

COMMUNITY AND ORGANIZATIONAL AWARENESS OF AND PREPAREDNESS FOR ACUTE CHEMICAL EMERGENCIES

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ABSTRACT

An open system model is used to analyze field data from a study of organizational and community preparedness for acute chemical emergencies. In particular, findings are presented on perceptions of threat, social climate and social or interorganizational linkages. It is shown that the awareness of a need for preparedness is not translated into preparedness activities and practices unless there are supportive social factors or conditions.

INTRODUCTION

The threat of chemical disaster presents significant challenges for planners--- perhaps even greater challenges than do natural disaster threats. Because of their past experience, most communities have some idea of the nature, magnitude and variety of the natural disaster threats they face. In contrast, however, chemical threats are not understood as well, for several reasons. First, while hazardous materials are themselves not entirely new in our society, their widespread production and use, as well as their damage-producing potential, have increased dramatically only in the last few years, and this increase is not yet universally recognized. Second, with literally hundreds of potentially dangerous substances present in or passing through our communities daily, and with thousands of potentially dangerous combinations possible, chemical threats display tremendous variety, compared with natural disaster threats. Third, compared to most natural disaster agents, hazardous materials are relatively unstable, complex, and capable of alteration. Fourth, taking precautions against chemical mishaps necessitates sophisticated protective measures which in general are not well understood by non-specialists. Finally, as we shall see later, chemical threats tend to involve rather atypical organizational ties and jurisdictional arrangements, compared with natural disasters.

Despite the differences between natural and chemical disaster agents, many of the tasks that need to be performed in a serious chemical emergency are not markedly different from those needed in a major natural disaster. Care of the sick and injured,

establishment of security at the disaster site, provision of information to the public, overall co-ordination of the response and a number of similar tasks all must be performed in any community emergency. Moreover, many of the same community emergency organizations---the police, the fire department, the civil defense office---become involved in any disaster response, regardless of the type of agent. Thus, it seems both efficient and cost effective to incorporate community preparedness for chemical emergencies into more comprehensive preparedness measures for the entire range of threats a community faces. By and large, however, this has not been the approach taken in most communities. This paper describes the kinds of preparedness measures that have been developed for dealing with chemical threats in the communities studied by the Disaster Research Center. It also attempts to advance some explanations for why these preparedness arrangements exist.

Two points should perhaps be stressed before the findings are discussed. One concerns the representativeness of the findings. The patterns discussed are based on material from interviews with key personnel in more than 400 different chemical producing, chemical transporting and emergency-relevant organizations in nineteen communities around the United States. The findings are, of course, representative only of these communities and organizations---rather than all U.S. communities and organizations---but there are reasons to believe many of the patterns seen in the preparedness study are broadly reflective of what is being done to plan for chemical threats in the society at-large. Based on global risk assessments and emergency experience, the communities chosen were all known to have a moderate-to-high risk of serious community emergencies involving hazardous materials. Because the sample was skewed in the direction of more severe risks, it seems reasonable to expect awareness and preparedness efforts in the sample communities would be as good as, or better than, those in other, less vulnerable cities.

The second point concerns the generality and abstractness of the points I will discuss. In some cases, I will be presenting merely empirical relationships: associations, comparisons, significant differences, and so on. At other times, however, I will be venturing some interpretations which can be placed on these findings through the use of basic perspectives from social psychology and the sociology of organizations. These kinds of statements are meant to provide a more general framework for understanding the preparedness process and to allow for the exploration of additional implications of the research.

The model employed in the study depicts chemical disaster preparedness and response as open systems. In this model, environmental threats constitute a demand on the emergency preparedness and response subsystems of the community system. However, these subsystems are affected not only by threats but also by several other factors, including threat perceptions, the social climate, and social linkages or interorganizational networks. Before discussing each of the elements in the model in turn, it might be useful to discuss why factors such as social climate are so important in

understanding community preparedness, that is, why the mere existence or even the perception of a threat is not sufficient to bring about preparedness efforts. Perhaps the best way to begin this discussion is to emphasize the distinction social scientists make between what people say---their attitudes and beliefs---and what people do---actual individual, group, and organizational behavior.

Why is this distinction important for understanding local preparedness? When we talk about planning for a new hazard in the environment---whether a natural catastrophe like the Mount St. Helen's volcano or a technological threat like hazardous materials---we are really talking about carrying out a type of planned social change. As the history of any number of government programs shows, bringing about planned change can be extraordinarily difficult regardless of how much change is needed or wanted. Some of this difficulty is due to the common and mistaken assumption that knowledge of better ways of doing things is sufficient for people to adopt these better methods, as well as to the equally widespread idea that if a large enough number of people change their individual attitudes about social conditions---if they have their consciousness raised---behavior will inevitably change and social conditions will be improved. On the contrary, it has been demonstrated time after time by social researchers---in the laboratory, in field experiments, and in the observation of the behavior of individuals and groups in everyday life---that attitudes and beliefs are at best only weak predictors of behavior (1,2). Any number of contingent factors can come into play in determining whether attitudes, beliefs, and intentions of individuals---and organizational policies and plans as well---ever get translated into action. Many factors besides the need for change, and awareness of the need, affect whether change occurs.

I stress the attitude/behavior discrepancy for several reasons. First, as I indicated above, it must be emphasized that many of us have a tendency to take a sort of "hearts and minds" approach to the solution of social problems and to planned social change: many believe it is sufficient to change attitudes about such matters as the need for disaster preparedness and that changes in attitudes will automatically cause things to happen. Second, I am stressing the factors which affect the relationship between what people say and what they do in an attempt to offset the tendency to see collective or organizational solutions to problems as the result of individual motivations and intentions---in other words, to neglect the social context which makes these motivations and intentions either harder or easier to carry out and more or less likely to succeed. It takes more than individual commitment to make preparedness happen. Third, this emphasis comes out of an awareness that there are people in the chemical industry and in public safety organizations who are working to make the environment safer through better preparedness and who at the same time want to better understand why this is so difficult to do when there is widespread public government and industry concern with the problem. If our study shows anything, it shows how difficult it sometimes can be to turn attitudes, awareness, and concern into practice.

To more fully understand the discussion that follows, it might be useful to think of disaster preparedness not as linear process, but rather as a funnel or a value-added process in which factors such as the social climate become important once minimal conditions, e.g., awareness of chemical threats, are met in a community. According to this perspective, awareness of the need for planning is a necessary, but not a sufficient condition for organized preparedness efforts. Awareness of the problem is something that may be present, but that may not necessarily lead to any lasting or potentially effective preparedness arrangements. Since one of the things we learned in this research is that there is not even attitudinal agreement in many of the communities we studied on the magnitude of chemical threats, it becomes a little more understandable why carrying out preparedness activities is so difficult.

PERCEPTION OF THREAT

Moving now to a consideration of perceptions of chemical threats or beliefs about the probability of chemical incidents in the communities we studied, several interesting patterns were noted at the community, sector, and organizational level. Beginning with the most general level, the community, the findings can be summarized as follows.

Although all the communities we visited could be considered high risk localities in terms of the magnitude of production and/or transportation of hazardous chemicals, the perceived risk of chemical incidents---sudden toxic substance releases, plant explosions, chemical spills---by organizational representatives was only moderate. However, chemical disasters are among the most frequently mentioned threats in the communities we studied. In 9 of the 19 cities, respondents rated all three of the different chemical threats as among the most likely to occur. All but two cities rated at least one chemical threat as one of the five most probable types of emergencies. Perceptions of risk were affected by community size, with respondents in the smallest communities significantly less likely than those in medium-sized and large cities to rate the probability of chemical incidents as high. Respondents in communities with recent chemical disaster experience also tended to rate the probability of chemical disasters as high.⁺

Concern with chemical hazards is increasing. Six years before this study, representatives of comparable organizations in about one-third of our sample cities had been asked about their perceptions of the probability of a number of natural and technological hazards (3). Comparing 1972 and 1978 figures, the perceived risk of chemical emergencies had increased, and this was especially true in the case of transportation mishaps. This sensitivity may, however, reflect the fact that two highly publicized chemical transportation emergencies occurred just before our research on

⁺This whole matter is discussed in more detail in the Helms' article in this journal issue.

preparedness began. It should also be noted the increase in awareness does not necessarily mean people understand the technical or social aspects of chemical disasters, or that they are actively engaged in planning.

Awareness of chemical threats is not necessarily associated with awareness of and planning for other environmental hazards. Organizational personnel in the communities we studied could be aware of weather-related threats without necessarily being concerned with hazardous materials. This is consistent with other findings in the disaster research literature, which suggest sensitivity to and experience with a particular disaster agent does not inevitably generalize to others (4).

While transportation accidents involving hazardous materials were seen as an increasing threat, there was not a high degree of agreement among respondents about which organizations or governmental entities should be planning for and responding to these kinds of emergencies. In any given community, different organizational representatives could state such incidents should be the responsibility of various groups and organizations: the manufacturer; the transporter; the state Environmental Protection Agency; the state police; the local fire department; the military; or some other organization. Of course, any or all of these organizations could have a role to play in a transportation emergency, so the respondents were not wholly incorrect in their answers. The problem is that there appears to be an informational void regarding what each organization is really empowered and able to do, i.e., what the community can reasonably expect from each organization in the event of a major transportation accident involving chemicals.

To simply report general figures on community beliefs about the likelihood of chemical disasters glosses over important differences in risk perception which exist among different community sectors. Ratings of the perceived likelihood of a toxic spill, plant explosion, and sudden toxic substance release made by representatives of chemical manufacturing and transporting concerns were compared with those of public organizations, as well as with the ratings of representatives of emergency response organizations. The last two groups were significantly more likely to see chemical threats as a problem for the community than were industry representatives.

This finding is understandable, given the different frames of reference of private industry and public and emergency organizations. Private chemical concerns tend to equate chemical safety with their own efforts to protect the health, safety, and well-being of their employees and to make the work environment safe. For these companies, stating chemical incidents are highly likely would be tantamount to saying their own safety efforts are not working. This would scarcely enhance industry prestige. In contrast, public organizations are charged with considering the safety of the entire community; they are expected to take a public service stance and to worry about all possible threats. To do otherwise---to say chemical threats are not a problem---could seem to reflect a lack of vigilance or concern. In effect, personnel in these organizations are "doing their job" when they expect the worst, while industry people

are "doing their job" when they say they have taken all possible precautions to make the job environment safe.

Perceptual differences were also noted at the organizational level, and these too can be seen as reflecting, in part, differences in organizational frames of reference. Findings analyzed by organization type show these patterns clearly. For example, among public and emergency organizations, there is diversity in perceptions about the risk of chemical hazards. Fire department representatives are by far the most likely of all public organizational personnel to be aware of these threats. In the chemical industry, respondents from larger chemical manufacturing facilities, especially those linked with large, multi-site manufacturers tend to manifest more awareness than personnel in smaller facilities.

Like the findings regarding different community sectors, these findings contain more general implications for the way organizational perspectives influence perceptions of threat. They illustrate the point made by other students of organizations (5,6,7) that organizations take positions on issues which help bolster their own autonomy and prestige. That is, they seek to maintain freedom from outside constraints and to be viewed as doing important and effective work. Since the fire department is commonly charged with responding to chemical threats---that is, since hazardous materials incidents are within the fire department's regular task domain---and since good performance on tasks within its domain is essential to any organization's community image, chemical threats are more salient to fire department personnel and tend to be highlighted. Chemical companies, on the other hand, can better maintain their prestige and freedom from interference and outside regulation by minimizing the threat their operation represents to the community. The differences between large and small chemical companies in their beliefs about the probability of chemical mishaps might possibly be explained by the fact that larger companies---thinking about the chance of losing important resources and prestige and of receiving outside intervention should an incident occur---make safety more salient. They know they have a great deal to lose if they do not.

In the case of both local fire departments and large chemical companies, what we are observing is perhaps more a case of organizational learning than anything else. Not only are chemical threats seen as very much within the domain of these organizations, making such threats very salient, but also the price paid for mistakes, either by these particular organizations in the past or by similar organizations whose experience is known to respondents, may make the risk seem more real and pressing.

These findings on community, sector, and organizational perceptions of the threat of chemical disasters suggest chemical emergencies are beginning to be perceived as important potential community problems. They also indicate virtually all communities contain at least a minimal core group of organizations which are concerned about the problem. However, there is no agreement among different organizations on the nature and severity of the problem. This lack of consensus has its basis in differences in

organizational frames of reference, interests, and priorities. While not a widespread or insurmountable problem, lack of agreement on the risk of chemical threats does handicap preparedness efforts. Without agreement on the need for planning and without highly visible hazards or recent chemical emergencies or near misses which might act as a spur for local planners, it can be difficult to create interest in preparedness in communities.

SOCIAL FACTORS

The discussion now moves to a consideration of social factors which affect the degree to which beliefs about threat and the need for preparedness are transformed into actual preparedness activities. Two different categories of factors were identified: the community social climate and social linkages. Generally speaking, social climate factors are community and organizational beliefs, attitudes, values and standards regarding chemical disaster preparedness. Social linkages are contacts, agreements, or working ties among individuals, groups, and organizations which are oriented towards preparedness.

Earlier, the point was made that community chemical disaster preparedness can be viewed as the product of a value-added or funneling process, in which steps in the process either contribute to or impede progress once there is minimal agreement on the need for preparedness. From the standpoint of the organizational actors involved, social climate and social linkages are important because they produce either incentives or disincentives for preparedness. Well-developed preparedness arrangements at the community level can be seen as the result of elements in the social climate and of social linkages which are high in incentives to plan and low in disincentives.

While terms such as social climate and incentives are rather abstract, the things they refer to are not. They are, by and large, circumstances which were well-known and understood in the communities we visited and which were discussed when interviewees were offering explanations for why preparedness efforts either were or were not developing.

Social Climate

First, with regard to social climate factors, several characteristics and trends can be identified. One of the factors providing incentives for preparedness is the apparent public awareness of the problem of chemical threats, which is increasing. Another is the trend in larger chemical corporations towards taking an attitude of responsibility towards the general public and towards communities where plants are located. As noted earlier, incentives to better preparedness also exist because of the increasing awareness that not planning can be very costly to organizations and communities. Chemical companies are increasingly taking advantage of the financial incentives for planning, one of which is insurance reductions.

At the same time, several aspects of the social climate tend to discourage pre-

paredness for chemical emergencies. One is the belief on the part of many public officials that, in a time of inflation and cutbacks in basic public services, it is politically disadvantageous to advocate "frills" such as elaborate planning for things that might never happen anyway. Moreover, as is the case with any prevention program that works, program personnel probably rightly claim they will get very few rewards or little recognition for working on chemical emergency preparedness because their successes, unlike their failures and unlike the successes of other programs, are non-events. Prevention programs tend to be dropped because, paradoxically, the fact that prevention works in an area means the problem is less evident; this can be used as a justification for eliminating the program.

There are other social climate factors which make it likely that preparedness efforts in the hazardous materials area will be minimal, rather than optimal. For example, the perceived potential for legal problems which could result from making planning agreements or furnishing equipment or personnel certainly influences some corporations to stay aloof from preparedness activities beyond the plant gates, except when absolutely necessary. The sometimes sensational coverage of chemical threats by mass media also seems to contribute to a climate in which local groups may feel it is better to keep a low profile than have their efforts exposed to media scrutiny. Recalling the point made earlier on the tendency for organizations to eschew activities which could lead to reduced autonomy and other costs, it is not difficult to see why most private and many public organizations tend to see preparedness as risky. On the whole, it appears that the social climate in most of the communities we studied provided more disincentives than incentives for preparedness. In general, unless some dramatic event occurs which highlights the need for preparedness, community organizations---except of course those organizations such as fire departments for which chemical emergencies are highly relevant---tend to give higher priority to other problems.

Social Linkages

Interorganizational linkages or relationships provide another set of factors which can facilitate and/or inhibit. The most obvious factor is the quality of the relationships among community organizations, i.e., the nature and extensiveness of intergroup contacts. The ease with which coordination is achieved in a group of organizations depends in large measure on the degree of knowledge the organizations possess about one another's structure and functions as well as on the history of their contacts and joint activities. In communities characterized by a history of communication and cooperation among community organizations on disaster preparedness, cooperation in planning for chemical emergencies is more likely. When organizations have mutual knowledge of one another and have worked together successfully, preparedness for chemical emergencies does not have to start from scratch. On the other hand, a lack of interorganizational contact or a history of intergroup conflict, competition, or rivalry can also carry over into the emergency planning sphere, inhibiting planning

efforts. Conflict is normal; it is characteristic of all social relationships and is widespread in many communities. However, it can and does hamper preparedness for chemical emergencies---particularly since a type of conflict of interest already exists in the chemical area between public and private sectors of the community.

In addition to the quality of interorganizational relationships, the forms of interorganizational ties dictated by the anticipated division of labor in a chemical emergency further complicate preparedness efforts. In the chemical disaster area, there are many disaster-related tasks which can be performed by the same groups and organizations which typically perform them in other types of community disasters; crowd control, site security, and evacuation are examples of these kinds of tasks. In the case of some tasks---traffic routing and medical care, for example---there is also considerable continuity in task specialization from normal, non-emergency times, through disasters of all types, including chemical emergencies. These continuities can be expected to render both planning and response for chemical disasters easier. At the same time, however, by their very nature, chemical emergencies also necessitate types of interorganizational co-ordination and co-operation which are out of the ordinary in terms of both normal organizational operations and typical disaster operations and which additionally have an element of verticality which makes co-ordination particularly problematic for local organizations. Because of the nature of the disaster agent, planning for and responding to chemical emergencies entails involving additional extracommunity groups and establishing complex relationships which are typical neither of everyday operations nor of more general community disaster planning. Corporate headquarters, industry-wide response teams, and federal regulators are only a few of the groups likely to become involved in the response to a major chemical threat.

Vertical linkages are extremely advantageous in terms of resources they can mobilize in times of emergencies, and extracommunity ties can undoubtedly stimulate local planning efforts. However, from the standpoint of local organizations, instituting and maintaining these linkages for planning purposes can be costly in both time and effort. Extra resources and expertise are paid for at the cost of increased efforts in learning about and coordinating with so many outside groups. Moreover, keeping in mind the point made earlier about the tendency for organizations to wish to maintain autonomy and control, the prospect of losing it to some outside entity at the time of a serious chemical incident is not welcomed by many local organizations---who will, in fact, be the ones to bear the brunt of public indignation if an incident is mishandled. As a result, despite the existence of outside resources, there is a tendency for organizational personnel to hope rather than plan. That is, community emergency personnel assume outside help will be forthcoming from somewhere in that one chance in a thousand it will be needed, rather than expend the effort needed on a day-to-day basis to determine what forms of emergency assistance are available and where and how they can be obtained. Thus, the existence of complex vertical links is a mixed

blessing in regard to community-wide planning. When other factors favorable to planning exist,---when the need is seen and when groups have a history of cooperative disaster planning efforts, for example---verticality may encourage preparedness efforts. But it can also create tremendous ambiguity and produce a large demand for interorganizational coordination, which not all organizations welcome because it is costly. This, of course, assumes local disaster-related organizations know about the existence of outside agencies which could be called upon---and often they do not.

EFFECTS ON PREPAREDNESS

I have stated a minimal condition for organized preparedness efforts---agreement on the need for preparedness---only exists to a moderate degree in the communities we studied. I have suggested the prevailing social climate does not, on the whole, encourage community sectors to pool their resources and plan together. I have also indicated efforts to formulate community-wide preparedness efforts can be hampered by the existence of community conflict and by the increasingly complex preparedness and response arrangements which local community organizations must take into consideration in their planning. It should, thus, come as no surprise that disaster preparedness at the community level is not highly developed at the present time. In the final part of this discussion, I call attention to the consequences of existing social relationships and beliefs, particularly vertical linkages and task-specific organizational orientations for community preparedness.

Most formal planning for chemical emergencies takes place within those few organizations which contain the personnel resources and know-how for handling them---chemical companies and fire departments. These organizations possess a great deal of valuable knowledge and resources, but our research suggests these things remain at the organizational level, or, at best, within organizational sectors and are not readily accessible to the larger community disaster preparedness subsystem. For example, chemical industry mutual aid associations exist in several of the communities we studied. Some of these planning bodies are quite elaborate and rich in resources. However, they tend to plan on their own for chemical emergencies only, rather than coordinate with other community disaster-relevant organizations.

This high degree of specialization has several ramifications for overall community disaster preparedness and response. First, while various specialized organizations know a great deal about the particular tasks they focus on---neutralization of chemical agents, for example---there appears to be a lack of mutual understanding among these groups and other community emergency organizations about how other important tasks such as evacuation or overall coordination of a response will be handled and who will carry them out. In the initial phase of the DRC research, it was felt this lack of general consensus would make working together in major acute chemical disasters very difficult. This was the case when actual responses were studied. Second, due to the jurisdictionally complex and compartmentalized nature of chemical emergency

preparedness, gaps occur in planning. For example, communities with chemical facilities may contain organizations with the knowledge, expertise, and resources to handle emergencies at local chemical production facilities, while no organization considers transportation emergencies as within its jurisdiction. Or, in a different example, certain disaster-related tasks, such as emergency medical care for victims, may not be considered in chemical emergency plans. These kinds of gaps are unlikely to come to light during non-emergency times in communities where personnel in different community sectors do not communicate regularly. A disaster drill involving the simulation of a major chemical emergency would make such gaps evident; however, these are seldom conducted on a community-wide basis. As is the case with the development of formal plans, drills typically occur within organizations and sectors, not across sectors. Third, the entry of particular organizations or groups of organizations into the chemical disaster preparedness area seems to result in inactivity in other emergency-relevant organizations, again due to lack of salience of the problem of chemical threats and to other disincentives.

In conclusion, to encourage a more comprehensive approach to hazardous materials threats is not to say specialists in chemical emergency preparedness are not needed---on the contrary, they are essential to an effective response to a chemical emergency. However, it is also the case that preparedness involves sharing information and resources so that all potentially involved organizations cannot only anticipate the threat from the agent, but also anticipate one another's actions in disaster so as to avoid conflict, duplication of effort and gaps in the response.

Launching an effective preparedness program in the chemical hazards area should not require vast expenditures for resources in most communities. The problem is not a shortage of funds, expertise, or other resources. Rather, what is needed are more extensive efforts to increase awareness of the need for chemical disaster planning, promote the exchange of information among all disaster-relevant community groups, and integrate preparedness for chemical emergencies as much as possible with more general community disaster preparedness. Community risk assessments, community preparedness meetings, training sessions, and community-wide drills are all means to these ends. Beyond these kinds of activities are broader efforts that need to be made beyond the community level to reduce disincentives and increase incentives to engage in preparedness---that is to alter the social climate and establish social linkages in a positive direction---promoting preparedness.

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