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*Accidents and Salting in Monroe County*

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# Accidents and Salting in Monroe County

by
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Summary

A study of accident reports, weather reports and records of salt use in all Monroe County Towns showed that the curb on the use of salt in Monroe County in 1974-75 did not result in a measurable increase in the total number of winter related accidents in the County.

Each year in five consecutive years the rate of accidents rose sharply in November and December, the first two snowy months, but there was no parallel increase in injuries or deaths, indicating that the rise in accidents caused by snow and ice consisted mostly of property damage collisions.

Comparisons of different towns which used salt at different rates failed to show any correlation between the curb on salt and rise in accidents.

There was a clear correlation between the winter accident rate and the severity of winter weather, with the lowest winter rise in accident rates found in the mild winter of 1972-73 and the highest in the harsh winter of 1970-71.

## Question: Is It Safe To Put Less Salt On Roads?

In the winter of 1974-75 Monroe County towns spread an average of 36% less salt than in any of the five preceding winters. This was true in spite of considerable variation in the amount of salt spread per mile by the different towns (1). Since the fall of 1975, towns in Monroe County have adopted uniform guidelines for the use of deicing salt. These guidelines are expected to reduce by 10% the amount of salt spread to keep driving safe in winter. This year (1975-76) for the first time a public education campaign is teaching sensible driving on roads covered with snow and ice.

Salt is spread on roads to save lives and reduce accidents, but there have been no analyses of local data to demonstrate that the salt used in Monroe County reduced winter accidents to some predictable extent. Existing studies from other regions provided conflicting data about the relationship of salting and accidents (2).

This bulletin presents and analyses data for Monroe County in order to determine whether the sizable cutbacks in salting last winter (1974-75) had any measurable impact on the accident rate in Monroe County.

Sources and Kinds of Information

The number of tons of salt used yearly by each town on state, county and town roads as well as the total number of tons used by all Monroe County towns for the last five winters (1970-71 through 1974-75) were provided by the Monroe County Department of Public Works. These data did not include either the salt used by the City of Rochester or the salt spread by state crews on state highways in the county.

Weather data for 1970-75 were obtained from National Weather Service records (3). They included maximum, minimum and average daily temperatures, daily snow and ice precipitation and monthly and yearly snow precipitation totals. To convert this huge amount of data into a measure of the severity of winters a "snow day" was defined as a day on which more than a trace of snow fell and the temperature was 32°F or below at least part of the day. This means that all the days on which drivers could have found snow in the street were called "snow days", including a few days when weather cleared up and streets were dry.

Table 1 shows the distribution of snow days and the inches of snowfall for each month of the years 1970-75. Essentially all snowfall and snow days occurred in the months November through April; these are defined as "winter" months. The remaining months of May through October are referred to in this report as "summer" months. This divides the year into a snow-free half and a snowy half.

Accident data for each Monroe County town for the years 1969-75 were provided by the Monroe County Sheriff's Office, Department of Records. These included:

1. Total number of accidents
2. Number of fatal accidents (accidents in which at least 1 person was killed)
3. Fatalities (total number of people killed)
4. Number of non-fatal accidents (accidents in which at least one person was injured)
5. Injuries (total number of people injured)
6. Property damage accidents (in which no person was hurt).

Included in these data were all accidents reported by county, town and village police to the County Sheriff's record office. Where a town had no police force, County Police investigated and reported the accidents. Some property damage accidents are unreported, of course, lowering the total obtained. Also, approximately 10% of all Monroe County accidents (about 1,000 per year) are investigated by the state police; these include accidents on all types of roads in all parts of the county. The state police report only fatal accidents to the county. Thus accident frequencies reported here for the towns were probably low by about 10%.

Table 1. Monroe County Snowfall, Snowdays, 1970-75 as Measured at the Monroe County Airport

| | Number of Snowdays*/Month | | | | | | Total Snowfall/Month (inches) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 |
| Jan. | 20 | 21 | 14 | 12 | 11 | 15 | 37.9 | 34.1 | 18.1 | 8.9 | 14.4 | 10.8 |
| Feb. | 14 | 13 | 20 | 16 | 16 | 16 | 27.7 | 29.7 | 35.7 | 18.4 | 26.6 | 23.2 |
| Mar. | 9 | 16 | 14 | 5 | 11 | 10 | 4.9 | 29.7 | 19.0 | 4.4 | 22.3 | 10.9 |
| Apr. | 2 | 2 | 5 | 2 | 4 | 5 | 1.3 | 1.2 | 7.3 | 1.5 | 8.2 | 14.9 |
| May | 0 | 0 | 0 | 0 | 0 | 0 | T | 0 | 0 | 0 | 0 | 0 |
| June | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Aug. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sept. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oct. | 0 | 0 | 2 | 0 | 1 | 0 | 0.2 | 0 | 0.2 | 0 | 0.3 | 0 |
| Nov. | 3 | 9 | 9 | 5 | 6 | 2 | 3.6 | 11.2 | 16.9 | 4.2 | 4.6 | 1.8 |
| Dec. | 22 | 8 | 13 | 11 | 14 | | 44.2 | 13.8 | 22.7 | 23.4 | 26.5 | |
| Total | 70 | 69 | 77 | 51 | 63 | | 119.8 | 119.7 | 119.9 | 60.8 | 102.9 | |

* Snowday = day with more than a trace of snow and temperatures below or equal to 32°F at least part of the day.

Data on accidents in the City of Rochester are collected by a city agency and were not included in this report.

Occasionally for various reasons such as the absence of the officer in charge of reporting, the towns do not report fully the year's accidents to the county. Incomplete recording probably accounted for the surprisingly low accident totals in Brighton in 1972-73 and in Greece in 1974-75.

In all, more than 7,000 items on accidents in Monroe County towns during 1969-1975 were collected and reviewed for this bulletin. The procedure by which these were reduced to a manageable form is discussed below.

## Trends in Traffic Accidents and Injuries

Figure 1 shows traffic accidents for each month of the year in Monroe County towns for the years 1970-1975. The reported accident rate was fairly stable from month to month except for the month of December, when the number of reported accidents rose greatly each year (Fig. 1). On checking the way in which accidents were recorded, we found that accident rates increased in November to the point that the recording procedure fell behind. Many of the November accidents were only put on record in December, and the tolls for the two months could not be separated. This "spillover" did not happen in other months.

Comparing snowfall (Table 1) with accidents (Fig. 1), we found that accident rates changed from one winter month to the next with no correlation either with the amount of snowfall or with the number of snowy days. On the contrary, the two initial snowy months (November and December) always had more accidents than the next two (January and February), even if those two had more snow. Snow could be related to accidents only when summer and winter or light and heavy snow years were compared. Information on the amount of salting was available only for the winter as a whole.

In the following analysis the six "winter" months (November - April) were treated as a unit, with the preceeding August, September, October and the following May, June, July treated as a "corresponding summer" for comparing accident rates.

Fatal accidents comprised at most 0.6% of the accidents in the county for any month in any of the five years considered; thus the numbers were too low to consider their relation to salting. Accidents resulting in non-fatal injuries were far more common. Figure 1 shows the average number of such victims in Monroe County towns for each month of the year for 1970-75. Numbers of injuries rather than numbers of accidents which resulted in injuries were considered, since numbers of injuries reflected both the number of accidents and their severity. The number of injuries did not vary greatly month to month (Fig. 1); further, there was not significant winter increase in the number of injuries in the county. The November - December increase in total accidents was an increase in property damage accidents. The data on total number of accidents can be used to indicate the hazards of winter driving, and those are the data used below.

How Many More Accidents in Winter Than Summer?

Table 2 shows the total number of accidents for Monroe County towns in the "winter" months over the last six winter seasons, and for the "corresponding summer" months. We used the summer accident rate as an indicator of year-to-year changes in traffic conditions in the county, and (in Table 3) as an indicator of differences of traffic between towns. The increase in accidents during the winter months was then computed as percent of accidents in summer for any given year. This number provided a measure of the effect of winter weather, independent of other traffic conditions.

Did accidents increase in winter in proportion to the amount or frequency of snowfall on the roads? Did they change in proportion to the amount of salt used? Some answers could be found in Table 2, after we allowed for one other factor that influenced the rate of accidents. The winter of 1973-74 was the winter of gas shortages. With less traffic, fewer accidents would be expected. Traffic was actually reduced in two ways: fewer miles were travelled, and a 55 mph speed limit was imposed on highways. Only the first of the two was important for the data reported here, because most of the roads covered in this report already had speed limits below 55 mph. The accident frequency in 1973-74 was consequently not comparable to that in other years: we could not separate the effect of reduced winter traffic from the effect of weather (which was mild) and the use of salt (which was high).

In the three preceeding years, the winter increase in accidents was roughly related to snow. The winter of 1970-71 was most severe (more snow days and more snowfall), and had the highest percent increase; the winter of 1972-73 was the mildest, and had the lowest percent increase. The use of salt in that period was also proportional to snow on the roads: highest in 1970-71 and lowest in 1972-73. We call the reader's attention to the pitfalls of interpreting the relation among the numbers in the last four rows of Table 2. In the four years from 1969 through 1973, the increase in winter accidents was higher every time that more salt was used. This

was not a proof that salt caused the accidents! On the contrary, it was the other variable - snow - that controlled the accident rate as well as the use of salt, because salt was spread in proportion to snow. This proportion was more or less the same in the years from 1971 through 1974 in Monroe County, and was cut down significantly for the first time in the winter of 1974-75.

Figure 1. Number of Accidents and Number of Non-Fatal Injuries in Monroe County (outside the City of Rochester)

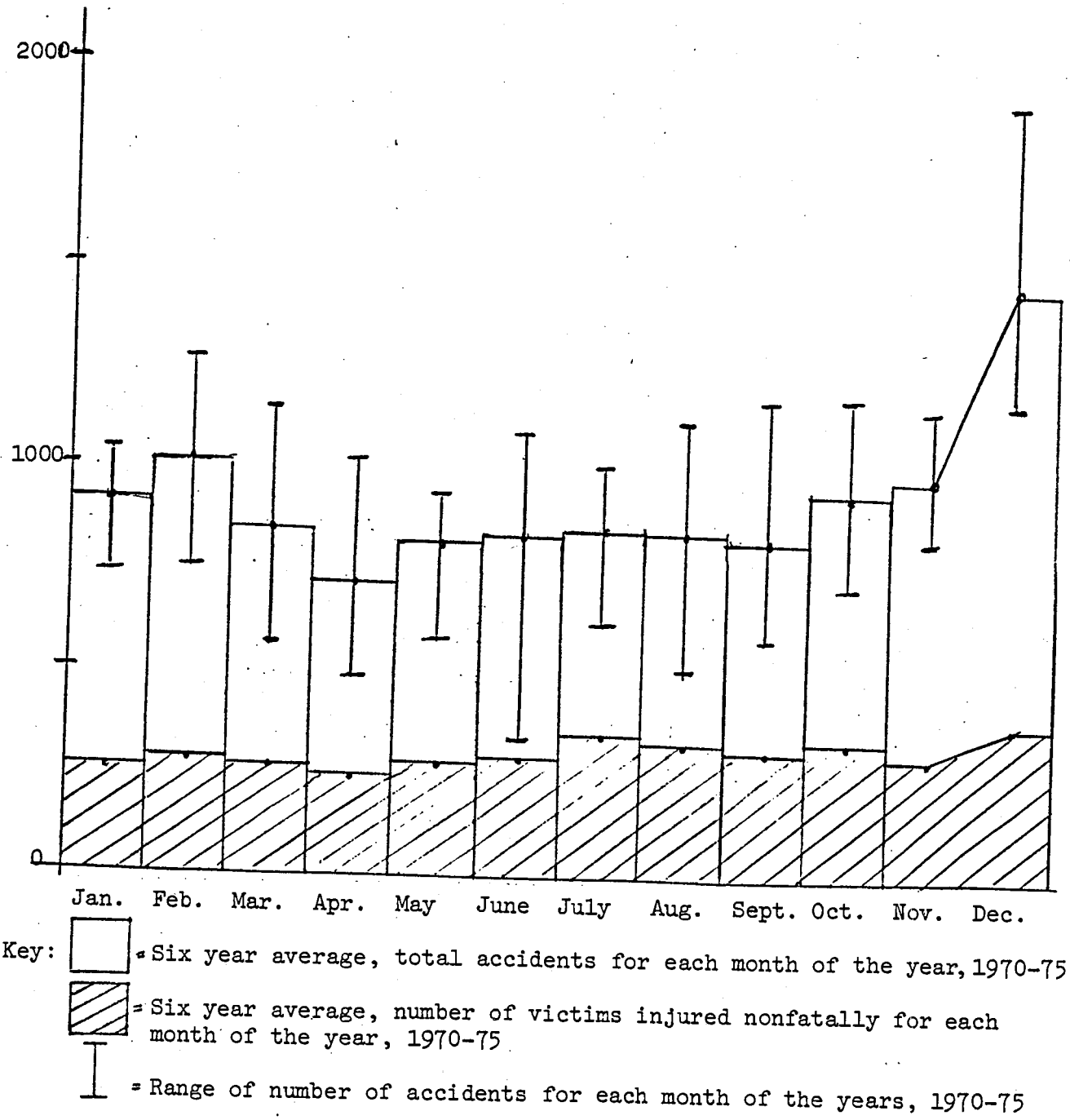

Table 2. Accidents and Snow in Monroe County Towns

| | 1969-70 | 1970-71 | 1971-72 | 1972-73 | 1973-74 | 1974-75 |
|---|---|---|---|---|---|---|
| Total Accidents, "Summer" months (Snow-free; Aug.-Oct & May-July) | 4383 | 3888 | 4720 | 5324 | 5890 | 5242 |
| Total Accidents, "Winter" Months (Snowy; Nov.-April) | 5399 | 5355 | 5753 | 5756 | 6380 | 6273 |
| % increase in accidents $\frac{w-s}{s}$ | 23% | 38% | 22% | 8% | 8% | 20% |
| Number of snow days | 70 | 77 | 70 | 57 | 58 | 66 |
| Total snowfall in inches | 119.6 | 142.5 | 105.1 | 72.8 | 99.1 | 90.9 |
| Total salt used (tons) | 166,350 | 166,754 | 136,336 | 122,516 | 124,760 | 78,026 |

Did the Curb on Salting Influence Winter Accidents?

In the winter of 1974-75 the towns in Monroe County spread 35% less salt per inch of snowfall than in the previous five years. The total use of salt was reduced by 46% from the average used yearly in the previous five years (Table 2). Yet, snow-related accidents showed no increase which could be related to the restriction on salt. With the gas-shortage years of 1973-74 excluded (as explained above), the winter of 1974-75 was second mildest in snow, and also second lowest in the winter-related accidents. The year 1974-75 was most closely comparable to 1971-72 in snowfall and in snow days. The winter rise in accidents was also comparable, and actually somewhat lower in 1974-75, even though the use of salt was curbed by 43% as compared to 1971-72 (Table 2). We have shown that other factors, such as a change in the severity of winter weather, or a gas shortage, could alter the winter accident increase by as much as 14%. Thus we concluded that the decrease in salt use in 1974-75 caused no major change in the accident rates reported that winter.

In order to test this conclusion we compared accidents and salt use in selected Monroe County towns. The 1971-72 and 1974-75 winters were considered since they were most closely comparable in snow days and snowfall; the two intervening winters (1972-73 and 1973-74) were excluded, as they were influenced more by mild weather or gas shortage than the use of salt. Towns were excluded where summer accident data for the years in consideration were so far out of line with other years as to raise doubts about the validity of accident reports (Greece was omitted for this reason). Included were the remaining towns which had high numbers of accidents and represented a geographic cross-section of the county. Brighton and Henrietta have similar weather typical of the south side of the county. Irondequoit and Webster by contrast, have lake front weather with heavier snow, typical of the north side of the county.

The towns in Table 3 were ranked in order of their summer traffic accidents in 1971-72. The order proved to be highly variable from year to year. Brighton, for example, ranked fourth in accident-causing conditions in 1971-72, but moved to first place in 1974-75. The winter accident statistics for each year varied even more widely from town to town. Only the figures on salt use were more or less consistent in any one year, and the use of salt decreased substantially (by 1/4 to 1/2) in all six towns in 1974-75. If this decrease in salt use did not cause more accidents, then we would predict no correlation between the change in the use of salt and the changes in winter accident rates in each of the towns. In fact, no significant correlation can be found in Table 3. In 1974-75 winter related accidents increased in three of the towns and decreased in the other three. Overall, there was no net change (as shown in Table 2).

There are other ways to look in Table 3 for some relation between the reduction in salt use and the increase in winter accidents. Brighton (48% cutback) and Pittsford (51% cutback) are adjoining towns with similar weather. Yet winter accidents (as measured in percent increase) increased in Pittsford in 1974-75 to just about the same extent as they decreased in Brighton. In summary, the variability in traffic conditions unrelated to salt use was so large from town to town and from year to year, that no significant effect could be ascribed to the curtailed use of salt on the roads.

## Discussion

The information presented in this report confirmed what every Monroe County resident knew - that snow increased the hazards of driving. Heavy salting, however, is costly in terms of rust on cars and damage to the environment. In 1974 RCSI published evidence that some towns spread four times as much salt as others on similar roads in Monroe County (1). The Bulletin recommended that highway departments curb the use of salt as far as practicable and use additional methods to keep winter driving safe. Salt use went down for the first time in the winter of 1974-75. Later the County of Monroe appointed a task force on the salt problem, and the county now has uniform guidelines for the application of salt.

The control of road salt in Monroe County brought ecological benefits for water and soil (4). These gains have been made with no measurable increase in accidents. The RCSI would like to give credit to the road crews that worked longer hours plowing snow, and to the Monroe County drivers who adjusted so well to the snow-covered roads.

## Acknowledgements

I am indebted to Drs. George Berg and Robert Holmes for their assistance in evaluating the data for this report. Thanks go to Sheriff's Deputy Edward Boehm, Monroe County Sheriff's Office Record Bureau, for his patience and help in providing accident records and information on their collection.

Table 3. Accidents and Use of Salt for Two Comparable Winter Seasons in Six Monroe County Towns

| Town | Total accidents in summer (Aug-Oct;May-July) | % increase in accidents in winter | Salt used (tons) | Total accidents in summer (Aug-Oct;May-July) | % increase in accidents in winter | Salt used (tons) | %decrease in salt used |
|---|---|---|---|---|---|---|---|
| Henrietta | 531 | 32% | 10,115 | 609 | 13% | 6,776 | 33% |
| Gates | 492 | 25% | 9,047* | 558 | 27% | 4,200 | 54% |
| Irondequoit | 483 | 2% | 21,272 | 595 | 8% | 9,466 | 56% |
| Brighton | 473 | 31% | 11,875 | 673 | 18% | 6,206 | 48% |
| Pittsford | 338 | 2% | 11,830 | 390 | 12% | 5,741 | 51% |
| Webster | 292 | 9% | 7,668 | 299 | 5% | 5,930 | 23% |
| Totals for all Monroe County Towns | 4720 | 22% | 136,336 | 5242 | 20% | 78,026 | 43% |

* Assumes as much salt was used on Town roads that year as the following year.

References

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(3) Local Climatological Data, U. S. Department of Commerce, National Oceanic and Atmospheric Administration Environmental Data Service

(4) Burton, Richard, Monroe County Health Department. Unpublished data presented at Rochester Institute of Technology Symposium, "Management of Chemicals Released Into the Environment", October 13-14, 1975