IPM policies and practices (HSA compliance, IPM, ant and weed scales). In the second step, the intervening district actions and perceptions that were treated as dependent variables in the first step were now used as independent measures, and evaluated for their effect alone on IPM policies and practices. These first two steps were done in order to see which group of independent variables explained more of the variance on IPM policies and practices – district characteristics, or district actions and perceptions. The third step was to combine district characteristics and intervening actions and perceptions as independent variables in the same model, and evaluate their effect on IPM policies and practices.

Since research on people and their institutions cannot generally utilize an experimental design that makes it possible to identify cause and effect relationships between variables, social scientists make use of statistical modeling to understand these relationships and identify the more important independent or "causal" variables that are related to variability in a given dependent variable (the "effect"). These models are useful to policy makers because they suggest points of entry for influencing the outcome variable. The models are "suggestive," not definitive because all of the possible independent variables that might influence a dependent variable are usually not measured in a descriptive study and, lacking random assignment, they are not controlled by an experimental design.

Surveys of a defined population—in this case, school districts—are descriptive in nature because the districts are not randomly assigned to experimental and control groups, and they are not measured prior to the introduction of an independent variable in the experimental group, and again after its introduction. In other words, school districts cannot be randomly given a particular cost per ADA, or assigned an average ADA, or randomly required to attend IPM training. Instead, many of these variables are linked. Urban districts are larger in terms of number of schools and students, while rural schools are smaller on both variables. In this study, statistical models try to separate mathematically the independent contributions of population, region, district type, size and cost per ADA, and length of time as an IPM coordinator to variations in dependent variables of interest to DPR. These dependent variables include:

- Compliance with the requirements of the HSA (HSA scale)
- Adoption of IPM policies and pest monitoring and recordkeeping practices (IPM scale)
- Ant management practices scale
- Weed management practices scale
- Pesticide use scale

Five other variables serve as both independent and dependent variables in the analysis:

- Adoption of an IPM program
- Specific barriers to using IPM practices
- Pest management information resource use
- Participation in DPR's IPM training
- The number of pest control contracts

These last "intervening" variables may be affected by the school district variables and may, in turn, have an influence on the dependent or outcome variables.

Scale Construction and Findings

Four scales were constructed that summarize each district's degree of compliance with HSA requirements, the extent of their IPM-related policies and pest monitoring and recordkeeping activities, and the degree to which their ant and weed management practices adhere to key IPM principles. Two more scales from 2004 were constructed this year to summarize awareness and use of IPM information resources. Four new variables: pesticide use, the importance of resource-based barriers to adopting IPM, and the number and nature of pest control contracts,

are introduced. This section describes the components of each scale or new variable and how they were combined and weighted to reflect the relative importance of various district policies and practices. Finally, average scores on each scale will be described for the sample as a whole. Relationships between district or respondent characteristics and the scales will be discussed in Chapter 3. See Table 2.3 for summary statistics on the following eight scales.

Healthy Schools Act compliance scale. The HSA Compliance scale summarizes four questions regarding whether a district has officially adopted four practices. The HSA requires districts that use non-exempt pesticides to incorporate these four practices in their management of pesticide use on school campuses. Districts which rely on exempt pesticides or none at all are excluded from any analysis of the HSA scale in this report. Their inclusion would artificially lower the scores on the scale because they are not required to comply with the requirements of the HSA. The districts' pesticide practices, and their status as a regulated district, were identified by a combination of responses to questions 1, 10 and 15.

Responses to three of the four items[9] are significantly and positively correlated with each other, which reinforces the earlier conclusion that similar adoption levels for the four practices suggest that districts are adopting the requirements as a package. School districts maintaining a list of parents wanting to be notified about pesticide applications is not significantly correlated with warning signs being posted about pesticide treatment (Appendix Table 2.2). Figure 2.2 shows the four practices and their assigned points.

Districts were assigned 10 points for each HSA requirement that they had adopted, yielding a range of 0 to 40 points for the scale. The distribution of those districts which use non-exempt pesticides (regulated districts) is shown in Figure 2.3. Almost two-thirds (64%) of the school districts had complied with all four requirements of the Act, while another 22% had complied with three of the four. Only 3% of districts had failed to comply with any of the Act's requirements. The mean score for the sample was 33.9. See Appendix Table 2.3 for the frequency distribution of the HSA scale.

Figure 2.2 Practices and Assigned Points for Components of the Healthy Schools Act Compliance Scale

Each school site maintains records for all pesticides used for at least four years, and makes these records available to the public ..... 10 points

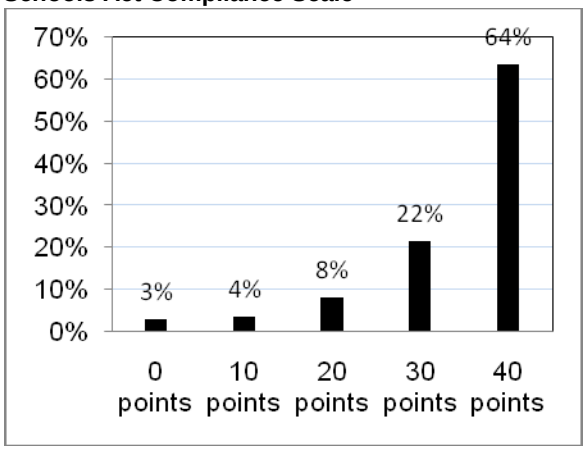
District or school annually provides staff and parents with written notification of expected pesticide use at their school ..... 10 points

District or school maintains a list of parents wanting to be notified of specific pesticide applications..... 10 points

Warning signs are posted at least 24 hours before and 72 hours after pesticide treatment ..... 10 points

Total maximum score possible ..... 40 points

Figure 2.3 Distribution of Scores on the Healthy Schools Act Compliance Scale*



*regulated HSA participants

IPM program scale. Responses to seven questions comprise the IPM program scale.[10] All but one of the 28 pairs of items is significantly correlated. Inspecting buildings for potential pest problems (Question 4 item 1) is not related to the existence of a policy requiring use of the least toxic pest management practices (Question 3a) (Appendix Table 2.4). Districts were assigned five points for Questions 3a and

[9] Questions 3d, 3e, 3f and 3g. (Appendix Table 1.2) Note that only a subgroup of those who responded to these questions is in the regulated group, based on actual practices.

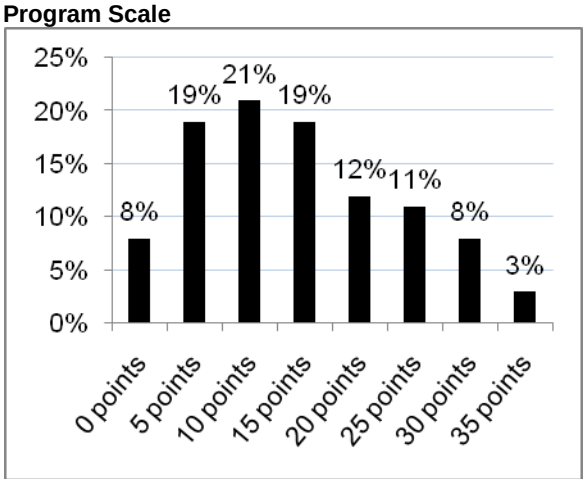
[10] Questions 3a and 3c and Question 4, items 1, 2, and 4 through 6 (see Appendix Tables 1.2 and 1.3).

3c, and five points for each of the five items in Question 4, yielding a range of 0 to 35 points for this scale. The policies, monitoring and recordkeeping activities with their assigned points are shown in Figure 2.4. The distribution of districts on the scale is shown in Figure 2.5, and the frequency distribution is in Appendix Table 2.5.

Figure 2.4 Practices and Assigned Points for Components of the IPM Program Scale

Policy	
Written policy requiring the use of least-toxic pest management practices	5 points
Written policy requiring the monitoring of pest levels	5 points
Monitoring	
Buildings are inspected for potential pest problems	5 points
Pests are monitored during the course of a year	5 points
Recordkeeping	
Records are kept of building inspections	5 points
Records are kept of results of pest monitoring	5 points
Records are kept of pest sightings	5 points
Total maximum score possible	35 points

Figure 2.5 Distribution of Scores on the IPM Program Scale



Districts are much more dispersed on this scale because these are voluntary rather than mandatory activities. Only 11% of the districts have 30 or more points on the IPM program scale. Half of the districts score between 10 and 20 points on these policy, monitoring and recordkeeping activities. The mean of 14.26 is pulled below the median of 15 by the large group of low-scoring districts, creating a distribution that is negatively skewed.

Ant management scale. The ant management scale measures the extent to which districts used IPM methods to manage ant problems inside school buildings. DPR staff developed the scale in cooperation with ISR. Scores on the ant management scale range from 5 to 150 points with a theoretical maximum of 153 points. Districts lost and gained scale points depending on whether their practices were consistent with IPM. To avoid negative values, all districts started the scoring process with 25 points. High scores indicate ant management practices are consistent with IPM principles.

The scale was constructed from responses to 15 items covered in three survey questions. Question 10 asked respondents to indicate which of seven practices they used to manage ants inside buildings. Districts could score up to 70 points on this portion of the scale. Question 12 asked respondents to indicate how their districts decided when treatment with each of the seven practices was necessary. Districts could score from -35 to +43 points on this portion of the scale. Question 13 asked respondents which one practice they use most frequently to manage ants inside school buildings. Districts could score from -15 to +15 points on this portion of the scale. Table 2.4 shows the points allocated for each response.

In order to understand how the scale works, it is helpful to review the scoring process for a specific district. One district received the lowest score of five. Figure 2.6 shows how this district's practices were scored. In contrast, the highest scoring district received 150 points. Figure 2.7 shows how this district's practices were scored.

Figure 2.6 Scoring for a District with 5 Points on the Ant Management Scale

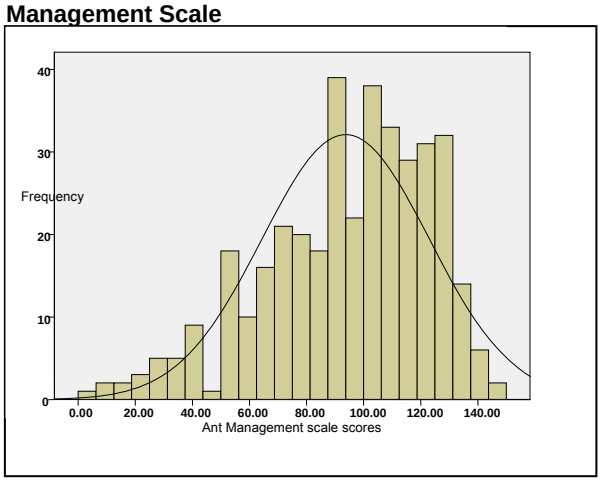
Starting score	+25 points
Used only insecticides sprayed using other application methods	0 points
Used insecticidal spray at regular time intervals	-10 points
Most frequently used practice was insecticides sprayed using other application methods	-10 points
Total score	5 points

Figure 2.7 Scoring for a District with 150 Points on the Ant Management Scale

Starting score	+25 points
Did not use insecticidal spray from an aerosol can	+15 points
Did not use insecticides sprayed using other application methods	+10 points
Used ant baits	+10 points
Used soapy water spray	+5 points
Used caulk in cracks	+15 points
Used improved sanitation	+15 points
Used ant baits when the number exceeded an established threshold	+5 points
Used soapy water spray when ants were first noticed	+5 points
Used caulk in cracks at regular time intervals	+15 points
Used improved sanitation at regular time intervals	+15 points
Most frequently used practice was improved sanitation	+15 points
Total score	150 points

Districts are widely dispersed on this scale, from a low of 5 to a high of 150 out of 153 possible points (Figure 2.8 and Appendix Table 2.6). School districts score on the high side in using more IPM-compatible ant management practices. The mean of 93.7 is pulled below the median of 98 by some extremely low scores that contrast with the large group of high-scoring districts, creating a sample that is negatively skewed (Table 2.3).

Figure 2.8 Distribution of Scores on the Ant Management Scale



Weed management scale. The weed management scale measures the extent to which districts used IPM methods to manage weed problems. DPR staff developed the scale in cooperation with ISR. Scores on the weed management scale range from 0 to 160 points out of a possible 160 points. Districts lost points for using practices not consistent with IPM and gained points for using practices consistent with IPM. To avoid negative values, all districts started the scoring process with 60 points. High scores indicate weed management practices are consistent with IPM principles.

The scale was constructed from responses to 11 items covered in three survey questions. Question 15 asked respondents to indicate which of seven practices they used to manage weeds. Districts could score up to 80 points on this portion of the scale. Question 17 asked respondents to indicate how their district decided when treatment with herbicides was necessary. Districts could lose up to 25 points on this portion of the scale. Question 18 asked respondents which practice they use most frequently to manage weeds in athletic fields and playgrounds. Districts could score from -35 to +30 points on this portion of the scale. Table 2.5 shows the points allocated for each response.

In order to understand how the scale works, it is helpful to review the scoring process for specific districts. One district received a score of zero on the weed management scale. Figure 2.9 shows how this district's practices were scored. In contrast, the highest scoring district received 160 points. Figure 2.10 shows how they were scored.

Figure 2.9 Scoring for a District with 0 Points on the Weed Management Scale

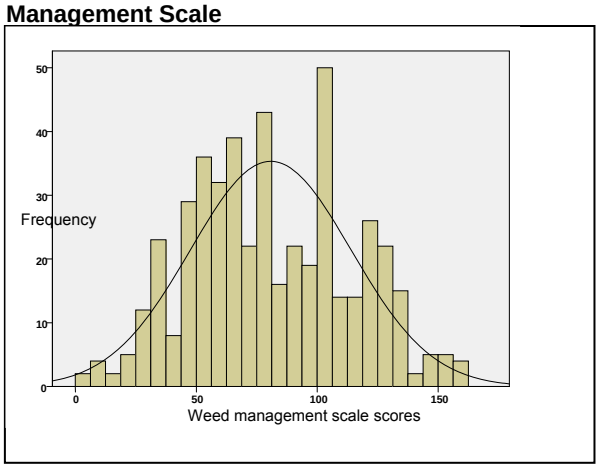
Starting score	+60 points
Used only broadcast treatment with herbicides and spot treatment with herbicides	0 points
Used broadcast treatment with herbicides at regular time intervals	-15 points
Used spot treatment with herbicides at regular time intervals	-10 points
Broadcast treatment with herbicides was the most frequently used practice for athletic fields	-15 points
Broadcast treatment with herbicides was the most frequently used practice for playgrounds	-20 points
Total score	0 points

Figure 2.10 Scoring for a District with 160 Points on the Weed Management Scale

Starting score	+60 points
Did not use broadcast treatment with herbicides	+10 points
Did not use spot treatment with herbicides	+5 points
Used mulches, ground covers, barrier cloth or plastic	+15 points
Used irrigation management	+15 points
Used turf selection	+15 points
Used physical controls such as hand pulling, cultivating, mowing	+10 points
Used flaming	+10 points
Flaming was the most frequently used practice for athletic fields	+10 points
Physical controls such as hand pulling, cultivating and mowing were the most frequently used practice for playgrounds	+10 points
Total score	160 points

Districts were also widely dispersed on this scale, from a low of 0 to a high of 160 out of 160 possible points (Figure 2.11 and Appendix Table 2.7). The mean, 80.8, is lower than the ant scale because the weed scale is less complex and offers fewer variations in practices. The sample is more normally distributed on this scale, with a median of 75, but it is skewed in the opposite direction (Table 2.3). Over half of the districts (54.6%) score lower than the mean while over a third (35.4%) score between 90 and 130, creating the positive skew. In other words, although a significant group of districts are using more IPM-compatible weed management practices, the majority of districts are not using practices consistent with IPM.

Figure 2.11 Distribution of Scores on the Weed Management Scale



IPM information resource awareness and use scales. Respondents were asked whether they were aware of or had used each of eight information resources on IPM (Appendix 1, Question 24). Two scales were constructed: one that counted either awareness or use for each of the eight (the information resource awareness scale) and one that counted use only (the information resource use scale). Each scale varied from zero to eight. Appendix Tables 2.8 and 2.9 show the frequency distributions for these two scales.

Respondents were aware of 5.8 resources, on average, and had used 3.6. In other words, they were aware of more IPM information resources than they had used (Table 2.3).

Pesticide Use. There were four possible responses to question 1, "During the last 12 months, what type of exempt or non-exempt pesticides were used in your school district?" Responses that were most consistent with IPM goals were those indicating use of pesticides that were exempt from the HSA or no pesticide use at all. These were given a score of 3 or 4, respectively. Responses indicating use of only non-exempt pesticides were least supportive of IPM goals. These were given a score of 1. Districts that used both exempt and non-exempt pesticides were given a score of 2.

The resulting distribution of scores on the pesticide use scale yielded 18% of districts with practices that were most supportive of IPM goals and 1% of districts that were least supportive. Most districts (80%) used a mix of exempt and non-exempt practices (Appendix Table 2.9 and Table 2.3).

It should be noted that the distribution of scores in the above referenced tables reflects recoded rather than original responses to Q1. This recoding was the result of various interpretations of the new 2007 variable and possibly incomplete options in Q15. Responses to Q1 were sometimes inconsistent with actual practices as measured by responses to questions 10 and 15. The decision was made to assign pesticide use scale scores on the basis of actual practices described in Qs 10 and 15. A crosstab of original responses to Q1 with responses to Qs 10 and 15 is shown in

Appendix Table 2.10. This table was created to examine potential inconsistencies, and was used to resolve inconsistent responses. The cell shadings in Appendix Table 2.10 correspond to the final coding of the categories of pesticide use, as indicated in the first column of that table, as well as the shadings in Appendix Table 2.9.

For example, 49 respondents (initially recoded "6") said that their district used only exempt pesticides while indicating spot treatment with herbicides in Q15b. It is possible that some respondents may not have recognized an herbicide as a pesticide; but it is also possible that some districts used an exempt herbicide and found no other place for that response. Since 46 of the 49 respondents indicated a mix of exempt and non-exempt practices in Qs 10 and 15, they were recoded as "2s." The three remaining respondents who checked 15a or b only were coded as "unsure."

Another 77 respondents (initially recoded "8") said that their district used no pesticides or only exempt pesticides while checking 10a/b or 15a/b – use of insecticidal sprays or herbicides. Since 76 of the 77 respondents indicated a mix of exempt and non-exempt practices in Qs 10 and 15, they were also recoded as "2s." One respondent who indicated use of only non-exempt pesticides and herbicides in Qs 10 and 15 was coded as "1."

A small group of 12 respondents (initially recoded "7") said that their district did not use pesticides, but 11 identified use of both exempt and non-exempt pesticides in Qs 10 and 15. They were recoded as "2s." The remaining respondent indicated use of a non-exempt herbicide in Q15 and was recoded as unsure.

Most (57) of the 67 respondents who described themselves as "unsure" about their districts' practices (coded "5") were recoded as using both exempt and non-exempt pesticides based on their responses to Qs 10 and 15. Seven others were recoded as using only exempt pesticides (a "3") and three were recoded as using only non-exempt pesticides (a "1").

Since Qs 10 and 15 are also available in the 2004 survey, an analogous pesticide use scale based on practices reported in 2004 can be analyzed for change between the two survey years. Chapters IV and V report the findings.

Because more than 80% of respondents were coded as using a mix of exempt and non-exempt practices on the pesticide use scale, the scale was dichotomized for the purpose of performing regressions: one group which used no pesticides or only exempt pesticides and practices, and one group which used either a mix of exempt and non-exempt or only non-exempt practices.

Barriers scale. The significance of eight barriers to using IPM practices constituted the Barriers scale. Responses a through h to Q8 were assigned a "1" if the barrier was "not at all significant," a "2" if the barrier was "somewhat significant," and a "3" if it was "very significant." There were 443 districts with valid scores on all eight responses to Q8. A higher score reflects a perception of increased barriers to IPM practices. Eleven percent of respondents had the lowest score possible, which means they did not believe any of the practices listed in Q8 were significant barriers to using IPM practices. A median and mean of 12 and 12.6 respectively suggests that respondents recognized few significant resource-based barriers to the adoption of IPM practices. See Appendix Table 2.11 for the statistics on this scale.

Nature and number of contracts. Two contracting variables were developed, one measuring the number of contracts held (varying from 0 or termite[11]* only to 3), while the other measures the nature of the contracts held (none, ant or ant and perimeter only, grounds only, and ant or perimeter plus grounds). The 2007 sample is roughly evenly distributed across the four categories of number of contracts with slightly more districts having one or two contracts (29% and 30% respectively) and slightly fewer having three (19%). Almost a fourth (23.1%) of the districts have no pest control or termite only contracts, while 40% have only ant or perimeter contracts. While very few districts restrict contracting to grounds only (7%), 29% have both grounds and ant/perimeter contracts (Table 2.6).

Sample Description

District characteristics. The unit of analysis in this study is the school district. The results do

[11] Given the focus on ant and weed management, contracts for termite control were not included in this scale.

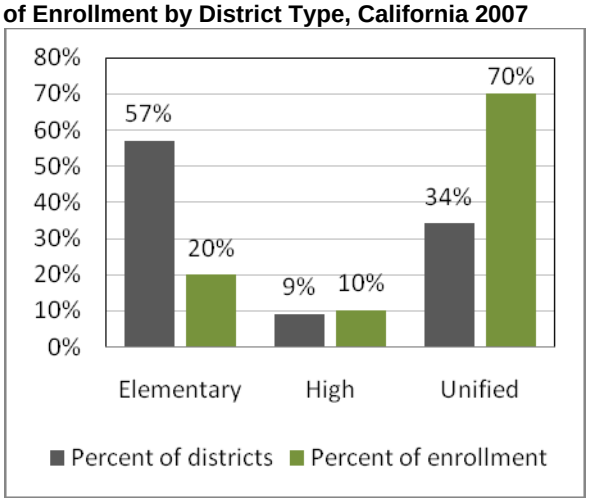
not refer to the number of students affected by IPM policies and practices because districts vary widely in the number of students enrolled. Respondents are speaking on behalf of the district, describing their understanding of the district's IPM policies and practices.

Thirty percent of the 505 respondents represented school districts in large cities or their urban fringes, with another 35% representing districts in mid-sized cities and their urban fringes (Table 2.2). The remaining 35% of respondents came from rural areas and towns. Almost a third of the respondents were from districts in the Los Angeles area and southeastern part of the state (32%). The valley (Central and North Central) and coastal areas (including the Bay Area, Central Coast and the North Coast) each comprised a little under a third of the respondents (30% and 28% respectively). Districts in the Sierra region accounted for 10% of all respondents.

A majority of respondents (54%) were from elementary school districts while a little over a third (36%) represented unified school districts. Nearly two-thirds (66%) represented districts with nine or fewer schools with two-thirds of these (44%) concentrated in districts with only one or two schools. The distribution of ADA was bimodal: ADA was under a thousand in roughly a third (38%) of the respondents' districts and 5,000 or more in another third (34%). Less than a third (30%) of the respondents came from districts with lower costs per ADA (under $7,000); slightly more than a third (35%) represented districts with higher costs ($8000 and up). Finally, 70% of responding districts had attended DPR's IPM training.

The importance of distinguishing school districts and students can be seen in the relationship between the type of district and the percent of statewide student enrollment. Elementary school districts make up 57% of all school districts in the state, but account for only 20% of student enrollment. Conversely, unified school districts constitute a third of all districts, but account for 70% of student enrollment. High school districts alone are balanced, accounting for 9% or 10% of each (Figure 2.12).

Figure 2.12 Percent of Districts and Percent of Enrollment by District Type, California 2007



A more important example might be the relationship between enrollment and DPR's IPM training. Although 70% of all California public school districts had attended training by June 2007, these districts include 82% of all statewide students (Table 2.7). DPR has clearly focused on training districts with the largest enrollments. In selecting the next group of school districts, DPR may also want to concentrate on districts with the largest number of elementary school children due to the increased exposure and vulnerability among younger students. These will include both elementary school districts and unified districts with large elementary populations. Elementary school children are more apt than high school students to play outside and are therefore more apt to be exposed to chemicals that may have been used in that environment.

Respondent characteristics. Most of the respondents (83%) served as the designated IPM coordinator for their district (Table 2.8). Almost half (49%) had been the IPM coordinator for 1 to 4 years, while more than a third had served in this capacity for 5 years or more. . The most common pest management responsibilities assumed by the respondents included:

- Directing others to apply pest management treatments (70%)
- Deciding when to use pest management treatments (64%)
- Deciding which pest management practices to use (64%)

- Keeping records of all pest management treatments used (60%)

- Using pest management practices (53%)

Respondents were less involved in setting pest management policies (43%) or pest management and pesticide safety training (43%) (Table 2.8) .

To determine what job categories were assigned specific pest management responsibilities, respondents were asked to write in their job title. Responses to this request typically included two pieces of information: the area in which a respondent worked (administration, front office/business, safety/risk management, or maintenance and operations) and their job level (administrator, director/coordinator, manager/supervisor, or worker). These two aspects of respondent's jobs were coded separately and then combined into a single job category variable. Appendix Table 2.13 shows the joint distribution of the sample on the separately coded variables while Table 2.9 shows the distribution on the two combined. Respondents who worked in the business offices were grouped together, irrespective of job level; similarly, those working in safety or risk management were grouped independently of job level. Within maintenance and operations, job level distinctions were maintained.

Typically, the respondents were either director/coordinators or manager/supervisors of Maintenance and Operations (70%) (See Table 2.9). The remaining 30% were equally divided among administrative positions, business or safety/risk management positions, and maintenance and operations workers.

Table 2.1 Response Rates by Seven District Characteristics

		Number of districts that were mailed the survey	Number of districts that completed the survey	Response Rate
Overall		*974*	*505*	52%
Population area	Large City	*39*	*22*	56
	Urban fringes of large city	*252*	*133*	53
	Mid-size city	*126*	*74*	59
	Urban fringes of mid-size city	*181*	*101*	56
	Large or small town	*46*	*23*	50
	Rural, inside MSA	*200*	*89*	45
	Rural, outside MSA	*130*	*63*	49
Region	North Coastal	*63*	*38*	60%
	Sierra	*129*	*51*	40
	North Central	*83*	*36*	43
	Bay Area	*162*	*75*	46
	Central Valley	*210*	*113*	54
	Central Coastal	*55*	*33*	60
	LA/Surrounding Area	*191*	*109*	57
	South Eastern	*81*	*50*	62
District type	Elementary	*560*	*273*	49%
	High School	*88*	*50*	57
	Unified	*326*	*182*	56
Number of schools in district	1-2	*327*	*154*	47%
	3-4	*142*	*65*	46
	5-9	*229*	*111*	49
	10-19	*163*	*102*	63
	20 or more	*113*	*73*	65
Number of students (ADA)[1]	Under 200	*189*	*96*	51%
	200-499	*120*	*43*	36
	500-999	*108*	*49*	45
	1,000-1,999	*105*	*55*	52
	2,000-2,999	*78*	*38*	49
	3,000-4,999	*97*	*46*	47
	5,000-9,999	*116*	*69*	59
	10,000 or more	*149*	*99*	66
	Total	*962*	*495*	52
Cost per student (cost per ADA*)	Under $6,000	*19*	*10*	53%
	$6,000-$6,499	*78*	*42*	54
	$6,500-$6,999	*187*	*96*	51
	$7,000-$7,999	*372*	*189*	51
	$8,000-$9,999	*168*	*83*	49
	$10,000 or more	*138*	*75*	54
	Total	*962*	*495*	52
District Attended DPR IPM training	Yes	*609*	*355*	58%
	No	*365*	*150*	41

[1]No ADA figures are reported for the 12 state-wide common districts; they were dropped from these two analysis categories, leaving an N of 962 for all districts mailed the survey. 10 of the 12 common districts completed the survey, for an N of 495 responding districts.

Table 2.2 District Characteristics for All Districts and for Responding Districts

		All districts that were mailed the survey		Districts that completed the survey		
		Percent	*Number*	Percent	*Number*	p[1]
Population area	Large city	4%	*39*	4%	*22*	.658
	Urban fringes of large city	26	*252*	26	*133*	
	Mid-size city	13	*126*	15	*74*	
	Urban fringes of mid-size city	19	*181*	20	*101*	
	Large or small town	5	*46*	4	*22*	
	Rural, inside MSA	21	*200*	18	*90*	
	Rural, outside MSA	13	*130*	13	*63*	
	Total	100	*974*	100	*505*	
Region	North Coastal	7%	*63*	8%	*38*	.180
	Sierra	13	*129*	10	*51*	
	North Central	9	*83*	7	*36*	
	Bay Area	17	*162*	15	*75*	
	Central Valley	22	*210*	23	*113*	
	Central Coastal	6	*55*	7	*33*	
	LA/Surrounding Area	20	*191*	22	*109*	
	South Eastern	8	*81*	10	*50*	
	Total	100	*974*	100	*505*	
District type	Elementary	58%	*560*	54%	*273*	.293
	High School	9	*88*	10	*50*	
	Unified	34	*326*	36	*182*	
	Total	100	*974*	100	*505*	
Number of schools in district	1-2	34%	*327*	31%	*154*	.039
	3-4	15	*142*	13	*65*	
	5-9	24	*229*	22	*111*	
	10-19	17	*163*	20	*102*	
	20 or more	12	*113*	15	*73*	
	Total	100	*974*	100	*505*	
Average daily attendance (ADA)[2]	Under 200	20%	*189*	19%	*96*	.038
	200-499	13	*120*	9	*43*	
	500-999	11	*108*	10	*49*	
	1,000-1,999	11	*105*	11	*55*	
	2,000-2,999	8	*78*	8	*38*	
	3,000-4,999	10	*97*	9	*46*	
	5,000-9,999	12	*116*	14	*69*	
	10,000 or more	16	*149*	20	*99*	
	Total	100	*962*	100	*495*	
Cost per ADA[2]	Under $6,000	2%	*19*	2%	*10*	.993
	$6,000-$6,499	8	*78*	9	*42*	
	$6,500-$6,999	19	*187*	19	*96*	
	$7,000-$7,999	39	*372*	38	*189*	
	$8,000-$9,999	18	*168*	17	*83*	
	$10,000 or more	14	*138*	15	*75*	
	Total	100	*962*	100	*495*	
District Attended DPR IPM training	Yes	63%	*609*	70%	*355*	.000
	No	38	*365*	30	*150*	
	Total	100	*974*	100	*505*	

[1] Significance of chi square goodness-of-fit test. Probabilities ≤ .05 are boxed for easy identification.
[2] No ADA figures are reported for the 12 state-wide common districts; they were dropped from these two analysis categories.

Table 2.3 Summary of Statistics and Variability on Scales

	Range	Mode	Median	Mean	Standard Deviation	*Number of cases*
Healthy Schools Act Compliance Scale*	40	40	40	33.9	9.94	*359*
IPM Program Scale	35	10	15	14.26	9.24	*458*
Ant Management Scale	145	90	98	93.68	29.27	*377*
Weed Management Scale	160	105	75	80.76	33.24	*471*
Information Resource Awareness Scale	8	8	6	5.76	2.3	*417*
Information Resource Use Scale	8	4	4	3.61	2.25	*417*
Pesticide Use Scale	4	2	2	2.27	.65	*458*
Barrier Scale	8-24	10	12	12.63	3.33	*443*

*Regulated group only

Table 2.4 Scoring for Ant Management Scale

	Q 10) Did district use practice? (7 items)		Q12) For districts that used a practice, how did they decide when treatment was necessary? (7 times)				Q13) Most frequently used practice (1 item)
	Yes	No	Regular time intervals	When ants are first noticed	When number exceeds pre-established threshold	After a certain number of complaints	
Insecticidal spray from an aerosol can	0	+15	-15	-10	-1	-5	-15
Insecticides sprayed using other application method	0	+10	-10	-5	0	-3	-10
Exempt insecticidal spray from an aerosol can	0	0	-5	+2	+3	0	-3
Ant baits	+10	0	-5	+3	+5	0	0
Soapy water spray	+5	0	0	+5	+3	0	+5
Caulk in cracks	+15	0	+15	+10	+7	+5	+10
Improved sanitation	+15	0	+15	+10	+7	+5	+15

Table 2.5 Scoring for Weed Management Scale

	Q15) Did district use practice? (7 items)		Q17) For districts that used herbicides, how did they decide when treatment was necessary? (2items)				Q18) Most frequently used practice for: (2 items)	
	Yes	No	Regular time intervals	When weeds are first noticed	When number exceeds pre-established threshold	After a certain number of complaints	Athletic fields	Play-grounds
Broadcast treatment with herbicides	0	+10	-15	-10	-1	-5	-15	-20
Spot treatment with herbicides	0	+5	-10	-5	0	-3	-10	-15
Mulches, ground covers, barrier cloth or plastic	+15	0	n/a	n/a	n/a	n/a	+15	+15
Physical controls such as hand pulling, cultivating, mowing	+10	0	n/a	n/a	n/a	n/a	+10	+10
Flaming	+10	0	n/a	n/a	n/a	n/a	+10	+10
Irrigation management	+15	0	n/a	n/a	n/a	n/a	+15	+15
Turf selection	+15	0	n/a	n/a	n/a	n/a	+15	+15

"n/a" means not applicable.

Table 2.6 Number and Nature of Contracts Held by School Districts

Number of contracts held	Percent	*Number of Cases*
Zero (or termite only)	23.1%	*113*
One	28.6%	*140*
Two	29.7%	*145*
Three	18.6%	*91*
Total	100%	*489*
Nature of contracts held	Percent	*Number of cases*
No contract (or termite only)	23.1%	*113*
Ant or perimeter contract only	40.3%	*197*
Grounds contract only	7.2%	*35*
Ant and grounds, or perimeter and grounds contracts	29.4%	*144*
Total	100%	*489*

Table 2.7 Percent and Number of Students Enrolled in All California Public School Districts by District Type and DPR IPM Training

	Had district attended DPR IPM training by June 2007?	Elementary	High School	Unified	Total
Percent of students	Yes	75%	75%	85%	82%
	No	25%	25%	15%	18%
	Total	100%	100%	100%	100%
Number of students	Yes	926,852	467,653	3,690,765	5,085,270
	No	300,776	153,944	667,644	1,122,364
	Total	1,227,628	621,597	4,358,409	6,207,634

Table 2.8 Respondent Responsibilities

		Percent	*Number of cases*
Designated IPM coordinator for district	Yes	83%	*409*
	No	17%	*85*
	Total	100%	*494*
For designated IPM coordinators, length of time with this responsibility	Less than 1 year	14%	*57*
	1-2 years	22%	*91*
	3-4 years	27%	*110*
	5-10 years	31%	*124*
	More than 10 years	6%	*26*
	Total	100%	*408*
Pest management responsibilities	Pest management and pesticide safety training	43%	*307*
	Setting pest management policies	43%	*212*
	Deciding when to apply pest management treatments	64%	*312*
	Deciding which pest management practices to use	64%	*315*
	Applying pest management treatments	53%	*260*
	Directing others to apply pest management treatments	70%	*342*
	Keeping records of all pest management treatments used	60%	*293*
	Other	4%	*21*
	Total	n/a	*489*

"n/a" means not applicable.

Table 2.9 Respondent Job Category*

	Number of cases	Percent
Administration	*50*	10%
Front office/business	*28*	6%
Safety/risk management	*19*	4%
Maintenance & Operations Director/Coordinator	*184*	38%
Maintenance & Operations Manager/Supervisor	*159*	32%
Maintenance & Operations Worker	*49*	10%
Total	*489*	100%

*The survey form asked respondents to write in their job title. Respondents provided nearly 200 different job titles. In order to construct the variable described here, the individual job titles were categorized according to area and level. Appendix Table 2.1 shows the distribution of job area and job level. The Maintenance and Operations categories include respondents with job titles involving one or more of the following areas: Maintenance, Operations, Transportation, Grounds, Facilities, Custodial, Buildings, Bus Drivers or Pest Management.

Chapter III - Relationship of District Characteristics, District Actions/Perceptions and IPM Policies and Practices within the 2007 Survey

This chapter summarizes the inter-relationships between district characteristics, district actions and perceptions, and their IPM policies and practices. This analysis answers the question: what is it that determines the IPM-related actions and perceptions and the IPM practices a school district adopts? It can also answer another question: what impact has DPR's IPM training program had on compliance with the HSA and the adoption of IPM policies and practices? Does the effect of training vary by type of district?

Impact of district characteristics and actions on IPM policies and practices (2007 multivariate analysis)

The impact of district characteristics on IPM policies and practices is assessed in three stages. First, the six non-redundant characteristics (region, location in a rural or urban area, district type, number of students -- instead of number of schools -- and cost per student, along with length of time as an IPM coordinator) are used as independent variables in models testing their effects on district actions and perceptions (adoption of an IPM program, participation in DPR training, the number of ant, perimeter and weed contracts – instead of the nature of those contracts, perceived barriers to using IPM practices and use of IPM information resources – instead of awareness of IPM resources) and on the use of policies and practices supportive of IPM, including scores on the HSA, IPM, ant and weed scales and the dichotomous variable, pesticide use. In the second stage, district actions and perceptions are used as independent variables in models describing the five IPM policies and practices measures. In the final stage, district characteristics and actions/perceptions are combined to produce a set of models explaining the five measures. The results of this three-stage analysis are summarized in Table 3.1.

Each model is described in terms of the percentage of variance in a given dependent variable that can be explained by a set of independent variables included in the model. Unexplained variance can be due to sampling and measurement error, as well as other, often unmeasured variables that are not included in the model. In the social sciences, the proportion of explained variation is typically well under 50%. Explained variation in the 20% range is certainly worth noting; percentages below 10% suggest a limited understanding of the forces affecting a dependent variable. The significance level of individual independent variables included in a model describes the strength of their effect on a dependent variable. The most significant effects have been boxed for easy identification. Lack of statistical significance, however, does not mean that a variable makes no contribution to the overall model.

Stage 1: Impact of district characteristics on actions and perceptions. District characteristics significantly affect adoption of an IPM program, participation in DPR's training, the number of pest control contracts held, perceived barriers to adopting IPM practices and use of IPM information resources (Table 3.2). The most effective model is that predicting contracting; 21.5% of the variance in the number of contracts is explained by location, region, and cost per student. Specifically, districts located in large cities have more pest control contracts than other districts. This difference is statistically significant for all areas except those in the urban fringes of a large city. Districts in the Bay Area have fewer pest control contracts than those in other regions of the state. Districts with higher per student costs have fewer contracts.

Three of the remaining four models explain roughly a third less variance than the number of contracts. Use of IPM information resources is predicted by four variables – location, district type, respondent's length of time as IPM coordinator and number of students. Elementary school districts are less apt to use these resources while districts in mid-sized cities are more apt to do so. Districts with more students and an IPM coordinator with more tenure are also more apt to use these resources.

Together, these variables predict 17.3% of the variance in use of information resources.

Three of the same variables – location, number of students and the respondent's length of time as IPM coordinator – predict 14.5% of the variance in adoption of an IPM program. Districts in large or small towns, the urban fringes of mid-size cities, and rural areas outside MSAs and those with more than 200 students are more likely to have adopted an IPM program (Appendix Table 3.3). A respondent's greater tenure as IPM coordinator is also associated with adoption of an IPM program.

A single significant variable -- cost per student predicts 12.5% of the variance in receipt of DPR training. Specifically, districts with the highest per student costs are less apt to have been trained (Appendix Table 3.4).

Finally, two district characteristics predict a small amount of variance (3.9%) in the perception of barriers to using IPM practices – the length of time a respondent has served as IPM coordinator is inversely related to the perception of barriers – the longer they've served, the less significant the barriers are perceived to be. And, districts in mid-sized cities are less apt to perceive barriers to adopting IPM practices (Table 3.2).

Impact of district characteristics on IPM policies and practices. With two exceptions, district characteristics have only a modest impact on IPM policies and practices. The exceptions are pesticide use, where district characteristics explain 26.2% of the variance, and compliance with the HSA, with 16.4% of the variance explained. Region, district type and number of students all contribute significantly to predicting whether a district uses non-exempt pesticides or not. Specifically, districts in the Central Valley are more apt to use non-exempt pesticides while elementary school districts are much less likely to use them. Districts with more than 200 students are more apt to use non-exempt pesticides (Table 3.3 and Appendix Table 3.5).

Four variables explain variation in HSA scale scores: the respondent's length of time as IPM coordinator, the number of students, the cost per student, and population area. HSA scores are higher when respondents have more experience as IPM coordinator and in districts with more students. They are also higher in mid-size cities and their urban fringes, and in large or small towns (borderline significance) than they are in large cities. HSA compliance is lower in districts with higher costs per student (Table 3.3).

The amount of predicted variation in the remaining three scales is much smaller, varying from a low of 7.2% for the ant scale to a high of 10.7% for the weed scale. Significant contributors to predicting scores on the ant scale are region and the respondent's length of time as IPM coordinator. The Sierra and Central Valley regions have less IPM-compatible ant management practices while districts with IPM coordinators that have more tenure use more IPM-compatible ant management practices.

Higher IPM scores occur in larger school districts – the only significant variable in a model explaining 9.2% of the variance.

IPM-compatible weed management practices occur less often in the North Central and Central Valley regions, the only significant variables in a model explaining 10.7% of the variance. Region or location team with number of students in the other three models (the HSA, IPM and weed scales) (Table 3.3).

Stage 2: Impact of district actions and perceptions on IPM policies and practices. The strongest models relating district actions and perceptions to their IPM policies and practices are those for HSA compliance and pesticide use. Compliance with the HSA is predicted by adoption of an IPM program and increased use of IPM information resources, which includes DPR's training. This model predicts 22.4% of the variance in HSA compliance.

Use of IPM information resources and the number of contracts held predict 17.9% of the variance in the use of non-exempt pesticides. Districts with more contracts are more apt to use non-exempt pesticides. Similarly, those that use more information resources – which include using information from pest control businesses – are also more likely to use non-exempt pesticides. (Three quarters of the districts engage in contracts and 81% of districts use a mix of exempt and non-exempt pesticides.)

The remaining three models explain half or less of the variance of the first two (11.3% for the Ant scale, 9.6% for the IPM scale and 5.1% for the Weed scale). Use of information resources

remains an important contributor to these three models as well. Adoption of an IPM program is important in two of them – the IPM policies and practices scale and the Ant scale. A district's number of contracts predicts higher scores on the IPM scale and lower scores on the Weed scale (Table 3.4).

It is important to note that participation in DPR's training, alone, was not a significant variable in predicting IPM policies and practices. However, as noted later in this analysis, its inclusion in the broader use of the resource use scale undoubtedly contributes to the importance of that variable.

Stage 3: Impact of district characteristics, actions and perceptions on IPM policies and practices. It is clear from the above analysis that, with the exception of pesticide use and HSA compliance, district characteristics and district actions/perceptions have only a modest impact on IPM policies and practices. Both have the greatest impact on the same measures: pesticide use and compliance with the HSA. However, district characteristics (specifically, region, number of students, and district type) alone have a greater impact on pesticide use (26.2% of the variance explained) while district actions/perceptions (specifically, adopting an IPM program and resource use) alone have a greater effect on compliance with the HSA (22.4% of the variance explained) (Tables 3.3 and 3.4).

District characteristics' impact on district actions and perceptions are somewhat similar to the effect of those actions and perceptions on IPM policies and practices. That is, district characteristics have a substantial impact (explaining 21.5% of the variance) on a single district action (number of contracts) and a mid-range impact (17.3%, 14.5% and 12.5%) on three others (use of IPM information resources, adopting an IPM program, and receipt of DPR's training), while district actions have a significant impact on compliance with the HSA(22.4%) and a range of lesser impacts on pesticide use (17.9%), the Ant scale (11.3%), the IPM scale (9.6%) and the Weed scale (5.1%).

When both district characteristics and district actions/perceptions are combined in models predicting IPM policies and practices, the models are stronger, predicting a greater percentage of the variance in the five outcome variables (Table 3.5).

The strongest model, predicting 29.1% of the variance, is that explaining variability in pesticide use. Districts with more contracts are more apt to use non-exempt pesticides.

Three actions – length of time as IPM coordinator, IPM program adoption and use of IPM information resources – are the only significant variables in the second strongest model, which explains 26.4% of the variance in compliance with the four requirements of the HSA. Districts with more experienced coordinators, that have adopted an IPM program and make greater use of IPM information resources, are more apt to comply with the HSA. Adoption of an IPM program and score on the resource use scale combine to explain 15.0% of the variance in the Ant scale. Districts that have adopted an IPM program and make greater use of IPM information resources are more apt to use IPM-compatible ant management practices.

Region, number of students, adoption of an IPM program, number of contracts held, and use of IPM resources are all significant variables in IPM scale model. The North Coast and districts which have adopted an IPM program are more likely to have a higher score on the IPM scale, and as the number of students and contracts held increase and the use of IPM resources goes up, so does the district score on the scale.

The least effective model is that predicting IPM-compatible weed management practices. Region predicts 10.3% of the variance in the Weed scale. Districts in north central California are less apt to use IPM-compatible weed management practices (See Table 3.5).

Impact of district characteristics on IPM resource awareness and use. The impact of training appears to be through its role in increasing awareness and use of information resources. Although the training program is one of those resources, there are seven others. Trained districts are aware of and use more of those resources than districts that have not been trained. Attending DPR's training program is the most important variable in predicting use of IPM information resources, and the second most important variable in predicting awareness (Table 3.6). Awareness is also positively associated with adoption of an IPM program.

Region was a third, but less important, variable predicting awareness; Bay Area districts were less apt to be aware of IPM information resources.

Clearly, DPR's training is encouraging school districts to use more of the information resources available to them. Use of these resources is highly predictive of compliance with the HSA, more IPM-compatible ant and weed management practices, greater use of IPM supportive policies, monitoring and record keeping, and a higher likelihood of using both exempt and non-exempt pesticides and herbicides (Table 3.1).

Table 3.1 Summary of Direction of Significant Standardized Betas on District Characteristics, Actions and Perceptions on District Actions, Perceptions, and IPM Policies and Practices (2007)

		Stage One										Stage Two					Stage Three				
		District actions and perceptions					IPM Policies and Practices					IPM Policies and Practices					IPM Policies and Practices				
		Adopt IPM program	Trained	Number of contracts	Barrier scale	Resource use scale	HSA	IPM	Ant	Weed	Pest use[2]	HSA	IPM	Ant	Weed	Pest use[2]	HSA	IPM	Ant	Weed	Pest use[2]
District charact-eristics[1]	Population area	+		-	-	+	+					Not in stage									
	Region			-					-	-	+							+		-	
	District type					-					-										
	Number of students	+				+	+	+			+							+			
	Cost per student		+	-			-														
	Length of time as IPM coordinat-or	+			-	+	+		+								+				
District actions and percep-tions	Adopted IPM program	Not in stage					Not in stage					+	+	+			+	+	+		
	Trained																				
	Number of contracts												+		-	+		+			-
	Barriers scale																				
	Resource Use scale											+	+	+	+	+	+	+	+		
Adjusted r square		.145	.125	.215	.039	.173	.164	.092	.072	.107	.262	.224	.096	.113	.051	.179	.264	.150	.150	.103	.291

[1] Reference categories are large city, LA/surrounding area, unified districts
[2]Negative on pesticide use practice means more likely to use good IPM practices.

Table 3.2 District Characteristics' Effect on District Actions and Perceptions (2007)

		Number of contracts		Barriers		Resource Use Scale		Adopted an IPM program				Trained			
Variable	Category	St. beta	Sig.[2]	St. beta	Sig. [2]	St. beta	Sig. [2]	B	S.E.	Sig. [2]	Exp(B)	B	S.E.	Sig. [2]	Exp(B)
Population area[1]	Mid city	-.188	.037	-.211	.041	.310	.003	1.224	.771	.112	3.402	.629	.792	.427	1.875
	Urban fringes of large city	-.200	.073	-.111	.390	.223	.094	1.076	.710	.129	2.933	.243	.733	.741	1.275
	Urban fringes of mid-size city	-.322	.004	-.125	.326	.110	.396	1.516	.772	.050	4.553	.360	.795	.651	1.433
	Large or small town	-.273	.000	-.098	.236	.053	.541	2.726	1.12	.015	15.28	.611	1.048	.560	1.842
	Rural, outside MSA	-.463	.000	-.099	.438	.130	.318	1.749	.893	.050	5.749	-.428	.895	.633	.652
	Rural, inside MSA	-.376	.000	-.057	.648	-.018	.885	.986	.765	.197	2.680	-.406	.784	.604	.666
Region[1]	North Coast	-.043	.542	-.090	.285	-.059	.474	-.464	.774	.548	.629	.982	.742	.185	2.670
	Sierra	-.048	.444	-.008	.910	-.048	.514	-.132	.573	.818	.877	.163	.526	.756	1.177
	North Central	.075	.170	.029	.638	-.016	.783	-.465	.614	.449	.628	.931	.648	.151	2.538
	Bay Area	-.116	.039	-.085	.195	-.069	.274	.152	.462	.743	1.164	.535	.450	.235	1.707
	Central Valley	.115	.075	-.031	.671	.055	.446	.349	.467	.455	1.418	.582	.426	.172	1.790
	Central Coastal	-.046	.387	.004	.953	.018	.757	-.993	.571	.082	.371	-.851	.547	.120	.427
	South Eastern	.091	.094	-.066	.289	-.078	.189	-.051	.509	.920	.950	-.808	.438	.065	.446
District type[1]	Elementary	-.045	.413	-.059	.353	-.148	.015	.136	.310	.662	1.146	-.538	.306	.079	.584
	High	.047	.343	-.035	.548	.007	.901	-.450	.486	.355	.638	-.857	.467	.067	.424
Number of students (ADA)		-.066	.276	.023	.753	.140	.048	.000	.000	.004	1.000	.000	.000	.086	1.000
Cost per student		-.154	.002	-.102	.071	-.043	.439	.000	.000	.902	1.000	.000	.000	.043	1.000
Length of time as IPM coordinator		-.028	.548	-.171	.002	.125	.016	.591	.119	.000	1.806	-.082	.108	.447	.921
Adjusted r square*		.215		.039		.173		.145				.125			
DF/N		388		353		330		397				399			

[1] Reference categories: Large city, LA/surrounding area, unified school district.
[2] Significance of linear or logistic regression. Probabilities ≤ .05 are boxed for easy identification.
*Cox and Snell r square in logistic regression.

Table 3.3 District Characteristics' Effect on IPM Policies and Practices (2007)

		HSA scale		IPM scale		Ant scale		Weed scale		Pesticide Use**			
Variable	Category	St. beta	Sig. [2]	St. beta	Sig. [2]	St. beta	Sig. [2]	St. beta	Sig. [2]	B	S.E.	Sig. [2]	Exp(B)***
Population area[1]	Mid city	.230	.046	.063	.554	.074	.507	-.139	.153	-17.581	8099.385	.998	.000
	Urban fringes of large city	.252	.075	.012	.931	-.070	.611	-.131	.274	-18.026	8099.385	.998	.000
	Urban fringes of mid-size city	.333	.020	.055	.688	.043	.760	-.042	.731	-18.547	8099.385	.998	.000
	Large or small town	.178	.057	-.010	.902	.032	.743	-.072	.357	-18.098	8099.385	.998	.000
	Rural, outside MSA	.053	.627	-.028	.825	.095	.455	.151	.174	-19.730	8099.385	.998	.000
	Rural, inside MSA	.213	.109	.080	.547	-.063	.616	.010	.931	-18.726	8099.385	.998	.000
Region[1]	North Coast	-.036	.619	.146	.067	.085	.343	.052	.494	-1.112	1.020	.276	.329
	Sierra	.038	.603	-.039	.583	-.158	.041	-.055	.420	.878	.810	.278	2.407
	North Central	.006	.933	-.081	.186	-.069	.291	-.193	.001	1.636	1.072	.127	5.137
	Bay Area	.096	.143	-.024	.710	.028	.681	-.017	.787	-.931	.626	.137	.394
	Central Valley	.053	.509	.027	.713	-.174	.029	-.145	.040	1.772	.734	.016	5.883
	Central Coastal	-.084	.185	-.101	.094	.049	.445	.077	.180	-.204	.747	.785	.815
	South Eastern	.013	.839	.066	.277	-.078	.231	.034	.562	-1.004	.684	.142	.366
District type[1]	Elementary	.027	.687	.033	.585	.017	.797	.040	.500	-.926	.448	.039	.396
	High	.029	.639	.019	.734	-.056	.357	-.037	.498	18.309	5987.221	.998	89472002
Number of students (ADA)		.239	.002	.295	.000	.079	.306	.066	.322	.000	.000	.051	1.000
Cost per student		-.140	.014	-.032	.557	.012	.840	.085	.111	.000	.000	.274	1.000
Length of time as IPM coordinator		.302	.000	.080	.124	.114	.046	-.008	.880	.005	.155	.976	1.005
Adjusted r square*		.164		.092		.072		.107		.262			
DF/N		286		359		306		372		364			

[1] Reference categories: Large city, LA/surrounding area, unified school district.
[2] Significance of linear or logistic regression. Probabilities ≤ .05 are boxed for easy identification.
*Cox and Snell r square in logistic regression.
**Pesticide Use is a dichotomized version of the Pesticide Use Scale, since a large majority of respondents had the same value on that scale (81% use a mix of non-exempt and exempt pesticides). The dichotomized variable uses 0 as no pesticides or only exempt pesticides, 1 as non-exempt or mix of non-exempt and exempt pesticides. Therefore, an Exp(B) value greater than 1.000 indicates a greater likelihood of using only non-exempt or a mix of non-exempt and exempt pesticides, and an Exp(B) value less than 1.000 indicates a greater likelihood of using no pesticides or only exempt pesticides.
***the Pesticide Use logistic regression population area results appear unusual since the reference category (large city) had no districts that used only exempt pesticides. Rerunning this regression using a different reference category did not produce any significant population areas. See Appendix Table 3.1 for that regression.

Table 3.4 District Actions and Perceptions' Effect on IPM Policies and Practices (2007)

	HSA scale		IPM scale		Ant scale		Weed scale		Pesticide Use**			
	St. beta	Sig.[1]	St. beta	Sig. [1]	St. beta	Sig. [1]	St. beta	Sig. [1]	B	S.E.	Sig. [1]	Exp(B)
Adopted IPM program	.340	.000	.183	.001	.176	0.003	-.061	.292	.211	.366	.564	1.235
Trained	.036	.533	.020	.718	.041	.493	-.074	.196	.482	.345	.162	1.619
Number of contracts held	.067	.219	.129	.016	-.106	.061	-.218	.000	1.102	.189	.000	3.010
Barriers scale	-.055	.337	.014	.803	-.059	.313	.020	.725	.031	.051	.539	1.032
Resource use scale	.212	.000	.173	.002	.224	.000	.115	.051	.163	.081	.044	1.177
Adjusted r square*	.224		.096		.113		.051		.179			
DF/N	264		337		284		337		330			

[1] Significance of linear or logistic regression. Probabilities ≤ .05 are boxed for easy identification.
*Cox and Snell r square in logistic regression.
**Pesticide Use is a dichotomized version of the Pesticide Use Scale, since a large majority of respondents had the same value on that scale (81% use a mix of non-exempt and exempt pesticides). The dichotomized variable uses 0 as no pesticides or only exempt pesticides, 1 as non-exempt or mix of non-exempt and exempt pesticides. Therefore, an Exp(B) value greater than 1.000 indicates a greater likelihood of using only non-exempt or a mix of non-exempt and exempt pesticides, and an Exp(B) value less than 1.000 indicates a greater likelihood of using no pesticides or only exempt pesticides.

Table 3.5 Combined Effect of District Characteristics, Actions and Perceptions on IPM Policies and Practices (2007)

		HSA scale		IPM scale		Ant scale		Weed scale		Pesticide Use**			
Variable		St. beta	Sig. [2]	St. beta	Sig. [2]	St. beta	Sig. [2]	St. beta	Sig. [2]	B	S.E.	Sig. [2]	Exp(B)***
Population area[1]	Mid city	.177	.157	.055	.640	.058	.646	-.110	.355	-15.559	9988.679	.999	.000
	Urban fringes of large city	.186	.222	.021	.889	-.113	.475	-.145	.324	-16.895	9988.679	.999	.000
	Urban fringes of mid-size city	.193	.207	.067	.648	-.013	.931	-.011	.937	-16.897	9988.679	.999	.000
	Large or small town	.137	.185	.017	.857	-.039	.726	-.097	.321	-16.120	9988.679	.999	.000
	Rural, outside MSA	-.023	.852	.011	.938	.081	.600	.129	.388	-18.060	9988.679	.999	.000
	Rural, inside MSA	.138	.323	.148	.299	-.033	.815	-.022	.874	-17.337	9988.679	.999	.000
Region[1]	North Coast	-.010	.898	.191	.037	.177	.088	.068	.470	-1.134	1.228	.356	.322
	Sierra	-.003	.966	-.025	.748	-.089	.316	-.061	.465	1.190	.983	.226	3.288
	North Central	.000	.996	-.123	.068	-.073	.313	-.205	.004	1.849	1.456	.204	6.351
	Bay Area	.050	.488	-.023	.748	.054	.482	-.030	.682	-.290	.757	.702	.748
	Central Valley	.001	.990	.030	.707	-.091	.296	-.111	.180	1.607	.846	.058	4.990
	Central Coastal	.005	.945	-.045	.491	.110	.124	.053	.432	-.254	.877	.772	.775
	South Eastern	.022	.751	.062	.362	-.070	.340	.019	.788	-1.080	.807	.181	.340
District type[1]	Elementary	.059	.429	.043	.538	.007	.927	.004	.952	-.953	.536	.076	.386
	High	.024	.719	.011	.860	-.053	.422	-.027	.677	18.201	6949.758	.998	80293886
Number of students (ADA)		.105	.204	.279	.000	.060	.484	.053	.515	.000	.000	.203	1.000
Cost per student		-.015	.820	.058	.359	.025	.719	.079	.235	.000	.000	.466	1.000
Length of time as IPM coordinator		.216	.001	-.041	.514	.087	.199	-.031	.625	-.011	.208	.959	.989
Adopted IPM program		.329	.000	.133	.035	.180	.008	-.063	.341	-.054	.540	.921	.948
Trained		.052	.439	-.032	.615	.038	.585	-.004	.947	.232	.483	.631	1.261
Number of contracts held		.032	.641	.181	.007	.003	.966	-.101	.153	.599	.256	.019	1.821
Barriers scale		.044	.509	.019	.756	-.035	.594	-.042	.505	.009	.074	.900	1.009
Resource use scale		.161	.027	.189	.005	.164	.024	.127	.067	.058	.114	.613	1.060
Adjusted r square*		.264		.150		.150		.103		.291			
DF/N		215		271		233		270		267			

[1] Reference categories: Large city, LA/surrounding area, unified school district.
[2] Significance of linear or logistic regression. Probabilities ≤ .05 are boxed for easy identification.
*Cox and Snell r square in logistic regression.
**Pesticide Use is a dichotomized version of the Pesticide Use Scale, since a large majority of respondents had the same value on that scale (81% use a mix of non-exempt and exempt pesticides). The dichotomized variable uses 0 as no pesticides or only exempt pesticides, 1 as non-exempt or mix of non-exempt and exempt pesticides. Therefore, an Exp(B) value greater than 1.000 indicates a greater likelihood of using only non-exempt or a mix of non-exempt and exempt pesticides, and an Exp(B) value less than 1.000 indicates a greater likelihood of using no pesticides or only exempt pesticides.
***the Pesticide Use logistic regression population area results appear unusual since the reference category (large city) had no districts that used only exempt pesticides. Rerunning this regression using a different reference category did not produce any significant population areas. See Appendix Table 3.2 for that regression.

Table 3.6 Combined Effect of District Characteristics, Actions and Perceptions on IPM Resource Awareness and Use Scales (2007)

		Awareness		Use	
Variable		St. beta	Sig. [2]	St. beta	Sig. [2]
Population area[1]	Mid city	.147	.134	.143	.128
	Urban fringes of large city	.178	.139	-.013	.913
	Urban fringes of mid-size city	.152	.186	-.085	.436
	Large or small town	.065	.428	-.092	.240
	Rural, outside MSA	.050	.678	-.009	.939
	Rural, inside MSA	.098	.371	-.133	.203
Region[1]	North Coast	-.033	.686	-.103	.184
	Sierra	-.082	.240	-.068	.304
	North Central	.010	.868	.000	.999
	Bay Area	-.122	.039	-.099	.080
	Central Valley	-.088	.197	-.007	.915
	Central Coastal	.033	.552	.072	.179
	South Eastern	-.035	.545	-.058	.288
District type[1]	Elementary	-.093	.097	-.115	.032
	High	.038	.474	.049	.340
Number of students (ADA)		.034	.531	.055	.294
Cost per student		.024	.669	-.038	.473
Adopted IPM program		.297	.000	.192	.000
Trained		.145	.006	.250	.000
Number of contracts held		-.033	.564	-.076	.166
Barriers scale		-.072	.167	-.100	.046
Adjusted r square*		.153		.231	
DF/N		354		354	

[1] Reference categories: Large city, LA/surrounding area, unified school district.
[2]Significance of linear regression. Probabilities ≤ .05 are boxed for easy identification.

Table 3.7 Mean Scores on IPM Policies and Practices by Length of Time as an IPM Coordinator (2007)

Length of time as IPM coordinator	HSA scale			IPM scale			Ant scale			Weed scale			Barriers scale		
	Mean	*N*	SD	Mean	*N*	SD	Mean	*N*	SD	Mean	*N*	SD	Mean	*N*	SD
Less than 1 year	26.90	*42*	14.90	12.65	*49*	9.90	88.66	*44*	27.20	79.83	*54*	29.46	13.75	*48*	3.31
1 -2 years	33.22	*59*	10.08	14.13	*80*	8.96	92.47	*66*	25.77	83.50	*80*	32.29	12.70	*77*	3.48
3-4 years	34.53	*75*	8.43	14.16	*101*	8.22	92.42	*84*	27.33	78.96	*105*	33.38	12.89	*101*	3.17
5-10 years	37.78	*99*	5.06	15.31	*113*	9.83	97.67	*101*	28.16	78.97	*117*	33.95	11.61	*110*	2.79
More than 10 years	34.38	*16*	9.64	15.83	*24*	9.63	102.33	*18*	32.45	83.71	*24*	33.93	12.40	*25*	2.97
Total	34.26	*291*	9.78	14.41	*367*	9.21	94.17	*313*	27.64	80.34	*380*	32.73	12.54	*361*	3.20
Significance[1]	.000			.467			.238			.845			.001		

[1] Significance of ANOVA F-test . Probabilities ≤ .05 are boxed for easy identification.

Table 3.8 Type of Insecticide Practice and Belief in Effectiveness of that Practice (2007)

Method	Non-exempt practices only		Both exempt and non-exempt		Exempt practices only		*p*[1]
	believe effective	believe not effective/ uncertain	believe effective	believe not effective/ uncertain	believe effective	believe not effective/ uncertain	
Insecticide from aerosol can	100%	0%	91.3%	8.7%	n/a		.770
N	*3*	*0*	*42*	*4*			
Insecticide from other spray method	71.4%	28.6%	97.4%	2.6%			.026
N	*5*	*2*	*112*	*3*			
Exempt insecticidal spray	n/a		71.4%	28.6%	86.7%	13.3%	
N			*40*	*16*	*52*	*8*	.043
Ant baits			93.7%	6.3%	90.4%	9.6%	
N			*89*	*6*	*123*	*13*	.377
Soapy water spray			62.1%	37.9%	80.2%	19.8%	
N			*36*	*22*	*89*	*22*	.011
Caulk/seal cracks to prevent entry			87.1%	12.9%	89.4%	10.6%	
N			*81*	*12*	*118*	*14*	.596
Improved sanitation			93.8%	6.2%	89.9%	10.1%	
N			*122*	*8*	*151*	*17*	.221

[1] Significance of chi square or Fisher's Exact test. Probabilities ≤ .05 are boxed for easy identification.
"n/a" means not applicable.

Table 3.9 Type of Herbicide Practice and Belief in Effectiveness of that Practice (2007)

Method	Non-exempt practices only		Both exempt and non-exempt		Exempt practices only		
	believe effective	believe not effective/ uncertain	believe effective	believe not effective/ uncertain	believe effective	believe not effective/ uncertain	*p*[1]
Broadcast treatment with herbicides	83.3%	16.7%	94%	6%	n/a		.331
N	*5*	*1*	*156*	*10*			
Spot treatment with herbicides	100%	0%	98.8%	1.2%			.784
N	*21*	*0*	*333*	*4*			
Use of mulches, ground covers, barrier cloth or plastic	n/a		93%	7%	95.2%	4.8%	.452
N			*200*	*15*	*40*	*2*	
Physical controls such as hand pulling, cultivating, mowing			90.4%	9.6%	91.4%	8.6%	.504
N			*303*	*32*	*64*	*6*	
Flaming			85.2%	14.8%	100%	0%	.266
N			*23*	*4*	*10*	*0*	
Irrigation mgt			84.3%	15.7%	86.4%	13.6%	.548
N			*156*	*29*	*19*	*3*	
Turf selection			86.3%	13.7%	100%	0%	.250
N			*82*	*13*	*10*	*0*	

[1] Significance of Fisher's Exact test. Probabilities ≤ .05 are boxed for easy identification.
"n/a" means not applicable.

Table 3.10 Multivariate Analysis of Variance: Impact of Training and Contracting on IPM Policies and Practices (2007)

		Means		Significance of test variables[1]			
Scale	Change in training status	Not Trained	Trained	Corrected model	Training status	Contract status	Interaction between contracting and training
HSA scale	No contracts held	30	32.19	.010	.080	.080	.745
	One or more contracts held	32.19	35.37				
IPM scale	No contracts held	10.23	13.97	.009	.027	.016	.220
	One or more contracts held	14.20	15.27				
Ant scale	No contracts held	101.1	104.24	.008	.236	.001	.695
	One or more contracts held	86.77	93.02				
Weed scale	No contracts held	97.80	89.33	.000	.124	.000	.509
	One or more contracts held	79.86	76.47				
Resource Awareness scale	No contracts held	4.9	5.89	.000	.000	.401	.965
	One or more contracts held	5.12	6.13				
Resource Use scale	No contracts held	2.18	3.93	.000	.000	.104	.379
	One or more contracts held	2.84	4.12				
Barriers Scale	No contracts held	12.52	12.10	.354	.870	.567	.218
	One or more contracts held	12.26	12.82				

[1] Significance of multivariate analysis of variance. Probabilities ≤ .05 are boxed for easy identification.

School district experience with the HSA and broader coverage by DPR's IPM training program should increase compliance with HSA provisions and improve IPM practices in schools throughout the state. To determine whether these positive changes have occurred, responses to the same questions were compared between at least two survey years (2004 and 2007) and sometimes four (2001, 2002, 2004 and 2007). Although a consistent increase or decrease over three or four points in time is suggestive of a linear trend, changes between two points in time could reflect a difference in the type of person or district responding to the questionnaire rather than changed behavior on the part of a specific set of school districts. This limitation of the trend design cannot be overcome in assessing change over four survey years because the identity of school districts participating in the 2001 and 2002 surveys was not available and, therefore, their previous responses could not be matched with their 2004 or 2007 responses. Information on the job responsibilities of the respondent was also not available in the first two survey years, so the impact of respondent experience with IPM and their level of responsibility within the school district could not be assessed.

Beginning in 2004, however, information identifying the responding school district and the respondent's IPM responsibilities was included in the data file. As a result, a panel analysis can be performed on districts responding in both 2004 and 2007. In a panel analysis, changes can be tracked by district and controlled by the role and experience of the respondents. This will increase the likelihood that any observed changes could be tied to DPR training, district experience with the HSA, or other district characteristics. The panel analysis is described in Chapter 5.

This chapter describes the changes that occurred between DPR's surveys of IPM policies and practices in California's school districts. The chapter is divided into four sections, generally paralleling the 2007 survey's organizational structure. Within each section, comparisons are made over two, three or four survey years, depending upon the question. The 2007 survey retained six questions from the 2001 and 2002 surveys (questions 4, 10, 13, 14, 15 and 19), allowing a comparison over four survey years. Another seven questions were introduced in 2002 (questions 2, 3, 5, 6, 7, 23 and 24), permitting a comparison over three survey years. Questions on the 2004 survey that were either revised or reformatted versions of questions asked on the earlier surveys (9, 11, 12, 16, 17 and 18) or newly introduced in 2004 (8, 20, 21 and 22) permit comparisons over two survey years. The inclusion of questions about specific insecticide and herbicide practices since 2002 made it possible to design a pesticide use scale that could be compared over three survey years.

District and Respondent Characteristics

Since the interpretation of changes in IPM practices can be influenced by the characteristics of districts responding to the survey, it is important to understand what changes, if any, have occurred in the characteristics of districts responding in 2004 and 2007 – the two years for which reliable data is available. There were no differences between the two years on region and type of district (elementary, high school or unified) (Table 4.1) .However, districts responding in 2007 were significantly different in their urban/rural distribution, number of schools, cost per student and, of course, percent trained. Districts responding in 2007 were more likely to be located in mid-size cities or their urban fringe or rural areas within an MSA, and were more likely to represent small districts with only 1 or 2 schools, districts with higher costs per student and districts that had received DPR's IPM training. These differences are probably the result of DPR's training priorities, which focused first on districts with the largest numbers of students and subsequently on smaller and less urban districts. By 2007, DPR's training program had reached a significant percentage of the state's districts.

There has been no change in the proportion of responding districts that have adopted an IPM program (69-70% in 2002, 2004 and 2007. But compared to 2002, more 2004 and 2007 survey

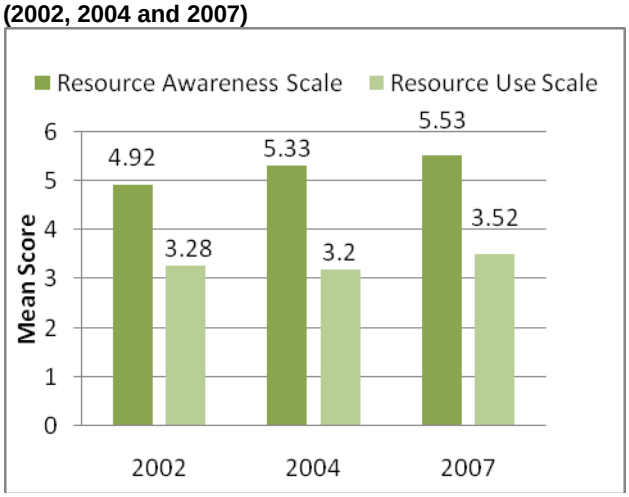
respondents were unsure about whether their district had adopted a program (Table 4.2).

There has been a steady increase in the proportion of districts that believe that adopting an IPM program has resulted in more effective pest management – from a low of 41% in 2002 to 49% in 2004 and a high of 62% in 2007. There has been no agreement on the impact of an IPM program on the cost of pest management and no change in that lack of agreement over time (Table 4.2). There was an increase in respondents' years of service as IPM coordinator (30% have been in this position for 5 to 10 years, up from 9% in 2004). There were changes in the respondents' specific pest management responsibilities. More are responsible for using pest management practices and fewer are responsible for keeping records of pest management practices used (Table 4.4). There were no significant changes in 2004 and 2007 respondents' job categories, but in 2007, there were slightly more respondents working in maintenance and operations and slightly fewer in administrative, business and risk management positions (Table 4.5).

There was no change in the significance of barriers to using IPM practices between 2004 and 2007. With means close to the 25th percentile, districts did not see the eight possible barriers as having any significant effect on the use of IPM in either year (Table 4.6). There was also no change in the number and nature of pest control contracts entered into by districts between 2004 and 2007 (Table 4.7).

Significant, linear increases in resource awareness and use of IPM information resources from 2002 to 2007 suggests that school district personnel are not only getting trained in IPM practices, they are also learning about and using related resources introduced during the training. By 2007, respondents were aware of 5.5 of the eight resources identified in the survey, up from 4.9 in 2002. Specifically, more respondents had experienced presentations on school IPM by DPR staff (40% vs. 29% in 2002 and 2004), more had attended training workshops on school IPM (60% vs. 51% in the earlier years), and, although more were aware of the resource, significantly fewer were using information provided by licensed pest control businesses (52% in 2007 vs. 67% and 56% in 2002 and 2004 respectively). Because of the significant decline in use of this one resource, an increase in the Resource Use scale has borderline significance ($p = .059$), with a 2007 mean of 3.5 resources used compared with 3.28 in 2002. Thus, resource awareness grew by 12% while usage increased by 7% (Figure 4.1 and Table 4.8).

Figure 4.1 Resource Use and Awareness Trends (2002, 2004 and 2007)

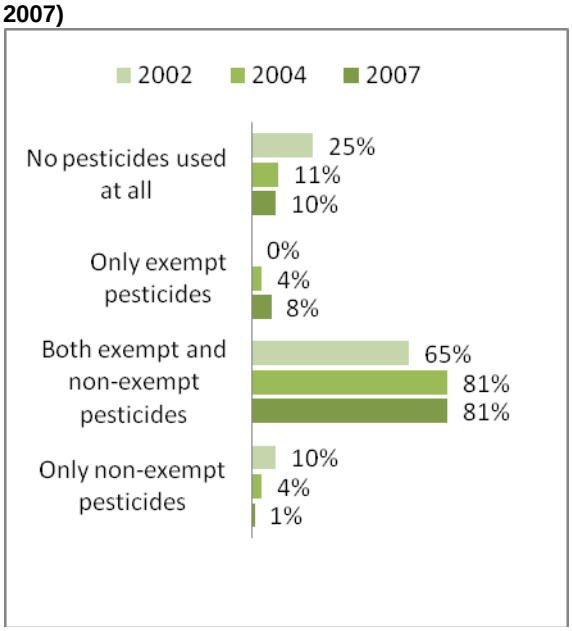


Respondents were also asked to rate their district on IPM-related issues for the past year. These included communication between district pest managers and other district staff on pest management issues, availability of technical information on pest management in schools, overall reduction of exposure to pesticides, training opportunity for district staff in pest management and contracting procedures for hiring outside pest control services. No significant changes occurred in respondent ratings (Table 4.9). A majority of respondents in all years gave a "good" rating to communication between district pest managers and other district staff, the availability of technical information on pest management in schools, overall reduction of exposure to pesticides, and contracting procedures used for hiring outside pest control services. A plurality rated the use of pest prevention methods as good (47 – 48%) with a similar percentage rating this as fair (43 – 45%). Pluralities also rated as "fair" the use of pest monitoring methods and training opportunities for district staff in pest management. Ratings could not be compared for two items in the 2002 survey—use of pest prevention methods and use of pest monitoring methods—because these had been combined in the earlier survey.

Pesticide Use

Because respondents could indicate their district's specific pesticide and herbicide practices over the last three surveys, it was possible to create a pesticide use scale based on actual practices for 2002, 2004 and 2007. Figure 4.2 and Table 4.10 indicate a significant decline in districts using only non-exempt pesticides and no pesticides at all with a concomitant increase in districts using only exempt pesticides or a combination of both exempt and non-exempt pesticides and practices. The marked change between 2002 and 2004 suggests that the shift may be due to an improved understanding of what a pesticide is and the distinction between exempt and non-exempt practices rather than a change in actual behavior. While the 100% increase (from 4% to 8% in 2004 and 2007) in districts using only exempt practices is heartening, most districts (80 – 81% in 2004 and 2007, up from 65% in 2002) use both exempt and non-exempt practices.

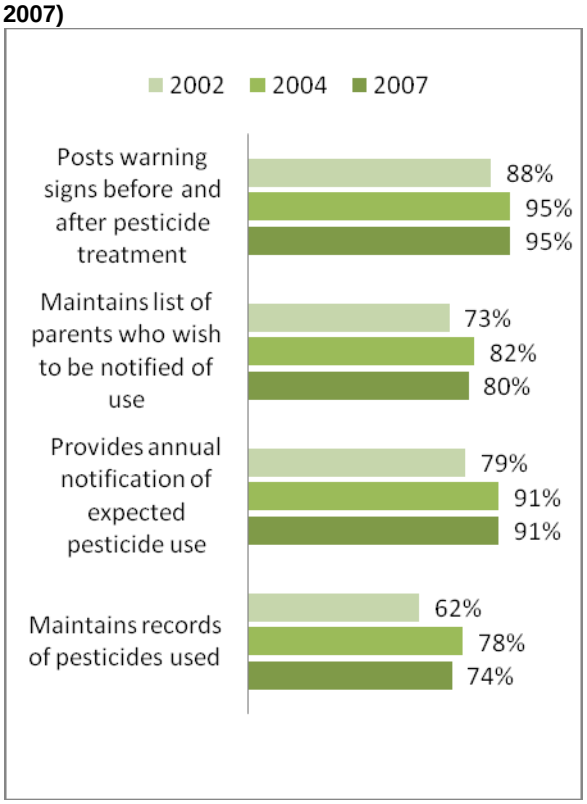
Figure 4.2 Pesticide Use Trends (2002, 2004 and 2007)



Healthy Schools Act Scale

School district compliance with each of the four HSA requirements has increased significantly between 2002 and 2007, with most of the change occurring between 2002 and 2004 (Figure 4.3 and Table 4.11). While compliance in 2002 ranged between 62% and 88%, it varied more narrowly between 74% and 95% in 2007. Mean scores on the HSA scale reinforce this trend, increasing significantly (from 30.2 in 2002 to 34.6 in 2004 and 33.9 in 2007) while variation around the means decreased (from 12.9 to 9.7 and 9.9 respectively).

Figure 4.3 Percent of Districts Officially Adopting Practices Required for Compliance with the Healthy Schools Act (2002, 2004 and 2007)

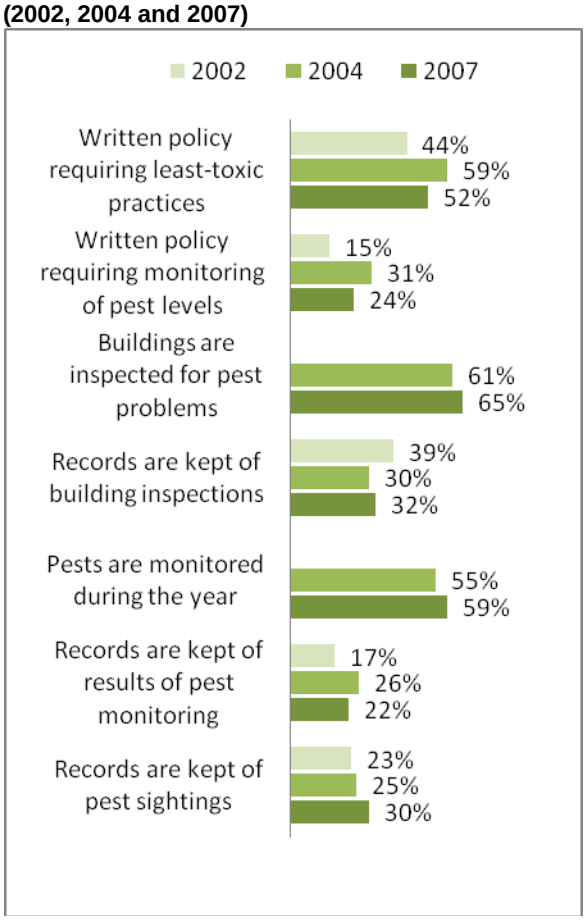


IPM Policies and Practices Scale

Scores on the IPM policies and practices scale did not change between 2004 and 2007. The 2004 mean was 14.7, the 2007 mean, 14.3 (See Figure 4.4 and Table 4.12). Some record keeping activities increased significantly between the two years (e.g., keeping records of building inspections and pest sightings). Others, however, decreased, including keeping records of pest monitoring results and having written policies requiring use of the least toxic pest management practices and monitoring of pest levels. One item not included in the scale – maintaining a list of pesticide products approved for use in district schools – increased significantly between 2002 and 2004 (from 50% to 67%), declining in 2007 to 61%. Whether these differences reflect real changes in district behaviors (towards less IPM supportive policies

but more monitoring), a difference in the areas of expertise of respondents completing the survey, or the characteristics of responding districts (more small districts in mid-sized cities and rural areas) will be explored in the panel analysis in Chapter 5.

Figure 4.4 Percent of Districts Adopting Additional IPM Policies, Practices, and Activities (2002, 2004 and 2007)



Ant Management Practices

Most school districts (75% to 83%) had done something to manage ants inside school buildings in the years preceding the four surveys (Table 4.13). The question wording varied slightly in each of the surveys with the 2001 survey asking for ant management practices during the past *two* years while the 2002, 2004 and 2007 surveys asked about the preceding 12 months. However, the consistency of responses on ant management over four survey years increases confidence in the results. The significant decline in this proportion since 2002 may reflect a change in the type of districts trained and responding to the surveys. Ants may be more of a problem in large, urban school districts.

Ant baits and non-exempt aerosol sprays were the most common methods of managing ants in 2001 (37% and 32% respectively) (Table 4.13). The use of ant baits almost doubled between 2002 and 2007, while use of the non-exempt aerosol sprays was halved over the same time period. Other IPM-compatible methods also increased dramatically -- soapy water spray (from 14% to 51%), caulking (from 19% to 69%), and improved sanitation (from 63% in 2002 to 88% in 2007). On the other hand, the use of non-exempt sprays using another application method increased as well, from 21% in 2001 to 37% in 2007, taking up the slack, so to speak, of the decrease in the use of non-exempt aerosol sprays (Table 4.13).

Ant baits were the one method most frequently used to manage ants in all four survey years (32%). However, while the use of non-exempt aerosol sprays was the second most common single method used to manage ants in 2001 (23%), this method was replaced by improved sanitation in subsequent survey years (21 – 24% vs. 5 to 9% using non-exempt aerosol sprays). Non-exempt sprays using another application method remained a persistent third in all four survey years (Table 4.13).

Scores on the ant management scale increased significantly between 2004 and 2007 from 89.0 to 93.7 (Table 4.13).

Weed Management Practices

Almost all school districts have done something to manage weeds in the years preceding the four surveys (91% to 94%) (Table 4.14). Despite slight changes in wording and time frames, weed management is commonplace in California schools. In 2001, the most frequently used practices for managing weeds were spot treatment with herbicides (68%) and physical controls such as hand pulling, cultivating, and mowing (61%). In 2002, the same methods dominated, but the order was reversed (61% and 68% respectively). In 2004, the noticeable increase in the use of all weed management methods is probably the result of a change in question wording. In the first two years, respondents were asked which methods their district "typically" used to manage weeds. In 2004 and 2007, respondents were asked

whether their district *used* the following practices to manage weeds. Fewer respondents selected a practice as "typical;" many more indicated simple use of a practice. Physical controls and spot treatment with herbicides remain the most common practices (91- 94% and 80-82% respectively). Over half (55- 60%) of all districts use mulches and roughly half (41 - 50%) use irrigation management. A similar percentage (42%) used broadcast treatment with herbicides in 2007.

In general, the practices used most often in 2007 to manage weeds on athletic fields and playgrounds were very similar to those reported in 2004. Spot treatment with herbicides and physical controls remained the most frequently used practices in both locations. There were, however, some small but statistically significant shifts.

There was a decrease from 2004 to 2007 in the percent of districts reporting that herbicide spot treatment was the method they most often used to manage weeds in both athletic fields and playgrounds. The percent of districts reporting that herbicide spot treatments was the method they used most frequently for athletic fields fell from 40% in 2004 to 34% in 2007. And the percent of districts reporting that herbicide spot treatments was the method they used most frequently for playgrounds fell from 48% in 2004 to 43% in 2007.

On a less positive note, there was also a small increase in the percent of districts indicating that broadcast treatments with herbicides was the method they used most often on athletic fields. Thirteen percent of districts in 2004 said this was the practice they used most often for athletic fields, compared with 16% in 2007. Far fewer districts said that broadcast herbicides are the method they use most frequently for playgrounds (6%), but no decrease in this method was reported for 2007.

The location where weeds cause the most problems for schools has shifted from fence rows and athletic fields/playgrounds (33% and 32% in 2001) to fence rows and landscaping in the last three survey years (32 to 39% for fence rows and 29 to 35% for landscaping). Trouble with weeds on athletic fields and playgrounds decreased from a high of 32% in 2001 to 17% and 20% in 2004 and 2007 respectively (Table 4.14).

With a significant increase in mean weed management scale scores (from 69.5 to 80.8), it can be concluded that districts significantly improved their weed management practices between 2004 and 2007.

Table 4.1 Characteristics of Responding Districts* (2004 and 2007)

		2004	2007	p^1
Population Area	Large city	4%	4%	.000
	Mid-size city	10	15	
	Urban fringes of large city	36	26	
	Urban fringes of mid-size city	12	20	
	Large town	1	0	
	Small town	6	4	
	Rural, outside MSA	16	12	
	Rural, inside MSA	15	18	
	Total	100%	100%	
Region	North Coastal	8%	8%	.782
	Sierra	13	10	
	North Central	8	7	
	Bay Area	14	15	
	Central Valley	19	23	
	Central Coastal	5	7	
	LA/Surrounding Area	23	22	
	South Eastern	10	10	
	Total	100%	100%	
District Type	Elementary	53%	54%	.815
	High	9	10	
	Unified	38	36	
	Total	100%	100%	
Number of schools in district	1-2 schools	19%	31%	.001
	3-4	15	13	
	5-9	29	22	
	10-19	22	20	
	20 or more	15	14	
	Total	100%	100%	
Average Daily Attendance	Under 200 students	16%	19%	.780
	200-499	10	9	
	500-999	11	10	
	1,000-1,999	9	11	
	2,000-2,999	8	8	
	3,000-4,999	11	9	
	5,000-9,999	15	14	
	10,000 or more	20	20	
	Total	100%	100%	
Cost per Student	Under $6,000	12%	2%	.000
	$6,000-$6,499	25	8	
	$6,500-$6,999	27	19	
	$7,000-$7,999	19	38	
	$8,000-$9,999	8	17	
	$10,000 or more	9	15	
	Total	100%	100%	
Did the district attend training?	No	72%	30%	.000
	Yes	28	70	
	Total	100%	100%	
Total Responding Districts		527	505	

* Six responding districts in 2004 removed their district identification from their surveys. Those six districts have been dropped from all trend analyses, so 2004 figures in this report will not always exactly match previously published data.

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 4.2 Adoption of IPM Program and Impact of IPM Program on Effectiveness and Long-Term Cost of Pest Management (2002, 2004, and 2007)

		2002	2004	2007	*p*[1]
Has district adopted an IPM program?	Yes	70%	69%	70%	.006
	No	23%	18%	18%	
	Not sure	7%	13%	12%	
	Total %	100%	100%	100%	
	Number of cases	*413*	*515*	*499*	
Impact of IPM program on effectiveness of pest management[1]	More effective	41%	49%	62%	.000
	Made no difference	20%	23%	16%	
	Resulted in less effective pest management	20%	15%	9%	
	Uncertain/no opinion	19%	13%	13%	
	Total %	100%	100%	100%	
	Number of cases	*285*	*349*	*347*	
Impact of IPM program on long-term cost of pest management[1]	Reduced the long term cost	28%	32%	29%	.407
	Had no impact on long term cost	25%	25%	28%	
	Increased the long term cost	28%	21%	25%	
	Uncertain/no opinion	19%	22%	18%	
	Total %	100%	100%	100%	
	Number of cases	*286*	*348*	*343*	

[1]Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 4.3 IPM Coordinator Designation and Tenure in Position (2004 and 2007)

		2004	2007	*p*[1]
Are you the designated IPM coordinator?	Yes	84%	83%	.735
	No	16%	17%	
	Total %	100%	100%	
	Number of cases	*518*	*494*	
If yes, for how long?	Less than 1 year	16%	14%	.000
	1-2 years	34%	22%	
	3-4 years	34%	27%	
	5-10 years	9%	30%	
	more than 10 years	7%	6%	
	Total %	100%	100%	
	Number of cases	*429*	*408*	

[1]Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 4.4 Pest Management Responsibilities of Respondent (2004 and 2007)

	2004	2007	p^1
Pest management and pesticide safety training	62%	61%	.781
Setting pest management policies	48%	42%	.074
Deciding when to use pest management practices	65%	62%	.292
Deciding which pest management practices to use	64%	62%	.639
Using pest management practices	32%	51%	.000
Directing others to use pest management practices	70%	68%	.504
Keeping records of all pest management practices	68%	58%	.002
Other	3%	4%	.291

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 4.5 Respondent Job Categories (2004 and 2007)

	2004	2007	p^1
Administration	14%	10%	.088
Front office/business	8%	6%	
Safety/risk management	5%	4%	
MO Director/coordinator	34%	38%	
MO Manager/supervisor	27%	33%	
MO Worker	12%	10%	
Total %	100%	100%	
Number of cases	*485*	*489*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 4.6 Perceived Significance of Barriers to Using IPM Practices (2004 and 2007)

Year	Barriers Scale Mean²	Standard Deviation	*N*	p^1
2004	12.67	3.558	*427*	.849
2007	12.63	3.325	*443*	

[1]Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.
² See Appendix Table 4.1 for change in the individual components of the scale.

Table 4.7 Number and Nature of Contracts held by Responding Districts (2004 and 2007)

Number of contracts held	2004	2007	p^1
None or termite only	27%	23%	.457
One	28%	29%	
Two	28%	30%	
Three	16%	19%	
Total %	100%	100%	
Number of cases	*517*	*489*	
Nature of contracts held	2004	2007	p^1
None or termite only	27%	23%	.105
Ant or perimeter or both	42%	40%	
Grounds only	4%	7%	
Ant plus grounds or perimeter plus grounds	26%	29%	
Total %	100%	100%	
Number of cases	*517*	*489*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 4.8 Respondent Awareness and Use of Pest Management Information Resources (2002, 2004 and 2007)

		2002	2004	2007	p^1
DPR School IPM Website	Have accessed	57%	58%	64%	.167
	Aware of but have not accessed	20	21	19	
	Not aware of	23	21	17	
	Total %	100%	100%	100%	
	Number of cases	383	503	474	
Brochures/handouts from DPR	Have accessed	61%	59%	63%	.067
	Aware of but have not accessed	16	18	20	
	Not aware of	23	22	16	
	Total %	100%	100%	100%	
	Number of cases	383	498	473	
Presentations on school IPM by DPR staff	Have accessed	29%	29%	40%	.000
	Aware of but have not accessed	27	36	30	
	Not aware of	44	34	30	
	Total %	100%	100%	100%	
	Number of cases	374	483	458	
Training workshops on school IPM	Have accessed	51%	51%	60%	.000
	Aware of but have not accessed	23	30	25	
	Not aware of	26	19	15	
	Total %	100%	100%	100%	
	Number of cases	390	501	478	
Information provided by licensed pest control businesses	Have accessed	67%	56%	52%	.000
	Aware of but have not accessed	14	23	24	
	Not aware of	19	20	24	
	Total %	100%	100%	100%	
	Number of cases	388	494	472	
University of California resources	Have accessed	27%	27%	33%	.195
	Aware of but have not accessed	30	33	31	
	Not aware of	43	40	37	
	Total %	100%	100%	100%	
	Number of cases	366	483	456	
Information from other web site sources	Have accessed	39%	35%	40%	.080
	Aware of but have not accessed	23	27	28	
	Not aware of	39	37	31	
	Total %	100%	100%	100%	
	Number of cases	362	484	457	
CA Dept of Education, School Facilities Planning Division	Have accessed	25%	21%	20%	.089
	Aware of but have not accessed	29	36	37	
	Not aware of	47	42	43	
	Total %	100%	100%	100%	
	Number of cases	369	481	448	
Resource Awareness Scale	Mean	4.92	5.33	5.53	.001
	Standard Deviation	2.42	2.51	2.33	
	Number of cases	413	520	494	
Resource Use Scale	Mean	3.28	3.20	3.52	.059
	Standard Deviation	2.11	2.24	2.21	
	Number of cases	413	520	494	

[1]Significance of chi square for individual practices and policies. Significance of ANOVA F-test for the Resource Awareness and Resource Use Scales. Probabilities ≤ .05 are boxed for easy identification.

Table 4.9 Respondent Ratings of IPM Related Issues (2002, 2004 and 2007)

		2002	2004*	2007*	*p*[1]
Communication between district pest manager(s) and other district staff	Good	58%	56%	56%	.901
	Fair	35%	35%	35%	
	Poor	8%	9%	10%	
	Total %	100%	100%	100%	
	Number of cases	406	496	476	
Availability of technical info on pest management in schools	Good	50%	56%	57%	.099
	Fair	38%	34%	35%	
	Poor	12%	10%	8%	
	Total %	100%	100%	100%	
	Number of cases	405	489	477	
Use of pest prevention methods	Good	-	47%	48%	.188
	Fair	-	43%	45%	
	Poor	-	11%	7%	
	Total %	-	100%	100%	
	Number of cases	-	494	475	
Use of pest monitoring methods	Good	-	35%	36%	.923
	Fair	-	47%	47%	
	Poor	-	18%	17%	
	Total %	-	100%	100%	
	Number of cases	-	472	459	
Overall reduction of exposure to pesticides	Good	73%	71%	71%	.851
	Fair	25%	26%	27%	
	Poor	2%	3%	2%	
	Total %	100%	100%	100%	
	Number of cases	408	497	469	
Training opportunities for district staff in pest management	Good	38%	35%	36%	.088
	Fair	46%	43%	41%	
	Poor	17%	23%	24%	
	Total %	100%	100%	100%	
	Number of cases	406	468	457	
Contracting procedures used for hiring outside pest control services	Good	58%	68%	66%	.067
	Fair	35%	27%	29%	
	Poor	6%	6%	5%	
	Total %	100%	100%	100%	
	Number of cases	370	434	422	

[1]Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.
* 2004 and 2007 added a "not sure" category to the responses for these questions. In order to compare trends across all three years, "not sure" responses were coded as missing in the chi square analyses.

Table 4.10 Pesticide Use Scale* (2002, 2004 and 2007)

	2002	2004	2007	p^1
1 Only non-exempt pesticides used	10%	4%	1%	
2 Both exempt and non-exempt pesticides used	65%	81%	81%	.000
3 Only exempt pesticides used	0%	4%	8%	
4 No pesticides used at all	25%	11%	10%	
Total %	100%	100%	100%	
Number of cases	403	508	462	

*Based on actual pesticide practices reported in Questions 10 and 15.
[1]Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 4.11 Healthy Schools Act Scale*: Policies and Practices Officially Adopted by Districts (2002, 2004 and 2007)

		2002	2004	2007	p^1
Practices officially adopted by district (required for compliance with Healthy Schools Act)	Each school site maintains records of all pesticides used for at least four years, and makes these records available to the public	62%	78%	74%	.000
	District or school annually provides staff and parents with written notification of expected pesticide use at their school	79%	91%	91%	.000
	District or school maintains a list of parents to be notified of specific pesticide applications	73%	82%	80%	.006
	Warning signs are posted at least 24 hours before and 72 hours after pesticide treatment	88%	95%	95%	.000
Healthy Schools Act Scale	Mean	30.17	34.58	33.90	.000
	Standard deviation	12.85	9.73	9.94	
	Number of cases	302	397	359	

*Regulated groups only, based on actual practices listed in Questions 10 and 15
[1]Significance of chi square for individual practices and policies. Significance of ANOVA F-test for the Healthy Schools Act Scale. Probabilities ≤ .05 are boxed for easy identification.

Table 4.12 IPM Scale*: Recordkeeping and Pest Monitoring Activities (2001, 2002, 2004 and 2007)

IPM Scale Components	2001	2002	2004	2007	p^1
Written policy requiring use of least-toxic practices	n/a	44%	59%	52%	.000
Written policy requiring monitoring of pest levels	n/a	15%	31%	24%	.000
Buildings are inspected for potential pest problems	n/a	n/a	61%	65%	.268
Pests are monitored during course of the year	n/a	n/a	55%	59%	.172
Records are kept of building inspections	n/a	39%	30%	32%	.008
Records are kept of pest monitoring results	11%	17%	26%	22%	.000
Records are kept of pest sightings	15%	23%	25%	30%	.000
IPM Scale					
Mean			14.72	14.26	.475
Standard Deviation			10.44	9.24	
Number of cases			466	458	
Question 3B					
Written list of pesticide products approved for use in district schools**	n/a	50%	67%	61%	.000

[1] Significance of chi square for individual practices and policies. Significance of ANOVA F-test for the IPM Scale. Probabilities ≤ .05 are boxed for easy identification.
*Not the same IPM scale as in 2004 report, due to a change in wording for Question 4g in 2007 (Question 4f in 2004). The previous scale had eight items. The 2004 values presented here have been recalculated using the same seven items as the 2007 scale, and will not match previously reported data for 2004.
**This question (Question 3B), as in 2004, was not included in either the HSA or IPM scales. It is listed here for informational purposes.
"n/a" means not applicable.

Table 4.13 Ant Management Practices (2001, 2002, 2004 and 2007)

		2001*	2002**	2004**	2007	p^1
Did district do anything to manage ants?	Yes	75%	83%	80%	77%	.023
	No	25%	17%	20%	23%	
	Total	100%	100%	100%	100%	
	Number of cases	392	418	533	500	
Practices used to manage ants	Non-exempt aerosol spray	32%	17%	16%	14%	.494
	Non-exempt spray, other method	21%	25%	32%	37%	.004
	Exempt insecticidal spray	n/a	n/a	35%	35%	.894
	Ant baits	37%	58%	69%	69%	.001
	Soapy water spray	14%	38%	45%	51%	.001
	Caulk in cracks	19%	36%	50%	69%	.000
	Improved sanitation	n/a	63%	80%	88%	.000
	Other	13%	22%	6%	14%	.000
One method used most frequently to manage ants inside school buildings	Non-exempt aerosol spray	23%	9%	7%	5%	.000
	Non-exempt spray, other method	18%	12%	12%	15%	
	Exempt insecticidal spray	n/a	n/a	9%	8%	
	Ant baits	32%	31%	36%	32%	
	Soapy water spray	12%	12%	9%	11%	
	Caulk in cracks	4%	4%	2%	1%	
	Improved sanitation	n/a	22%	21%	24%	
	Other	11%	11%	4%	5%	
	Total	100%	100%	100%	100%	
	Number of cases	254	321	388	332	
Ant Management Scale	Mean			88.97	93.68	.028
	Standard Deviation			30.88	29.27	
	Number of cases			424	377	

* 2001 percentages for specific practices used to manage ants were not included in the chi square analyses above, but are displayed here for trend comparison purposes.
** Some 2002 and 2004 responses displayed here to the ant methods questions (Questions 10 and 13) are inconsistent with the 2004 report, due to collapsing of two (2002) or three (2004) spray pesticide categories for that report. Categories of spray pesticides for 2002 and 2004 have been restored in order to compare all three spray categories with 2007 for this trend analysis.
[1]Significance of chi square for individual practices and policies. Significance of ANOVA F-test for the Ant Management Scale. Probabilities ≤ .05 are boxed for easy identification.
"n/a" means not applicable.

Table 4.14 Weed Management Practices (2001, 2002, 2004 and 2007)

		2001	2002	2004	2007	p^1
Did district do anything to manage weeds?	Yes	91%	91%	94%	93%	.089
	No	9%	9%	6%	7%	
	Total	100%	100%	100%	100%	
	Number of cases	394	418	533	504	
Practices used to manage weeds	Broadcast treatment with herbicides	30%	23%	38%	42%	.000
	Spot treatment with herbicides	68%	61%	82%	80%	.000
	Mulches/ground cover/physical barriers	25%	26%	55%	60%	.000
	Physical controls such as hand pulling, cultivating, mowing	61%	68%	91%	94%	.000
	Flaming	8%	7%	8%	10%	.651
	Irrigation management	n/a	17%	41%	50%	.000
	Turf selection	n/a	n/a	20%	26%	.031
	Other	9%	10%	3%	4%	.000
Most frequent practice used on athletic fields	Broadcast treatment with herbicides			13%	16%	.036
	Spot treatment with herbicides			40%	34%	
	Physical controls only			39%	37%	
	Other			2%	3%	
	Multiple responses given			6%	10%	
	Total			100%	100%	
	Number of cases			469	431	
Most frequent practice used on playgrounds	Broadcast treatment with herbicides			6%	6%	.052
	Spot treatment with herbicides			48%	43%	
	Physical controls only			40%	39%	
	Other			1%	1%	
	Multiple responses given			5%	11%	
	Total			100%	100%	
	Number of cases			460	434	
Location which has the most trouble with weeds*	Athletic fields/playgrounds	32%	22%	17%	20%	.000
	Landscaping	23%	29%	33%	35%	
	Rights of way	7%	4%	2%	2%	
	Fence rows	33%	32%	39%	33%	
	Other	4%	14%	8%	10%	
	Total	100%	100%	100%	100%	
	Number of cases	357	298	374	348	
Weed Management Scale	Mean			69.5	80.8	.000
	Standard Deviation			32.2	33.2	
	Number of cases			497	471	

[1]Significance of chi square for individual practices and policies. Significance of ANOVA F-test for the Weed Management Scale. Probabilities ≤ .05 are boxed for easy identification.
*About 25% of responding districts in 2004 and 2007 noted multiple locations which have trouble with weeds. The percentages noted for this question do not include those districts in the chi square analysis. We are unable to compute rates of multiple responses given by districts in the 2001 and 2002 surveys.
"n/a" means not applicable.

Chapter V: Panel Analysis

This chapter helps to answer the question: how have IPM practices changed since introduction of the HSA in 2000 and what district characteristics have influenced these changes?

A panel analysis compares responses from the same school districts in two survey years. This permits a true measurement of change in the districts' IPM policies and procedures and compliance with the HSA, their ant and weed management practices, pesticide use, contracting, perceived barriers to adopting IPM, and awareness and use of resources. Any observed changes cannot be attributed to variation in the nature of responding districts because districts are only included in this analysis if they responded in both survey years. Changes *could* be due to changes in the position and experience of the responding individual. Although it is possible to control for changes in position and experience between a district's respondents in the two survey years, it is not possible to control for different respondents with the same position and experience. While the panel analysis is an improvement over the trend design, it is still possible that individual perspectives could account for observed changes in a district's described IPM behaviors over time.

Beginning in 2004, information identifying the responding school districts and the respondents' position and IPM responsibilities was included in the data file. This chapter will compare changes in the subgroup of 344 districts that responded to both the 2004 and 2007 surveys. After noting changes in district characteristics, respondent characteristics and district actions and perceptions, this chapter will describe the changes that occurred in IPM policies and practices independent of district characteristics and actions. It will then follow the analysis stages described in Chapter 3 and explore the impact of district characteristics on changes in district actions and perceptions and on changes in IPM policies and practices (Stage 1) and the impact of district actions and perceptions on changes in IPM policies and practices (Stage 2). Due to sample size limitations, multivariate models were not used in the panel analysis and a Stage 3 analysis was therefore unnecessary.

District Characteristics

Since the same districts are responding in both years, it is to be expected that there would be no change in the sample distribution by region and district type. There is a noticeable, though not quite significant, shift toward fewer schools in the responding districts which probably reflects school closures that are occurring in many parts of the state. Cost per student has gone up significantly, possibly due to inflation (Table 5.1).

Respondent Characteristics

While the districts included in this panel analysis responded to both the 2004 and 2007 surveys, the respondents could and did differ. Of the 344 districts, only 42% were clearly represented by the same respondent (Table 5.2). This becomes important when we try to evaluate the meaning of responses describing district IPM policies and practices. Respondents may differ in their understanding of their district's policies and practices. As a result, a given district may appear to have changed its behaviors or policies when, in fact, its respondents vary in their understanding of district actions.

For example, there is no significant difference in the overall proportion of districts that have adopted an IPM program in 2004 and 2007 (Table 5.3). There is a slight increase in the proportion who said they have such a program (from 71.6% to 73.2%), a slight increase in the proportion who say they do not (from 15.1 to 16.5%) and a noticeable decline in the proportion who are unsure (from 13.3% to 10.5%). However, when 2004 responses are cross tabbed against 2007 responses, respondents for 11% of the districts that were described as having an IPM program in 2004 now say that they don't have such a program, or the respondent is unsure (Table 5.3). It seems unlikely that a district would drop its IPM program. So, the inconsistency is probably due to a difference in the knowledge of the respondent rather than in the behavior of the district.

Table 5.4 supports this interpretation. Of the 109 districts with the same respondent who previously indicated an IPM program was in place, 94% had identical responses to Question

5 each year, compared to 77% of the 129 districts with different respondents. Given the disparity in responses between same and different respondents, we can only say with confidence that about 60% of the panel group had an IPM program in place both years (201 of 334 districts) (Table 5.3).

Among the 201 districts that had an IPM program in both years, there was no difference in the proportion of respondents who felt that the program resulted in more effective pest management or in the proportion who felt that the program reduced the cost of pest management. A clear majority continued to feel that the program led to more effective pest management (57% and 58% of different respondents and 50% and 62% of the same respondents in 2004 and 2007) while in both years opinion was divided over the program's impact on cost (Table 5.5).

A change in respondents between the two survey years was accompanied by other changes in respondent characteristics. In 2007, fewer respondents served as the designated IPM coordinator (87.1% in 2004 vs. 82.4% in 2007, borderline significance of p = .055) (Table 5.6). Among those who served in this position, the average tenure as IPM coordinator was significantly longer – an expected outcome since the program has been in effect since 2000 (Table 5.6). There were also a few shifts in pest management responsibilities among the coordinators responding in the two years. Significantly more of the 2007 IPM coordinators actually used pest management practices (53.8% vs. 33.7% in 2004), while fewer were involved in keeping records of pest management practices (60.5% vs. 71.6% in 2004) (Table 5.7). There was no significant change in the respondents' job category between the two survey years (Table 5.8).

Changes in District Actions and Perceptions

Of the six possible district actions and perceptions, only two changed significantly between 2004 and 2007: training and resource use (Tables 5.9 and 5.10). These two variables may be related: resource use increased significantly due, no doubt, to greater involvement in DPR's IPM training program. The change of interest is the significant increase in the percentage of districts that had attended DPR's IPM training. In 2004, 70% had not been trained; in 2007, 73% had received DPR's IPM training. Most districts were trained between 2004 and 2007. Thirty percent of those responding in both years had been trained before the 2004 survey while 43% were trained between the two survey years (Appendix Table 5.1).

Changes in IPM Policies and Practices independent of district characteristics and actions

Significant changes between 2004 and 2007 occurred in only two scales: weed management and use of IPM resources (Table 5.11). There was significant improvement in weed management scores (up 11.9 points on average when the same person is responding in both years and 10.95 when different people respond). This indicates increased use of IPM compatible methods of managing weeds. There was also a significantly increased use of IPM resources (up .50 among the same respondents). Change in resource use was not significant, however, when different people responded in the two years.

There were two other scales where increases were of borderline significance. There was an increase in the ant management scale -- up 4.6 points when the respondents were the same in both years (p = .085). Similarly, there was an increase in the HSA score of .86 among the same group (p = .103).

Impact of District Characteristics on Changes in District Actions and Perceptions

As shown with the larger group of 2007 survey respondents in Chapter 3, IPM policies and practices measures are significantly affected by district characteristics and actions. One measure of district action, the Resource Use scale, includes involvement in DPR training. In the larger group of respondents, this variable, rather than training alone, is significantly related to the HSA, IPM, Ant, Weed and Pesticide use scales in Stage two – where the models include only district actions and perceptions. It is significantly related to only the first three in models which include both district characteristics and actions. These relationships clearly suggest that exposure to DPR's training has had a significant impact on school districts' IPM-related policies and practices, at least in terms of the larger group of 2007 respondents.

Turning to the panel analysis, district characteristics had a significant impact on changes in district actions. These actions included changes in training status, pesticide

use, IPM program adoption, number of contracts held by the district, and when a district held one or more contracts.

The multivariate models described in Chapter 3 cannot be used successfully with the more limited panel sample because of the panel's smaller number of cases. The 2007 sample to which the Chapter 3 models were applied began with 505 cases. This number was reduced to 250 – 300 cases as more variables were added into the model. The panel sample begins with 334 cases, so when a full model is utilized, so many cases drop out that nothing is significant. In order to develop a limited understanding of what the relationships would be with a larger sample, this section depends upon zero-order or two-variable relationships, comparing each scale against one of the district characteristics at a time, with several district variables collapsed into fewer categories.

Training status. Every district characteristic significantly affected the change in training status (Table 5.12). Less than one in five urban districts never received DPR's IPM training compared with 43% of rural districts. Half of the remaining urban districts were trained before 2004 (41%) and half were trained between 2004 and 2007 (40%). In contrast, most of the rural districts that received training were trained between the two survey years. Similarly, when regions are collapsed into urban coastal areas (Los Angeles, Central Coast and Bay Area), the Central Valley (Central and North Central), and remote and mountainous areas (Sierra, North Coast and Southeastern), these regions differ significantly in when and if they were trained. A fourth of the urban coastal areas and central valley districts have never been trained in comparison to a third of the remote and mountainous districts. Almost half of the remote and central valley districts were trained between 2004 and 2007 while the coastal urban districts were almost equally divided between being trained before 2004 (40%) and trained between 2004 and 2007 (36%). This is consistent with DPR's early focus on training the largest school districts with more attention in recent years to the smaller districts in the more rural and remote parts of the state. At the time of the 2007 survey, a fourth of all districts had yet to experience IPM training, with slightly more of these districts in the more remote parts of the state.

Unified school districts, typically found in urban areas, were among the first to be trained; 40% were trained prior to 2004 with another 41% trained between 2004 and 2007. Only a fourth of elementary and high school districts were trained prior to 2004 and a third of elementary school districts have never been trained. Most elementary school children, however, would be included in the unified districts. Training these smaller elementary school districts should probably take priority over training the much less numerous high school districts since elementary school children are more apt to play outside.

As expected, ADA is strongly related to the training status of districts. The larger the ADA, the earlier districts were trained. Almost half (46%) of the smallest districts have never been trained compared with 15% of the largest districts; more than half of the largest districts were trained prior to 2004. Similarly, districts with the highest per student cost and the fewest number of schools are less apt to have been trained.

IPM program adoption. Three district characteristics were significantly related to changes in IPM program adoption: population area, ADA, and number of schools (Table 5.13). Districts in large and mid-sized urban areas were more apt to have the program in both years (roughly two-thirds in each) compared with less than half in rural districts (46%). And, as would be expected, districts with more schools and more students are also more apt to have had an IPM program in both years. Larger schools districts are also much less likely to be uncertain about whether they have such a program. Uncertainty is greatest in the small school districts.

Number of contracts and contract status. Population area is the only district characteristic that is significantly related to a change in the number of contracts, whereas all district characteristics except district type are related to contract status (no contracts in either year, contracts in both years, and contracts in 2004 or 2007 only). Contracting status in mid-sized urban and rural areas was more apt to remain unchanged (54% and 48% respectively vs. 37% in large cities). Large urban districts are more apt to have changed the number of contracts between the last two survey years. In almost 40% of these districts, the number of contracts increased, while in another fourth the number

decreased (Table 5.14). Districts with no pest-control contracts in either year occurred more often in rural areas and in remote, north coastal and mountainous areas; they also occurred disproportionately in smaller districts and those with higher per student costs (Table 5.15).

There was no significant relationship between district characteristics and the Resource Awareness, Resource Use, and Barriers scales (Appendix Tables 5.2, 5.3, and 5.4).

Impact of District Characteristics on Changes in IPM Policies and Practices

District characteristics had a significant impact on only two IPM policy and practice measures: the HSA scale score and pesticide use. District size, measured by both number of students and number of schools, affected the change in HSA scale scores (Table 5.16). Smaller districts were more apt to improve their HSA compliance while larger districts were more apt to have the same degree of compliance in both years. This is probably due to the earlier involvement of large districts in IPM training.

In contrast, all district characteristics significantly affected changes in pesticide use between survey years (Table 5.17). Districts were divided into those whose pesticide practices stayed "good" or improved to "good" between 2004 and 2007 and those whose pesticide practices were in the middle or improved to the middle (Appendix Table 5.5). More rural areas had good pesticide practices (31.6%) while only 7% of large and medium-sized cities and their urban fringes fell in this category. Urban areas, including large and small towns, were concentrated in the middle or improved to the middle category of pesticide use (93 – 94%). The best practices were also more characteristic of remote, north coastal and mountainous areas in California (25.3%), less characteristic of urban/coastal areas (12.6%) and least true of the Central and Northern Valley (2.5%). Elementary schools districts were much more apt to have continued with or improved to good practices (20.7%). This was true of only 9.5% of unified districts and no high school districts. There were linear relationships between a district's number of schools, number of students and cost per student and the proportion of districts that continued with or improved to good practices. With number of students and number of schools, the relationship is inverse – the smaller the district the larger the percentage that remained or improved to good. With cost per student, the relationship is direct – the higher the cost, the higher the percentage of districts that remained or improved to good (Table 5.17).

No significant relationship exists between district characteristics and the other IPM scales (IPM, ant, and weed) (Appendix Tables 5.6, 5.7, and 5.8).

Impact of Changes in District Actions on Changes in District Perceptions

Change in training status significantly affected changes in resource awareness and use, as well as the perception of barriers to adopting IPM (Tables 5.18, 5.19, and 5.20). Resource awareness and resource use were more apt to decrease among districts trained before 2004 and more apt to increase among those trained between the two years. Counter-intuitively, fewer barriers were perceived in 2007 by districts that had never been trained or were trained before 2004, while districts trained between the two years perceived more barriers in 2007 than they had in 2004. There was no significant relationship between when a district held a pest management contract, and the resource awareness, use and barriers scales (Appendix Table 5.9).

Controlling for the type of respondent provides new information about the relationship between a change in training status and changing perceptions (Table 5.21). Irrespective of the type of respondent, resource awareness and use increase significantly more for those trained between survey years than for those never trained or trained prior to 2004. Resource awareness increases .66 and .63 for same and different respondents and resource use goes up 1.2 and .81 for the same groups, compared with much more modest gains or even losses for those never trained or trained before 2004.

Impact of Changes in District Actions on Changes in IPM Policies and Practices

This section looks at how changes in district actions and perceptions from 2004 to 2007 relate to changes in IPM policies and practices over that same time period. For example, a change in program adoption had a significant impact on changes in HSA compliance and in pesticide use (Table 5.22 and 5.23). Districts that had an IPM program in both years were more likely to have the same HSA scores in both years (77%) whereas districts whose

respondents said “no” or “not sure” were the most likely to change in either direction – while 45% stayed the same, 26% had decreasing HSA scores and 29% increasing scores. Good pesticide practices were less typical of districts that had an IPM program in both survey years (10%) than of districts where respondents said “no” or “not sure” in both years (23%) or said that they had a program in one year but not both (19%). In all likelihood, the hidden variable behind these findings is population area. Districts that have not adopted an IPM program tend to be in rural areas where, for other reasons, pesticides are less apt to be used.

Districts that had never been trained were more apt to retain or adopt good pesticide use practices (22%) than districts trained before 2004 (8%) or between the two survey years (13%) (Table 5.23). Again, the rural/urban association with training status probably accounts for this difference.

Finally, districts that changed from having no contracts in 2004 to having one or more in 2007 increased their IPM scale score while those that had at least one contract in the earlier year and had none in 2007 sharply decreased their IPM scale score (Table 5.24). Contracting is therefore associated with improved record keeping and the adoption of IPM policies. Pesticide use was more likely to remain or improve to good in districts that had no pest management contracts in either year or in at least 2004 (37% and 44%) (Table 5.24). There was no significant relationship between change in program adoption, change in training status, and change in number of contracts for changes in a district’s IPM, ant or weed scale scores (Appendix Tables 5.10, 5.11, and 5.12).

Controlling for type of respondent and changes in scale scores between survey years, the only significant finding was with the interaction variable between training and respondent type for the IPM and Weed scales (Table 5.25). However, the details of the interaction varied between the two variables. On the IPM scale score, districts with a different respondent in 2004 and 2007 significantly improved their score if their district was trained between 2004 and 2007. Recent training appeared to highlight a district’s IPM policies and practices for the new respondent. On the other hand, districts with the same respondent adopted more IPM-compatible policies and practices only when they had been trained prior to 2004. These districts experienced the greatest decrease in IPM policies and practices if they had been trained between 2004 and 2007. This suggests that “seasoned” respondents perceived that improvements in IPM policies and practices took some time to achieve; those in districts that were most recently trained seemed to be more aware of their district’s limitations in reaching IPM-compatible policies and practices.

Impact of Changes in District Actions on 2007 District Perceptions

It can be informative to examine whether a change in district actions had any impact on districts’ 2007 scale scores, whether these scales measured perceptions - described in this section - or IPM policies and practices - described in the following one.

Changes in program adoption were significantly related to 2007 mean scores for the resource awareness, use and perception of barriers scales (Tables 5.26, 5.27, and 5.28). Districts with an IPM program in both years were more aware of IPM information resources (mean of 6.31) than those without a program in either year (5.23), or those who never had one or were unsure about it (4.22). The same pattern occurs with the resource use scale – districts with a program in place both years had the highest mean (4.32), compared to 3.24 for districts with a program in only one year, and 2.47 for those with no program or lack of certainty about having one. Districts with programs both years also perceived fewer barriers (12.17) compared to districts with programs in a single year (12.81) or districts lacking a program or certainty (13.93).

Changes in training status significantly affected 2007 resource awareness and use scale scores: those trained before 2004 had the highest awareness and use mean scores (6.10 and 4.45, respectively), compared to districts trained later (5.92 for awareness, 3.98 for use), or districts which were never trained (4.81 for awareness, 2.62 for use) (Tables 5.26 and 5.27).

Controlling for the type of respondent adds to our understanding of the relationship between change in training status and district perceptions. Changing training status, the type of respondent and an interaction of the two all significantly affect resource awareness and use (Table 5.29). Independent of training,

experienced respondents report greater awareness and use of IPM information resources than different respondents representing a single district in the two survey years. However, both types of respondents report greater resource awareness and use if their districts have been trained. The difference between respondent types comes in the timing of training. Experienced respondents report greater awareness and use if their district was trained before the 2004 survey while unique respondents report greater awareness if training has occurred more recently and no impact of the timing of training on resource use.

Impact of Changes in District Actions on 2007 IPM Policies and Practices

Changes in district actions between 2004 and 2007 had a significant impact on all four scales measuring their 2007 IPM policies and practices, specifically the HSA, IPM Ant and Weed scales, and pesticide use (Tables 5.30, 5.31, 5.32, 5.33, and 5.34). Districts that had an IPM program in both survey years were much more compliant with the HSA than districts with a program in one year, but not both or districts where the respondent said "no or not sure" when asked about the existence of an IPM program (mean of 37.4 vs. 33.6 and 30.0). In addition, districts that had an IPM program in both years had more IPM-compatible policies and practices (16.8 vs. 13.2 and 10.0) and more IPM-compatible ant management practices (100.4 vs. 90.6 and 87.9). Changes in program adoption had no effect on 2007 pesticide use.

Districts that maintained the same number of contracts in 2004 and 2007 had more IPM-compatible ant management practices than those where the number of contracts increased or decreased (100.8 vs. 96.3 and 90.3) (Table 5.32).

Contracting status significantly affected compliance with the HSA, IPM, ant and weed scale scores, and pesticide use. Districts with no contract in either year were less compliant with the HSA (Table 5.30). Those with contracts in both years or in 2007 only had lower ant and weed scale scores in 2007, but higher IPM scale scores (Tables 5.31, 5.32, and 5.33). Districts with no contracts in either year or in 2004 only were much more likely to use exempt pesticides only or none at all (40% and 47% respectively vs. 11% and 6%) (Table 5.34).

Training status affected only pesticide use (Table 5.34). Districts that were never trained were much more likely to use only exempt pesticides or none at all (23% vs. 7% for those trained before 2004 and 14% for those trained between 2004 and 2007).

This relationship between training status and pesticide use is maintained when the type of respondent is introduced as a control (Table 5.35). In addition, the apparent lack of relationship between training status and the other IPM policies and practices measures is clarified. Significant interactions occur between type of respondent and training status in their effect on both the 2007 HSA and IPM scores. Training status has no effect on HSA compliance in districts represented by the same respondent whereas compliance is reported to be lower by unique respondents in districts that have never been trained. Similarly, IPM scale scores are lower when reported by unique respondents in untrained districts, increasing with the currency of training. Experienced respondents, on the other hand, have the lowest IPM scores if their districts were trained between 2004 and 2007.

Whether controlled by type of respondent or not, training status had no effect on the 2007 Ant and Weed scores (Table 5.35).

Table 5.1 Characteristics of Responding Districts (2004 and 2007 panel)

		2004	2007	p^1
Population area	Large city	4.9%	4.9%	1.000
	Urban fringes of large city	26.2	26.2	
	Mid-size city	16.6	16.6	
	Urban fringes of mid-size city	19.2	19.2	
	Large or small town	5.2	5.2	
	Rural, inside MSA	15.4	15.4	
	Rural, outside MSA	12.5	12.5	
	Total	100%	100%	
Region	North Coastal	8%	8%	1.000
	Sierra	10.8	10.8	
	North Central	6.7	6.7	
	Bay Area	14.2	14.2	
	Central Valley	19.5	19.5	
	Central Coastal	5.5	5.5	
	LA/Surrounding Area	23.5	23.5	
	South Eastern	11.6	11.6	
	Total	100%	100%	
District Type	Elementary	48.8%	48.8%	1.000
	High	10.2	10.2	
	Unified	41	41	
	Total	100%	100%	
Number of schools in district	1-2 schools	17.2%	25.9%	.065
	3-4	14.8	11.3	
	5-9	26.2	22.7	
	10-19	24.4	22.4	
	20 or more	17.4	17.7	
	Total	100%	100%	
Average Daily Attendance	Under 200 students	15.4%	17.1%	.996
	200-499	7.3	7.6	
	500-999	10.5	9.1	
	1,000-1,999	10.2	10.3	
	2,000-2,999	5.8	6.5	
	3,000-4,999	11.3	11.2	
	5,000-9,999	16	14.7	
	10,000 or more	23.5	23.5	
	Total	100%	100%	
Cost per Student	Under $6,000	13.4%	2.4%	.000
	$6,000-$6,499	24.7	10.3	
	$6,500-$6,999	25.3	19.7	
	$7,000-$7,999	20.3	38.2	
	$8,000-$9,999	6.7	15	
	$10,000 or more	9.6	14.4	
	Total	100%	100%	
Did the district attend training?	No	69.5%	27.3%	.000
	Yes	30.5	72.7	
	Total	100%	100%	
Total Responding Districts		344	344	

[1]Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.2 Matched and Unmatched Respondents (2004 and 2007 Panel)

	Number of cases	Percent
No name either year	*27*	8%
Missing a name one year	*100*	29%
Different names each year	*73*	21%
Same name each year	*144*	42%
Total	*344*	100%

Table 5.3 Consistency of Response to IPM Program Adoption Question (2004 and 2007 Panel)

		2004	2007	p^1
Did the district adopt an IPM program (Question 5)?	Yes	71.6%	73.2%	.459
	No	15.1%	16.5%	
	Not Sure	13.3%	10.3%	
	Total	100%	100%	
	Number of cases	*338*	*339*	

		Number of cases	Percent
How did the district's response change over time?	Program in place in both survey years	*201*	60.2%
	Program in place in 2004, no or not sure in 2007	*37*	11.1%
	No or not sure in 2004, program in place in 2007	*43*	12.9%
	No or not sure both years	*53*	15.9%
	Total	*334*	100%

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.4 Consistency of IPM Program Adoption Responses by Same and Different Respondents (2004 and 2007 Panel)

		2007 response to Q5			
	2004 response to Q5	Yes	No	Not sure	Total
Same respondent both years	Yes	102	6	1	109
	Percent	93.6%	5.5%	.9%	100%
	No	8	8	2	18
	Percent	44.4%	44.4%	11.1%	100%
	Not sure	5	3	3	11
	Percent	45.5%	27.3%	27.3%	100%
	Count total	115	17	6	138
	Percent total	83.3%	12.3%	4.3%	100%

		2007 response to Q5			
	2004 response to Q5	Yes	No	Not sure	Total
Different respondents each year	Yes	99	16	14	129
	Percent	76.7%	12.4%	10.9%	100%
	No	14	14	5	33
	Percent	42.4%	42.4%	15.2%	100%
	Not sure	16	8	10	34
	Percent	47.1%	23.5%	2.4%	100%
	Count total	129	38	29	196
	Percent total	65.8%	19.4%	14.8%	100%

Table 5.5 Perceived Impact of IPM Program on Effectiveness and Long-Term Cost by Same and Different Respondents (2004 and 2007 Panel)

		Same respondent each year			Different respondent each year		
		2004	2007	p^1	2004	2007	p^1
Impact of IPM program on effectiveness of pest management*	More effective	50%	62%	.270	57%	58%	.335
	Made no difference	24%	16%		20%	18%	
	Resulted in less effective pest management	16%	12%		13%	8%	
	Uncertain/no opinion	10%	11%		9%	17%	
	Total %	100%	100%		100%	100%	
	Number of cases	*99*	*102*		*98*	*97*	

		Same respondent each year			Different respondent each year		
		2004	2007	p^1	2004	2007	p^1
Impact of IPM program on long-term cost of pest management*	Reduced the long-term cost	32%	31%	.330	33%	28%	.410
	Had no impact on long-term cost	26%	26%		20%	28%	
	Increased the long-term cost	22%	32%		19%	24%	
	Uncertain/no opinion	19%	12%		28%	21%	
	Total %	100%	100%		100%	100%	
	Number of cases	*99*	*101*		*98*	*97*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.
*In districts with an IPM program in 2004 and 2007.

Table 5.6 IPM Coordinator Designation and Tenure in Position (2004 and 2007 Panel)

		2004	2007	p^1
Are you the designated IPM coordinator?	Yes	87.1%	82.4%	
	No	12.9%	17.6%	.055
	Total %	100%	100%	
	Number of cases	341	335	
If yes, for how long?	< 1 year	14.9%	11.2%	
	1-2 years	34.6%	18.5%	.000
	3-4 years	35.3%	27.5%	
	5-10 years	10.5%	37.0%	
	more than 10 years	4.7%	5.8%	
	Total %	100%	100%	
	Number of cases	295	276	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.7 Pest Management Responsibilities of Respondent (2004 and 2007 Panel)

	2004	2007	p^1
Pest management and pesticide safety training	67.2%	65.4%	.628
Setting pest management policies	48.7%	46.5%	.576
Deciding when to use pest management practices	69.9%	64.2%	.120
Deciding which pest management practices to use	68.7%	66%	.459
Using pest management practices	33.7%	53.8%	.000
Directing others to use pest management practices	72.5%	71.5%	.766
Keeping records of all pest management practices	71.6%	60.5%	.002
Other	2.7%	4.9%	.126

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.8 Respondents' Job Category (2004 and 2007 Panel)

	2004	2007	p^1
Administration	12.1%	10.8%	.955
Front office/business	6.5%	6.0%	
Safety/risk management	3.7%	3.3%	
MO Director/coordinator	37.4%	37.5%	
MO Manager/supervisor	29.6%	32.7%	
MO Worker	10.6%	9.6%	
Total %	100%	100%	
Number of cases	*321*	*333*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.9 District Actions (2004 and 2007 Panel)

		2004	2007	p^1
Did the district Adopt an IPM program (Question 5)?	Yes	71.6%	73.2%	.459
	No	15.1%	16.5%	
	Not Sure	13.3%	10.3%	
	Total	100%	100%	
	Number of cases	*338*	*339*	
Has the district attended DPR training?	Yes	30.5%	72.7%	.000
	No	69.5%	27.3%	
	Total	100%	100%	
	Number of cases	*344*	*344*	
How many contracts does the district hold?	0 (or termite only)	26.5%	21.3%	.440
	1	28.5%	29.7%	
	2	27.1%	28.2%	
	3	17.9%	20.7%	
	Total	100%	100%	
	Number of cases	*340*	*333*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.10 District Perceptions (2004 and 2007 Panel)

Scale	Year	Mean	SD	*N*	Standard error	*p*[1]
Resource Awareness	2004	5.557	2.44	*337*	.133	.543
	2007	5.68	2.29	*338*	.124	
Resource Use	2004	3.38	2.24	*337*	.122	.028
	2007	3.76	2.27	*338*	.123	
Barriers	2004	12.37	3.36	*296*	.196	.423
	2007	12.59	3.2	*307*	.183	

[1]Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.

Table 5.11 Mean Differences in Scale Scores for Districts with the Same and Different Respondents (2004 and 2007 Panel)

		Same Respondent each year			
Scale	Change in mean	*N*	SD	Standard error	Significance[1]
HSA*	.86	*93*	5.03	.52	.103
IPM	-.87	*115*	8.92	.83	.298
Ant	4.63	*102*	26.84	2.66	.085
Weed	11.9	*129*	29.83	2.63	.000
Resource Awareness	.29	*139*	2.34	.20	.149
Resource Use	.50	*139*	2.15	.18	.006
Barriers	.05	*110*	2.98	.28	.848

		Different Respondent each year			
Scale	Change in mean	*N*	SD	Standard error	Significance[1]
HSA*	-.48	*145*	11.39	.95	.610
IPM	.54	*175*	11.97	.90	.549
Ant	2.69	*130*	37.36	3.28	.413
Weed	10.95	*186*	34.03	2.50	.000
Resource Awareness	-.03	*193*	2.93	.21	.902
Resource Use	.28	*193*	2.66	.19	.145
Barriers	.17	*162*	4.36	.34	.615

[1]Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.
*Statistics in this row summarize only those districts that use non-exempt pesticides (i.e. regulated districts).

Table 5.12 Change in Training Status (2004 and 2007 Panel)

	Change in training status					
Population area	Never Trained	Trained before 2004	Trained between 2004 and 2007	Total	*N*	*p*[1]
Large city and urban fringes	18.7%	41.1%	40.2%	100%	*107*	.000
Mid city, urban fringes, large or small town	23.4%	33.3%	43.3%	100%	*141*	
Rural, in or outside of MSA	42.7%	12.5%	44.8%	100%	*96*	
Region						
Urban/coastal areas	24.2%	39.6%	36.2%	100%	*149*	.003
Central and northern valley	24.4%	28.9%	46.7%	100%	*90*	
Remote, north coastal and mountainous areas	34.3%	17.1%	48.6%	100%	*105*	
District Type						
Elementary	34.5%	22.6%	42.9%	100%	*168*	.005
High school	25.7%	25.7%	48.6%	100%	*35*	
Unified	19.1%	39.7%	41.1%	100%	*141*	
Number of Students in district (ADA)						
Lower third (< 925 students)	45.5%	12.5%	42%	100%	*112*	.000
Middle third (925 to 6131)	21.1%	31.6%	47.4%	100%	*114*	
Upper third (> 6131)	14.9%	44.7%	40.4%	100%	*114*	
Cost per Student						
Lower third (< $7020/student)	23.9%	34.5%	41.6%	100%	*113*	.042
Middle third ($7020 to $7822/student)	20.4%	30.1%	49.6%	100%	*113*	
Upper third (> $7822/student)	36.8%	24.6%	38.6%	100%	*114*	
Number of schools in district						
Lower third (One to three schools)	47.2%	8.3%	44.4%	100%	*108*	.000
Middle third (Four to 11 schools)	21%	35.5%	43.5%	100%	*124*	
Upper third (> 11 schools)	15.2%	44.6%	40.2%	100%	*112*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.13 Change in IPM Program Adoption (2004 and 2007 Panel)

	Change in IPM program adoption					
Population area	District had program both survey years	Yes in one survey year, no/not sure in other	None or not sure both survey years	Total	*N*	*p*[1]
Large city and urban fringes	64.7%	26.5%	8.8%	100%	*102*	.003
Mid city, urban fringes, large or small town	66.7%	16.7%	16.7%	100%	*138*	
Rural, in or outside of MSA	45.7%	31.9%	22.3%	100%	*94*	
Region						
Urban/coastal areas	58.6%	26.9%	14.5%	100%	*145*	.496
Central and northern valley	62.8%	17.4%	19.8%	100%	*86*	
Remote, north coastal and mountainous areas	60.2%	25.2%	14.6%	100%	*103*	
District Type						
Elementary	57.1%	23.3%	19.6%	100%	*163*	.075
High school	79.4%	11.8%	8.8%	100%	*34*	
Unified	59.1%	27.7%	13.1%	100%	*137*	
Number of Students in district (ADA)						
Lower third (< 925 students)	48.6%	25.7%	25.7%	100%	*109*	.000
Middle third (925 to 6131)	58.6%	26.1%	15.3%	100%	*111*	
Upper third (> 6131)	73.6%	20.9%	5.5%	100%	*110*	
Cost per Student						
Lower third (< $7020/student)	62.2%	24.3%	13.5%	100%	*111*	.187
Middle third ($7020 to $7822/student)	66.4%	22.4%	11.2%	100%	*107*	
Upper third (> $7822/student)	52.7%	25.9%	21.4%	100%	*112*	
Number of schools in district						
Lower third (One to three schools)	48.1%	3.2%	21.7%	100%	*106*	.005
Middle third (Four to 11 schools)	62.5%	19.2%	18.3%	100%	*120*	
Upper third (> 11 schools)	69.4%	23.2%	7.4%	100%	*108*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.14 Change in Number of Contracts Held (2004 and 2007 Panel)

	Change in number of contracts held					
Population area	No change in number	Number increased	Number decreased	Total	*N*	*p*[1]
Large city and urban fringes	36.9%	37.9%	25.2%	100%	*103*	.028
Mid city, urban fringes, large or small town	54.1%	28.9%	17%	100%	*135*	
Rural, in or outside of MSA	48.4%	23.1%	28.6%	100%	*91*	
Region						
Urban/coastal areas	42.1%	33.6%	24.3%	100%	*140*	.583
Central and northern valley	48.9%	29.5%	21.6%	100%	*88*	
Remote, north coastal and mountainous areas	52.5%	25.7%	21.8%	100%	*101*	
District Type						
Elementary	53.5%	26.8%	19.7%	100%	*157*	.162
High school	44.1%	38.2%	17.6%	100%	*34*	
Unified	40.6%	31.9%	27.5%	100%	*138*	
Number of Students in district (ADA)						
Lower third (< 925 students)	52.9%	25%	22.1%	100%	*104*	.667
Middle third (925 to 6131)	44%	32.1%	23.9%	100%	*109*	
Upper third (> 6131)	44.6%	32.1%	23.2%	100%	*112*	
Cost per Student						
Lower third (< $7020/student)	45.9%	29.7%	24.3%	100%	*111*	.947
Middle third ($7020 to $7822/student)	47.7%	28%	24.3%	100%	*107*	
Upper third (> $7822/student)	47.7%	31.8%	20.6%	100%	*107*	
Number of schools in district						
Lower third (One to three schools)	55.6%	23.2%	21.2%	100%	*99*	.237
Middle third (Four to 11 schools)	40.8%	35.8%	23.3%	100%	*120*	
Upper third (> 11 schools)	46.4%	30%	23.6%	100%	*110*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.15 Change in Contract Status (2004 and 2007 Panel)

	Change in contracts status						
Population area	No contracts either year	Contract in 2004 only	Contract in 2007 only	Contracts held both years	Total	*N*	*p*[1]
Large city and urban fringes	4.9%	3.9%	7.8%	83.5%	100%	*103*	.000
Mid city, urban fringes, large or small town	12.6%	3.7%	9.6%	74.1%	100%	*135*	
Rural, in or outside of MSA	31.9%	8.8%	12.1%	47.3%	100%	*91*	
Region							
Urban/coastal areas	11.4%	7.1%	11.4%	70%	100%	*140*	.001
Central and northern valley	9.1%	1.1%	6.8%	83%	100%	*88*	
Remote, north coastal and mountainous areas	26.7%	5.9%	9.9%	57.4%	100%	*101*	
District Type							
Elementary	18.5%	5.1%	12.1%	64.3%	100%	*157*	.555
High school	14.7%	5.9%	5.9%	73.5%	100%	*34*	
Unified	12.3%	5.1%	8.0%	74.6%	100%	*138*	
Number of Students in district (ADA)							
Lower third (< 925 students)	34.6%	7.7%	15.4%	42.3%	100%	*104*	.000
Middle third (925 to 6131)	6.4%	6.4%	8.3%	78.9%	100%	*109*	
Upper third (> 6131)	7.1%	1.8%	4.5%	86.6%	100%	*112*	
Cost per Student							
Lower third (< $7020/student)	10.8%	2.7%	7.2%	79.3%	100%	*111*	.000
Middle third ($7020 to $7822/student)	6.5%	3.7%	6.5%	83.2%	100%	*107*	
Upper third (> $7822/student)	29.9%	9.3%	14.0%	46.7%	100%	*107*	
Number of schools in district							
Lower third (One to three schools)	31.3%	6.1%	14.1%	48.5%	100%	*99*	.000
Middle third (Four to 11 schools)	10.0%	7.5%	8.3%	74.2%	100%	*120*	
Upper third (> 11 schools)	7.3%	1.8%	7.3%	83.6%	100%	*110*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.16 Change in HSA Compliance (2004 and 2007 Panel)

	Change in HSA scale score					
Population area	District scale score decreased	District scale score stayed the same	District scale score improved	Total	*N*	*p*[1]
Large city and urban fringes	14.3%	69%	16.7%	100%	*84*	.076
Mid city, urban fringes, large or small town	104. %	75.5%	14.2%	100%	*106*	
Rural, in or outside of MSA	20.8%	52.1%	27.1%	100%	*48*	
Region						
Urban/coastal areas	12.1%	71%	16.8%	100%	*107*	.407
Central and northern valley	14.7%	72%	13.3%	100%	*75*	
Remote, north coastal and mountainous areas	16.1%	58.9%	25%	100%	*56*	
District Type						
Elementary	16.3%	65.3%	18.4%	100%	*98*	.856
High school	133%	66.7%	20%	100%	*30*	
Unified	11.8%	71.8%	16.4%	100%	*110*	
Number of Students in district (ADA)						
Lower third (< 925 students)	20%	52.7%	27.3%	100%	*55*	.010
Middle third (925 to 6131)	17.5%	65%	17.5%	100%	*80*	
Upper third (> 6131)	8.1%	79.8%	12.1%	100%	*99*	
Cost per Student						
Lower third (< $7020/student)	10.8%	71%	18.3%	100%	*93*	.163
Middle third ($7020 to $7822/student)	10.8%	74.3%	14.9%	100%	*74*	
Upper third (> $7822/student)	22.4%	58.2%	19.4%	100%	*67*	
Number of schools in district						
Lower third (One to three schools)	16.1%	58.9%	25%	100%	*56*	.010
Middle third (Four to 11 schools)	19.5%	59.8%	20.7%	100%	*82*	
Upper third (> 11 schools)	8%	81%	11%	100%	*100*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.17 Change in Pesticide Use (2004 and 2007 Panel)

	Change in pesticide practices*				
Population area	Practices stayed "good" or improved to good	Practices stayed "middle" or improved to middle	Total	*N*	*p*[1]
Large city and urban fringes	6.5%	93.5%	100%	*92*	.000
Mid city, urban fringes, large or small town	7.3%	92.7%	100%	*124*	
Rural, in or outside of MSA	31.6%	68.4%	100%	*79*	
Region					
Urban/coastal areas	12.6%	87.4%	100%	*127*	.000
Central and northern valley	2.5%	97.5%	100%	*81*	
Remote, north coastal and mountainous areas	25.3%	74.7%	100%	*87*	
District Type					
Elementary	20.7%	79.3%	100%	*135*	.001
High school	0%	100%	100%	*34*	
Unified	9.5%	90.5%	100%	*126*	
Number of Students in district (ADA)					
Lower third (< 925 students)	31%	69%	100%	*87*	.000
Middle third (925 to 6131)	9.5%	90.5%	100%	*95*	
Upper third (> 6131)	3.7%	96.3%	100%	*109*	
Cost per Student					
Lower third (< $7020/student)	3.8%	96.2%	100%	*104*	.000
Middle third ($7020 to $7822/student)	10.9%	89.1%	100%	*92*	
Upper third (> $7822/student)	27.4%	72.6%	100%	*95*	
Number of schools in district					
Lower third (One to three schools)	29.1%	70.9%	100%	*86*	.000
Middle third (Four to 11 schools)	10.9%	89.1%	100%	*101*	
Upper third (> 11 schools)	3.7%	96.3%	100%	*108*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.
*Due to chi square's sensitivity to small cell counts, the 14 districts whose pesticide practices deteriorated are not included in this chi square analysis. Please see Appendix Table 5.5 for how this variable was constructed.

Table 5.18 Change in Resource Awareness by Change in District Actions (2004 and 2007 Panel)

	Change in Resource Awareness scale score					
Program adoption	District score decreased	Score stayed the same	District score increased	Total	*N*	*p*[1]
District had IPM program both years	36%	24.4%	39.6%	100%	*197*	.449
District no or not sure both years	32%	16%	52%	100%	*50*	
District had program one year, not other	39%	24.7%	36.4%	100%	*77*	
Change in training status						
District never trained	33.3%	23.3%	43.3%	100%	*90*	.021
District trained before 2004	41.7%	30.1%	28.2%	100%	*103*	
District trained between 2004 and 2007	34.5%	17.3%	48.2%	100%	*139*	
Change in number of contracts						
Number of contracts stayed the same	30.4%	26.4%	43.2%	100%	*148*	.160
Number of contracts increased	39.1%	21.6%	39.2%	100%	*97*	
Number of contracts decreased	47.3%	17.6%	35.1%	100%	*74*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.19 Change in Resource Use by Change in District Actions (2004 and 2007 Panel)

	Change in Resource Use scale score					
Program adoption	District score decreased	Score stayed the same	District score increased	Total	*N*	*p*[1]
District had IPM program both years	31%	23.4%	45.7%	100%	*197*	.300
District no or not sure both years	32%	16%	52%	100%	*50*	
District had program one year, not other	39%	13%	48%	100%	*77*	
Change in training status						
District never trained	38.9%	20%	41.1%	100%	*90*	.002
District trained before 2004	40.8%	24.3%	35%	100%	*103*	
District trained between 2004 and 2007	23.7%	16.5%	59.7%	100%	*139*	
Change in number of contracts						
Number of contracts stayed the same	33.1%	18.2%	48.6%	100%	*148*	.345
Number of contracts increased	26.8%	24.7%	48.5%	100%	*97*	
Number of contracts decreased	40.5%	17.6%	41.9%	100%	*74*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.20 Change in Perception of Barriers by Change in District Actions (2004 and 2007 Panel)

	Change in Barriers scale score					
Program adoption	District perceived fewer barriers	No change in perception of barriers	District perceived more barriers	Total	*N*	*p*[1]
District had IPM program both years	42%	14.2%	43.8%	100%	*169*	.269
District no or not sure both years	61.8%	5.9%	32.4%	100%	*34*	
District had program one year, not other	49.2%	11.1%	39.7%	100%	*63*	
Change in training status						
District never trained	50.7%	15.9%	33.3%	100%	*69*	.029
District trained before 2004	52.9%	12.6%	34.5%	100%	*87*	
District trained between 2004 and 2007	37.1%	9.5%	53.4%	100%	*116*	
Change in number of contracts						
Number of contracts stayed the same	40.2%	14.2%	45.7%	100%	*127*	.351
Number of contracts increased	53.9%	9.2%	36.8%	100%	*76*	
Number of contracts decreased	50.8%	10.2%	39%	100%	*59*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.21 Changes in District Perceptions by Training Status and Respondent Type (2004 and 2007 Panel)

Scale	Training status	Means		Significance of Test Variables[1]			
		Same Respondent	Different Respondent	Corrected model	Nature of Respondent	Training	Interaction between respondent and training
Mean difference in Resource Awareness score between surveys	Never trained	.18	-.31	.037	.259	.010	.748
	Trained before 2004 survey	-.14	-.64				
	Trained between 2004 and 2007	.66	.63				
Mean difference in Resource Use score between surveys	Never trained	-.16	.19	.004	.538	.001	.439
	Trained before 2004 survey	.12	-.34				
	Trained between 2004 and 2007	1.20	.81				
Mean difference in Barriers score between surveys	Never trained	-.13	-.26	.075	.985	.058	.309
	Trained before 2004 survey	-.11	-.90				
	Trained between 2004 and 2007	.31	1.20				

[1]Significance of multivariate analysis of variance. Probabilities ≤ .05 are boxed for easy identification.

Table 5.22 Change in HSA Compliance by Change in District Actions (2004 and 2007 Panel)

	Change in HSA scale score					
Program adoption	District score decreased	Score stayed the same	District score increased	Total	*N*	*p*[1]
District had IPM program both years	9.3%	76.8%	13.9%	100%	*151*	.006
District no or not sure both years	25.9%	45.2%	29%	100%	*31*	
District had program one year, not other	18.4%	61.2%	20.4%	100%	*49*	
Change in training status						
District never trained	18.2%	70.9%	10.9%	100%	*55*	.465
District trained before 2004	10.3%	69%	20.7%	100%	*87*	
District trained between 2004 and 2007	14.6%	66.7%	18.8%	100%	*96*	
Change in number of contracts						
Number of contracts stayed the same	11.4%	71.4%	17.1%	100%	*105*	.679
Number of contracts increased	18.3%	64.8%	16.9%	100%	*71*	
Number of contracts decreased	11.1%	68.5%	20.4%	100%	*54*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.23 Change in Pesticide Practices by Change in District Actions (2004 and 2007 Panel)

	Change in Pesticide practices				
Program adoption	Practices stayed good or improved to good	Practices stayed middle or improved to middle	Total	*N*	*p*[1]
District had IPM program both years	10.1%	89.9%	100%	*179*	.039
District no or not sure both years	23.1%	76.9%	100%	*39*	
District had program one year, not other	19.1%	80.9%	100%	*68*	
Change in training status					
District never trained	21.9%	78.1%	100%	*73*	.027
District trained before 2004	7.5%	92.5%	100%	*93*	
District trained between 2004 and 2007	13.2%	86.8%	100%	*129*	
Change in number of contracts					
Number of contracts stayed the same	15.2%	84.8%	100%	*132*	.467
Number of contracts increased	9.4%	90.6%	100%	*85*	
Number of contracts decreased	13.1%	86.9%	100%	*66*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.24 Mean Changes in IPM Policies and Practices Scale by Change in Contracting Status (2004 and 2007 Panel)

	Contract status	*N*	Mean change between years	SD	Standard Error	*p*[1]
HSA scale change	No contract either year	*24*	-1.67	10.5	2.14	.122
	Contract in 2004 only	*21*	2.38	11.36	2.48	
	Contract in 2007 only	*8*	6.25	9.16	3.24	
	Contract(s) both years	*177*	-0.06	8.63	0.65	
IPM scale change	No contract either year	*42*	-0.83	9.69	1.49	.027
	Contract in 2004 only	*28*	3.04	10.66	2.01	
	Contract in 2007 only	*14*	-7.5	10.88	2.91	
	Contract(s) both years	*193*	0.41	11.15	0.8	
Ant scale change	No contract either year	*28*	0.07	25.04	4.73	.184
	Contract in 2004 only	*20*	-4.25	39.4	8.81	
	Contract in 2007 only	*10*	22.8	22.35	7.07	
	Contract(s) both years	*166*	4.51	34.04	2.64	
Weed scale change	No contract either year	*44*	11.45	34.58	5.21	.088
	Contract in 2004 only	*26*	-2.35	29.28	5.74	
	Contract in 2007 only	*15*	22.13	28.96	7.48	
	Contract(s) both years	*219*	12.05	31.85	2.15	

		N	Stayed good or improved to good	Stayed in the middle or improved to middle	Total	*p*[2]
Pesticide Use Change	No contract either year	*38*	36.8%	63.2%	100%	.000
	Contract in 2004 only	*16*	43.8%	56.3%	100%	
	Contract in 2007 only	*26*	11.5%	88.5%	100%	
	Contract(s) both years	*203*	6.4%	93.6%	100%	

[1]Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.
[2] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.25 Changes in IPM Policies and Practices Scale by Training Status and Respondent Type (2004 and 2007 Panel)

Scale	Change in training status	Means		Significance of test variables[1]			
		Same Respondent	Different Respondent	Corrected model	Nature of Respondent	Training	Interaction between respondent and training
Mean difference in HSA score between surveys	Never trained	1.36	-4.55	.086	.131	.277	.116
	Trained before 2004 survey	.57	1.35				
	Trained between 2004 and 2007	.83	.167				
Mean difference in IPM score between surveys	Never trained	-1.03	-.87	.169	.462	.721	.054
	Trained before 2004 survey	1.54	-.67				
	Trained between 2004 and 2007	-2.77	2.21				
Mean difference in Ant score between surveys	Never trained	4.20	12.87	.287	.869	.360	.233
	Trained before 2004 survey	5.61	-5.48				
	Trained between 2004 and 2007	4.04	4.20				
Mean difference in Weed score between surveys	Never trained	-.35	14.98	.062	.976	.237	.017
	Trained before 2004 survey	16.29	4.19				
	Trained between 2004 and 2007	16.28	13.38				
Mean difference in pesticide use score between surveys	Never trained	-.1176	-.0426	.098	.105	.309	.308
	Trained before 2004 survey	-.0256	-.0172				
	Trained between 2004 and 2007	-.0755	.1481				

[1]Significance of multivariate analysis of variance. Probabilities ≤ .05 are boxed for easy identification.

Table 5.26 Mean 2007 Resource Awareness Scale by Changes in District Actions

Program adoption	*N*	Mean score	SD	Standard Error	*p*[1]
District had IPM program both years	*199*	6.31	1.88	.133	.000
District no or not sure both years	*51*	4.22	2.54	.356	
District had program one year, not other	*78*	5.23	2.38	.269	
Change in training status					
District never trained	*90*	4.81	2.44	.257	.000
District trained before 2004	*103*	6.10	2.24	.221	
District trained between 2004 and 2007	*145*	5.92	2.10	.124	
Change in number of contracts					
Number of contracts stayed the same	*151*	5.97	2.09	.170	.088
Number of contracts increased	*98*	5.34	2.42	.244	
Number of contracts decreased	*75*	5.55	2.43	.280	
Change in contract status					
No contract either year	*49*	5.51	2.15	.307	.365
Contract in 2004 only	*17*	5.53	3.24	.786	
Contract in 2007 only	*32*	5.09	2.41	.427	
Contract(s) both years	*226*	5.81	2.21	.147	

[1]Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.

Table 5.27 Mean 2007Resource Use Scale by Changes in District Actions

Program adoption	*N*	Mean score	SD	Standard Error	*p*[1]
District had IPM program both years	*199*	4.32	2.08	.147	.000
District no or not sure both years	*51*	2.47	2.45	.343	
District had program one year, not other	*78*	3.24	2.16	.245	
Change in training status					
District never trained	*90*	2.62	1.96	.206	.000
District trained before 2004	*103*	4.45	2.33	.229	
District trained between 2004 and 2007	*145*	3.98	2.16	.179	
Change in number of contracts					
Number of contracts stayed the same	*151*	3.89	2.26	.184	.864
Number of contracts increased	*98*	3.77	2.27	.230	
Number of contracts decreased	*75*	3.73	2.36	.273	
Change in contract status					
No contract either year	*49*	3.55	2.45	.350	.750
Contract in 2004 only	*17*	3.76	2.33	.566	
Contract in 2007 only	*32*	3.63	2.58	.455	
Contract(s) both years	*226*	3.90	2.21	.147	

[1]Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.

Table 5.28 Mean 2007 Barriers Scale by Changes in District Actions

Program adoption	*N*	Mean score	SD	Standard Error	*p*[1]
District had IPM program both years	*185*	12.17	2.94	.216	.003
District no or not sure both years	*45*	13.93	3.74	.557	
District had program one year, not other	*70*	12.81	3.35	.400	
Change in training status					
District never trained	*79*	12.67	3.58	.403	.840
District trained before 2004	*98*	12.43	2.99	.303	
District trained between 2004 and 2007	*130*	12.65	3.14	.275	
Change in number of contracts					
Number of contracts stayed the same	*141*	12.57	3.20	.269	.618
Number of contracts increased	*89*	12.79	3.34	.354	
Number of contracts decreased	*65*	12.28	2.91	.361	
Change in contract status					
No contract either year	*47*	12.26	3.23	.471	.307
Contract in 2004 only	*16*	12.25	2.49	.622	
Contract in 2007 only	*31*	13.55	3.70	.665	
Contract(s) both years	*201*	12.52	3.12	.220	

[1]Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.

Table 5.29 Mean 2007 District Perceptions by Training Status and Respondent Type (2004 and 2007 Panel)

Scale	Training status	Means		Significance of Test Variables[1]			
		Same Respondent	Different Respondent	Corrected model	Nature of Respondent	Training	Interaction between respondent and training
2007 Resource Awareness score	Never trained	5.68	4.17	.000	.000	.000	.050
	Trained before 2004 survey	6.9	5.54				
	Trained between 2004 and 2007	6.07	5.82				
2007 Resource Use score	Never trained	2.82	2.48	.000	.001	.000	.053
	Trained before 2004 survey	5.43	3.77				
	Trained between 2004 and 2007	4.27	3.78				
2007 Barriers score	Never trained	12.13	13.04	.206	.039	.935	.398
	Trained before 2004 survey	12.35	12.48				
	Trained between 2004 and 2007	11.89	13.20				

[1]Significance of multivariate analysis of variance. Probabilities ≤ .05 are boxed for easy identification.

Table 5.30 Mean 2007 HSA Compliance by Change in District Actions

Program adoption	Mean	SD	*N*	Standard error	*p*[1]
District had IPM program both years	37.39	5.87	*161*	.162	.000
District no or not sure both years	30.00	13.56	*38*	2.20	
District had program one year, not other	33.62	9.86	*58*	1.29	
Change in training status					
District never trained	33.38	11.49	*65*	1.43	.116
District trained before 2004	36.02	8.52	*88*	.91	
District trained between 2004 and 2007	35.98	7.03	*112*	.67	
Change in number of contracts					
Number of contracts stayed the same	35	9.83	*116*	.91	.539
Number of contracts increased	35.97	6.93	*77*	.79	
Number of contracts decreased	36.39	7.75	*61*	.99	
Change in contract status					
No contract either year	30.69	14.13	*29*	2.62	.010
Contract in 2004 only	37.78	4.41	*9*	1.47	
Contract in 2007 only	36.09	7.22	*23*	1.51	
Contract(s) both years	36.22	7.48	*193*	.54	

[1]Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.

Table 5.31 Mean 2007 IPM Scale Scores by Change in District Actions

Program adoption	Mean	SD	*N*	Standard error	*p*[1]
District had IPM program both years	16.84	9.88	*182*	.732	.000
District no or not sure both years	10.00	8.04	*52*	1.12	
District had program one year, not other	13.15	7.88	*73*	.923	
Change in training status					
District never trained	12.89	9.76	*83*	1.07	.109
District trained before 2004	15.16	9.61	*96*	.98	
District trained between 2004 and 2007	15.62	9.36	*137*	.80	
Change in number of contracts					
Number of contracts stayed the same	14.86	10.09	*142*	.85	.567
Number of contracts increased	15.39	9.25	*90*	.98	
Number of contracts decreased	13.79	8.74	*70*	1.05	
Change in contract status					
No contract either year	13.48	9.83	*46*	1.45	.052
Contract in 2004 only	9.06	6.64	*16*	1.66	
Contract in 2007 only	15.00	8.61	*30*	1.57	
Contract(s) both years	15.45	9.66	*210*	.67	

[1]Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.

Table 5.32 Mean 2007 Ant Scale Scores by Change in District Actions

Program adoption	Mean	SD	*N*	Standard error	*p*[1]
District had IPM program both years	100.42	27.07	*163*	2.12	.014
District no or not sure both years	87.91	32.30	*33*	5.62	
District had program one year, not other	90.58	29.97	*60*	3.87	
Change in training status					
District never trained	92.43	28.32	*68*	3.43	.261
District trained before 2004	100.05	28.19	*87*	3.02	
District trained between 2004 and 2007	95.96	29.77	*110*	2.84	
Change in number of contracts					
Number of contracts stayed the same	100.77	28.21	*121*	2.56	.045
Number of contracts increased	90.26	28.22	*78*	3.20	
Number of contracts decreased	96.30	31.35	*56*	4.19	
Change in contract status					
No contract either year	107.00	19.25	*36*	3.21	.001
Contract in 2004 only	109.45	18.17	*11*	5.48	
Contract in 2007 only	79.72	31.14	*25*	6.23	
Contract(s) both years	96.05	29.99	*183*	2.22	

[1]Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.

Table 5.33 Mean 2007 Weed Scale Scores by Change in District Actions

Program adoption	Mean	SD	*N*	Standard error	*p*[1]
District had IPM program both years	79.62	31.41	*190*	2.28	.405
District no or not sure both years	86.35	35.66	*48*	5.14	
District had program one year, not other	78.95	35.21	*77*	4.01	
Change in training status					
District never trained	83.11	33.71	*87*	3.61	.698
District trained before 2004	79.21	32.44	*101*	3.23	
District trained between 2004 and 2007	80.12	32.62	*136*	2.80	
Change in number of contracts					
Number of contracts stayed the same	82.87	33.64	*148*	2.77	.521
Number of contracts increased	78.38	32.17	*91*	3.37	
Number of contracts decreased	78.82	33.41	*72*	3.94	
Change in contract status					
No contract either year	93.91	31.26	*47*	4.56	.007
Contract in 2004 only	93.00	34.68	*15*	8.96	
Contract in 2007 only	77.33	32.26	*27*	6.21	

Contract(s) both years	77.37	32.83	*222*	2.20	

[1]Significance of ANOVA F-test. Probabilities ≤ .05 are boxed for easy identification.

Table 5.34 2007 Pesticide Use by Change in District Actions

	Pesticide Practices 2007				
Program adoption	Only non-exempt OR both exempt and non-exempt pesticides used	Only exempt pesticides used OR no pesticides used at all	Total	*N*	*p*[1]
District had IPM program both years	88.8%	11.2%	100%	*188*	.120
District no or not sure both years	79.6%	20.4%	100%	*49*	
District had program one year, not other	81.1%	18.9%	100%	*74*	
Change in training status					
District never trained	76.7%	23.3%	100%	*86*	.008
District trained before 2004	92.8%	7.2%	100%	*97*	
District trained between 2004 and 2007	86.2%	13.8%	100%	*138*	
Change in number of contracts					
Number of contracts stayed the same	82.8%	17.2%	100%	*145*	.200
Number of contracts increased	91.1%	8.9%	100%	*90*	
Number of contracts decreased	86.1%	13.9%	100%	*72*	
Change in contract status					
No contracts either year	60.4%	39.6%	100%	*48*	.000
Contract in 2004 only	52.9%	47.1%	100%	*17*	
Contract in 2007 only	88.9%	11.1%	100%	*27*	
Contracts both years	94%	6%	100%	*215*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Table 5.35 Mean 2007 IPM Policies and Practices by Training Status and Respondent Type (2004 and 2007 Panel)

Scale	Change in training status	Means		Significance of test variables[1]			
		Same Respondent	Different Respondent	Corrected model	Nature of Respondent	Training	Interaction between respondent and training
2007 HSA score	Never trained	37.78	30.26	.004	.013	.259	.014
	Trained before 2004 survey	35.56	36.35				
	Trained between 2004 and 2007	36.98	35.36				
2007IPM score	Never trained	15.31	11.37	.024	.415	.274	.014
	Trained before 2004 survey	16.38	14.29				
	Trained between 2004 and 2007	13.68	17				
2007 Ant score	Never trained	91.45	93.15	.509	.675	.207	.488
	Trained before 2004 survey	104.46	96.78				
	Trained between 2004 and 2007	95.2	96.58				
2007 Weed score	Never trained	79.82	85.23	.407	.346	.878	.206
	Trained before 2004 survey	86.24	74.20				
	Trained between 2004 and 2007	82.57	78.50				
2007 Pesticide Use score	Never trained	2.37	2.33	.115	.692	.014	.992
	Trained before 2004 survey	2.10	2.09				
	Trained between 2004 and 2007	2.24	2.21				

[1]Significance of multivariate analysis of variance. Probabilities ≤ .05 are boxed for easy identification.

2007 Survey Questionnaire of School Districts

Appendix Tables

Appendix Table 1.1 Responses to Questions 1 and 2

		Percent	*Number of cases*
During the last twelve months, what type of exempt or non-exempt pesticides were used in your school district? Please check only one answer.	Only pesticides exempt from the Healthy Schools Act (HSA)	8	*36*
	Only pesticides that are not exempt from the HSA	1	*5*
	Both exempt and non-exempt pesticides	80	*370*
	No pesticides were used at all	10	*47*
	Not sure	1	*4*
	Total	100	*462*
For what type(s) of pest control does your district contract with pest control businesses? Please check all appropriate boxes	Termite control	41	*203*
	Food service area pest control	53	*264*
	Perimeter pest control	51	*253*
	Grounds pest control (for example, turf, landscape, paved areas)	37	*186*
	Have contracts for pest control, but uncertain about the type	5	*26*
	Don't know whether the district has contracts for pest control	1	*3*
	Do not contract with pest control businesses	91	*18*
	Total	100	*500*

Appendix Table 1.2 Responses to Question 3

3. Has your district officially adopted (through a school board action or administrator's directive) the following policies or practices?	Percent				
	Yes	No	Not sure	Total	*Number of cases*
a. Written policy requiring the use of least-toxic pest management practices	53	25	22	100	*477*
b. Written list of pesticide products approved for use in district schools	61	23	16	100	*475*
c. Written policy requiring the monitoring of pest levels	24	52	24	100	*463*
d. Each school site maintains records of all pesticides used for at least four years, and makes these records available to the public	70	19	11	100	*471*
e. District or school annually provides staff and parents with written notification of expected pesticide use at their school	88	7	5	100	*487*
f. District or school maintains a list of parents wanting to be notified of specific pesticide applications	76	15	9	100	*490*
g. Warning signs are posted at least 24 hours before and 72 hours after pesticide treatment	91	7	2	100	*493*

Appendix Table 1.3 Responses to Questions 4-7

		Percent	*Number of cases*
4. Which of the following describes your district's recordkeeping and pest monitoring/detection activities? Please check all that apply.	Buildings are inspected for potential pest problems	66	*327*
	Pests are monitored during the course of a year	61	*299*
	No pest monitoring/detection activities	5	*23*
	Records are kept of building inspections	33	*163*
	Records are kept of pest monitoring results	23	*113*
	Records are kept of pest sightings (for example, by teachers)	30	*149*
	Records are kept of pest management practices used other than pesticides	22	*106*
	No records are kept on pest management	16	*7*
	Total	n/a	*494*
5. Has your school district adopted an IPM program?	Yes	70	*349*
	No	18	*91*
	Not sure	12	*59*
	Total	100	*499*
If yes, how many years ago?	One year ago	2	*4*
	Two years ago	8	*23*
	Three years ago	10	*29*
	Four years ago	13	*37*
	Five years ago	20	*57*
	More than five years ago	45	*127*
	Not sure	2	*5*
	Total	100	*282*
6. Do you think your district's IPM program has: (Please check only one answer)	Resulted in more effective pest management	62	*215*
	Made no difference in pest management effectiveness	16	*57*
	Resulted in less effective pest management	9	*30*
	Uncertain/no opinion	13	*45*
	Total	100	*347*
7. Has your district's IPM program affected the long-term cost of pest management? (Please check only one answer)	Reduced the cost	29	*99*
	Increased the cost	25	*85*
	Had no impact on the cost	28	*95*
	Uncertain/no opinion	18	*64*
	Total	100	*343*

"n/a" means not applicable.

Appendix Table 1.4 Responses to Question 8

8. What are the barriers to using IPM practices in your district? Please rate the significance of each of the following:	Percent				
	Not at all significant	Somewhat significant	Very significant	Total	*Number of cases*
a. Age and condition of school facilities	42	40	18	100	*465*
b. Poor communication within the district	66	25	9	100	*457*
c. Budget restrictions	48	38	14	100	*466*
d. Inadequate staff training	42	44	14	100	*460*
e. Understaffing	30	37	33	100	*470*
f. Insufficient tool/equipment inventory	60	32	8	100	*460*
g. Lack of technical information resources	67	28	5	100	*463*
h. Contracting problems	77	18	5	100	*457*

Appendix Table 1.5 Responses to Question 9

		Percent	*Number of cases*
9. Did your district do anything to manage ants inside school buildings within the last 12 months?	Yes	77	*386*
	No	20	*101*
	Not sure	3	*13*
	Total	100	*500*

Appendix Table 1.6 Responses to Questions 10 and 11

			11. If yes, please rate the effectiveness of each practice used:						
			Percent						
10. Did your district use the following practices to manage ants inside buildings?	Percent Yes	*Number of cases*	Very effective	Some-what effective	Un-certain	Some-what in-effective	Very in-effective	Total	*Number of cases*
a. Insecticidal spray from an aerosol can (for example, Raid®)	13	51	43	49	4	4	0	100	*49*
b. Insecticides sprayed using other application method	35	137	57	39	3	1	0	100	*123*
c. Exempt insecticidal spray from an aerosol can (for example, mint, citrus or other plant based oils)	33	128	13	67	5	11	4	100	*116*
d. Ant baits	66	256	37	55	5	2	1	100	*231*
e. Soapy water spray	49	188	15	59	9	13	4	100	*170*
f. Caulk/seal cracks to prevent entry of ants	67	257	32	56	8	3	1	100	*226*
g. Improved sanitation	87	335	48	44	7	1	0	100	*299*
h. Other	12	46	48	44	8	0	0	100	*25*
Total	n/a	386						n/a	*354*

"n/a" means not applicable.

Appendix Table 1.7 Responses to Question 12

12. For each practice used, which best describes how your district decided when this treatment for ants was necessary?	Percent							
	Regular time intervals	When ants first noticed	When exceed pre-established threshold	After a certain number of complaints	Other	Multiple responses given [1]	Total	*Number of cases*
a. Insecticidal spray from an aerosol can (for example, Raid®)	0	59	14	19	8	0	100	*51*
b. Insecticides sprayed using other application method	30	32	18	15	4	2	100	*131*
c. Exempt insecticidal spray from an aerosol can (for example, mint, citrus or other plant based oils)	4	71	16	8	1	0	100	*119*
d. Ant baits	13	65	9	11	0	2	100	*251*
e. Soapy water spray	6	79	2	10	2	1	100	*183*
f. Caulk/seal cracks to prevent entry of ants	22	53	8	14	3	0	100	*240*
g. Improved sanitation	46	45	3	3	2	1	100	*312*
h. Other	15	29	6	6	41	3	100	*34*

[1]Most common practice listed of multiple responses: "when ants are first noticed" (32%), closely followed by "regular time intervals" (29%).

Appendix Table 1.8 Responses to Question 13

		Percent	*Number of cases*
13. Which one practice did your district use most frequently to manage ants inside school buildings? Please check only one answer.	Insecticidal spray from an aerosol can (for example, Raid®)	4	*15*
	Insecticides sprayed using other application method	13	*51*
	Exempt insecticidal spray from an aerosol can (for example, mint, citrus or other plant based oils)	7	*25*
	Ant baits	27	*105*
	Soapy water spray	10	*37*
	Caulk/seal cracks to prevent entry of ants	1	*4*
	Improved sanitation	21	*79*
	Other	4	*16*
	Multiple responses given [1]	13	*49*
	Total	100	*381*

[1]Most common practice listed among multiple responses was "improved sanitation" (73%) closely followed by "ant baits" (71%).

Appendix Table 1.9 Responses to Question 14

		Percent	*Number of cases*
14. Did your district do anything to manage weeds within the last 12 months?	Yes	93	*471*
	No	6	*30*
	Not sure	1	*3*
	Total	100	*504*

Appendix Table 1.10 Responses to Questions 15-16

			16. If yes, please rate the effectiveness of each practice used:						
			Percent						
15. Did your district use the following practices to manage weeds?	Percent Yes	*Number of cases*	Very effective	Some-what effective	Un-certain	Some-what in-effective	Very in-effective	Total	*Number of cases*
a. Broadcast treatment with herbicides (for example, preemergents)	39	184	47	46	4	1	2	100	*172*
b. Spot treatment with herbicides (for example, Roundup®)	79	374	75	23	1	1	0	100	*359*
c. Use of mulches, ground covers, barrier cloth or plastic	57	268	29	65	5	1	0	100	*258*
d. Physical controls such as hand pulling, cultivating, mowing	92	432	35	55	3	6	1	100	*406*
e. Flaming	9	41	24	65	3	5	3	100	*37*
f. Irrigation management	47	220	23	61	12	3	1	100	*208*
g. Turf selection	24	113	33	54	9	3	1	100	*105*
h. Other (please describe below)	3	13	44	56	0	0	0	100	*9*
Total	n/a	471						n/a	*444*

"n/a" means not applicable.

Appendix Table 1.11 Responses to Question 17

17. Which best describes how your district decided when herbicide treatment for weeds was necessary?	a. Broadcast treatment with herbicides (for example, preemergents)		b. Spot treatment with herbicides (for example, Roundup®)	
	Percent	*Number of cases*	Percent	*Number of cases*
Regular time intervals (annually, seasonally, monthly, etc.)	69	*127*	42	*157*
When weeds are first noticed	11	*22*	32	*120*
When weed abundance exceeds a pre-established threshold	15	*27*	20	*75*
After a certain number of complaints	1	*1*	1	*4*
Other	2	*4*	2	*7*
Multiple responses given	2	*3*	3	*10*
Total	100	*184*	100	*373*

Appendix Table 1.12 Responses to Question 18

18. Which one practice did your district use most frequently to manage weeds in the following locations?	a. Athletic fields		b. Playgrounds	
	Percent	*Number of cases*	Percent	*Number of cases*
Broadcast treatment with herbicides	16	*68*	5	*24*
Spot treatment with herbicides	34	*147*	43	*188*
Use of mulches, ground covers, barrier cloth or plastic	1	*3*	5	*21*
Physical controls such as hand pulling, cultivating, mowing	30	*130*	30	*133*
Flaming	1	*4*	2	*9*
Irrigation management	4	*17*	2	*7*
Turf selection	2	*7*	1	*3*
Other	2	*11*	1	*5*
Multiple responses given [1]	10	*44*	11	*46*
Total	100	*431*	100	*436*

[1]Most common athletic field and playground practice listed among multiple responses given was the same: “physical controls” (66% and 89% respectively).

Appendix Table 1.13 Responses to Question 19

		Percent	*Number of cases*
19. At which one of the following locations does your district typically have the most trouble with weeds? Please check only one answer.	Athletic fields	9	*40*
	Playgrounds	6	*28*
	Landscaping	26	*123*
	Rights of way	2	*8*
	Fence lines	24	*114*
	Paved areas/cracks in asphalt	5	*25*
	Other	2	*10*
	Multiple answers given [1]	26	*122*
	Total	100	*470*

[1]Most common location listed when multiple answers given was "fence lines" (84%).

Appendix Table 1.14 Responses to Questions 20-22

		Percent	*Number of cases*
20. Which of the following are you responsible for in your district? Please check all that apply.	Pest management and pesticide safety training	43	*307*
	Setting pest management policies	43	*212*
	Deciding when to use pest management practices	64	*312*
	Deciding which pest management practices to use	64	*315*
	Using pest management practices	53	*260*
	Directing others to use pest management practices	70	*342*
	Keeping records of all pest management practices used	60	*293*
	Other	4	*21*
	Total	n/a	*489*
21. Are you the designated IPM coordinator for your school district?	Yes	83	*409*
	No	17	*85*
	Total	100	*494*
22. How long have you been the IPM coordinator for your school district?	Less than 1 year	14	*57*
	1-2 years	22	*91*
	3-4 years	27	*110*
	5-10 years	31	*124*
	More than 10 years	6	*26*
	Total	100	*408*

"n/a" means not applicable.

Appendix Table 1.15 Responses to Question 23

23. Please rate each of the following for the past year in your school district.	Percent					
	Good	Fair	Poor	Not sure	Total	*Number of cases*
a. Communication between district pest manager(s) and other district staff (teachers, administrators) on pest management issues	*54*	*34*	*9*	*3*	*100*	*492*
b. Availability of technical information on pest management in schools	56	34	7	3	100	*491*
c. Use of pest prevention methods	47	43	7	3	100	*489*
d. Use of pest monitoring methods	34	44	16	6	100	*487*
e. Overall reduction of exposure to pesticides	67	26	2	5	100	*491*
f. Training opportunities for district staff in pest management	34	38	22	6	100	*486*
g. Contracting procedures used for hiring outside pest control services	59	25	5	11	100	*473*

Appendix Table 1.16 Responses to Question 24

24. Please indicate whether you have accessed each of the following information resources on pest management in schools. Please check only one box for each information resource.	Percent				
	Have accessed	Aware of but have not accessed	Not aware of	Total	*Number of cases*
a. DPR School IPM web site	64	19	17	100	*474*
b. Brochures/handouts from DPR	63	20	17	100	*473*
c. Presentations on school IPM by DPR staff	40	30	30	100	*458*
d. Training workshops on school IPM	60	25	15	100	*478*
e. Information provided by licensed pest control business	52	24	24	100	*472*
f. University of California resources	33	31	36	100	*456*
g. Information from other web site sources	41	28	31	100	*457*
h. California Department of Education, School Facilities Planning Division	20	37	43	100	*448*

Appendix Table 2.1 SPSS Procedure Syntax for Statistical Tests Used in Analysis

Test	Syntax for SPSS procedure used[1]
Chi-square test of independence	Crosstabs /tables insert variable name by insert variable name /statistics=chisq.
Chi-square goodness of fit	Npar test /chisquare=insert variable name /expected=insert population frequencies, in order.
Pearson's correlation	Correlations variables= insert variable names /missing=pairwise.
Analysis of variance F-test	Means /tables insert dependent variable name by insert independent variable name(s) /cells mean count stddev /statistics anova.
Linear regression	Regression /missing listwise /statistics coeff outs r anova /dependent insert dependent variable name /method=enter insert independent variable names.
Logistic regression	Logistic regression insert dependent variable name /method = enter insert independent variable names.
Multivariate analysis of variance	Unianova insert dependent variable name by insert independent variable name insert independent variable name /method = sstype(3) /intercept = include /print = descriptive etasq homogeneity /criteria = alpha(.05) /design = insert independent variable insert independent variable insert independent variable * insert independent variable .

[1] Shaded text indicates specifications unique to the particular relationship being examined. For example, insert variable name indicates that the name of the variable should be inserted into the syntax.

Appendix Table 2.2 Correlation Coefficients for Components of Healthy Schools Act Compliance Scale (regulated groups)

		Maintains record	Provides parents with notification	Maintains list	Warning signs posted
Maintains record	Pearson Correlation	1	.182(**)	.236(**)	.142(**)
	Significance (2-tailed)		.001	.000	.008
	N	348	348	348	348
Provides parents with notification	Pearson Correlation	.182(**)	1	.446(**)	.114(*)
	Significance (2-tailed)	.001		.000	.034
	N	348	348	348	348
Maintains list	Pearson Correlation	.236(**)	.446(**)	1	.027
	Significance (2-tailed)	.000	.000		.610
	N	348	348	348	348
Warning signs posted	Pearson Correlation	.142(**)	.114(*)	.027	1
	Significance (2-tailed)	.008	.034	.610	
	N	348	348	348	348
Healthy Schools Act* compliance scale	Pearson Correlation	.724(**)	.642(**)	.749(**)	.311(**)
	Significance (2-tailed)	.000	.000	.000	.000
	N	348	348	348	348

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Appendix Table 2.3 Frequency Distribution and Statistics for HSA Scale (Regulated)

HSA scale score:	*Number of cases*	Percent
0	*11*	3.1
10	*13*	3.6
20	*29*	8.1
30	*78*	21.7
40	*228*	63.5
Total	*359*	100%
Mean	33.9	
Median	40	
Mode	40	
Std. Deviation	9.94	
Range	0-40	

Appendix Table 2.4 Correlation Coefficients for Components of IPM Program Scale

		Written policy requiring least-toxic practices	Written policy requiring monitoring	Buildings inspected for potential pest problems	Pests are monitored during course of year	Records are kept of building inspections	Records are kept of pest monitoring results	Records are kept of pest sightings
Written policy requiring least-toxic practices	Pearson Correlation	1	.460	.066	.100	.141	.174	.185
	Sig. (2-tailed)		.000**	.150	.030*	.002**	.000**	.000**
	N	477	458	477	477	477	477	477
Written policy requiring monitoring	Pearson Correlation	.460	1	.131	.134	.240	.235	.205
	Sig. (2-tailed)	.000**		.005**	.004**	.000**	.000**	.000**
	N	458	463	463	463	463	463	463
Buildings inspected for potential pest problems	Pearson Correlation	.066	.131	1	.189	.341	.267	.105
	Sig. (2-tailed)	.150	.005**		.000**	.000**	.000**	.019*
	N	477	463	505	505	505	505	505
Pests are monitored during course of year	Pearson Correlation	.100	.134	.189	1	.194	.233	.131
	Sig. (2-tailed)	.030*	.004**	.000**		.000**	.000**	.003**
	N	477	463	505	505	505	505	505
Records are kept of building inspections	Pearson Correlation	.141	.240	.341	.194	1	.473	.222
	Sig. (2-tailed)	.002**	.000**	.000**	.000**		.000**	.000**
	N	477	463	505	505	505	505	505
Records are kept of pest monitoring results	Pearson Correlation	.174	.235	.267	.233	.473	1	.288
	Sig. (2-tailed)	.000**	.000**	.000**	.000**	.000**		.000**
	N	477	463	505	505	505	505	505
Records are kept of pest sightings	Pearson Correlation	.185	.205	.105	.131	.222	.288	1
	Sig. (2-tailed)	.000**	.000**	.019*	.003**	.000**	.000**	
	N	477	463	505	505	505	505	505
IPM Scale	Pearson Correlation	.550	.590	.524	.511	.656	.650	.527
	Sig. (2-tailed)	.000**	.000**	.000**	.000**	.000**	.000**	.000**
	N	458	458	458	458	458	458	458

**Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Appendix Table 2.5 Frequency Distribution and Statistics for IPM Program Scale

IPM scale score:	*Number of cases*	Percent
0	*37*	8
5	*89*	19
10	*94*	20
15	*85*	19
20	*53*	12
25	*51*	11
30	*36*	8
35	*13*	3
	458	100

Mean	14.26
Median	15
Mode	10
Std. Deviation	9.24
Range	0-35

Appendix Table 2.6 Frequency Distribution and Statistics for Ant Management Scale

Score	*Number of cases*	Percent
5	*1*	0.3
10	*2*	0.5
15	*2*	0.5
20	*3*	0.8
25	*4*	1.1
27	*1*	0.3
32	*1*	0.3
35	*4*	1.1
38	*2*	0.5
40	*5*	1.3
42	*2*	0.5
48	*1*	0.3
50	*8*	2.1
52	*3*	0.8
53	*2*	0.5
55	*5*	1.3
58	*1*	0.3
59	*2*	0.5
60	*5*	1.3
62	*2*	0.5
63	*10*	2.7
65	*3*	0.8
67	*3*	0.8
69	*2*	0.5
70	*9*	2.4
71	*1*	0.3
72	*4*	1.1
73	*4*	1.1
74	*1*	0.3
75	*7*	1.9
77	*3*	0.8
78	*1*	0.3
79	*1*	0.3
80	*7*	1.9
81	*1*	0.3
82	*2*	0.5
83	*2*	0.5
85	*9*	2.4
87	*5*	1.3
88	*12*	3.2
89	*2*	0.5
90	*15*	4.0
92	*4*	1.1
93	*6*	1.6
94	*4*	1.1
95	*9*	2.4
96	*1*	0.3
98	*7*	1.9
99	*1*	0.3
100	*12*	3.2
102	*5*	1.3
103	*6*	1.6
104	*2*	0.5
105	*10*	2.7
106	*3*	0.8
107	*4*	1.1
108	*5*	1.3
109	*3*	0.8
110	*11*	2.9
111	*1*	0.3
112	*9*	2.4
113	*5*	1.3
115	*11*	2.9
117	*7*	1.9
118	*6*	1.6
119	*1*	0.3
120	*10*	2.7
122	*6*	1.6
123	*14*	3.7
125	*14*	3.7
126	*1*	0.3
127	*1*	0.3
128	*8*	2.1
129	*1*	0.3
130	*7*	1.9
133	*8*	2.1
135	*6*	1.6
138	*2*	0.5
139	*1*	0.3
140	*2*	0.5
143	*1*	0.3
147	*1*	0.3
150	*1*	0.3
Total	*377*	100.0
Mean	93.68	
Median	98	
Mode	90	
Std. Deviation	29.27	
Range	5-150	

Appendix Table 2.7 Frequency Distribution and Statistics for Weed Management Scale

Score	*Number of cases*	Percent
0	*1*	0.2
5	*1*	0.2
10	*4*	0.8
15	*2*	0.4
20	*5*	1.1
25	*4*	0.8
29	*2*	0.4
30	*6*	1.3
34	*1*	0.2
35	*22*	4.7
39	*1*	0.2
40	*7*	1.5
45	*27*	5.7
49	*2*	0.4
50	*13*	2.8
54	*1*	0.2
55	*22*	4.7
59	*3*	0.6
60	*27*	5.7
62	*2*	0.4
64	*1*	0.2
65	*36*	7.6
67	*2*	0.4
70	*21*	4.5
74	*1*	0.2
75	*28*	5.9
79	*2*	0.4
80	*13*	2.8
84	*2*	0.4
85	*14*	3.0
90	*21*	4.5
92	*1*	0.2
94	*2*	0.4
95	*15*	3.2
97	*1*	0.2
99	*1*	0.2
100	*10*	2.1
104	*1*	0.2
105	*39*	8.3
109	*1*	0.2
110	*12*	2.5
112	*1*	0.2
115	*14*	3.0
119	*1*	0.2
120	*24*	5.1
124	*1*	0.2
125	*7*	1.5
129	*2*	0.4
130	*13*	2.8
134	*2*	0.4
135	*13*	2.8
140	*2*	0.4
145	*5*	1.1
150	*3*	0.6
155	*2*	0.4
160	*4*	0.8
Total	*471*	100.0
Mean	80.76	
Median	75	
Mode	105	
Std. Deviation	33.24	
Range	0-160	

Appendix Table 2.8 Frequency Distribution and Statistics for Resource Awareness and Use Scales

Score	*Number of cases*	Percent	Score	*Number of cases*	Percent
0	*17*	4.1	0	*40*	9.6
1	*11*	2.6	1	*45*	10.8
2	*22*	5.3	2	*59*	14.1
3	*20*	4.8	3	*58*	13.9
4	*39*	9.4	4	*69*	16.5
5	*51*	12.2	5	*53*	12.7
6	*54*	12.9	6	*46*	11.0
7	*73*	17.5	7	*25*	6.0
8	*130*	31.2	8	*22*	5.3
Total	*417*	100.0	Total	*417*	100
Mean	5.76			3.61	
Median	6			4	
Mode	8			4	
Std. Deviation	2.3			2.24	
Range	0-8			0-8	

Appendix Table 2.9 Frequency Distribution and Statistics for Pesticide Use Scale

Scale Score	*Number of cases*	Percent
1 -Only non-exempt pesticides	*5*	1.1
2 - Both exempt and non-exempt pesticides	*370*	80.8
3 - Exempt pesticides	*36*	7.9
4 - No pesticides used	*47*	10.3
Total	*458*	100%
Mean	2.27	
Median	2	
Mode	2	
Std. Deviation	.65	
Range	1-4	

Appendix Table 2.10 Crosstab of Original Q1 Responses with Actual Practices Listed in Questions 10 and 15

	Reported Ant and Weed Practices (answers to Q10 and Q15)[1]													
	Non-response/non-use				Use of non-exempt practices only			Use of exempt practices only			Use of both non-exempt and exempt practices			
					10a or b only	15a or b only	Both 10a/b and 15a/b	10c-g only	15c-g only	Both 10c-g and 15c-g	10a-g only	15a-g only	Both 10a-g and 15a-g	
Original Q1 responses recoded into 8 response categories	no herb, missing pesticide answers	no pesticides listed, missing herbicide answers	No answer given	no pest-icide or herbicide used at all	non-exempt pesticides only	non-exempt herb-icides only	only non-exempt herbicide and pesticides	only exempt pest-icide prac-tices	only exempt herbicide practices	only exempt herbicide and pesticide practices	exempt and non-exempt pest-icides only	exempt and non-exempt herb-icides only	mix of exempt and non-exempt herbicides and pesticides	Total
No answer given	0	1	0	2		1	0	4	6	13	0	5	11	43
1 Only pesticides exempt from HSA	3			4				3	1	8				19
2 Only pesticides that are not exempt from HSA			1			1			2	2	1	7	38	52
3 Both exempt and non-exempt pesticides						1	1	2	3	5	1	17	114	144
4 No pesticides were used at all	1	1		6				3	13	18				42
5 Not sure				1		1	1	1	1	5		14	43	67
6 exempt + yes on 15b						3						10	36	49
7 none used but yes on 15b						1						3	8	12
8 probably wrong (q1 or 4=yes, plus a yes to more than one non-exempt practice)							1				2	10	64	77
Totals	4	2	1	13	0	8	3	13	26	51	4	66	314	505

[1]Q10a – insecticidal spray/Q10b – insecticides using other application/Q15a – broadcast herbicide treatment/Q15b – spot herbicide treatment/Q10 and Q15 c-g answers – exempt or non-chemical practices

Appendix Table 2.11 Frequency Distribution and Statistics for Barriers to IPM Practices Scale

Score	*Number of cases*	Percent
8	*47*	10.6
9	*35*	7.9
10	*64*	14.4
11	*39*	8.8
12	*50*	11.3
13	*35*	7.9
14	*54*	12.2
15	*35*	7.9
16	*21*	4.7
17	*23*	5.2
18	*16*	3.6
19	*13*	2.9
20	*4*	0.9
21	*3*	0.7
22	*1*	0.2
23	*1*	0.2
24	*2*	0.5
Total	*443*	100

Mean	12.63
Median	12
Mode	10
Std. Deviation	3.33
Range	8-24

Appendix Table 2.12 Number of Respondents in Job Area and Job Level Categories

	Job Level				
Job Area	Administration	Director/ Coordinator	Manager/ Supervisor/Head	Worker	Total
Administration	50	0	0	0	50
Front office/business	0	9	11	10	30
Safety/risk management	0	9	12	0	21
Maintenance & Operations	0	181	158	49	388
Total	50	199	181	59	489

Appendix Table 2.13 Correlation coefficients between Question 24 Responses, Training, and the 2007 Resource Use Scale

		DPR School IPM website	Brochures/handouts from DPR	Presentations on school IPM by DPR staff	Training workshops on school IPM	Information provided by licensed pest control business	University of California resources	Information from other web site sources	CA Department of Education, School Facilities Planning Division	District attended training	2007 Resource Use scale
DPR School IPM website	Pearson Correlation	1	.460(**)	.284(**)	.321(**)	.071	.386(**)	.435(**)	.202(**)	.202(**)	.663(**)
	Sig. (2-tailed)		.000	.000	.000	.131	.000	.000	.000	.000	.000
	N	474	462	455	463	455	446	449	438	474	417
Brochures/handouts from DPR	Pearson Correlation	.460(**)	1	.350(**)	.327(**)	.080	.307(**)	.228(**)	.161(**)	.102(*)	.616(**)
	Sig. (2-tailed)	.000		.000	.000	.087	.000	.000	.001	.026	.000
	N	462	473	451	465	458	449	450	443	473	417
Presentations on school IPM by DPR staff	Pearson Correlation	.284(**)	.350(**)	1	.528(**)	.069	.224(**)	.214(**)	.187(**)	.322(**)	.616(**)
	Sig. (2-tailed)	.000	.000		.000	.143	.000	.000	.000	.000	.000
	N	455	451	458	456	451	443	445	437	458	417
Training workshops on school IPM	Pearson Correlation	.321(**)	.327(**)	.528(**)	1	.108(*)	.254(**)	.263(**)	.193(**)	.326(**)	.630(**)
	Sig. (2-tailed)	.000	.000	.000		.020	.000	.000	.000	.000	.000
	N	463	465	456	478	463	452	453	446	478	417
Information provided by licensed pest control business	Pearson Correlation	.071	.080	.069	.108(*)	1	.159(**)	.142(**)	.150(**)	.078	.362(**)
	Sig. (2-tailed)	.131	.087	.143	.020		.001	.002	.002	.092	.000
	N	455	458	451	463	472	451	452	442	472	417
University of California resources	Pearson Correlation	.386(**)	.307(**)	.224(**)	.254(**)	.159(**)	1	.506(**)	.336(**)	.165(**)	.647(**)
	Sig. (2-tailed)	.000	.000	.000	.000	.001		.000	.000	.000	.000
	N	446	449	443	452	451	456	448	440	456	417
Information from other web site sources	Pearson Correlation	.435(**)	.228(**)	.214(**)	.263(**)	.142(**)	.506(**)	1	.389(**)	.097(*)	.656(**)
	Sig. (2-tailed)	.000	.000	.000	.000	.002	.000		.000	.039	.000
	N	449	450	445	453	452	448	457	442	457	417
CA Dept of Ed, School Facilities Planning Division	Pearson Correlation	.202(**)	.161(**)	.187(**)	.193(**)	.150(**)	.336(**)	.389(**)	1	.059	.515(**)
	Sig. (2-tailed)	.000	.001	.000	.000	.002	.000	.000		.216	.000
	N	438	443	437	446	442	440	442	448	448	417
District attended training	Pearson Correlation	.202(**)	.102(*)	.322(**)	.326(**)	.078	.165(**)	.097(*)	.059	1	.296(**)
	Sig. (2-tailed)	.000	.026	.000	.000	.092	.000	.039	.216		.000
	N	474	473	458	478	472	456	457	448	978	417
2007 Resource Use scale	Pearson Correlation	.663(**)	.616(**)	.616(**)	.630(**)	.362(**)	.647(**)	.656(**)	.515(**)	.296(**)	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	417	417	417	417	417	417	417	417	417	417

**Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Appendix Table 3.1 Impact of District Characteristics on Pesticide Use using a Different Reference Category

		Pesticide Use			
Variable		B	S.E.	Sig.[2]	Exp(B)
Population area[1]	Large city	18.726	8100.506	.998	135759705.131
	Mid city	1.145	.912	.209	3.144
	Urban fringes of large city	.697	.557	.211	2.008
	Urban fringes of small city	.179	.547	.743	1.197
	Large or small town	.627	1.107	.571	1.872
	Rural, outside MSA	-1.005	.740	.174	.366
Region[1]	North Coast	-1.113	1.020	.275	.328
	Sierra	.877	.810	.279	2.404
	North Central	1.635	1.072	.127	5.130
	Bay Area	-.931	.626	.137	.394
	Central Valley	1.765	.735	.016	5.843
	Central Coastal	-.206	.747	.783	.814
	South Eastern	-1.005	.684	.142	.366
District type[1]	Elementary	-.927	.448	.039	.396
	High	18.309	5988.651	.998	89447179.111
Number of students (ADA)		.000	.000	.051	1.000
Cost per student		.000	.000	.274	1.000
Length of time as IPM coordinator		.005	.155	.974	1.005
Adjusted r square		.262			
DF/N		364			

[1]Reference categories: rural area inside MSA, LA/surrounding area, unified school district.
[2]Significance of logistic regression. Probabilities ≤ .05 are boxed for easy identification.

Appendix Table 3.2 Impact of District Characteristics, Actions and Practices on Pesticide Use Using a Different Reference Category

		Pesticide Use			
Variable		B	S.E.	Sig.[2]	Exp(B)
Population area[1]	Large city	17.337	9988.667	.999	33838943.601
	Mid city	1.778	1.268	.161	5.918
	Urban fringes of large city	.442	.665	.506	1.556
	Urban fringes of small city	.440	.712	.536	1.553
	Large or small town	1.217	1.240	.326	3.379
	Rural, outside MSA	-.723	.920	.432	.485
Region[1]	North Coast	-1.134	1.228	.356	.322
	Sierra	1.190	.983	.226	3.288
	North Central	1.849	1.456	.204	6.351
	Bay Area	-.290	.757	.702	.748
	Central Valley	1.607	.846	.058	4.990
	Central Coastal	-.254	.877	.772	.775
	South Eastern	-1.080	.807	.181	.340
District type[1]	Elementary	-.953	.536	.076	.386
	High	18.201	6949.758	.998	80293886.327
Number of students (ADA)		.000	.000	.203	1.000
Cost per student		.000	.000	.466	1.000
Length of time as IPM coordinator		-.011	.208	.959	.989
Adopted IPM program		-.054	.540	.921	.948
Trained		.232	.483	.631	1.261
Number of contracts held		.599	.256	.019	1.821
Barriers scale		.009	.074	.900	1.009
Resource use scale		.058	.114	.613	1.060
Adjusted r square*		.291			
DF/N		267			

[1]Reference categories: rural area inside MSA, LA/surrounding area, unified school district.
[2]Significance of logistic regression. Probabilities ≤ .05 are boxed for easy identification.

Appendix Table 3.3 IPM Program Adoption and Number of Students in the District (2007)

Number of students	Adopted an IPM program: No	Adopted an IPM program: Yes	Total	*Number of cases*
Under 200	54.2%	45.8	100%	*96*
200-499	23.3%	76.7	100%	*43*
500-999	29.2%	70.8	100%	*48*
1,000-1,999	29.6%	70.4	100%	*54*
2,000-2,999	29.7%	70.3	100%	*37*
3,000-4,999	26.7%	73.3	100%	*45*
5,000-9,999	26.1%	73.9	100%	*69*
10,000 or more	13.4%	86.6	100%	*97*

Appendix Table 3.4 District Training Status and Cost per Student (2007)

Cost per student	District was trained: No	District was trained: Yes	Total	*Number of cases*
Lower third	27.2%	72.8	100%	*169*
Middle third	19.3%	80.7	100%	*161*
Upper third	41.2%	58.8	100%	*165*

Appendix Table 3.5 Pesticide Use and Number of Students (2007)

Number of students	Pesticide Use: Exempt only or no pesticides used	Pesticide Use: Non-exempt or mix of exempt and non-exempt pesticides used	Total	*Number of cases*
Under 200	51.7%	48.3	100%	*87*
200-499	13.9%	86.1	100%	*36*
500-999	26.2%	73.8	100%	*42*
1,000-1,999	11.3%	88.7	100%	*53*
2,000-2,999	9.4%	90.6	100%	*32*
3,000-4,999	5.1%	94.9	100%	*39*
5,000-9,999	6.2%	93.8	100%	*65*
10,000 or more	3.2%	96.8	100%	*93*

Appendix Table 4.1 Perceived Significance of Barriers to using IPM Practices (2004 and 2007)

		2004	2007	p^1
Age and condition	Not at all significant	45%	42.4%	.706

of school facilities	Somewhat significant	37.7	40	
	Very significant	17.2	17.6	
	Total %	100%	100%	
	Number of cases	453	465	
Poor communication within the district	Not at all significant	70.8%	66.5%	.319
	Somewhat significant	22.5	24.7	
	Very significant	6.7	8.8	
	Total %	100%	100%	
	Number of cases	448	457	
Budget restrictions	Not at all significant	36.5%	48.1%	.000
	Somewhat significant	38.7	38	
	Very significant	24.7	13.9	
	Total %	100%	100%	
	Number of cases	457	466	
Inadequate staff training	Not at all significant	49.6%	42.4%	.090
	Somewhat significant	38.8	43.5	
	Very significant	11.7	14.1	
	Total %	100%	100%	
	Number of cases	446	460	
Understaffing	Not at all significant	33.8%	30%	.245
	Somewhat significant	32	37	
	Very significant	34.2	33	
	Total %	100%	100%	
	Number of cases	456	470	
Insufficient tool/equipment inventory	Not at all significant	59.6%	60%	.432
	Somewhat significant	29.7	31.7	
	Very significant	10.7	8.3	
	Total %	100%	100%	
	Number of cases	441	460	
Lack of technical information resources	Not at all significant	65.5%	67.2%	.213
	Somewhat significant	26.5	27.6	
	Very significant	8.1	5.2	
	Total %	100%	100%	
	Number of cases	446	463	
Contracting problems	Not at all significant	78.3%	77.2%	.885
	Somewhat significant	16.7	17.9	
	Very significant	5	4.8	
	Total %	100%	100%	
	Number of cases	443	457	

[1]Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Appendix Table 5.1 Change in District Training Status (2004 and 2007 Panel Group)

	Number	Percent

Never trained	*94*	27.3%
Trained before 2004	*103*	29.9%
Trained between 2004 and 2007	*147*	42.7%
Total	*344*	100%

Appendix Table 5.2 Change in Resource Awareness Scale Score from 2004 to 2007 by District Characteristics (Panel Group)

	Change in Resource Awareness scale score					
Population area	District scale score decreased	District scale score stayed the same	District scale score improved	Total	*N*	*p*[1]
Large city and urban fringes	41%	18.1%	41%	100%	*105*	.183
Mid city, urban fringes, large or small town	35.8%	28.5%	35.8%	100%	*137*	
Rural, in or outside of MSA	32.2%	20%	47.8%	100%	*90*	
Region						
Urban/coastal areas	37.5%	25.7%	36.8%	100%	*144*	.118
Central and northern valley	44.2%	19.8%	36%	100%	*86*	
Remote, north coastal and mountainous areas	28.4%	21.6%	50%	100%	*102*	
District Type						
Elementary	37.1%	21.4%	41.5%	100%	*159*	.958
High school	32.4%	26.5%	41.2%	100%	*34*	
Unified	36.7%	23.7%	39.6%	100%	*139*	
Number of Students in district (ADA)						
Lower third (< 925 students)	30.2%	21.7%	48.1%	100%	*106*	.384
Middle third (925 to 6131)	39.1%	22.7%	38.2%	100%	*110*	
Upper third (> 6131)	39.3%	25%	35.7%	100%	*112*	
Cost per Student						
Lower third (< $7020/student)	37.3%	22.7%	40%	100%	*110*	.959
Middle third ($7020 to $7822/student)	33.3%	24.1%	42.6%	100%	*108*	
Upper third (> $7822/student)	38.2%	22.7%	39.1%	100%	*110*	
Number of schools in district						
Lower third (One to three schools)	32.4%	20.6%	47.1%	100%	*102*	.223
Middle third (Four to 11 schools)	33.3%	27.5%	39.2%	100%	*120*	
Upper third (> 11 schools)	43.6%	20%	36.4%	100%	*110*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Appendix Table 5.3 Change in Awareness Use Scale Score from 2004 to 2007 by District Characteristics (Panel Group)

	Change in Awareness Use scale score

Population area	District scale score decreased	District scale score stayed the same	District scale score improved	Total	*N*	*p*[1]
Large city and urban fringes	35.2%	23.8%	41%	100%	*105*	.562
Mid city, urban fringes, large or small town	32.8%	19%	48.2%	100%	*137*	
Rural, in or outside of MSA	31.1%	16.7%	42.2%	100%	*90*	
Region						
Urban/coastal areas	34%	22.2%	43.8%	100%	*144*	.104
Central and northern valley	41.9%	15.1%	43%	100%	*86*	
Remote, north coastal and mountainous areas	24.5%	20.6%	54.9%	100%	*102*	
District Type						
Elementary	34%	20.8%	45.3%	100%	*159*	.979
High school	32.4%	20.6%	47.1%	100%	*34*	
Unified	32.4%	18.7%	48.9%	100%	*139*	
Number of Students in district (ADA)						
Lower third (< 925 students)	32.1%	21.7%	46.2%	100%	*106*	.310
Middle third (925 to 6131)	31.8%	14.5%	53.6%	100%	*110*	
Upper third (> 6131)	34.8%	24.1%	41.1%	100%	*112*	
Cost per Student						
Lower third (< $7020/student)	37.3%	18.2%	44.5%	100%	*110*	.335
Middle third ($7020 to $7822/student)	28.7%	25.9%	45.4%	100%	*108*	
Upper third (> $7822/student)	32.7%	16.4%	50.9%	100%	*110*	
Number of schools in district						
Lower third (One to three schools)	32.4%	20.6%	47.1%	100%	*102*	.291
Middle third (Four to 11 schools)	27.5%	19.2%	53.3%	100%	*120*	
Upper third (> 11 schools)	40%	20%	40%	100%	*110*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Appendix Table 5.4 Change in Barriers Scale Score from 2004 to 2007 by District Characteristics (Panel Group)

Change in Barriers scale score

Population area	District perceived fewer barriers	No change in barriers perceived	District perceived more barriers	Total	*N*	*p*[1]
Large city and urban fringes	42.4%	11.8%	45.9%	100%	*85*	.622
Mid city, urban fringes, large or small town	46.5%	14.9%	38.6%	100%	*114*	
Rural, in or outside of MSA	47.9%	8.2%	43.8%	100%	*73*	
Region						
Urban/coastal areas	45.3%	14.5%	40.2%	100%	*117*	.778
Central and northern valley	43.8%	12.3%	43.8%	100%	*73*	
Remote, north coastal and mountainous areas	47.6%	8.5%	43.9%	100%	*82*	
District Type						
Elementary	44.8%	9.6%	45.6%	100%	*125*	.476
High school	42.9%	21.4%	35.7%	100%	*28*	
Unified	47.1%	12.6%	40.3%	100%	*119*	
Number of Students in district (ADA)						
Lower third (< 925 students)	46.8%	8.9%	44.3%	100%	*79*	.799
Middle third (925 to 6131)	46.2%	12.1%	41.8%	100%	*91*	
Upper third (> 6131)	43.4%	15.2%	41.4%	100%	*99*	
Cost per Student						
Lower third (< $7020/student)	50%	12.8%	37.2%	100%	*94*	.745
Middle third ($7020 to $7822/student)	41.6%	11.2%	47.2%	100%	*89*	
Upper third (> $7822/student)	44.2%	12.8%	43%	100%	*86*	
Number of schools in district						
Lower third (One to three schools)	46.8%	11.4%	41.8%	100%	*79*	.993
Middle third (Four to 11 schools)	46.3%	12.6%	41.1%	100%	*95*	
Upper third (> 11 schools)	43.9%	12.2%	43.9%	100%	*98*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Appendix Table 5.5 Pesticide Use (Panel Group)

		Pest Use Scale 2007				Total
		Only non-exempt	Both non- and exempt	Only exempt	No pesticides at all	
Pest Use Scale 2004	Only non-exempt	0	7*	0	1+	8
	Both non- and exempt	1	251*	8+	5+	265
	Only exempt	0	5	4+	1+	10
	No pesticides at all	0	8	7+	14+	29
	Total	1	271	19	21	312

*Districts that were classified as "middle" and remained in the middle, or improved to the middle.
+Districts that were classified as "good" and remained good, or improved to good.
Due to chi square's sensitivity to small cell counts, the 14 districts whose pesticide practices deteriorated are not included in the chi-square analyses done in Chapter V.

Appendix Table 5.6 Change in IPM Scale score from 2004 to 2007 by District Characteristics (Panel Group)

	Change in IPM scale score					
Population area	District scale score decreased	District scale score stayed the same	District scale score improved	Total	*N*	*p*[1]
Large city and urban fringes	40.7%	25.3%	34.1%	100%	*91*	.313
Mid city, urban fringes, large or small town	42.6%	18%	39.3%	100%	*122*	
Rural, in or outside of MSA	32.5%	19.5%	48.1%	100%	*77*	
Region						
Urban/coastal areas	36.6%	22.9%	40.5%	100%	*131*	.200
Central and northern valley	49.4%	13%	37.7%	100%	*77*	
Remote, north coastal and mountainous areas	34.1%	24.4%	41.5%	100%	*82*	
District Type						
Elementary	36.2%	22%	41.8%	100%	*141*	.717
High school	41.4%	13.8%	44.8%	100%	*29*	
Unified	42.5%	20.8%	36.7%	100%	*120*	
Number of Students in district (ADA)						
Lower third (< 925 students)	37.2%	19.1%	43.6%	100%	*94*	.267
Middle third (925 to 6131)	46.2%	16.1%	37.6%	100%	*93*	
Upper third (> 6131)	36.6%	27.3%	36.4%	100%	*99*	
Cost per Student						
Lower third (< $7020/student)	32.7%	21.8%	45.5%	100%	*101*	.379
Middle third ($7020 to $7822/student)	43.2%	22.7%	34.1%	100%	*88*	
Upper third (> $7822/student)	44.3%	18.6%	37.1%	100%	*97*	
Number of schools in district						
Lower third (One to three schools)	33.3%	20%	46.7%	100%	*90*	.319
Middle third (Four to 11 schools)	46.6%	18.4%	35%	100%	*103*	
Upper third (> 11 schools)	37.1%	23.7%	39.2%	100%	*97*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Appendix Table 5.7 Change in Ant Scale Score from 2004 to 2007 by District Characteristics (Panel Group)

	Change in Ant scale score				
Population area	District scale score decreased	District scale score stayed the same or improved	Total	*N*	*p*[1]
Large city and urban fringes	42.7%	57.3%	100%	*82*	.488
Mid city, urban fringes, large or small town	45%	55%	100%	*109*	
Rural, in or outside of MSA	34.1%	65.9%	100%	*41*	
Region					
Urban/coastal areas	40%	60%	100%	*105*	.174
Central and northern valley	36.1%	63.9%	100%	*61*	
Remote, north coastal and mountainous areas	51.5%	45.8%	100%	*66*	
District Type					
Elementary	39.6%	60.4%	100%	*101*	.764
High school	45.8%	54.2%	100%	*24*	
Unified	43.9%	56.1%	100%	*107*	
Number of Students in district (ADA)					
Lower third (< 925 students)	34.7%	65.3%	100%	*49*	.422
Middle third (925 to 6131)	42.2%	57.8%	100%	*83*	
Upper third (> 6131)	46%	54%	100%	*100*	
Cost per Student					
Lower third (< $7020/student)	47.1%	52.9%	100%	*85*	.526
Middle third ($7020 to $7822/student)	39.8%	60.2%	100%	*83*	
Upper third (> $7822/student)	39.1%	60.9%	100%	*64*	
Number of schools in district					
Lower third (One to three schools)	30.2%	69.8%	100%	*53*	.129
Middle third (Four to 11 schools)	45.9%	54.1%	100%	*85*	
Upper third (> 11 schools)	45.7%	54.3%	100%	*94*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Appendix Table 5.8 Change in Weed Scale Score from 2004 to 2007 by District Characteristics (Panel Group)

	Change in Weed scale score					
Population area	District scale score decreased	District scale score stayed the same	District scale score improved	Total	*N*	*p*[1]
Large city and urban fringes	34.3%	6.9%	58.8%	100%	*102*	.081
Mid city, urban fringes, large or small town	37.4%	6.1%	56.5%	100%	*131*	
Rural, in or outside of MSA	19.5%	6.1%	74.4%	100%	*82*	
Region						
Urban/coastal areas	35.3%	8.1%	56.6%	100%	*136*	.477
Central and northern valley	30.2%	5.8%	64%	100%	*86*	
Remote, north coastal and mountainous areas	28%	4.3%	67.7%	100%	*93*	
District Type						
Elementary	31.5%	7.5%	61%	100%	*146*	.739
High school	25.7%	8.6%	65.7%	100%	*35*	
Unified	33.6%	4.5%	61.9%	100%	*134*	
Number of Students in district (ADA)						
Lower third (< 925 students)	26.9%	6.5%	66.7%	100%	*93*	.881
Middle third (925 to 6131)	33%	5.7%	61.3%	100%	*106*	
Upper third (> 6131)	33%	6.3%	60.7%	100%	*112*	
Cost per Student						
Lower third (< $7020/student)	37%	4.6%	58.3%	100%	*108*	.318
Middle third ($7020 to $7822/student)	31.7%	7.7%	60.6%	100%	*104*	
Upper third (> $7822/student)	24.2%	6.1%	69.7%	100%	*99*	
Number of schools in district						
Lower third (One to three schools)	29.7%	8.8%	61.5%	100%	*91*	.683
Middle third (Four to 11 schools)	30.7%	4.4%	64.9%	100%	*114*	
Upper third (> 11 schools)	34.5%	6.4%	59.1%	100%	*110*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Appendix Table 5.9 Mean Changes in Scale Scores by Change in Contracting Status (Panel Group)

	Contract status	*N*	Mean change between years	SD	Standard Error	*p*[1]
Resource awareness scale change	No contract either year	*49*	0.47	2.65	0.38	.620
	Contract in 2004	*31*	-0.16	3.24	0.58	
	Contract in 2007	*16*	-0.38	3.59	0.9	
	Contract(s) both years	*223*	0.04	2.53	0.17	
Resource Use scale change	No contract either year	*49*	0.59	2.59	0.37	.534
	Contract in 2004	*31*	0.87	2.95	0.53	
	Contract in 2007	*16*	0.69	1.92	0.48	
	Contract(s) both years	*223*	0.28	2.36	0.16	
Barriers scale change	No contract either year	*40*	0.48	4.43	0.7	.734
	Contract in 2004	*22*	0.59	4.39	0.94	
	Contract in 2007	*15*	-0.47	3.09	0.8	
	Contract(s) both years	*185*	-0.04	3.74	0.27	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Appendix Table 5.10 Change in IPM Scale Scores by Change in District Actions (Panel Group)

	Change in IPM scale score					
Program adoption	District score decreased	Score stayed the same	District score improved	Total	*N*	*p*[1]
District had IPM program both years	41.9%	23.4%	34.7%	100%	*167*	.197
District no or not sure both years	37.3%	15.7%	47.1%	100%	*51*	
District had program one year, not other	31.3%	18.8%	50%	100%	*64*	
Change in training status						
District never trained	41.3%	18.7%	40%	100%	*75*	.598
District trained before 2004	35.2%	26.4%	38.5%	100%	*91*	
District trained between 2004 and 2007	41.1%	17.7%	41.1%	100%	*124*	
Change in number of contracts						
Number of contracts stayed the same	38.3%	20.3%	41.4%	100%	*133*	.574
Number of contracts increased	32.9%	23.2%	43.9%	100%	*82*	
Number of contracts decreased	46.8%	17.7%	35.5%	100%	*62*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Appendix Table 5.11 Change in Ant Scale Scores by Change in District Actions (Panel Group)

	Change in Ant scale score				
Program adoption	District score decreased	Score stayed the same or improved	Total	*N*	*p*[1]
District had IPM program both years	42.6%	57.4%	100%	*148*	.863
District no or not sure both years	44.4%	55.6%	100%	*27*	
District had program one year, not other	38.8%	61.2%	100%	*49*	
Change in training status					
District never trained	35.3%	64.7%	100%	*51*	.506
District trained before 2004	45.2%	54.8%	100%	*84*	
District trained between 2004 and 2007	43.3%	56.7%	100%	*97*	
Change in number of contracts					
Number of contracts stayed the same	45.3%	54.7%	100%	*106*	.117
Number of contracts increased	46.3%	53.7%	100%	*67*	
Number of contracts decreased	29.4%	70.6%	100%	*51*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.

Appendix Table 5.12 Change in Weed Scale Scores by Change in District Actions (Panel Group)

	Change in Weed scale score					
Program adoption	District score decreased	Score stayed the same	District score increased	Total	*N*	*p*[1]
District had IPM program both years	31.4%	7.6%	61.1%	100%	*185*	.840
District no or not sure both years	35.6%	6.7%	57.8%	100%	*45*	
District had program one year, not other	32.9%	3.9%	63.2%	100%	*76*	
Change in training status						
District never trained	39.3%	6%	54.8%	100%	*84*	.254
District trained before 2004	34%	7%	59%	100%	*100*	
District trained between 2004 and 2007	25.2%	6.1%	68.7%	100%	*131*	
Change in number of contracts						
Number of contracts stayed the same	28%	7%	65%	100%	*143*	.564
Number of contracts increased	33.7%	5.6%	60.7%	100%	*89*	
Number of contracts decreased	38.9%	6.9%	54.2%	100%	*72*	

[1] Significance of chi square. Probabilities ≤ .05 are boxed for easy identification.