Toxic Shock Syndrome: Incidence and Geographic Distribution from a Hospital Medical Records Reporting System

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Abstract: A large database of hospital records maintained by the Commission on Professional and Hospital Activities Professional Activity Study (CPHA-PAS) was used to estimate the temporal incidence and geographic distribution of toxic shock syndrome (TSS). The CPHA-PAS hospital-diagnosed incidence was 3.5 times the reported TSS incidence, with a gradual decrease over the time period 1981–83. Marked differences in the regional occurrence of cases may provide clues to the etiology of this complex disease. (*Am J Publ Health* 1988; 78:578–580.)

Introduction

Determining the actual incidence of reportable infectious diseases in the United States is difficult because of the virtually universal underreporting of diseases identified in passive surveillance systems.[1,2] For toxic shock syndrome (TSS), the intense media attention in 1980 combined with the large variation between states in surveillance efforts further complicates the problem. Davis[3] has documented the influence of publicity on the reporting of TSS in a passive surveillance area in Wisconsin. To reduce these effects, the study reported here uses the CPHA database of hospital records to estimate the incidence of toxic shock syndrome. This method takes advantage of the assignment of a specific ICD-9-CM toxic shock syndrome code (040.89) in February 1981 to classify hospitalized patients discharged with this diagnosis.[4]

Methods and Materials

Approximately 1,300 of the 5,800 total United States short-term community hospitals are included in the CPHA-PAS data file. These represent approximately 25 per cent of all US hospital discharges. The proportion of patient discharges covered varies from 8.2 per cent to 99.0 per cent in the 47 states in this study. New Jersey, Georgia, and Arkansas are excluded because less than 1 per cent of their discharges are sampled. Toxic shock syndrome cases were identified by searching the CPHA data for all patients who were admitted to the hospital between January 1, 1981 and September 30, 1983 and who had the TSS code as a primary or secondary discharge diagnosis. The age, sex, race, state where hospitalized, date of admission and discharge, and disposition were obtained for each patient. The TSS coded cases identified were considered incident cases and projected incidence rates standardized to the total population of each of the 47 states in the study were computed by dividing the number of cases in each state by the sampling fraction for that state, and the total state population (1980 US Census). We also calculated TSS incidence rates from reported cases identified as definite cases in quarterly surveys of the 50 State Health Departments.

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Results

A total of 1,465 TSS cases were identified. The overall incidence rate calculated from CPHA projected cases is 7.7 per million person years for the 1981–83 time period, compared with 2.2 cases per million person years for reported cases.* The reported rate is 32 per cent of the diagnosed rate in 1981, 26 per cent in 1982, and 24 per cent in 1983.

The secular trend for diagnosed and reported cases is shown in Figure 1. The slopes of the regression lines for both of these data sets are negative (95% CI = −4.95, −28.07 for diagnosed cases and −2.51, −10.43 for reported cases). The reported cases declined 52 per cent from the second quarter of 1981 through the third quarter of 1983 while the projected diagnosed cases declined only 33 per cent.

The geographic variation in TSS occurrence was examined by mapping incidence rates by state, for CPHA diagnosed and reported cases (Figures 2, 3). To test apparent regional differences, rates were calculated for the nine US census divisions (Table 1). There is a similar ranking of geographic areas in both reported and diagnosed TSS cases, with the two highest census regions and four lowest census regions being the same in both sets of data. A four- to five-fold difference in rates between the highest and lowest regions was found in both sets of data.

On an individual state basis, differences between the two maps are most notable in the central plains states, where a high incidence of diagnosed TSS in Oklahoma, Nebraska, Kansas, Colorado, and Missouri has not previously been recognized from routine reporting.

Discussion

The assumption is made in this study that patients with the TSS code are actual TSS cases, similar to the assumption made by Markowitz, *et al*,[5] in a study of 1981–82 cases. Therefore, data validating the sensitivity and predictive value

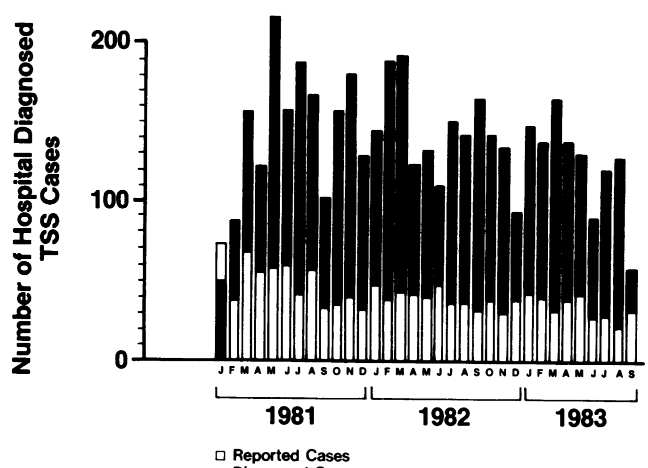
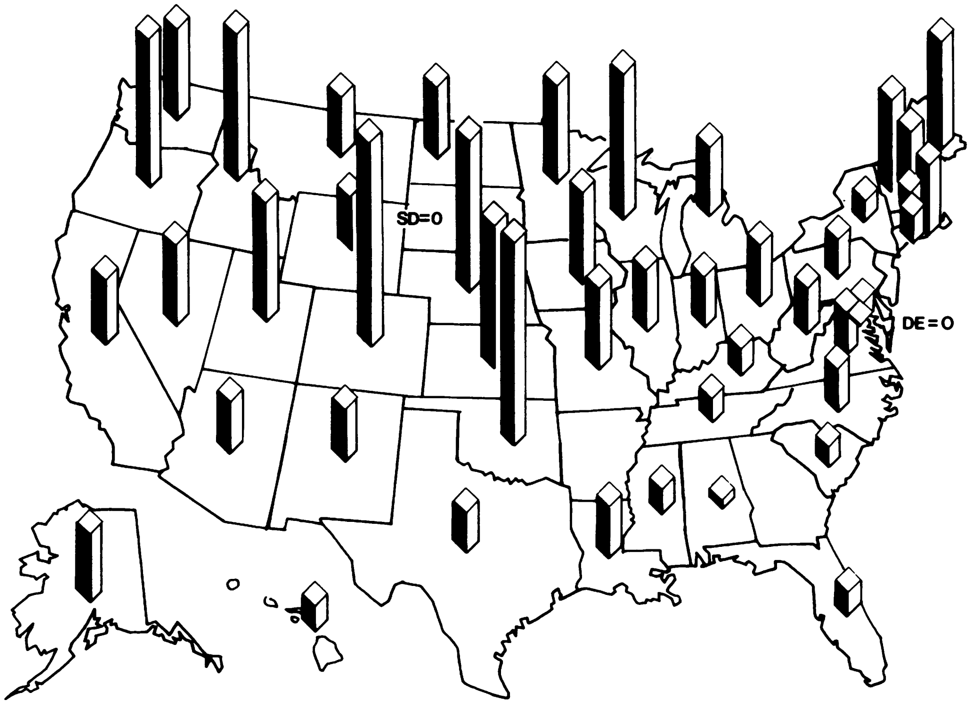


FIGURE 1—Projected Hospital Diagnosed and Reported Cases of Toxic Shock Syndrome by Date of Illness Onset

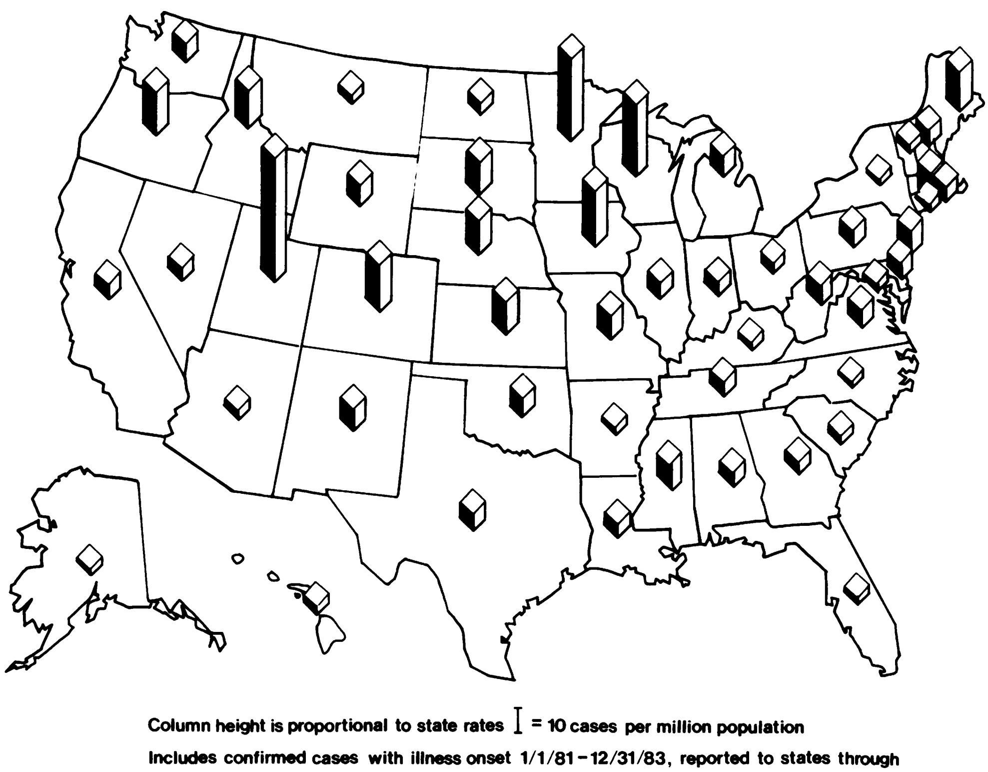
*Unpublished data compiled by Procter and Gamble from quarterly surveys of State Health Departments.



Column height is proportional to state rates I = 10 cases per million population

AR, GA and NJ have insufficient CPHA coverage to estimate rates

FIGURE 2—Cumulative 1981–83 TSS Incidence Based on Hospital Diagnosed Patients



Column height is proportional to state rates I = 10 cases per million population

Includes confirmed cases with illness onset 1/1/81–12/31/83, reported to states through January, 1984

FIGURE 3—Cumulative 1981–83 TSS Incidence Based on Reported Cases

TABLE 1—TSS Incidence Rates, 1981–83, by US Census Division

Region[b]	CPHA Projected Cases		Reported Cases[a]	
	Cases/10^6 population	95% CI	Cases/10^6 population	95% CI
Mountain	45.0	37.25, 52.79	14.4	12.22, 16.63
West North Central	40.7	33.53, 47.79	16.9	14.93, 18.82
Pacific	30.2	26.06, 34.38	5.8	4.92, 6.59
East North Central	28.0	25.23, 30.86	8.4	7.50, 9.25
West South Central	27.8	21.41, 34.16	5.2	4.27, 6.10
New England	21.7	15.36, 27.99	3.8	2.72, 4.89
South Atlantic	13.1	10.53, 15.75	2.9	2.34, 3.45
Mid-Atlantic	11.4	8.28, 14.58	3.0	2.46, 3.58
East South Central	9.5	5.29, 13.65	3.5	2.34, 3.45

[a]Includes definite cases reported as of June 1984.
[b]Mountain (MT, ID, WY, CO, NM, AZ, UT, NV)
West North Central (MN, IA, MO, ND, SD, NE, KS)
Pacific (WA, OR, CA, AK, HI)
East North Central (OH, IN, IL, MI, WI)
West South Central (AR, LA, OK, TX)
New England (ME, NH, VT, MA, RI, CT)
South Atlantic (DE, MD, DC, VA, NC, SC, GA, FL),
Mid-Atlantic (NY, NJ, PA),
East South Central (KY, TN, AL, MS)

of the code are important. Hayward, *et al*,[6] have examined this question in a statewide hospital survey, in Wisconsin, where the sensitivity (TSS cases with code/all TSS cases) was found to be 71 per cent and the predictive value (TSS cases with code/all patients with code) 65 per cent, during 1981–83. A parallel hospital survey in Ohio found similar results, with a sensitivity of 59 per cent and a predictive value of 70 per cent.** In Utah, which has had the highest reported TSS incidence and where the State Health Department has stated that their surveillance efforts identify essentially all of the hospitalized cases[7], the number of CPHA projected cases (65) is very close to the reported number (70). Because of these comparisons, we believe that the CPHA cases are a reasonable estimation of overall case occurrence, particularly for the types of descriptive regional differences being examined. The fact that the regional rankings are nearly equivalent in the CPHA and reported cases tends to support the validity of the hospital code derived cases, although the accuracy may be limited on an individual case basis.

The striking pattern of geographical variation found in this study raises important questions regarding the etiology of TSS. The regional variation in TSS occurrence previously noted with reported cases has been suggestive of differences due to surveillance activity, since states with known intense surveillance efforts (Minnesota, Wisconsin, Utah) had much higher reported incidence rates.[8] However, the similar regional pattern found with the CPHA hospital diagnosed cases indicates that the geographic differences are real. The reported risk factors (female, menstruation, tampon use and absorbency) vary only slightly from state to state and would not lead to this clear distribution pattern, indicating that there are one or more as yet unidentified risk factors that are geographically distributed and which are associated with five-fold differences in risk.***

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***Unpublished survey by Procter and Gamble of a national sample of 1,827 women, ages 12–49, 1980.