

Prevalence of Multiple Chemical Sensitivities: A Population-Based Study in the Southeastern United States

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We examined the prevalence of multiple chemical sensitivities (MCS), a hypersensitivity to common chemical substances. We used a randomly selected sample of 1582 respondents from the Atlanta, Ga, standard metropolitan statistical area. We found that 12.6% of our sample reported the hypersensitivity and that, while the hypersensitivity is more common in women, it is experienced by both men and women of a variety of ages and educational levels. Our prevalence for MCS is similar to that (15.9%) found by the California Department of Health Services in California and suggests that the national prevalence may be similar. (*Am J Public Health*. 2004;94:746–747)

Uncertainty surrounds the prevalence of hypersensitivity to common chemicals in the US population. This hypersensitivity, frequently labeled multiple chemical sensitivity (MCS),¹ is also known as environmental illness or toxicant-induced loss of tolerance.² A report published by the National Academy of Sciences in 1981 said that 15% of the American population could have a heightened sensitivity to chemicals.³ Subsequent studies using anecdotal evidence,⁴ self-selected subjects,⁵ clinical environments,⁶ or limited areas⁷ disclosed a wide range of results. A more recent random population study by the California Department of Health Services (CDHS) indicated a hypersensitivity prevalence of 15.9% in Californians surveyed.⁸

METHODS

In this study we investigated the prevalence of hypersensitivity to common chemi-

cals and the extent of the medical diagnosis of MCS in a geographic sample. We also explored this hypersensitivity's etiology, effects, and potential linkages to asthma, age, gender, and educational level.

We used a randomly selected sample of 1582 residents of the Atlanta, Ga, metropolitan area (sampling error 3%, confidence level 97%). Metropolitan Atlanta has a population of 4 112 000 persons and is a mixture of urban, suburban, and rural areas.⁹ Respondents were surveyed in 3 cohorts to account for seasonal variations: summer 1999 (n=496), fall 1999 (n=322), and winter–spring 2000 (n=764).

Our questionnaire was pretested on randomly selected individuals (n=253) and subsequently shortened to ensure maximum subject cooperation. The final version asked if the respondent had ever been diagnosed with MCS or environmental illness. It then asked, "Compared with other people, do you consider yourself to be allergic or unusually sensitive to everyday chemicals like those in household cleaning products, paints, perfumes, detergents, insect spray, and things like that?" This wording is identical to that of the CDHS questionnaire. Respondents who answered "yes" or "not sure" were asked additional questions about reaction magnitude, behavior modifications, age of onset, and the hypersensitivity's origin. All respondents were asked if they had asthma, and their replies were cross-tabulated with hypersensitivity. Questions on gender, age, and education level were asked of all respondents and also cross-tabulated with hypersensitivity.

RESULTS

In our study we found that 12.6% (n=199) of the respondents reported a hypersensitivity to common chemicals (Table 1). The percentage of respondents who reported having been medically diagnosed as having MCS or environmental illness was 3.1% (n=49). Respondents who reported a diagnosis of asthma made up 12.1% (n=192) of the sample. A cross-tabulation of hypersensitivity to chemicals with asthma indicated that 30.2% (n=60) of respondents with hypersensitivity also reported having asthma, while 69.3% (n=138) said that they did not.

The percentage of respondents with hypersensitivity who could identify its cause was

TABLE 1—Prevalence of Hypersensitivity: Diagnosis of Multiple Chemical Sensitivity

| Question | Yes, % (No.) | No, % (No.) | Don't Know, % (No.) | Refused, % (No.) | Total, % (No.) |
|---|--------------|-------------|------------------------|---------------------|----------------|
| Compared with others, do you have an unusual sensitivity to common chemical products? | 12.6 (199) | 85.7 (1351) | 1.4 (22) | 0.3 (4) | 100 (1576) |
| Has a medical doctor diagnosed you with multiple chemical sensitivity or environmental illness? | 3.1 (49) | 95.3 (1504) | 1.6 (25) | 0.1 (1) | 100 (1579) |
| Asthma with Hypersensitivity: Behavior Changes | | | | | |
| Do you also have asthma? ^a | 30.2 (60) | 69.3 (138) | 0.5 (1) | 0 | 100 (199) |
| Have you received medical treatment for your sensitivities? ^b | 45.1 (106) | 47.2 (111) | 5.5 (13) | 2.1 (5) | 100 (235) |
| Have you taken precautions at home because of your sensitivities? ^b | 61.7 (142) | 30.4 (70) | 5.2 (12) | 2.6 (6) | 99.9 (230) |
| Do your sensitivities make it difficult for you to shop in stores? ^b | 29.9 (64) | 65 (139) | 5.1 (11) | 0 | 100 (214) |
| Did your sensitivities cause you to lose employment? ^b | 13.5 (29) | 84.7 (182) | 0.5 (1) | 1.4 (3) | 100 (215) |

Note. Unequal totals are from damaged or unmarked questionnaires. Questions were asked of all respondents unless noted.

^aCross-tabulated with respondents with hypersensitivity.

^bAsked of respondents with hypersensitivity or who were not sure.

42.7% (n=93); 12.4% (n=27) specified chemical exposure as the cause, 5% (n=11) reported exposure to pesticides, 11.5% (n=25) indicated other types of exposure, and 13.8% (n=30) pointed to other causes.

The percentage of respondents with hypersensitivity who received medical treatment was 45.1% (n=106). Those who took precautions at home to avoid exposures to offending chemicals was 61.5% (n=142), while 29.9% (n=64) indicated that their hypersensitivity made it difficult to shop in stores. Moreover, 13.5% (n=29) reported losing their jobs because of their hypersensitivity.

This hypersensitivity first emerged for 32.4% (n=70) of respondents before they reached 20 years of age; for 35.2% (n=76) between 20 and 35 years of age; and for 14.8% (n=32) between 36 and 50 years of age. Only 7.9% (n=17) of respondents reported that their hypersensitivity first emerged after age 50 years.

The sample was 60.7% female (n=926) and 39.3% male (n=600); totals on this question were less than the total number of cases because of unmarked answers or damaged questionnaires. The educational level of respondents was: high school degree or less, 34.8%

(n=526); some college, 25.7% (n=389); and a college degree or higher, 39.4% (n=579). Ages of those sampled were: ≤20 years, 5.8% (n=89); 20–35 years, 24.3% (n=373); 36–50 years, 32.2% (n=510); and >50 years, 34.5% (n=530). Cross-tabulation indicated respondents with the hypersensitivity were 71.7% female and 28.3% male. Regarding education, 33.2% of the hypersensitive have a high school education or less, 29% have some college, and 37.8% have a college degree or higher. The ages of the hypersensitive were: <20 years, 6.5% (n=13); 20–35 years, 18.1% (n=36); 36–50 years, 35.2% (n=70); and >50 years, 38.2% (n=76).

The variations in the seasonal cohorts were not significant and the above data are aggregations.

DISCUSSION

The 12.6% hypersensitivity prevalence, though below the 15.9% found by the CDHS, is statistically similar. While the percentage of hypersensitive respondents is disproportionately female, the female bias in the sample exaggerates the gender differential. The higher education levels and ages of hypersen-

sitive respondents are also less significant because of the sample's bias. The data indicate, therefore, that hypersensitivity affects both genders as well as individuals of different ages and educational levels. ■

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Contributors

S. Caress designed the study, conducted the survey, and wrote part of the text. A. C. Steinemann collaborated on the study and questionnaire construction and wrote part of the text.

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Human Participant Protection

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References

- Cullen M., Pace P, Redlich C. The experience of the Yale Occupational and Environmental Medicine Clinics with multiple chemical sensitivities, 1986–1991. *Toxicol Ind Health*. 1992;8:15–19.
- Ashford NA, Miller CS. *Chemical Exposures: Low Levels and High Stakes*. 2nd ed. New York, NY: Van Nostrand Reinhold; 1998.
- National Research Council, Committee on Indoor Pollutants, Board on Toxicology and Environmental Health Hazards, Assembly of Life Sciences. *Indoor Pollutants*. Washington, DC: National Academy Press; 1981.
- Mooser SB. The epidemiology of multiple chemical sensitivities (MCS). *Occup Med*. 1987;2:663–668.
- Bell IR, Schwartz GE, Peterson JM, Amend D, Stini WA. Self-reported illness from chemical odors in young adults without clinical syndromes or occupational exposures. *Arch Environ Health*. 1993;48:6–13.
- Kipen HM, Hallman W, Kelly-McNeil K, Fiedler N. Measuring chemical sensitivity prevalence: a questionnaire for population studies. *Am J Public Health*. 1995;85:575–577.
- Meggs WJ, Dunn KA, Bloch RM, Goodman PE, Davidoff AL. Prevalence and nature of allergy and chemical sensitivity in a general population. *Arch Environ Health*. 1996;51:275–282.
- Kreutzer R, Neutra RR, Lashuay N. Prevalence of people reporting sensitivities to chemicals in a population-based survey. *Am J Epidemiol*. 1999;150:1–12.
- US Census Bureau. *Statistical Abstract of the United States: 2002*. Washington, DC: Bureau of the Census; 2002:122:32.