

Studies on Self-Reported Multiple Chemical Sensitivity in South Australia

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The prevalence of Multiple Chemical Sensitivity (MCS) in South Australia is unknown and was sought through population-based telephone surveys of approximately 4000 adults. These surveys revealed a 1% self-reported MCS prevalence but also a more general hypersensitivity prevalence of about 16%. Symptomology and symptom severity suggest a significant negative impact of environmental chemicals in the community.

Key words: *Multiple Chemical Sensitivity; Hypersensitivity*

Multiple Chemical Sensitivity (MCS) is a chronic condition characterised by fatigue, headaches, fibromyalgia, anxiety, nausea, depression, dizziness and various other non-specific symptoms (Graveling et al. 1999; Labarge & McCaffrey 2000; Pall 2007). Sufferers consider that low doses of a wide range of environmental chemicals can trigger these symptoms, though such causation is scientifically difficult to prove (Bornschein et al. 2007; Staudenmayer 2001). Due to this, MCS is a controversial condition, and it is reported as having aspects of toxicogenic and psychogenic aetiology. Detractors from a toxicogenic origin prefer the descriptor Idiopathic Environmental Intolerance (Staudenmayer et al. 2003a,b) and have demonstrated psychiatric comorbidity among patients with MCS, including anxiety, panic disorder and depression (Bailer et al. 2004; Bornschein et al. 2002; Caccappolo-van Vliet et al. 2002). Supporters of a toxicogenic origin have given consideration to a range of mechanisms, including toxicant-induced loss of tolerance (Miller 2000), elevated nitric oxide/peroxynitride (Pall 2003, 2007), immunological dysregulation, neurogenic inflammation, and limbic kindling/neural sensitisation (Graveling et al. 1999). Currently, there are no biomarkers for MCS, and there are no diagnostic or

clinical management guidelines for MCS in Australia. Yet it is evident that some medical practitioners attempt to diagnose and treat MCS.

In the late 1990s, the South Australian Department of Health became increasingly aware of cases of MCS. At that time, claims were being made of a high prevalence of MCS in the community. In order to inform this issue, the South Australian Department of Health commissioned two randomised population-based surveys the results of which form the basis of this paper.

Methods

Self-reporting data were obtained from computer-aided telephone interviewing (CATI), arranged through the South Australian Department of Health's Population Research & Outcome Studies Unit in collaboration with Harrison Health Research, Adelaide. Responses to questions were entered directly into the computer and the CATI system enforces a range of checks with most questions having a set of predetermined response categories. Response categories can also be automatically rotated when required, to minimise bias. Open-ended responses were recorded verbatim by the interviewer.

The survey methodology is reported in detail elsewhere (Population Research &

Outcomes Studies Unit 2002); however, in brief, all households in South Australia, with a number listed in the Electronic White Pages were eligible for selection in the sample. Telephone numbers were selected randomly and approximately 2000 interviews were conducted on people aged 18 years and over (n=2007 in September 2002 [Phase 1] and n=2002 in June 2004 [Phase 2]). A letter was sent to each selected household introducing the survey. Within each household, the person who had their birthday last was selected for interview. There was no replacement for non-respondents. Data were weighted by probability of selection in the household and by age, sex and area of residence to the most recent Australian Bureau of Statistics Estimated Resident Population for South Australia for 30 June 2001 (Phase I) or for 30 June 2002 (Phase II).

Results and Discussion

Prevalence, age and gender distribution

Phase I and Phase II each included one key question to determine MCS prevalence:

Phase I

“Have you ever been told by a doctor that you have any of the following conditions? - asthma, other respiratory problems, chronic fatigue syndrome, heart disease, multiple chemical sensitivity?”

Phase II

“Have you been told by a medical doctor that you currently have any of the following conditions? - asthma, other respiratory problems, chronic fatigue syndrome, heart disease, multiple chemical sensitivity, fibromyalgia (muscle pain)?”

The Phase II question thus specified the type of doctor, a current diagnosis, and added one of the common symptoms

of MCS, that is, fibromyalgia. Otherwise, the two questions are the same. In both phases, the incidence of adult asthma was similar (11.5% and 11.7%), and corresponded to the known incidence of asthma in the community (Wilson et al. 2006), indicating that the sampled cohorts were representative of the population at large.

The MCS prevalence data from these initial questions are shown in Table 1. These reveal an MCS prevalence of 0.7 to 1.0% in the adult population. The slightly lower rate in Phase II could reflect the use of the present tense in the question, and which, though the number of cases is small, might suggest a degree of recovery from the condition.

Table 1: MCS prevalence and gender data from Phase I and Phase II

Phase ¹	Male	Female	Total	% of total population ²
I	4	17	21	1.0%
II	4	10	14	0.7%
Total	8	27	35	0.87%

Notes:

1 See text for specific questions

2 Based on 2007 people interviewed in Phase I, and 2002 in Phase II

Within the confines of self-reporting, it has been shown that false negatives might comprise about 50% of the true number of cases (Baker et al. 2004). It is thus possible that an MCS prevalence of up to 2% or down to 0.5% actually exists in the South Australian community.

This, therefore, is the first attempt to gain an understanding of MCS prevalence in South Australia. Similar prevalence has been reported in Denmark (Danish Ministry of the Environment 2006), while several other surveys report a prevalence of 2%-6% (Caress & Steinemann 2003; Gibson 2006; Kreutzer et al. 1999; Meggs et al. 1996) although some sought a diagnosis of ‘MCS or environmental illness’. In a NSW survey, with the question “Have you ever been

diagnosed with a chemical sensitivity?”, the prevalence was 2.9% (NSW Public Health 2003). It must be borne in mind that the survey data depend on the question that is asked, on how the medical profession view and diagnose chemical sensitivity, and on how patients interpret and relate a medical diagnosis.

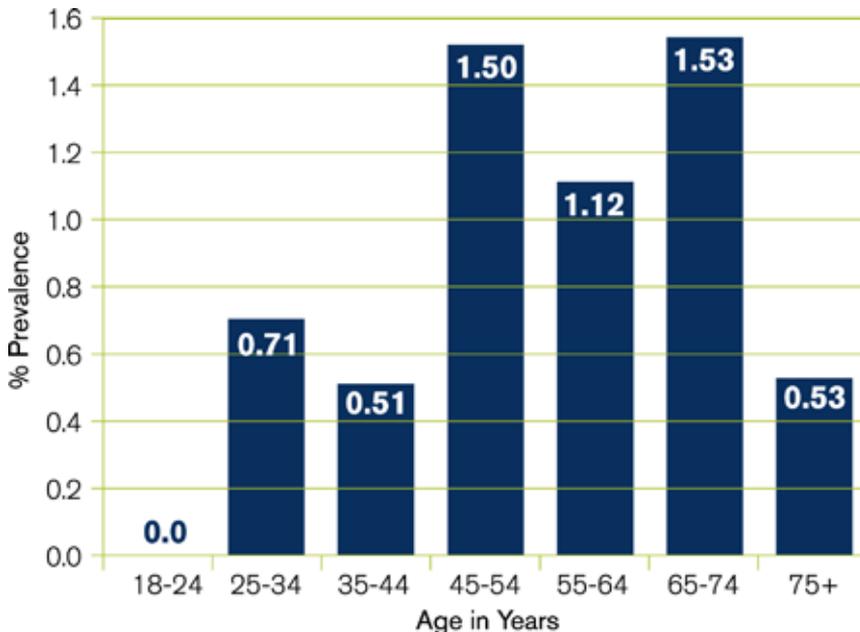
Regarding age distribution, the MCS cases from both phases were summed, were age-stratified and the prevalence calculated per population size in seven age groupings. Figure 1 shows no cases in the 18-24 year group, then a Gaussian-type distribution with peak prevalences of 1.5%, 1.12% and 1.53% in the 45-54 year group, 55-64 year group, and the 65-74 year group, respectively. These data may suggest a late onset of MCS, though this survey did not include adolescents or children. This contrasts with the significant number of hypersensitive cases in these early age groups (data not shown; Caress & Steinemann 2003).

These data indicate a greater proportion of female MCS cases, being 4.25-fold in Phase I and 2.5-fold in Phase II (average 3.4-fold overall; total ♀/♂ = 1.05). This could be explained if more females than males with the condition visited doctors; nevertheless this predilection toward female cases is in accordance with other surveys (Caress & Steinemann 2003; Joffres et al. 2001; Kreuzer et al. 1999; NSW Public Health 2003). If this is a real phenomenon, it suggests an underlying gender-specific mechanism.

City versus country

It has been suggested that compared to city environments, country environments are less polluted and would, therefore, be less likely to impact on chemically-sensitive individuals. In reality, many country environments are subject to regular agricultural spraying. Notwithstanding, the present survey examined this issue, revealing an MCS prevalence of 0.8%

Figure 1: Age distribution of combined MCS prevalence data. Total number of cases in each age group was divided by the total number of individuals in the corresponding age group



in metropolitan Adelaide and 1.1% in country SA. A lack of significant difference between city and country MCS prevalence was also found in a NSW survey (NSW Public Health 2003).

Anecdotally, some MCS sufferers move to the country to seek 'cleaner' air, thus these data might reflect this demographic. Alternatively, the data could simply suggest that country environments might not be healthier for those with MCS.

Household income

The surveys included a question to all respondents regarding household income, and Figure 2 shows MCS prevalence as a function of this parameter. The data indicate a significant trend towards decreased MCS prevalence with increasing household income. Unfortunately the data did not lend itself to determining the gender stratification by household income, but this would be interesting to ascertain in future. This same relationship

among hypersensitive individuals of decreased prevalence with increasing household income was also reported by others (Caress & Steinemann 2003; Joffres et al. 2001), with a bi-modal relationship reported by Kreutzer and colleagues (Kreutzer et al. 1999).

Other MCS-specific questions

Though the number of cases was small, a range of other questions was posed to those identifying with MCS in Phase II (Table 2). The responses tend to confirm what is generally known, namely that stress might be a major aetiological factor in MCS onset and that the family or social life of MCS sufferers is often significantly affected. Regarding those cases who could identify the origin of their sensitivity, it has been observed elsewhere that such cases were more likely to report severe symptoms than those who did not know the original cause (Caress & Steinemann 2003).

Figure 2: MCS prevalence as a function of household income (Phase I and II combined)

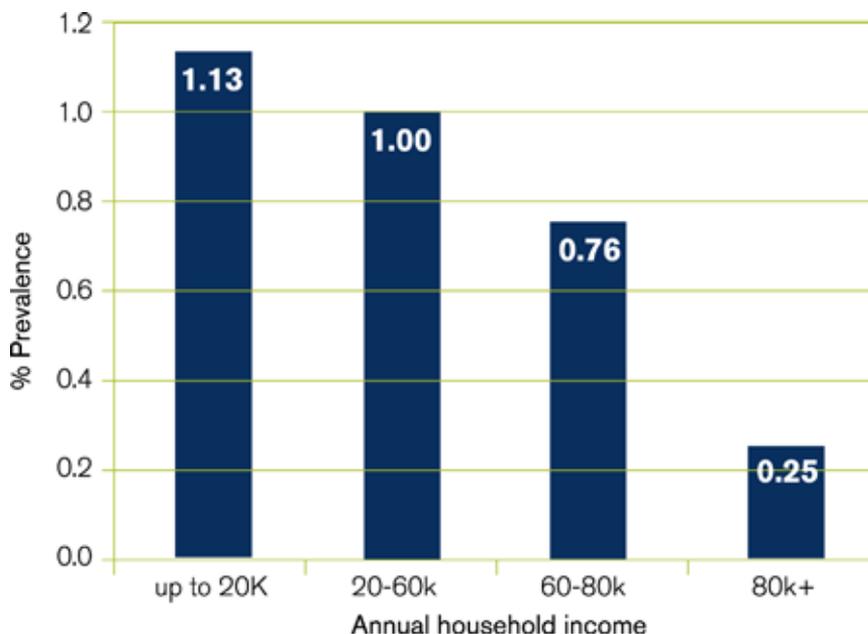


Table 2: MCS-specific questions in Phase II

Question	Response
Were you under any particular stress at the time when you first developed symptoms of MCS?	3/4 males Yes 2/10 females Yes
Do you have any idea what initially caused your chemical sensitivity?	11/14 Yes
To what extent does your condition affect your family or social life?	5/14 To a great extent 2/14 To some extent

General chemical hypersensitivity

Both phases of this investigation included questions to all respondents about general sensitivity to environmental chemicals. The Phase I question and data are given in Table 3, revealing prevalence of 3-10% across the genders for perfume, traffic pollution, household and workplace chemicals.

In Phase II, the question posed to non-MCS cases was different: “Do you consider yourself especially sensitive to everyday chemicals found in household cleaning products, perfumes, insect sprays, new carpets, fresh paints, etc?” To this, 9.9% of

Table 3: Phase I data on general chemical hypersensitivity¹

Is your health seriously affected by exposure to any of the following?	% males	% females	% total
Perfume	4.5	9.6	7.1
Traffic pollution	5.3	6.4	5.9
Household chemicals	2.8	8.2	5.6
Workplace chemicals	7.2	5.2	6.2

Notes:

¹ Based on 2007 people interviewed

males and 21.7% of females responded in the affirmative, with an average of 15.9%. This gender bias and average are similar to other reports (Caress & Steinemann 2003; Kreutzer et al. 1999).

Considering hypersensitivity in country versus metropolitan areas, the prevalence was 15.3% and 16.1%, respectively. Considering symptoms reported by hypersensitive individuals, 40% experienced headaches, 37% had asthma or other breathing problems, 31% had burning eyes, nose or throat, 18% had nausea or stomach problems, 17% had eczema, 9% had fatigue and 9% experienced dizziness or fever as a result of chemical exposure. These are, therefore, not insignificant reactions. Further, 8.4% of hypersensitive males and 15.7% hypersensitive females considered that their symptoms were moderate to severe.

In response to the question, “Have you received any medical treatment for your chemical sensitivity?”, 15.3% of males and 31.9% of females within the hypersensitive subset answered in the affirmative. Together, this represents an overall 4.3% of the total population seeking medical treatment due to chemical sensitivity. This is similar to the 6.7% reported by others (Caress & Steinemann 2003).

To ascertain more specifically the chemical triggers involved, respondents who identified with hypersensitivity were asked about specific chemical classes. Data in Table 4 indicate, first, that many individuals were affected by more than one chemical (and, therefore, could be undiagnosed MCS cases), and second, that a wide range of common environmental agents must be avoided to reduce risk of adverse reaction.

Given that MCS is a controversial area of environmental medicine, a final question was put to Phase II non-MCS respondents: “Do you agree or disagree with the following statement? “Chemical sensitivity

Table 4: Phase II data on chemical triggers of hypersensitivity

Which of these chemicals currently trigger any of your symptoms?	% males	% females	% hypersens population
Perfumes, etc.	66	90	82.5
Tobacco smoke	29	48	42.2
New building or renovation	34	43	40.4
Pesticides or herbicides	24	36	32.7
Petrochemicals	22	36	32.0
Vehicle smoke	17	32	27.1
Other chemicals	19	19	19.0

is a valid health condition with valid symptoms.” An overwhelming 86% agreed or strongly agreed with this statement. This may augur well for achieving success when those with MCS or chemical hypersensitivity seek understanding from the wider community and when plans are implemented to reduce specific chemical exposures in the community.

Conclusion

These two population-based surveys reveal a self-reported MCS prevalence in South Australia of about 1% and also

indicate that about 16% of the adult population identifies as having some chemical hypersensitivity. Since there are no diagnostic or clinical guidelines for MCS in Australia, it is possible that the 1% MCS prevalence is an under-reporting, and that some chemically hypersensitive individuals have symptomology more aligned with that of MCS cases. The prevalence of hypersensitivity and the severity of symptoms suggest an adverse effect of common environmental chemicals in a significant portion of the population.

Acknowledgments

The author acknowledges Sam Mangas for technical assistance; Peter Evans and Cathie Powell who assisted with question design in Phase II; and staff of the Department of Health’s Population Research & Outcome Studies Unit who aided study execution and statistical analysis.

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