

**Nurses and Teachers:
Worker health, worker concerns
February 2006**



**A report for the Human Ecology Action League, Inc. (HEAL)
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DATE: March 1, 2006

TO: John Howard, M.D.
Director, National Institute for Occupational Safety and Health

FROM: Muriel Dando, President
Human Ecology Action League, Inc. (HEAL)

RE: National Occupational Research Agenda (NORA)

Thank you for the opportunity to contribute to the National Occupational Research Agenda.

We urgently recommend that NORA undertake research to investigate work-related asthma in nurses and teachers, to identify workplace exposures related to asthma in nurses and teachers, and to recommend ways to reduce or eliminate these exposures.

Nurses and teachers are of critical importance to the nation, as they are entrusted with the well being of our most vulnerable citizens — the sick, and children. The Department of Labor anticipates a dramatic increase in demand for workers in both professions in the near future, yet current data indicate that worker turnover is high in both professions. We believe that work-related asthma may be playing a role in worker turnover in nurses and teachers, and that preventing workplace asthma exacerbations could help increase worker retention and productivity in both fields.

Our concern about the workplace health of nurses and teachers arises from the purpose and goals of the Human Ecology Action League, Inc. (HEAL). HEAL is a national nonprofit education and information organization concerned about the health effects of environmental exposures, particularly low-level exposures common in daily life and in many workplaces. One of the oldest environment and health organizations in the country, HEAL is an independent organization, funded solely by membership fees and donations. While HEAL has a primary responsibility to serve its own members, it also has an important responsibility to educate and inform the general public.

We have received reports from nurses and teachers about workplace conditions that they believe are harmful to their respiratory health. As the attached report illustrates, this perception is widespread in both professions. We believe that there is enough evidence to warrant a vigorous and extensive research effort to uncover the extent and nature of the problem of work-related asthma in nurses and teachers, to identify contributing factors that undermine respiratory health in these workers, and to recommend effective means of mitigating or eliminating these factors.

We hope that you will consider including this issue in the NORA agenda.

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Introduction

Nurses and teachers suffer from very high rates of asthma. This much is clear. That some of their asthma is work-related is also clear, though it is not known to what extent workplace exposures cause asthma in these workers. It is widely recognized that, regardless of what initially caused their asthma, workers with established asthma require good asthma management, including workplace exposure management, to remain healthy and productive. When workers are unable to work in their professions, society does not benefit from their training and skills, and the economy does not benefit from their full participation. Nurse and teacher workplace health should be of great concern to NORA, because of the high demand for these professionals in the current labor market, and the surge in demand for these workers that is anticipated by labor experts.

Identification of troublesome exposures — those that incite asthmatic responses — and mitigation or elimination of such exposures, play an important role in good asthma management, and are prudent practices in ensuring workplace health. Identification of exposures troublesome to nurses and teachers has been slow, but there is evidence these two groups of workers share similar concerns about similar workplace exposures. These exposures need to be investigated, and mitigation and elimination methods developed and implemented. Some of these same exposures are troublesome to people who report adverse health effects from low-level chemical exposures; these individuals report many exposure-related activity limitations and related adverse impacts on work. All of these workers need to be heard, understood, and helped. NORA has a vital role to play in this effort.

Respiratory health in nurses and teachers, scope of the problem.

The Bureau of Labor Statistics *Occupational Outlook Handbook 2005-2006* reports that in 2004, there were 2.4 million registered nurses in the U.S., and growth in demand for R.N.s was expected to grow rapidly, a projected 27 percent or more by 2014.¹ Teachers K-12 (not including special education teachers) numbered 3.8 million in 2004, and job opportunities were expected to grow in this sector by 9 percent to 17 percent by 2014.²

¹ Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2006-07 Edition*, Registered Nurses, <http://www.bls.gov/oco/ocos083.htm>

² Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2006-07 Edition*, Teachers — Preschool, Kindergarten, Elementary, Middle, and Secondary, on the Internet at <http://www.bls.gov/oco/ocos069.htm>

However, both occupations are also currently plagued with work-related health problems. The Bureau of Labor Statistics reported that in 2004, healthcare and social assistance workers experienced 18.4 percent of all the non-fatal occupational illnesses reported, and education service workers accounted for 0.7 percent.³

Workers in both healthcare and in education settings have well-documented elevated rates of one exposure-related illness — asthma. Some data sources used in this report suggest or indicate that the asthma cases under discussion are caused by work conditions; other sources differentiate between asthma caused by work, and asthma exacerbated by work. *Regardless of the cause*, once asthma is present, it must be managed appropriately in the workplace, for the health and productivity of the worker. There is mounting evidence that nursing and teaching workplaces are failing in this regard.

A survey of asthma prevalence in U.S. industry found that while the overall prevalence of asthma in the U.S. is 6.5 percent, the prevalence of asthma among male workers in healthcare settings is 8.5 percent — and among female workers it is 10.1 percent.

Asthma prevalence among male workers in education settings (K-12 and college) is 6.0 percent — and among females it is 9.5 percent (compared with 6.5 percent in industry overall).⁴ In a recent analysis of SENSOR data, education services workers accounted for 9 percent of all SENSOR-recorded occupational asthma cases between 1993 and 2000. Nearly 70 percent of these asthma cases were new-onset, 31 percent were work-aggravated, and 8 percent were RADS. The study's authors note: "The number of WRA cases among teachers and reported from elementary and secondary schools indicate that asthma in educational settings is an occupational health problem. Workers in this industry are primarily public sector employees, and in half of the states Occupational Safety and Health Administration (OSHA) provisions do not apply."⁵

Work-related asthma and exposures

The NIOSH *Worker Health Chartbook 2004* (all workers) indicates significant associations between work-related asthma (WRA) and exposures: "During 1993 –1999, the largest proportion of WRA cases was associated with miscellaneous chemicals (19.7%). This category of agents includes many exposures that are not easily classified (for example, perfumes, odors, and glues)." Other exposures associated with work-related asthma reported in the NIOSH *Chartbook* were indoor air pollutants (9.9 percent), cleaning materials (11.6 percent), solvents not otherwise specified (8.2 percent) and polymers (5.3 percent).⁶

As noted above, regardless of the cause, once asthma is present, it must be managed appropriately in the workplace, for the health and productivity of the worker. Identification of troublesome exposures — those that incite asthmatic responses — and mitigation or elimination

³ U.S. Department of Labor, Workplace Injuries and Illnesses in 2004. USDL 05-2195. November 2005. <http://www.bls.gov/news.release/osh.nr0.htm>

⁴ Bang, K.M. et al., Prevalence of asthma by industry in the US population: a study of 2001 NHIS data. *American Journal of Industrial Medicine* 47: 500-508. June 2005

⁵ Mazurek, J.M. et al. Work-related asthma in the educational services industry-California, Massachusetts, Michigan, and New Jersey, 1993-2000. American Public Health Association, 133rd Annual Meeting & Exposition, Philadelphia, Pennsylvania. December 10-14, 2005.

⁶ NIOSH, Chapter 2. Fatal and Nonfatal Injuries, and Selected Illnesses and Conditions. *Worker Health Chartbook 2004*. Publication No. 2004-146. <http://www.cdc.gov/niosh/docs/chartbook/>

of such sources, are part of good practice in asthma management, and prudent practice in workplace health.⁷ The exposures listed in the *Chartbook* as associated with work-related asthma are strikingly similar to those about which nurses and teachers have expressed concern.

Occupational health and nursing

“Hospitals have led the list of industries reporting 100,000 or more cases [of occupational illnesses] for the past two years. The rate of illnesses experienced by workers in the hospital industry was 72.9 cases per 10,000 full-time workers, compared to 27.9 cases for private industry as a whole,” according to the Bureau of Labor Statistics.⁸

Research on nurses’ occupational health has focused on *task*-related exposures (latex, glutaraldehyde, needle sticks, lifting) but has been scant in focus on other *workplace*-related exposures. In 2001, the American Nurses Association conducted an online health and safety survey, which gathered nearly 5000 responses in about a month. Over 70 percent of respondents had been nurses for 10 years or more, and more than half worked in acute care hospitals. Nearly 80 percent reported that they do not feel entirely safe in their workplaces. Nearly half reported a work-related illness, or illness exacerbation, in the year previous to taking the survey. Over 30 percent reported little information from employer about workplace health hazards, and an additional eight percent reported receiving no hazard information at all from employers. Three-quarters of the respondents indicated that unsafe work conditions interfered with delivery of patient care. Nearly 88 percent said that health and safety considerations influence their decision to remain in the profession.⁹

In March 2005, the Massachusetts Department of Health reported that among Massachusetts workers in healthcare settings, “Cleaning products were the agents most frequently reported by [asthma] cases (74/305, 24%), but the exposures that triggered asthma varied by occupation. Nurses most commonly reported latex, followed by cleaning products then aldehydes (glutaraldehyde and formaldehyde). Office workers in health care settings most often identified miscellaneous chemicals, paints, solvents and glues, followed by cleaning products and new carpet, dust (including renovation), molds, smoke and perfume. Laboratory workers and technicians reported aldehydes (glutaraldehyde and formaldehyde) most often and dental workers reported latex.”¹⁰ The substances identified as problematic are allergens, sensitizers and irritants, all of which have potential to cause or contribute to exacerbations of worker asthma.

The increasing need for additional nurses in the U.S. workforce, plus the high rate of occupational illnesses in nursing professionals, point to the need to make workplace health in healthcare facilities a national health priority. Work-related asthma alone may be having a significant negative current impact on worker productivity, retention and recruitment in both healthcare and education occupations. Unless addressed in a timely fashion, conditions contributing to these high rates of work-related illness could have serious negative impacts in the

⁷ American Thoracic Society, Guidelines for Assessing and Managing Asthma Risk at Work, School, and Recreation. *American Journal of Respiratory and Critical Care Medicine* 169 (7): 873–881. April 1, 2004. <http://ajrccm.atsjournals.org/cgi/content/full/169/7/873>

⁸ U.S. Department of Labor, Workplace Injuries and Illnesses in 2004. USDL 05-2195. November 2005. <http://www.bls.gov/news.release/osh.nr0.htm>

⁹ American Nurses Association, Nursing World.org Health and Safety Survey. September 2001. <http://nursingworld.org/surveys/hssurvey.pdf>

¹⁰ Massachusetts Department of Public Health, *SENSOR Occupational Lung Disease Bulletin*, December 2005.

future. Prevention of workplace illness exacerbations is indicated by both the nature of the substances reported as present in the work environment, and the association between these substances and work-related asthma exacerbations.¹¹

Occupational health and teaching

Education initiatives have been a Bush administration priority: After passage of the No Child Left Behind Act in 2002, the White House announced its program, “A Quality Teacher in Every Classroom,” saying, “This program represents the largest and most comprehensive Federal investment in preparing, training and recruiting teachers and principals. Nearly \$3 billion will be made available to States through formula grants to prepare, train, and recruit high-quality teachers.” The program is authorized under the Elementary and Secondary Education Act as amended by No Child Left Behind: Title II, Part A (P.L.107-110) 2002. About \$44.5 million was appropriated for the Transition to Teaching portion of the program in the FY 2006 budget, along with \$14.7 million for the Troops to Teachers portion.¹²

However, the program contains no funds for ensuring that schools are healthy workplaces. Teacher health is clearly important to teacher retention, and this in turn is clearly necessary to achieve administration education quality goals. However, nationwide, about one in four beginning teachers leaves the profession within four years.¹³ At the end of the 1999-2000 school year, the teacher workforce lost about eight percent of its personnel, including two percent to retirement, and four percent to other occupations. The rate of teacher loss to other occupations was double the rate found at the end of the 1987-88 and 1990-91 school years; losses to retirement were double the rate at the end of the 1987-88 school year.¹⁴ Though an estimated 700,000 teachers will retire by 2010, those losses will account for less than 30 percent of the projected teacher losses during the period 2002-2010; non-retirement reasons are anticipated to outnumber retirement reasons by three to one.¹⁵

Although there is widespread recognition that environmental conditions in schools can affect student health and performance, particularly for those with asthma, data is sparse on teacher work-related health and related concerns. However, a 1999 survey conducted by the U.S. National Center for Education Statistics found that the majority of complaints about unsatisfactory environmental conditions in U.S. public schools were related to ventilation (26 percent nationwide) and indoor air quality (18 percent nationwide). Nationwide, 29 percent of schools reported inadequate ventilation systems.¹⁶

¹¹ American Thoracic Society, Guidelines for Assessing and Managing Asthma Risk at Work, School, and Recreation. *American Journal of Respiratory and Critical Care Medicine* 169 (7): 873–881. April 1, 2004. <http://ajrccm.atsjournals.org/cgi/content/full/169/7/873>

¹² The White House, A quality teacher in every classroom: Preparing, Training and Recruiting High Quality Teachers and Principals. October 11, 2005.

¹³ In Schneider, M. et al., *The Effects of School Facility Quality on Teacher Retention in Urban School Districts*. 2004. Washington D.C.: 21st Century School Fund. <http://www.edfacilities.org/pubs/teacherretention.html>

¹⁴ National Center for Education Statistics, Special Analysis 2005: Mobility in the Teacher Workforce. <http://nces.ed.gov/programs/coe/2005/analysis/sa05.asp>

¹⁵ National Commission on Teaching and America’s Future, Symposium: Unraveling the “Teacher Shortage” Problem: Teacher Retention is the Key. August 2002. http://www.nctaf.org/documents/nctaf/Unraveling_Shortage_Problem.doc

¹⁶ National Center for Education Statistics, *Condition of America’s Public School Facilities: 1999*. <http://nces.ed.gov/surveys/frss/publications/2000032/indes.asp>

In a recent analysis of SENSOR data for work-related asthma 1993-2000, researchers found that the agents most frequently reported as associated with work-related asthma in teachers and teachers' aides were indoor air pollutants (28%), cleaning products (19%), mold (18%), and mineral and inorganic dusts (18%).¹⁷

A 2003 study that surveyed teachers in Chicago and Washington D.C. found that many respondents reported health problems related to the work environment (Chicago over 25 percent; D.C. over 30 percent), with respiratory symptoms predominating. The author of this report notes that the teacher-reported rates of health problems in this study far exceed OSHA reports of such problems (4 percent), but adds that the OSHA figures are derived from *employer* reports. About half the teachers surveyed in this report rated their schools' condition at "C" or lower, and of these, 40 percent were considering changing workplaces, with 30 percent of those contemplating change considering leaving the profession altogether.¹⁸ In a subsequent study of teacher retention in Washington D.C., a study found that good school quality was nearly as important as pay scale in teacher retention.¹⁹

Teacher dissatisfaction with facility quality is also reflected in recent a Canadian survey. Sixty percent of all respondents to this (very small) Canadian online survey about school indoor air quality were teachers, and teachers reported 41 percent of the indoor air concerns expressed in the survey. In all respondents, health problems related to school indoor air quality were reported by 16 percent, and dissatisfaction with ventilation was reported by 24 percent. Health problems reported were "headaches, nausea, asthma, allergies, chronic throat problems, severe sinus infections, respiratory illness, skin rashes, eye infections, watery eyes, cold-like symptoms, drowsiness, and mental confusion."

Problem exposures identified in this survey were poor ventilation; biological contaminants (mold, dust, bacteria); thermal discomfort; "fumes from vehicles; perfume; air fresheners; Volatile Organic Compounds (VOCs) from wallboard, furniture, and building materials; smelly markers; chlorine smell in water; sewer smells; musty stale air; photocopier ink; furnace fumes; cafeteria odours; smoke and gas smells; laundry soap smells on clothing; cleaning product fumes; floor wax;" CO₂; CO; carpet (emissions from new; mold/dust/bacteria from old); asbestos building materials; pesticides; rodent excrement; leaking roofs and foundations.²⁰ Many of these are allergens and irritants having the potential to exacerbate existing respiratory conditions.²¹

¹⁷ Mazurek, J.M. et al. Work-related asthma in the educational services industry-California, Massachusetts, Michigan, and New Jersey, 1993-2000. American Public Health Association, 133rd Annual Meeting & Exposition, Philadelphia, Pennsylvania. December 10-14, 2005

¹⁸ Schneider, M., *Public School Facilities and Teaching: Washington D.C. and Chicago*. 2003. Washington D.C.: 21st Century School Fund.

¹⁹ Schneider, M. et al., *The Effects of School Facility Quality on Teacher Retention in Urban School Districts*. 2004. Washington D.C.: 21st Century School Fund.

²⁰ Indoor Air Quality in Canadian Schools Project, *Indoor Air Quality in Canadian Schools —Final Report*. November 2003. <http://www.ahprc.dal.ca/Final%20Report.pdf>

²¹ American Thoracic Society, Guidelines for Assessing and Managing Asthma Risk at Work, School, and Recreation. *American Journal of Respiratory and Critical Care Medicine* 169 (7): 873–881. April 1, 2004. <http://ajrccm.atsjournals.org/cgi/content/full/169/7/873>

Two recent Scandinavian studies shed light on some of the exposures present in the school workplace. In one, dust samples obtained from known ‘problem’ schools provoked inflammation in cell cultures to a greater extent than dust from ‘no problem’ schools.²² In the other, long-lasting physiological effects were found in teachers working in a water-damaged school, effects that persisted for years after the schools were renovated.²³

HEAL member survey responses explicate exposure-related problems in the workplace.

²²Allermann, L. et al. Inflammatory potential of dust from schools associated with building related symptoms. *Occupational and Environmental Medicine* 60 (9): E5. September 2003.

<http://oem.bmjournals.com/cgi/content/full/60/9/e5> See also *Proceedings*, Ninth International Conference on Indoor Air Quality and Climate, Monterey, California. 2002. www.chps.net/info/iaq_papers/PaperV.1.pdf The authors note: “[I]nflammation could . . . be considered an integrated effect of the total biological and chemical exposure load from an indoor environment.” They collected dust samples from 20 schools (10 previously identified as having a high number of occupant health complaints (19.6% - 31.9%) and 10 with low numbers of such complaints (4.4% - 11.0%)) and added dust in different concentrations to lung cell cultures. They found a positive correlation between the inflammatory responses of the lung cells to dust obtained from schools with high occupant health complaints, and were able to distinguish high and low occupant complaint buildings by the inflammatory responses provoked by their respective dust samples. Itching eyes, nose congestion, and fatigue were positively correlated with cell inflammation, and prickly sensation of the skin, and headache were borderline correlated with it. A positive index of at least two of five symptoms of the mucous membrane and the skin, and a positive index of at least one symptom from the central nervous system, were positively correlated to inflammation in the lung cell cultures. The authors noted that, while inhalation of the dust itself may not be the culprit in the occupants’ reported health problems, the dust may serve as a characterization of problem materials in the building. The dust may have absorbed these materials, promoting inflammation. Those source materials may constitute the exposures of interest in school occupant health complaints.

²³Rudblad, S., *Nasal mucosal reactivity after long-time exposure to building dampness*. Doctoral dissertation, Karolinska University, October 2004. <http://diss.kib.ki.se/2004/91-974455-5-X/thesis.pdf> Abstract at <http://diss.kib.ki.se/2004/91-974455-5-X/> This investigation involved nasal mucosa reactivity in 28 teachers who had worked for at least five years in a school heavily damaged by moisture. Symptoms persisted in the teachers even after the school had been renovated. Compared with teachers working in a school with no known moisture problems, the teachers in the problem school had a clearly different pattern of reactivity to histamine challenge. The teachers also had a markedly different pattern of reactivity from incoming students without long exposure to the school. Two years after this phase of the study, the teachers were tested again, and again the originally hyper-reactive teachers were more reactive than teachers not exposed to the former problem conditions at the school, though the difference was less than it had been two years previously. Six years after initial testing, the reactive and non-reactive teachers were again tested, and this time the difference between the two groups was negligible. However, the reactive teachers displayed a continued difference in swelling and plasma leakage in nasal mucosa. The researcher concluded, “Consequently, longtime exposure to building dampness may increase the risk for hyper reactivity of the upper air-ways. This acquired hyper reactivity may last for years and decrease only slowly, even after the indoor climate has been properly improved.” An important finding in this study is that the students, who were also tested and followed during the study, did not show any increased reactivity — thus school environmental conditions that may be sufficient to protect student health may fail to fully protect teachers or to restore them to health after building remediation. See also: Rumbled S. et al. Nasal hyperreactivity among teachers in a school with a long history of moisture problems. *Am J Rhinol*, 2001; 15(2): 135-41. Rudblad S. et al. Slowly decreasing mucosal hyperreactivity years after working in a school with moisture problems. *Indoor Air*, 2002; 12(2): 138-44. Rudblad S. et al. Nasal mucosal histamine reactivity among young students and teachers, having no or prolonged exposure to a deteriorated indoor climate. *Allergy*, 2002; 57(11): 1029-35. Rudblad S. et al. Nasal histamine reactivity among adolescents in a remediated moisture-damaged school--a longitudinal study. *Indoor Air* 2004 Oct;14(5):342-50. Rudblad, S. et al. Nasal mucosal histamine reactivity among teachers six years after working in a moisture-damaged school. *Scand J Work Environ Health*. 2005 Feb;31(1):52-8.

For many years, HEAL has been aware that many HEAL members have multiple chemical sensitivities (MCS). In drafting a member survey in 1999, many of the questions included were directed at assessing the impact of MCS on daily activities, including work. The purpose of the survey was to assess the health and well being of the members, their life experiences with healthcare and work, their information needs and interests, and other matters.²⁴

In December 1999, a survey form was published in *The Human Ecologist*, HEAL’s flagship publication. That issue was distributed to all active HEAL members, and the survey form was also distributed to all incoming new members during 2000 (total number about 1700; response rate about 18 percent).²⁵ A noticeable number described themselves as current or former teachers and nurses, and reported difficulties with exposures related to (though not necessarily exclusive to) their work environments. (It was this pattern of response that initiated the research that resulted in this document.)

As the survey forms were returned, articles were published in *The Human Ecologist* on various topics covered by the survey. In December 2001, such an article appeared in the magazine regarding MCS and work, and could be considered a pilot study of MCS and worker health.²⁶ As far as we know, it is the first survey-based description of the impact of MCS on working life. It covered all of the member responses gathered from December 1999 to December 2000, and discussed the survey returns from all of those who answered ‘yes’ to the question, “Do you have MCS?” There were 269 surveys in this sample, age range from 26-86 years. There were 196 respondents of working age (64 and younger). Responses of the working-age group to selected survey items were compared to responses about those same items from the entire sample (269) in the article. Some information from previous articles about the survey results was used in the analysis of responses about work.

Rated on a scale of 1-10, with one being ‘nuisance’ and 10 being ‘life-threatening,’ average reported MCS severity in the entire sample was 6.55. In the working-age group, average reported MCS severity was 6.66, while in the employed sub-group it was 5.68.

In a previous article on the survey results²⁷, MCS had significant impacts on ordinary daily activities (see Table 1.) Many of these activities are also common to many workplaces.

Table 1. Activity levels reported by 8 women with self-reported MCS severity 5. (Workers with MCS self-reported MCS severity 5.68.)

MCS severity 5 “I can...	Read print material	Use a computer	*Attend meetings	Eat at restaurants	Take day trip	Over night trip	Stay hotel/motel
% usually	50.00	75.00	37.50	62.50	75.00	50.00	50.00
% sometimes	50.00	12.50	37.50	37.50	25.00	50.00	25.00
% never	0.00	12.50	12.50	0.00	0.00	0.00	12.50

From Kosta, L. MCS and work. Adapted from HEAL Member survey: MCS and activities. *The Human Ecologist* No. 90, Summer 2001.

*In the original table, this category was called “Attend worship services.” This activity has been interpreted here as the ability to remain for an hour in an enclosed space with a moderate to large group of people.

²⁴ HEAL member survey, *The Human Ecologist* No. 84, Winter 1999.

²⁵ Personal communication, Human Ecology Action League, Inc. (HEAL) 2000.

²⁶ Kosta, L. MCS and work: Data from the HEAL member survey. *The Human Ecologist* No. 92, Winter 2001.

²⁷ HEAL Member survey: MCS and activities. *The Human Ecologist* No. 90, Summer 2001.

The December 2001 article on work and MCS says, “It is plain that, even for those moderately affected by MCS, the ability to engage in activities common to many workplaces and essential for some jobs, can be severely restricted. Some workers must read and handle large quantities of print materials and use a computer for significant portions of the day. These include teachers, administrators, managers, and some technical workers.”²⁸

The survey also asked if respondents limited their activities to avoid exposures that exacerbated their symptoms. See Table 2 for the responses to this question. “These reported limitations on time spent using equipment, having unlimited contact with people, restrictions on destinations, and the use of devices to reduce contact with problematic substances have serious potential to disrupt or limit the working life of people with MCS.”²⁹

Table 2. Activity limitations reported by 8 women with self-reported MCS severity 5

Limitation	% reported MCS severity 5
Limit contact with people	50.0
No smoking	37.5
Limit time	25.0
Limit destination	12.5
Use device (filter, mask)	12.5
No fragrance	12.5
Air out items	12.5
Ill from activity	12.5

Kosta, L. HEAL member survey: MCS and activities. *The Human Ecologist* No.90 Summer 2001.

These limitations are also consistent with survey respondents’ reports of their “most troublesome” exposures reported in a previous sample from the same survey. (This question was open-ended in the survey, so respondents did not receive prompting or make a selection from a list.) In that sample, the top-ranking troublesome exposures were fragrance (40%), formaldehyde (8%), and mold (6%), with other troublesome exposures reported as well: pesticides, paint, carpet, cleaning products, building materials, volatile organic compounds, sprays, plastics, air fresheners, inks, printed materials and new textiles.³⁰

All of these are very common in many working environments, and many have been independently identified by nurses and teachers as being troublesome in their workplaces. The limitations reported by HEAL respondents can be seen as efforts to avoid exposures to these substances. In the HEAL survey, avoidance of troublesome exposures was, by far, the intervention reported as most helpful (72%). Other surveys have found similar responses from people with MCS: 95% in the Johnson survey; 74% in the Gibson survey.³¹ However in some workplaces, avoidance is very difficult — if not impossible — to achieve. (It is important to note that many people with MCS also report drug allergies and intolerances, and thus are unable

²⁸ Kosta, L. MCS and work: Data from the HEAL member survey. *The Human Ecologist* No. 92, Winter 2001.

²⁹ Kosta, L. MCS and work: Data from the HEAL member survey. *The Human Ecologist* No. 92, Winter 2001.

³⁰ Kosta, L. HEAL member survey: difficult exposures, helpful interventions. *The Human Ecologist* No.88, Winter 2000.

³¹ Kosta, L. Interventions for MCS: reports from three large surveys. *The Human Ecologist* No. 100 Winter 2003. See also Gibson, P.R., *Multiple Chemical Sensitivities—A survival guide*. Oakland California: New Harbinger Press. 2000. Johnson, A. MCS Survey. 1997. <http://www.conceptmed.com/Johnson>

to rely on pharmacological tools to manage their responses to exposures in the workplace and elsewhere.³²⁾

In the working age sample, 37 percent of the respondents were employed at the time of the survey. (Of the others in the working age sample, 33.2 percent received Social Security Disability benefits, most of them for MCS; their average reported MCS severity was 7.9 (nearly “severe.”). Nearly half of all respondents reported having lost a job because of MCS, 35 percent said they had taken early retirement because of MCS (often with a smaller-than-anticipated pension), and over 24 percent said they had had to make a career change because of MCS.

In the working-age sample, there were 63 survey responses that contained enough information to allow an estimate of the respondents’ lost earnings from MCS-related inability to work at their former jobs. In this subgroup, 27 percent were former teachers, and 10 percent were former nurses. Thus nearly 40 percent of these former workers were qualified to work in occupations in which there are currently worker shortages. For teachers K-12, personal earned income was reduced by 82%; for the nurses, it was reduced by 78%.

The picture that emerged from the HEAL member survey was of people who, though they themselves described their MCS as moderate, were unable to tolerate conditions common in many workplaces, had suffered financial and professional losses because of MCS, and were, in some cases, formerly employed in nursing and teaching — occupations that are highly respected in society, and greatly needed at this time and in the future.

The cost of MCS to individuals and society appears to be high, based on this sample. When the worker is unable to work in his or her profession, society does not benefit from the worker’s training and skills, and the economy does not benefit from the full participation of these workers.

The prevalence of MCS in the general population is unknown, but (other) surveys (all of them small) indicate that “unusual sensitivity to chemicals” may affect from 6% to 37% of the population.³³ Even at the low end of this range, chemical sensitivity in some form may be hindering many workers from full participation in the workforce, and it is possible that it is having a disproportionate impact on nurses and teachers. “Unusual sensitivity to chemicals” may be responsible for some of the work-related asthma that afflicts nurses and teachers in the U.S. For these workers, as for people with MCS, exposure control and avoidance is critical to maintaining health and preventing work-related exacerbations.

A model intervention to improve worker health: The Fragrance Controlled Workplace Policy at Brigham and Women’s Hospital, Boston, Massachusetts

³² Ashford, N. and Miller, C. *Chemical Exposure: Low levels and high stakes*. 2nd edition. New York et al.: Van Nostrand Reinhold. 1997. “[T]here seems to be an important overlap between individuals who react badly to medications and chemically sensitive patients.” This may be a particularly important observation, given the number of adverse drug reactions reported annually in the U.S. (245,750 reported to FDA in 2000 alone; see <http://www.fda.gov/cder/reports/RTN2000/RTN2000-3.HTM>).

³³ See: Caress, S. et al. Prevalence of Multiple Chemical Sensitivities: A Population-Based Study in the Southeastern United States. *American Journal of Public Health* 94:746–747. 2004.
Kreutzer, R. et al. Prevalence of people reporting sensitivities to chemicals in a population-based survey. *American Journal of Epidemiology* 150:1–12. 1999.
Meggs, W. J. et al. Prevalence and nature of allergy and chemical sensitivity in a general population. *Archives of Environmental Health* 51:275–282 1996.

The Human Ecologist published a series of articles beginning in 1992 regarding fragrance and health, and in 1998 published a book on the subject. One section of the book is called “Fragrance in the workplace: Who shouldn’t use it?” It notes that “some occupations are particularly unsuited to on-the-job fragrance use, because of the nature of the work, the people involved, or both.” The article identifies health care and educational facilities as two workplaces that should institute fragrance-free policies, noting that both employers and employees have an interest in protecting the health of susceptible individuals, and thus promoting the mission of the organization’s enterprise.³⁴ In 2000, one such workplace, Brigham and Women’s Hospital in Boston, independently came to the same conclusion and instituted a fragrance controlled workplace policy.

In December 2002, *The Human Ecologist* published an interview about this policy with Marlene Freeley R.N., M.S., Director of Occupational Health Services at Brigham and Women’s Hospital, Boston, Massachusetts.³⁵ Brigham and Women’s, a major teaching hospital of Harvard Medical School, employs 9000 workers, and has a daily occupant load of 20,000 people.

At Brigham and Women’s, policies for managing indoor contaminants were set in place in the 1990s, together with a beeper system for workers to report unfavorable working conditions. Worker awareness of indoor air quality issues is high, and workers are very likely to report health problems related to indoor air to the hospital’s Occupational Health Service. Such workers fill out a questionnaire about their views of what caused the problem, and their answers enabled the Occupational Health Service to notice a pattern of workers complaining about fragrance exposures on the job. “The pattern was so pronounced that we felt we had to look into fragrance and health. When I did, I found reasons for trying to reduce the exposures that both our patients and our workers were having to fragrance,” Freeley said.

The hospital’s senior management assigned Freeley to chair a task force to draft a fragrance policy for the hospital. The task force determined that, while they could not control all of the fragrance use of every one who came to the hospital, they “agreed that we could and should have a policy to control fragrance use within the hospital by people who work in the hospital.... We also agreed that we should take steps to limit fragrance use by inpatients.”

“We had clear evidence that our workers were having problems with fragrance exposures and that this was affecting their productivity [...] ... a bottom-line issue for managers. We also had scientific evidence that fragrance was causing these problems. It wasn’t hard to see that if workers were being affected, patients were also.... and this was very important to us as a premier health care organization. Finally, the policy was so clear-cut that...management was comfortable being responsible for it. We weren’t promising anything that we weren’t able to deliver, and we were committed to delivering what we knew we could: control of fragrance exposures in our workplace.”³⁶

³⁴ Kosta, L. *Fragrance and Health*. Atlanta, Georgia: HEAL Presents. 1998.

³⁵ Kosta, L. Fragrance control and health care facilities: an interview with Marlene Freeley R.N., M.S., Director of Occupational Health Services, Brigham and Women’s Hospital, Boston, Massachusetts. *The Human Ecologist* No.96, Winter 2002.

³⁶ As noted above, workers, in general, nurses, teachers, and HEAL members have all identified cleaning products as problematic. Freeley discussed the challenges involved in obtaining unscented cleaning products for use in the hospital. Noting that worker misuse of cleaning products (using too much, the wrong dilution, or no dilution at all) had already been identified by the hospital and addressed by the hospital’s Product Safety Committee, Freeley said that it was easy to add the requirement that cleaning products used in the hospital be unscented as well as not a threat to health or the environment. Finding the products was more difficult but was addressed though banding

The policy was accepted in September 2000, and the hospital launched an employee education campaign about it that was still ongoing in 2002. Informational brochures were distributed to all departments in the hospital, and to all incoming patients prior to their stay at the hospital. Nursing Grand Rounds were given on fragrance and health, and presentations were given to department personnel on request.³⁷

Compliance has been good. “The physicians have been very supportive, especially in the respiratory, OB/GYN and oncology services,” Freeley said, “Once the policy was in place, many of our workers ‘came out of the woodwork’ on this issue and said they’d been troubled for years by fragrance exposure on the job.” Patients report that they want to come to Brigham and Women’s in part *because* of the fragrance policy.

When asked what advice she would give to others interested in seeing similar policies adopted, she said the following:

- “It was an enormous help that our entire workplace was so aware of IAQ and health. Before we introduced the fragrance issue, workers and managers were already attuned to being aware of IAQ conditions, and used to reporting IAQ conditions that affect health, comfort and well being. Including fragrance in this context was very natural for us. So it helps to have good workplace awareness of IAQ.
- “Gathering information about worker complaints is important. It was very helpful that we were able to gather clear evidence of worker complaints about fragrance exposure. Since we already had the reporting mechanisms in place because of our IAQ awareness, it was relatively easy to see the pattern of these complaints.
- “Providing information about the impact of fragrance on health was also important. We’re a research and teaching institution, and our senior people were very interested in the science that underlies this issue. So getting and presenting reliable information is important.

together with another major hospital in Boston and using their combined purchasing power to convince product manufacturers to supply their products unscented.

³⁷ Excerpts from “Brigham and Women’s Hospital is a Fragrance-Controlled Environment,” brochure produced and distributed by Brigham and Women’s Hospital, Boston, Massachusetts: “There has been a significant increase in concerns that contact with strong scents and fragrances can cause discomfort in sensitive individuals and even cause troublesome health effects in people with certain medical conditions.”

“Moderate to strongly scented fragrance produces can adversely effect [sic] the health of individuals who have certain medical conditions such as asthma, allergies and migraine headaches. Also, individuals who are undergoing different medical therapies. . . are especially sensitive to odors and scents in the environment.”

“Some fragrances have also been shown to trigger symptoms in otherwise healthy individuals. Some of the concerns may include watery or itchy eyes, sneezing, nasal congestion, sinusitis, fatigue, dizziness, coughing, shortness of breath, difficulty with concentration, and headaches. Fortunately, these symptoms are self-limiting and will easily disappear after the individual is able to get some fresh air and *when fragrances are removed from the environment.*” (emphasis added)

“For the comfort and health of all patients cared for at the hospital, as well as all the employees who work here, BWH must provide the safest and healthiest environment. For this reason, the use of scents and fragrant products, other than minimally scented personal care products, is discouraged on all hospital property, particularly in the clinical areas.”

- “Last, but definitely not least, is that we were able to clearly state what the policy was and who was affected by it. As I said, we’re an institution that sees a lot of people coming in every day, and there was no way we could control or be responsible for what they did. But we’re a health care institution, and it was clear that we were responsible for taking action *as an institution* to protect the health of both our workers and our patients. Our policy does that.”

As noted earlier, respondents to HEAL’s member survey reported that fragrance was their “most troublesome exposure” far more often than any other exposure. We asked about the “most troublesome” exposure to capture several elements of exposure avoidance: the link with symptoms, the severity of the symptoms, and the difficulty in avoiding the exposure. It is striking that employees of Brigham and Women’s also experienced fragrance as a troublesome exposure — and that their workplace was prepared to take their concerns seriously. The symptoms shared in common between Brigham and Women’s workers, HEAL members who responded to the HEAL survey, and nurses and teachers, are also strikingly similar. It is likely that workplace interventions like the fragrance-controlled workplace policy at Brigham and Women’s Hospital could promote worker health and productivity in many workplaces, including those employing nurses and teachers.

Asthma and exposures — the same chemicals in different media can boost total exposure loads

The link between asthma exacerbations and allergen exposure is well-established, as is the association between asthma exacerbations and exposure to inhaled irritants, both chemical and particulate.³⁸ There has been a tendency to investigate the emissions of single products types (carpeting, fragrance products and the like), in order to better understand their constituents and potential for causing adverse respiratory and other responses. Many of the products investigated emit a variety of substances at comparatively low levels, after an initial ‘airing out’ period. Nevertheless, some individuals continue to experience adverse effects in environments containing comparatively low levels of irritant vapors, gases and particles emitted from products such as carpet, scented cleaning products, and other materials identified by various workers as troublesome workplace exposure sources.

Allergic responses to low-level allergen exposures are a hallmark of allergy and allergic asthma. But the reason for the exquisite sensitivity of some individuals to low-level chemical exposures remains elusive. There is one exposure factor that is easily overlooked if only single source emissions are considered as incitants of adverse responses. This is simultaneous total exposure to single chemicals from multiple sources.

The table below illustrates this factor. It shows chemicals occurring in three groups of very different substances: fragrances, building materials, and tobacco smoke. All three have been identified as sources of indoor air pollution, and two are clearly associated with asthma.³⁹ All have been identified as problematic exposures by HEAL members, workers in general, and

³⁸ American Thoracic Society, Guidelines for Assessing and Managing Asthma Risk at Work, School, and Recreation. *American Journal of Respiratory and Critical Care Medicine* 169 (7): 873–881. April 1, 2004. <http://ajrccm.atsjournals.org/cgi/content/full/169/7/873>

³⁹ EPA, Basic information about indoor air quality. Retrieved February 2006. <http://www.epa.gov/iaq/ia-intro.html>

nurses and teachers. Health effects listed are from inhalation or dermal exposures. The last column lists a few common consumer products containing the same chemicals.

Table 3. Chemicals in common — building materials, tobacco smoke, fragrance materials

Chemicals	Building materials (a)	Tobacco smoke (b)	Fragrance materials (c)	Selected health effects (d)	Contained in consumer products (e)
Aldehydes*	Formaldehyde	Formaldehyde	Formaldehyde	Respiratory irritant.	Adhesives, maintenance, pet care.
		Acetaldehyde	Acetaldehyde	Eye and respiratory irritant.	Adhesives
			Benzaldehyde	Eye and respiratory irritant.	Personal care
	Hexanal			Eye and respiratory irritant.	No record
Terpene hydrocarbons	Alpha-pinene		Alpha-pinene	Eye, mucous membrane and skin irritant.	(pine oil) cleaners, personal care, disinfectants
	Beta-pinene		Beta-pinene	Skin and mucous membrane irritant.	cleaners, personal care, disinfectants
	d-limonene	Limonene	Limonene	Skin irritant.	Auto, home, personal care
	Beta-carene			Expected effects are mucous membrane, skin irritation; sensitization among others.	No record
	Camphor			Skin, eye and mucous membrane irritant; GI and CNS effects at high doses;	Hobby; personal care (many products listed)

				sensitization.	
		Naphthalene		Skin irritation; headache, other CNS symptoms	Pesticides; auto products
	Borneol		Borneol	See camphor.	No record
Phenols		Phenols	Phenols	Skin, eye and mucous membrane irritant.	Personal care

(a) Hodgson, A.T. et al., Sources of Formaldehyde, Other Aldehydes and Terpenes in a New Manufactured House. *Indoor Air* 12 (4): 235-242. 2002. <<http://eetd.lbl.gov/IEP/viaq/pubs/LBNL-47627.pdf>>

(b) IOM, *Clearing the Smoke: Assessing the Science Base for Tobacco Harm Reduction*. Washington DC: National Academies Press. 2001 <http://www.nap.edu/catalog/10029.html>

(c) Kosta, L. *Fragrance and Health*. Atlanta, Georgia: HEAL Presents. 1998.

(d) TOXNET, Hazardous Substances Database. <http://toxnet.nlm.nih.gov/> Retrieved February 2006.

(e) National Library of Medicine, Household product database. <http://hpd.nlm.nih.gov/> Retrieved February 2006.

*Note that aldehydes are present in some foods and are also produced by both fixed and mobile (vehicle) combustion sources; thus they truly ubiquitous in the environment, and therefore extremely difficult to avoid.

Fragrance materials are ubiquitous in personal care, cleaning, and air freshening products. Although fragrance formulas are protected by trade secrecy and their ingredients are not listed on product labels, enough is known about fragrance materials to indicate that not only do some of them have irritant, sensitizing and allergenic potential, but also that some of their constituent chemicals may be present in other, less “pleasant” substances that are also commonly encountered in the environment. Some of these have identified as problematic by HEAL members, and nurses and teachers also indicate that they are troublesome workplace exposures.

Much has been made of the “many” chemicals to which people report sensitivity. Some skeptics argue that this is an indication that claims of chemical sensitivity lack plausibility.⁴⁰ However, it may be that some people who report “unusual sensitivity” to common chemicals, or who experience IAQ-related workplace health effects, have the most difficulty with a comparatively small group of chemicals that are very difficult to avoid. It is noteworthy that the fragrance-controlled policy adopted at Brigham and Women’s not only reduced worker and building occupant exposures to fragrances as such, but also reduced their total exposures to aldehydes, terpenes, and phenols. No-smoking policies have a similar effect on total exposure reductions.

It is certainly likely that, in some environments, worker exposures to single chemicals emitted from multiple sources could approach, or even exceed, health-based limits. It is at least intriguing that products as widely divergent as building materials, tobacco smoke, and fragrance materials, share some chemical constituents in common, and that symptoms associated with these common chemicals resemble symptoms reported by HEAL members, teachers, nurses, and employees of Women’s and Brigham Hospital (see note 27).

⁴⁰ For example, see Staudenmayer, H. *Environmental Illness: Myth and Reality*. Boca Raton, Florida: Lewis Publishers. 1999.

Recommendations

NORA can engage in multiple activities to investigate nurse and teacher respiratory health, with the goal of producing real-world, fact-based recommendations for nurse and teacher workplace health and worker retention.

1. Survey nurses and teachers about their respiratory health, and about the workplace exposures that they think cause adverse effects. Recruit participants from nurse and teacher professional associations, to provide cross-sections of workers from a variety of workplaces.
2. Compile data on suspect exposures and exposure sources identified in 1.
3. Do a literature search on materials known to be present in school and health care facilities, and their potential health effects. Look for commonalities between the two workplaces.
4. Do a literature search on the exposure sources identified as troublesome by nurses and teachers in 2., looking for links (or lack thereof) between what is known about the sources and their possible connection to nurse and teacher health complaints. Pay particular attention to those sources present in both work environments.
5. If the results of 1-4 justify it, conduct health and work satisfaction surveys of nurses and teachers who work in buildings of several different kinds:
 - Conventional buildings in good repair
 - Conventional buildings that have implemented comprehensive indoor environment policies (e.g. Brigham and Women's indoor air policy, including its fragrance controlled workplace policy; schools that have EPA Tools for Schools, health care facilities that have implemented EPA/NIOSH Building Air Quality — A guide for building owners and facility managers.)
 - Conventional buildings in poor repair.
 - New buildings built to “green” standards such as those promulgated by LEED.

Compare the survey results among all types of these buildings, matching survey responses for age, length of time in the workplace, plans to continue at that workplace, plans to continue in the profession.

6. Identify factors (from the surveys conducted in 5.) that contribute to worker health, satisfaction, and retention.
7. Formulate and publicize recommendations for health-promoting strategies that favor teacher and nurse workplace health based on 1-6.

This is an ambitious plan, but can be spread over several years, thus limiting its budget impact. It also provides many opportunities to publish results obtained from steps along the way to final completion in 7. These results should be disseminated widely to nurse and teacher professional organizations, to ensure continued public support for the effort.