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Public Inquiries about Indoor Air Quality in California

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To identify the indoor air quality issues about which Californians most often sought advice from a health department or a public information agency and to evaluate how well these agencies met the public's needs, members of the California Interagency Working Group (IWG) on Indoor Air Quality kept records of inquiries they received over a 30-month period from mid-1985 through 1987. Members of the IWG answered calls from residents of a least 49 of California's 58 counties. IWG members received more public inquiries about residences than about offices, educational institutions, commercial buildings, or medical facilities. However, each call about a residence probably represented fewer people at risk of exposure to a real or a potential problem than did calls about other types of buildings. Homeowners themselves asked the majority of the questions about residences, whereas a large number of the inquiries about office buildings were made, not by affected office workers, but by building managers, contractors, consultants, or company health and safety officers. The leading topics of concern in the residences were asbestos, chemical and biological contamination, and radon. In offices, chemical contamination, the ventilation system, biological contamination, asbestos, and tobacco smoke were the most frequently mentioned sources of problems. Callers often reported experiencing headaches, allergy symptoms, nose or throat irritation, and respiratory tract problems in connection with their complaints. IWG members directed a third of the calls elsewhere, of which half were referred to consultants or testing laboratories. The IWG's experience in the State of California could help other health departments prepare to face the public's increasing concern about indoor air pollution.

Introduction

Health authorities and the public are becoming increasingly aware of the potential hazards of indoor air pollution in residences and nonindustrial workplaces, for example, exposure to environmental tobacco smoke, solvents off-gassing from new interior furnishings, airborne asbestos, and radon. To develop a coordinated effort to determine the nature and extent of problems related to indoor air quality (IAQ) in California, the State Legislature passed a bill in 1982 to create the California Indoor Air Quality Program (CIAQP) within the California Department of Health Services. The CIAQP established an Interagency Working Group (IWG) on IAQ with members from state agencies and public assistance organizations that deal with different aspects of IAQ. To understand better the problems the public faces and the issues about which Californians need information, 43 IWG members, representing 12 agencies, completed a standard record form summarizing telephone requests for information, assistance, or advice on matters related to IAQ. The survey has helped the Department of Health Services and the IWG to identify the IAQ problems that the public encounters and for which they seek outside help; to prepare educational materials to fill gaps that were found; to evaluate how well various agencies meet the public's needs; and to focus on research that is of value to the public.

Methods

Report Form

The information requested on the report form used in this study is outlined in Table 1. During or soon after a conversation, contacted IWG members recorded the information that a caller volunteered, but they did not attempt to collect information for every item in the table.

Callers were placed into one of the following categories based on their association or connection with the building or the IAQ topic about which they inquired: residents; office workers; governmental health agency employees; public and private agency (other than health

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Table 1. Information recorded from IAQ inquiries.

Caller's name: used to match calls to different agencies and to identify caller sex
Caller's category, classification, or connection with the problem building
Address and telephone number: used to identify the county from which the call originated and to match callers with the same names
Type of building about which the caller requested information
IAQ issue about which the caller requested information
Physical symptoms
Other agencies the caller already had contacted
Type of assistance provided to the caller, e.g., information given over the telephone, information mailed to the caller, caller referred to another agency, building visited, samples from building tested, etc.

departments) employees; educational institution employees, parents, and students; health care workers and health care providers; public and commercial building users; consultants and contractors; occupational safety and health professionals employed by private companies; building owners and operators; builders, architects, and construction company employees; realtors; reporters; and others (callers who could not be placed in any of the categories listed above).

The types of buildings or indoor environments about which callers inquired were grouped into six categories, as follows: residences; offices; educational institutions; medical or research facilities; commercial or public buildings; and others (buildings that could not be placed in any of the above categories).

Nine topic categories were established, as follows: asbestos; airborne dusts and fibers other than asbestos; tobacco smoke; chemical contamination; radon; ventilation and air cleaning systems; biological contamination; general information on the causes and sources of indoor air pollution; and other (topics that could not be placed in any of the above categories).

Physical signs and symptoms were grouped into the following categories: respiratory tract symptoms; headache; allergy or asthma; eye irritation; gastrointestinal tract symptoms; tiredness; dizziness or fainting; infections; possible stress symptoms (e.g., stress, nervousness, trouble concentrating, memory loss, insomnia, chest pains, palpitations, raised heartbeat, and mood changes); reactions to chemicals; sick more often than usual; malaise; skin irritation; metal, chalk, chemical, dry, or salty tastes; cancer; and other (symptoms that could not be placed in any of the above categories).

Participating Agencies

The following agencies participated in the survey for varying periods of time: from the California Department of Health Services, the CIAQP, the Air and Industrial Hygiene laboratory (other than the CIAQP), the Epidemiological Studies and Surveillance Section, and the Hazard Evaluation Section and Information Service; the California Air Resources Board; regional Air Pollution Control Districts; the California Bureau of Home Furnishings; the California Occupational Safety and Health Administration (Cal/OSHA); the San Francisco Chapter of the American Lung Association; City and County Environmental Health Departments; the University of California's Northern California Occupational Health Clinic; and the Region IX office of the U.S. Environmental Protection Agency.

The number of inquiries received by each agency was weighted by the length of time the group participated in the survey to estimate the annual number of calls about various IAQ topics (Table 2). For all other summaries, the reports from the 2.5 years of the study period were unweighted.

Results

Counties in Which Callers Resided or Worked

The county in which a caller resided could be identified (e.g., from the callers's address or telephone number) for almost all reports. IWG members received calls from all but 9 of California's 58 counties.

IAQ Issues about Which Callers Requested Information or Assistance

Over half of the weighted annual number of calls were about asbestos (Table 2). In one-fifth of the weighted reports, callers mentioned some type of chemical contamination. In this diverse category, formaldehyde was the leading problem about which people were concerned or wanted information. The second most frequent complaint was of an unpleasant, irritating, or annoying odor. Included in the "other" topic category were questions about video display terminals and magnetic fields.

Table 2. Estimated annual number of calls on IAQ issues to participating IWG agencies.

IAQ issues	Estimated annual number of calls
Asbestos	793
Chemical contamination	306
Radon	165
Ventilation and air cleaning systems	84
Biological contamination	79
General information	30
Tobacco smoke	19
Airborne dusts and fibers (other than asbestos)	13
Other	2
Total	1491

Categories of Callers

Callers could be placed into one of the 14 categories of Table 3 in three-quarters of all contacts. Half of these callers were classified as residents, e.g.. homeowners, apartment dwellers, or people buying or selling a house. Twelve percent of the people whose connection could be determined were office workers. The category "other" included attorneys, manufacturers, industrial workers, artists, laboratory workers, researchers, engineers, fire fighters, insurance company employees, mediators, employment agency employees, and pet owners. Over all, male callers accounted for slightly more than half of all recorded contacts.

Types of Buildings about Which Callers Inquired

Participating IWG members recorded the type of building or the environment about which callers sought information in two-thirds of all cases (Tables 3 and 4). The majority of the identified buildings were residences, and approximately one-fifth were office buildings. Seventy percent of the calls about residences were inquiries about single-family houses, 13% were about apartments, and 6% were about mobile homes. Artists' studios, warehouses, abandoned or unused buildings, fire stations, prisons, automobiles, airplanes, trains. incinerators, and waste recovery plants were placed in the "other" category.

Symptoms That Callers Mentioned

Approximately one-third of the callers who mentioned one or more symptoms reported headaches, and one-quarter complained of allergy symptoms (Table 5). A number of callers who mentioned health effects did not elaborate specific symptoms, but reported that the affected people suffered more colds or respiratory infections or were sick more often than usual. Symptoms that were placed in the "other" category included hair loss, joint pain, miscarriage, asbestosis, body sourness, chills, cracked lips, death of a pet, earache, leg edema, numbness, sudden infant death, swollen fingers, and tingling.

Types of Assistance IWG Members Provided to Callers

Contact persons handled inquiries chiefly by giving information over the phone and by mailing written information to callers, principally on the subjects of radon and asbestos (Table 6). IWG members frequently recommended consulting companies or testing laboratories for callers inquiring about asbestos, radon, or biological or chemical contamination and less often recommended consultants for callers inquiring about ventilation systems or tobacco smoke.

Members of only five agencies actually visited complaint buildings, and only two agencies analyzed environmental samples from problem buildings. The Bureau

Table 3. Categories of callers who inquired about various types of buildings.

	Types of buildings about which callers inquired						
Categories of callers	Residences (598/598)[a]	Offices (209/209)	Educational institutions (46/47)	Commercial and public buildings (37/38)	Medical and research facilities (31/31)	Other (31/31)	Total 929/933
Residents (512/526)[b]	512	2	—	—	—	—	514
Office workers (126/128)	2	125	3	3	3	1	137
Government health agency employees (88/99)	32	41	2	5	9	2	91
Consultants and contractors (22/60)	8	6	2	—	3	3	22
Public/private agency employees (30/42)	19	4	3	2	1	3	32
Educational institution employees, parents, and students (27/27)	—	—	27	—	—	—	27
Company occupational health staff (20/23)	—	11	5	—	2	6	24
Building owners and operators (21/21)	4	11	—	7	—	—	22
Health care workers and providers (17/21)	4	2	3	1	6	2	18
Reporters (7/19)	2	4	—	—	—	1	7
Commercial and public building users (17/17)	—	—	—	15	—	2	17
Builders (11/16)	3	3	2	1	2	—	11
Realtors (15/15)	13	1	—	—	1	—	15
Other (24/36)	4	1	—	3	4	12	24
Total 929/1041	603	211	47	37	31	32	961[c]

[a]Number of inquiries about each building type for which the caller could be categorized/total number of inquiries about each building type in parentheses. For example, there was caller information for all of the 598 calls about residences, but this information was available for only 46 of the 47 calls about educational institutions.

[b]Number of inquiries from each caller category for which the building type was known/total number inquiries from each caller category in parentheses. For example, there was information on building type for 512 of the 526 calls from residents.

[c]The sum differs from the total number of reports (1374) because 441 callers did not mention a particular type of building, while others mentioned more than one, and 333 callers could not be categorized.

Table 4. Numbers of calls about various types of buildings and IAQ issues.

	Types of buildings about which callers inquired						
IAQ issues	Residences (598)[a]	Offices (209)	Educational institutions (47)	Commercial and public buildings (38)	Other (31)	Medical and research facilities (31)	Total 933
Radon (49/409)[b]	44	4	—	—	—	1	49
Chemical contamination (361/373)	220	93	22	18	10	13	376
Asbestos (317/361)	274	14	9	6	11	3	317
Biological contamination (139/143)	58	54	11	4	11	7	145
Ventilation systems (139/142)	23	87	11	11	7	11	150
General information (22/41)	12	8	3	—	—	—	23
Tobacco smoke (37/39)	2	23	—	9	3	—	37
Dusts and fibers (16/17)	7	6	4	—	—	1	18
Other (6/6)	1	5	—	—	—	—	6
Total 933/1374	641	294	60	48	42	36	1121[c]

[a]Total number of calls about each building type in parentheses. The IAQ issue was known for all 933 calls in which building type was known.
[b]Number of inquiries about each IAQ issue for which the building type was known/total number inquiries about each IAQ issue in parentheses. For example, information on building type was available for only 49 of the 409 calls about radon.
[c]The sum differs from the total number of reports (1374) because 441 callers did not mention a particular type of building, while others mentioned more than one.

of Home Furnishings examined furniture and bedding for odors, and the CIAQP examined bulk samples for asbestos content and air samples for biological and chemical contaminants.

Other Resources That Callers Already Had Contacted and to Which IWG Members Referred Callers

One-third of the callers reported having been in touch with at least one other source of information. The resources people most often already had contacted were their state and local health departments and Cal/OSHA. Ten percent of the callers previously had spoken with a consultant or a testing laboratory. Media reports, e.g., newspaper or magazine articles and radio or TV broadcasts, prompted many callers to seek further information. For situations perceived as emergencies, people often contacted their local fire departments for assistance, and many homeowners had contacted their natural gas utility to have gas appliances checked.

Discussion

This study represents the best available data on the type of IAQ problems about which California residents sought assistance from public agencies from mid-1985 through 1987. The number of reported calls underestimated the true magnitude of IAQ concerns for several reasons: *a*) non-IWG agencies were not included in the survey, *b*) not all IWG agencies participated, *c*) of those that did participate, not all offices or staff members were included, *d*) many participating IWG members filed reports for only 1 or 2 months, and *e*) even during the months they recorded contacts, some IWG members did not complete a report for every inquiry.

Nevertheless, this survey revealed that in California, indoor air pollution was not limited to large cities or counties, but occurred in both urban and rural settings. The people who called public agencies were not always directly affected by a problem, but were often the individuals who took or were given responsibility to obtain information for other family members, co-workers, or employees. People classified as office workers made more than half of the calls about offices, but company safety officers, building managers, contractors, and consultants initiated a substantial number of calls. People classified as residents made the vast majority of the calls about single-family houses and apartments, but realtors, contractors, apartment building managers, and city or county health department employees also inquired about residences.

As of January 1987, there were 27,292,300 people in California and 10,432,515 households (*1*). Therefore, although IWG members received more calls about single-family houses than about any other type of building, each of these inquiries represented an average of fewer than three people potentially at risk. An IAQ problem in an apartment building, an office, a school, or a hospital could affect many more people.

Chemical contamination of some sort represented the broadest category of IAQ concern and, along with suspected biological contamination, was mentioned frequently in association with possibly faulty ventilation systems. Many more callers were concerned about radon or asbestos in residences than in other types of buildings. In nonresidential buildings callers reported more problems with inadequate ventilation or tobacco smoke.

Fewer than one-third of all callers reported any symptoms among a building's occupants, but those who did associated a wide range of health problems with suspected indoor air pollution. Although most callers reported that the symptoms subsided when the affected

Table 5. IAQ issues about which callers requested information or assistance and the symptoms that they mentioned.

	IAQ issues or topics about which callers inquired									
Symptoms	Radon (7/409)[a]	Chemical contamination (235/373)	Asbestos (16/361)	Biological contamination (100/143)	Ventilation systems (100/142)	General information (13/41)	Tobacco smoke (17/39)	Dusts and fibers (17/17)	Other (2/6)	Total 385/1374
Respiratory tract symptoms (181)[b]	1	110	6	45	60	6	9	4	—	241
Headache (118)	—	89	3	24	31	3	9	2	—	161
Allergy or asthma (111)	3	47	5	47	31	5	8	5	—	151
Eye irritation (89)	1	65	2	9	25	1	6	2	—	111
Gastrointestinal tract symptoms (72)	1	60	1	8	16	1	5	1	—	93
Tiredness (43)	2	32	1	7	12	2	3	1	—	60
Infections (39)	1	18	2	21	19	1	1	—	—	63
Dizziness or fainting (37)	1	32	—	3	8	1	—	—	—	45
Possible stress symptoms (26)	1	19	—	6	10	—	1	1	—	38
Sick more often than usual (23)	—	11	2	7	8	1	1	—	—	30
Reactions to chemicals (19)	—	16	—	1	2	1	1	1	—	22
Malaise (15)	—	11	—	3	3	—	—	—	—	17
Skin irritation (14)	—	10	—	7	3	1	—	—	—	21
Cancer (7)	1	5	2	2	2	—	—	—	—	12
Tastes (7)	—	6	—	2	4	—	—	—	1	13
Other (12)	2	6	1	1	1	2	—	1	1	15
Total 385	14	537	25	193	235	25	44	18	2	1093[c]

[a]Number of inquiries about each IAQ issue in which symptoms were mentioned/total number of inquiries about each IAQ issue in parentheses. For example, in only seven inquiries about radon did the callers mention any symptoms.

[b]Total number of callers mentioning each category of symptoms in parentheses. Information on the IAQ issue about which a caller inquired was known in every case in which one or more symptom was mentioned.

[c]The sum differs from the total number of reports (1374) because 989 callers did not mention any symptoms, while others mentioned more than one.

Table 6. Assistance IWG members provided to callers asking about various IAQ issues.

	Types of assistance IWG members provided					
IAQ issues	Information by phone (952)[a]	Information mailed (652)	Caller referred elsewhere (465)	Site visit conducted (30)	Environmental samples tested (30)	Total 1374
Radon (409)[b]	59	356	36	—	—	451
Chemical contamination (373)	362	72	203	21	8	666
Asbestos (361)	305	149	111	1	4	570
Biological contamination (143)	142	49	73	8	15	287
Ventilation systems (142)	141	45	81	6	6	279
General information (41)	39	15	16	—	—	70
Tobacco smoke (39)	38	9	30	2	2	81
Dusts and fibers (17)	17	4	9	1	2	33
Total 1374	1103	699	559	39	37	2437[c]

[a]Total number of callers given each type of assistance in parentheses. The topic about which a caller inquired was known in every case.

[b]Total number of callers mentioning each IAQ issue in parentheses. The type of assistance given to a caller was known in every case.

[c]The sum exceeds the total number of reports (1374) because some callers received more than one type of assistance or asked about more than one IAQ topic.

people left the suspect environment, several callers were extremely concerned about the long-term consequences of some exposures. Other callers reported that the affected people were losing increasing amounts of time from work or school because of their building-related illnesses. Respiratory symptoms and headache were the leading complaints that callers reported in connection with concerns about inadequate ventilation or suspected exposure to chemicals or tobacco smoke. Allergy, asthma, or an infection were the major symptoms that callers reported along with complaints of biological contamination. Very few of the callers asking about asbestos or radon mentioned any symptoms.

Callers often assumed that control of IAQ, especially in public places, was subject to regulation much as is outdoor air pollution. Consequently, many people expected that their public health department would send an investigator to evaluate the air quality in homes, office buildings, or schools. However, public agencies generally do not have sufficient staff to respond to minor complaints, and they can provide only limited assistance with residential problems because their authority

covers workplace and buildings to which the public has access.

Eight public assistance groups to which IWG members directed callers were among the leading agencies that callers in general already had contacted, suggesting that the sources of information and assistance on IAQ were very limited. IWG members reported that callers who had been referred from agency to agency often were frustrated and annoyed. The IWG compiled a directory of public and private organizations that deal with IAQ issues, with descriptions of the agencies' capabilities, in the hopes that such a reference list would enable public assistance agencies to direct callers more accurately to appropriate resources. When advised that public agencies would not investigate a problem, callers often inquired about commercial consultants. The IWG makes available listings of certified industrial hygienists and fee-for-service microbiology laboratories, although the members do not recommend specific consulting companies (*2*).

The IWG has collected and written informational literature on the sources of indoor air contaminants, on symptoms and reactions to indoor pollutants, and on remedies that people can undertake themselves or hire a professional to apply. Public agency personnel have reported that having written information to mail has freed them from repeatedly answering the same questions over the telephone and equipped them to provide accurate information on a wider variety of subjects than they could cover otherwise. The IWG found that public concern about air quality in residences and nonindustrial workplaces was very strong, and a coordinated effort on the part of public assistance agencies will be necessary to meet the public's need for information and advice.

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