

Human exposures to pesticides

A 1979-1980 report of the Wisconsin Division of Health

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ABSTRACT. *Surveillance and reporting of acute human health effects resulting from pesticide exposures is difficult from both a medical and administrative perspective. This report describes an evolving system of collecting and organizing pesticide incident reports in Wisconsin and presents information based on a decade of Worker's Compensation data and 1979-1980 pesticide incident reports from the Department of Agriculture, Trade and Consumer Protection. There is much room for improvement in both the quantity and quality of the data pertaining to acute pesticide exposure incidents.*

RECOGNIZING AND confirming human health effects from exposure to various pesticide formulas is difficult for many reasons. The patient may not be aware of the exposure. The physician may not recognize that a problem is caused by a pesticide. The laboratory may not be equipped to properly analyze blood and urine specimens for cholinesterase levels or metabolic derivatives of the parent compound. Specimen collection may be improper or delayed causing both false positive and false negative results. Persons are often exposed to multiple pesticides in combination with carrier solvents resulting in a confusing toxicological picture. Finally, people exposed to similar amounts of a particular chemical may react differently depending on an individual's general health, body stature, age, drug use, and smoking history, among other factors.

The above pertains only to recognizing and confirming that an exposure and effect have taken place. There are other factors that determine whether such an incident is reported in a logical and consistent manner through a surveillance network. The type of incident and where it occurs are important reporting determinants. Occupational exposure data (encompassing pesticide contact on the job during the manufacture, formulation and application of pesticides) may be partially determined from Worker's Compensation reports or from com-

plaints directed to appropriate local, state, and federal agencies.

Data from accidental incidents (those taking place due to mixups, spills, and other haphazard events) and environmental exposures (similar to accidental exposures but usually involving lower concentrations often widely disseminated during "normal" pesticide use) may be derived from poison control centers, or a multitude of state, federal, and local agencies.

Despite the vagaries and scarcity in Wisconsin of previous years' accumulation of pesticide incident reports, useful summaries are available and are becoming more accessible from certain sources. A selected group of these sources and their recent data are presented below. It is hoped that with proper resources and development a more complete surveillance system can emerge from these and other repositories of pesticide incident data.

PESTICIDE EXPOSURE IN THE WORKPLACE Worker's Compensation Data 1970-79

An important source of information on pesticide exposures can be culled from Worker's Compensation data derived from a data-base maintained by

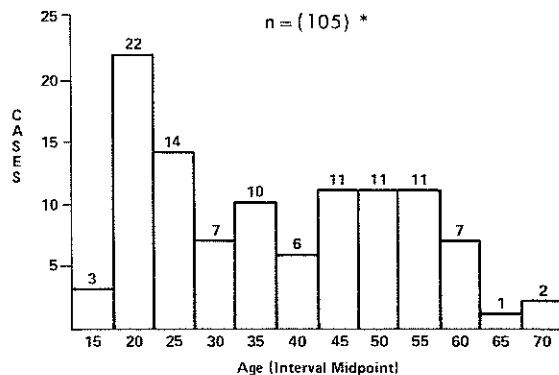


FIGURE 1—Pesticide-related Worker's Compensation reports by age group. Five-year intervals bracket the age range in which the specified number of incidents was reported over a ten-year period, 1970-1979.

From the Environmental Epidemiology Section, Bureau of Community Health and Prevention, Division of Health, Wisconsin Department of Health and Social Services, Madison, Wisconsin. Reprint requests to: Harold B Weiss, MS, MPH, PO Box 309, Room 325, Madison, Wis 53701 (ph 608/267-7174). Copyright 1981 by the State Medical Society of Wisconsin.

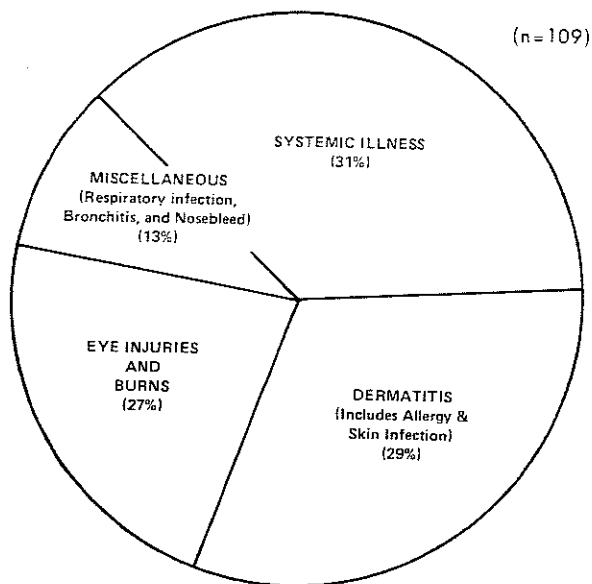


FIGURE 2—Types of pesticide-related Worker's Compensation reports by type of associated illness.

the Department of Industry, Labor, and Human Relations. For the period 1970-79, over one-half million records were reviewed, and from those 109 cases were abstracted with an exposure code listed as *insecticides*, *weed sprays*, and *fungicides*.

Sixty-eight percent (74) of the cases involved exposure to insecticides, 28% (30) weed sprays, and 5% (5) fungicides. Eighty-one percent (88) of the cases were male.

The types of illnesses, by site, are listed in Figure 2. The systemic illnesses were analyzed separately to ascertain if, as expected, they are more severe. This was the case as evidenced by an average number of healing days off of 9.3 days for systemic injuries compared to an average of 3.6 days for the other categories of injuries ($p < .01$ for $t = 3.01$, 107 d.f.).

Figure 3 shows the number of cases reported each year by the class of pesticide involved in the incident. It is not known if the increase in numbers over the decade represents a larger work force being exposed or a higher rate of exposure.

Figure 4 and Table 1 show the geographic distribution and occupational classification for the study population. Based on population figures, as expected, Milwaukee has the most cases. This emphasizes the often overlooked evidence that reported pesticide exposure incidents take place frequently in urban environments. Many reported cases were not well classified by occupation (24 unknown "laborers"). It is notable, however, that many of the classified cases occurred in occupations not normally associated with pesticide use.

The severity of the exposure, as measured by the number of healing days per case, varied widely. The mean, was 5.3 days (Standard Deviation = 9.0) with a range of 0 to 45 days. A plot of the variables heal-

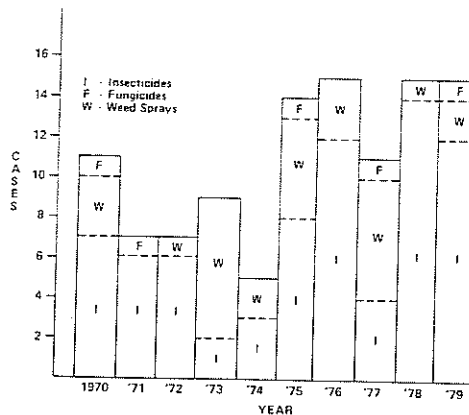


FIGURE 3—Worker's Compensation reports by year and pesticide type.

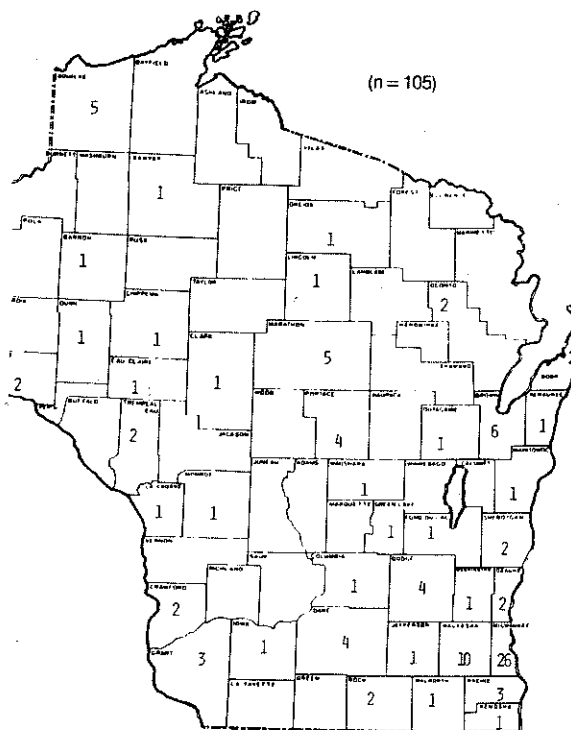


FIGURE 4—Geographic distribution of cases of pesticide-related Worker's Compensation reports.

ing days by age did not reveal any significant correlation.

One hundred nine reported cases over a ten-year period of pesticide related Worker's Compensation reports have been presented. However, these 109 reported cases do not measure the magnitude of actual cases since many go unreported. The National Institute for Occupational Safety and Health (NIOSH) for example, using a survey involving personal and physician interviews, reported that only 11% of all the occupational illnesses they found showed up on either OSHA reports or Worker's Compensation claims.¹ It is not known quantitative-

ly what the magnitude of under-reporting is for the particular category of "pesticide exposures," but if it is similar for all occupational illnesses, and in light of the aforementioned difficulties in recognition of pesticide-related morbidity, the under-reporting must be substantial.

In addition to under-reporting, the accuracy of reporting must also be kept in mind. Worker's Compensation data are not verified by an independent reviewer. The data are coded directly from compensation application claims submitted by the complainant or their representative. These data include claims that may have led to compensation and some that have not.

PESTICIDE INCIDENT REPORTS

Department of Agriculture, Trade, and Consumer Protection (DATCP)

The Plant Industry Division of the DATCP has a Pesticide Protection Section whose responsibilities include investigation and enforcement of cases of pesticide misuse. Any case coming to its attention is entered manually onto a Pesticide Incident report, revised in May 1979. For all of 1979, under the three categories of: (1) Drift, overspray, careless use and use of 2, 4, 5,-T, (2) improper storage, and (3) use contrary to label, 115 reports were filed, 10 of which concerned alleged human health effects from pesticide exposure. In 1980, 109 reports were filed of which 31 involved alleged human health effects. It should be noted that review of these records was accomplished manually and was dependent on abstracting only the data listed on the front page of the pesticide investigation form. Because these forms are used primarily for enforcement purposes and not health follow-up, the reports sometimes had incomplete information (blanks) and usually contained only subjective descriptions of symptoms by lay personnel or the exposed person themselves. Undoubtedly, cases of pesticide exposure with subjective health complaints were not included in the system due to reporting and recording deficiencies. On the other hand, there was rarely documentation by independent medical judgment as to the probability of a causal relationship between the alleged pesticide exposures and subjective health complaints. These data limitations must be kept in mind.

In 1979 six of the ten reports occurred in Dane County; all of the other four were reported from Portage County. In 1980 the reports were more scattered with Dane and Ashland counties reporting five incidents, followed by Milwaukee (three), Marathon, Waukesha, Wood, (two each), and single reports from 12 other counties (mostly in the southern part of the state).

Combining the 1979 and 1980 reports: Sixteen incidents involved use of an organophosphate insecticide and seven involved a carbamate compound. The cases occurred around the growing season with two events early in January and March, six in May

and June, eight in July, 13 in August and one in September. About half of these health-related reports involved aerial application and associated off-target drift or misapplication. Headache and nausea were the most prevalent symptoms reported in association with the exposures, with a large number of reports involving mucous membrane irritation. Without complete follow-up of the cases, it is difficult to precisely delineate the severity of these illnesses, although 13 of 41 of the incidents resulted in a physician visit.

Insecticides (which are generally the most acutely toxic compounds), followed by herbicides, were responsible for most health related complaints.

It is important to note that notification of DATCP was often delayed by many days to the extent of seriously jeopardizing the usefulness of any enforcement related action and investigation (about one-half were delayed by four days or more). This delay, if combined with failure of the complainant to seek medical attention, may be crucial in establishing the validity of a complaint. On the basis of these reports, efforts should be directed to ensure both prompt DATCP notification and medical follow-up, if necessary.

PESTICIDE REPORTS—Poison Centers

Perhaps the single most important source of reports on pesticide-related poisonings could be the

TABLE 1—A listing of occupational classifications for pesticide-related Worker's Compensation reports, Wisconsin, 1970-1979

OCCUPATIONAL CLASSIFICATION	NO. OF CASES
Laborers (unknown)	24
Farm laborers and farmers	12
Mechanics and repairmen (miscellaneous)	8
Managers	8
Gardeners	7
Cleaners and janitors	7
Machine operators	7
Secretaries and typists	4
Food service workers	3
Warehousemen	3
Law enforcement personnel	3
Road machine operators	3

One or two cases were reported under the following classifications: pilot, inspector, sales clerk, retail clerk, cashier, foreman, auto mechanic, heavy equipment mechanic, plumber, stationary engineer, telephone installer, surveyor, manufacturing inspector, freight handler, nurse, housekeeper, and not classified.

two regional and three satellite National Poison Center Network affiliated poison centers. It has been estimated by the author (by comparison with Michigan's poison center data), that well over 300 detailed case reports a year would be detected from this source. However, the resources to record, abstract, and report this data have not been available to all centers. Limited data from 1981 will be reviewed in the upcoming year.

CONCLUSION. This report has described the problems involved in recognizing, confirming and reporting human pesticide exposure incidents in Wisconsin. It also has presented summary data from two available sources as well as describing the current data procurement efforts that are underway by the Wisconsin Division of Health in cooperation with other organizations.

None of the data summaries should be interpreted as representative of the nature and magnitude of human exposure to all pesticides in the state. Both the quantity and quality of the data leaves much to be desired from a public health and public policy oriented perspective. Newly begun initiatives should improve the development of a reporting network over the next few years. At best, however, if properly recorded and interpreted, pesticide exposure reports should be viewed as reflecting only a proportion of actual exposures and illnesses related to the use of chemical pesticides on the job, in agriculture, and in and around the home.

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