MEDICAL WASTES AND THE BEACH WASHUPS OF 1988: ISSUES AND IMPACTS

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ABSTRACT

The beach washups of medical wastes in 1988 resulted in beach closings, even if the extent of public health hazard posed by these wastes is not known with certainty. The nature and extent of economic impacts of the closings to the Long Island and New Jersey areas are assessed, based on available information.

Investigations to determine the sources of medical waste and other floatable marine debris along the shores of New York City, Long Island, and other nearby coastlines find that the primary sources are the Fresh Kills landfill (including barges transporting waste to it), marine transfer stations, combined sewer overflows, raw sewage discharges, and storm water outlets. Other sources, such as illegal dumping, probably contribute a smaller portion of floatables. This has important implications for whether some types of laws and programs being proposed and adopted, such as a manifest tracking system, will adequately address the problem of beach washups.

OVERVIEW

On 23 May 1988, a garbage slick nearly a mile in length along the shore of Ocean County, New Jersey, marked the season's first major washup of marine debris. Needles, syringes, and empty prescription bottles with New York addresses were among the floatable marine debris washed ashore. Beaches were closed as a result of this and similar incidents, including closing of more than 24 km (15 mi) of Long Island beaches from 6 to 8 July.

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Throughout the summer of 1988, national attention focused on reports of beach washups of medical wastes at various locations in the United States, much of the attention being given to washups on the east coast.

The east coast washups actually were about 10% or less "medical-related" waste. The largest single medical-related floatable was the insulin-type disposable syringe (New York State Department of Environmental Conservation (NYSDEC) 1988). Misconceptions about the quantities and nature of medical wastes washed ashore apparently resulted in part from the misidentification of items and from inaccurate media reports.

The degree of risk posed by medical wastes is not known. Proper handling, treatment, and disposal of these wastes are believed to minimize human health and environmental risks. Yet incidents resulting from careless or illegal disposal do pose aesthetic problems, and certainly help create public apprehension over current medical waste management practices. Aesthetic degradation and possible adverse health effects from medical wastes on public beaches are impacts difficult to measure and assess directly. Economic impacts resulting from the washups may be a more direct measure of their importance.

First, it is useful to define medical wastes and look at the broader context within which they are generated, managed, and regulated. Medical wastes include all infectious waste, hazardous (including low-level radioactive) wastes, and any other wastes generated from all types of health care institutions, including hospitals, clinics, doctors' (including dental and veterinary) offices, and medical laboratories (Lee 1988). The main focus of concern has been on the portion of medical wastes that are defined as infectious or "red bag" wastes, and how they are classified (e.g., as a solid, hazardous, or "special" waste) and regulated. The Centers for Disease Control and the U.S. Environmental Protection Agency (EPA) both designate as infectious pathological waste blood and blood products, contaminated sharps, and microbiological wastes (U.S. Congress 1988). The main sources of these wastes receiving attention are hospitals and other large facilities, but other sources of infectious wastes, such as sewage overflows, can also be significant contributors of environmental contamination.

The EPA reports that approximately 3.2 million tons of medical wastes from hospitals are generated each year, or about 2% of the total municipal solid waste stream. Currently, most generators of medical waste designate between 10 and 15% of it as infectious. The NYSDEC estimates that approximately 315 tons of medical wastes a day are generated by New York City's (NYC) 75 hospitals; and of this about 63 tons is infectious waste (NYSDEC 1988). Most of the medical waste washed ashore in the Greater NYC, Long Island, New Jersey, and even Rhode Island coastal areas is presumed to have emanated from the Greater NYC area. The actual amount of waste which washes ashore is not known with certainty, but is regarded as a large volume (NYSDEC 1988). At times, in some locations two pieces of medical debris per mile are found, while during a "garbage slick," garbage bags full of medical waste can be collected (NYSDEC 1988; Associated Press 1989).

Most infectious waste from hospitals is incinerated, while most noninfectious medical waste is landfilled. However, just as beach wash-up incidents raise public concern over current medical waste management practices, considerations of liability and worker safety lead some operators of municipal solid waste landfills and incinerators to refuse to take any medical wastes. As medical waste management becomes increasingly problematic for these types of reasons, an additional concern becomes the increased potential for illegal disposal.

The situation is further complicated by an uncertain and incongruous regulatory climate. Inconsistencies exist in the Federal guidelines for states regarding definitions and management options suggested for medical and infectious waste. Currently, no Federal regulations exist that comprehensively address the handling, transportation, treatment, and disposal of medical waste. This could change if the issue of medical wastes remains part of the current reauthorization effort for the Resource Conservation and Recovery Act (RCRA) or if the demonstration program of the Medical Waste Tracking Act (MWTA 42 U.S.C. 6901 et seq.) is expanded and extended in the future. As will be discussed below, other, specific types of management and enforcement actions may best address the issue of medical waste in beach washups. The Office of Technology Assessment (OTA), as part of a larger assessment of municipal solid waste, issued a separate background paper on medical waste management in October 1988 (U.S. Congress 1988). Reference should be made to that paper for a more detailed overview of medical waste management issues.

POSSIBLE ECONOMIC IMPACTS

The beach washups of 1988 in the Long Island and New Jersey areas had potential economic impacts of both revenue losses and costs. Revenue losses to the travel and tourism industry can result from declines in beach use, recreational fishing, and use of charter and party boats (R. L. Associates and U.S. Travel Data Center 1988; Thomas Conoscenti & Associates 1988; Ofiara and Brown 1989). Other possible economic impacts include increased beach maintenance and surveillance costs.

The focus here, based on very limited available information and in light of important caveats, is on the possible revenue losses to travel and tourism. Available information is suggestive of the types of short-term economic impacts which may be associated with the beach washups of 1988. It should be emphasized, however, that the information is not conclusive; some of it is anecdotal, most of the estimates of revenue losses are based on limited data (at most, for 2 or 3 years), and longer-term trends were not taken into account.

Causal links between the changes in beach use and tourism patterns and the beach washups and closings have not been carefully established, but are assumed in the estimates cited. Further, the methods used to estimate the changes and their impacts are not highly rigorous. Valid comparisons between losses to both New Jersey and Long Island coastal communities cannot be made given the different techniques used to estimate revenue losses.

The Long Island Tourism and Convention Commission reported a decline of 18% (i.e., an estimated 4.6 million fewer persons) in beach attendance in 1988 compared to 1987, and attributes this to the beach closings (Thomas Conoscenti & Associates 1988; Fey 1989). The commission also noted a decrease in attendance at all resorts and beaches (whether closed or not) as a result of the beach closings. Not surprisingly, decreased spending accompanied the lower beach attendance (Table 1). The difference between the 1987 tourism base and the estimated actual 1988 tourism base was $921.2 million. The commission, however, calculated an estimated net loss of $1.4 billion due to the beach closings in 1988, comparing the actual estimated tourism base of 1988 with that of an estimate of the industry base if it had grown in 1988 at the historical rate of 5.6% (Thomas Conoscenti & Associates 1988). The commission also reported that the actual net effect was likely to be considerably less than $1.4 billion since it could be assumed that some of the tourists who did not visit the beaches probably participated in other activities on Long Island.

One part of the tourism and travel industry which may not be reflected in the calculations of the commission's survey (but is included in the marine recreational fishing category of the New Jersey estimates discussed below) is the charter and party boat businesses. A survey of NYC and Long Island charter and party boats owners found a 30 and 26% decline, respectively, in the number of passengers carried and trips conducted in 1988 compared to previous years (reportedly from 1985 through 1987) (DiLernia and Malchoff 1989). Floatables, including medical wastes, were considered by 60% of the party boat captains to be the most important issue affecting their business in 1988. Yet the respondents also agreed that a number of other factors threaten the profitability of the boat businesses, such as general marine pollution, a drop in fish stock abundance, and the high cost of operating vessels (DiLernia and Malchoff 1989).

One preliminary analysis of the impacts of the beach washups on all the beach towns in Monmouth, Ocean, Atlantic, and Cape May Counties, New Jersey, found that the overall range in beach attendance decrease from 1987 to 1988 was 7.9 to 34% (Ofiara and Brown 1989). (It should be noted that these investigators are completing their investigation and a more detailed version of their results will be available in April 1989.) Each of the four coastal counties experienced beach closings in 1987, but the beach attendance decrease between 1986 and 1987 ranged from 8.9 to 18.7%. The survey also indicated a 58% decline in beach attendance from 1985 to 1988 reported by seven New Jersey communities (Ofiara and Brown 1989).

According to the New Jersey Division of Travel and Tourism, an estimated 1.9 million fewer persons visited the New Jersey shore in 1988 than in 1987, a 22% drop in attendance (R. L. Associates and U.S. Travel Data Center 1988). In a 1988 survey of visitors, 22% considered themselves less likely to visit the New Jersey shore in 1989, with approximately the same number of respondents in this category as in 1987. Forty-four percent of this group of respondents identified pollution as their number one reason for not returning in 1989 (R. L. Associates and U.S. Travel Data Center 1988). (Pollution was in fact the single biggest reason given by those who indicated they would not be returning the following year to the New Jersey shore. This is a 10 percentage point increase over those who

Table 1.--Tourist and convention expenditures. Total Long Island, 1987 and 1988. (Source: Thomas Conoscenti & Associates, Inc. 1988.)

Visitors and their expenditures	1987	1988	Difference
Tourist and convention visitors (millions)	25.5	20.9	4.6
Expenditures (millions $)			
-Lodging[a] [b]	368.9	332.2	36.7
-Food[c]	1,147.5	1,003.2	144.3
-Transportation[d]	255.0	219.5	35.5
-Entertainment	561.1	505.3	55.8
-Other[e]	1,009.2	908.8	100.4
Total	3,341.7	2,969.0	372.7
Annual total impact (millions $)	7,685.9	6,828.7	857.2
Other direct summer activity (millions $)[f]	589.0	525.0	64.0
Total tourist/convention industry (millions $)	8,274.9	7,353.7	921.2

[a]Based on 14,000 rooms.
[b]Average lodging rate (1987 = $95/night; 1988 = $100/night).
[c]Average $45/day in 1987 and $48/day in 1988.
[d]Includes day trips.
[e]Other = e.g., retail sales.
[f]Visitors to homeowners in summer.

had indicated in a survey the year before that they would be less likely to visit the shore in 1988 due to pollution. Yet about the same percentage (50% in 1987 and 47% in 1988) indicated that they were as likely to visit the shore the following year.)

The division also reports that a 9% decline in total expenditures occurred in 1988 at the New Jersey shore, a loss of approximately $745.6 million. A more extensive analysis of revenue losses sustained by recreational fishing, beach use, and travel and tourism combined finds total estimated losses to range from $545.9 million to $2,022.85 million and, with all indirect effects included, to range from $820.7 million to $3,060.8 million (Ofiara and Brown 1989; Table 2).

It should be stressed again that these calculations are not comparable given the different methods used to derive them, and that the bases for them may be imprecise and have not been evaluated by the OTA. Yet, even with these qualifications, it appears that revenue losses have occurred. And it seems reasonable to assume that part of these losses was due to changes in beach use, recreational fishing and boating, and travel and tourism patterns which seem to have resulted primarily from the beach closings of 1988.

Table 2.--Aggregate estimated economic impacts to beach use, travel and tourism, and marine recreational fishing, New Jersey, 1988. All dollars are in 1987 dollars. (Source: Ofiara and Brown 1989.)

Category[a]	Trips (No.)	Economic benefits	Expenditures ($1,000,000)	Gross value
Beach use				
Minimum	5,763,200	117.61	223.07	340.68
Maximum	24,493,600	499.83	948.05	1,447.87
Multiplier impacts				
Minimum		117.61	423.61	541.22
Maximum		499.83	1,800.35	2,300.18
Travel and tourism				
No. of businesses affected				
Minimum				395
Maximum				1,699
No. of lost jobs				
Minimum				9,553
Maximum				14,114
Lost wages ($)				
Minimum				34.34
Maximum				147.79
Recreational fishing				
Minimum	1,332,600	88.28	82.60	170.88
Maximum	3,331,500	220.69	206.50	427.19
Multiplier impacts				
Minimum		88.28	156.86	245.14
Maximum		220.69	392.15	612.84
All activities				
Minimum		205.89	305.67	[b]545.90
Maximum		720.52	1,154.55	[b]2,022.85
Multiplier impacts				
Minimum		205.89	580.47	[b]820.70
Maximum		720.52	1,154.55	[b]3,060.80

[a]Minimum refers to the minimum of the range. Maximum refers to the maximum of the range. Multiplier impacts are derived from the product of expenditures times 1.899; the New Jersey State multiplier associated with net output (includes value added), plus economic benefits.

[b]The sum of benefits, expenditures, and lost wages.

Even more limited information exists on the actual or estimated dollar impacts of various economic costs than on revenue losses for travel and tourism. For example, New Jersey spends approximately $3 million annually on beach cleanups (New Jersey State 1987). A National Park Service official in Long Island indicates that the amount of money allocated for cleaning beaches and water quality testing has tripled, however, given the need for increased monitoring and surveillance since the beach wash-up problem arose in 1988 (J. Tanacredi, National Park Service, pers. commun. 14 February 1989). Figures are not readily available on these exact costs or how prevalent such increases are.

The actual washups may not have contained much medical waste, but the perception created by media reports that these wastes were appearing with frequency on beaches might have been a deterrent to beachgoers (R. L. Associates and U.S. Travel Data Center 1988; DiLernia and Malchoff 1989). It is not clear, even with a summer of fewer washups and the attendant lack of publicity, how quickly these economies will recover. Ofiara and Brown's (1989) review of previous studies indicates that there can be economic impacts (in some cases depressing fish prices for several years) from health advisories and subsequent media reporting of them.

BEACH WASHUPS: LOCATIONS AND SOURCES

In general, beaches closest to the sources of floatable marine debris (including medical waste floatable debris) are most likely to experience floatable strandings (New Jersey State 1987; NYSDEC 1988; Swanson 1988; Swanson and Zimmer 1989). Examination of potential sources and consideration of weather factors (i.e., winds and surface currents) seem to confirm this general relationship (NYSDEC 1988; Swanson 1988; Swanson and Zimmer 1989). There are a number of likely sources of the medical wastes and other materials in the beach washups along the NYC, Long Island, New Jersey, and other nearby shores. Table 3 lists the locations and dates of beach closings in the summer of 1988.

The weather appears to be an important factor in explaining the number of large beach washups in 1988. In 1988, as in 1976 (the last time long stretches of Long Island and other Greater NYC beaches closed due to pollution), a weather pattern of winds predominantly from one direction prevailed before the major washups (Swanson 1988; Spaulding et al. 1989; Swanson and Zimmer 1989). The most significant source of floatables is the Hudson/Raritan Estuary, and wind is the primary source of movement of floatables once they reach the bight. The prevailing south-southwesterly winds of early summer 1988 made Long Island beaches particularly susceptible to beach washups (Swanson 1988). A hindcast study for Long Island confirmed this relationship (NYSDEC 1988). The State of Rhode Island concluded that the New York Bight was also the probable source of the medical waste debris on its shores in 1988 (NYSDEC 1988; Spaulding et al. 1989).

Investigation showed that the primary sources of medical waste and other floatable marine debris along the shores of NYC, Long Island, and other nearby coastlines are the Fresh Kills landfill (including barges transporting waste to it), marine transfer stations, combined sewer

Table 3.--Summary of beach closings, 1988. (Source: New York State Department of Environmental Conservation 1988.)

County	Beach	Dates
	Long Island	
Nassau	Nassau	7/6-7
	Long	7/6 (7/29 high bacteria)
	Jones	7/6, 7/8
	Lido	7/6
	Oyster Bay Town	7/7-8
	Gilgo	7/8
Suffolk	Robert Moses State Park	7/6-8
	Fire Island	7/7-8
	Babylon Town	7/8-10
	Smith Point State Park	7/10
	Quogue	7/23-27 (high bacteria)
	Shirley	7/29 (high bacteria)
	New York City	
Queens	Rockaway	7/8, 7/26-28
	Jacob Riis Park	7/17-20
	Atlantic	7/17 (7/29 high bacteria)
Kings	Coney Island	7/12-13 (7/17 high bacteria)
	Brighton	7/12-13
	Manhattan	7/12-13
Richmond (Staten Island)	South	7/11 to close of season (9/3)
	Midland	7/10-8/18
	Great Kills	7/13-28 (8/9 high bacteria)
	Miller Field	7/13-25 (8/9 high bacteria)

overflows, raw sewage discharges, and storm-water outlets. Other sources such as illegal dumping probably contribute a smaller portion of floatables.

The NYSDEC's investigation into the sources of beach washups in 1988 concluded that medical-related wastes are sent to the Fresh Kills landfill, where some debris escapes into the water from a "hospital waste mooring" (NYSDEC 1988). Eight of nine municipal marine transfer stations (MTS's) and one private MTS currently operate in NYC. The NYC Department of Sanitation is responsible for off-loading wastes from trucks to barges for transfer to the landfills. Apparently, current loading practices cause spillage at the MTS's and there is not an effective system to remove such spillage (NYSDEC 1988).

The NYSDEC also reported that sewage treatment failures occurred prior to the beach washups in 1988, followed by rainstorms which flushed out floatable material collected in storm drains during a relatively dry period (NYSDEC 1988).

Although debris from the Fresh Kills landfill, sewage discharges (including combined sewage overflows), and MTS's are the most significant sources of floatables in the Greater NYC area, NYSDEC noted that "it is clear that medical-related waste has been disposed of illegally into the garbage and into the sewers [and that] these two sources contributed to the beach debris" (NYSDEC 1988). To date, illegal disposal of medical wastes appears to be a more significant problem on land than in the waterways, but it is possible that some illegal disposal directly into the water also occurs (NYSDEC 1988).

This information on the sources of medical waste in washups has important implications for whether some types of laws and programs being proposed and adopted to address the beach wash-up problem, such as a manifest tracking system, will be adequate. Another legitimate concern is that as regulation of medical wastes increases, disincentives for illegal disposal also need to be pursued, e.g., a manifest system or vigorous enforcement.

GOVERNMENTAL RESPONSES AND RELEVANT POLICY ISSUES

Whatever their actual aesthetic, social, and economic impacts may be, a critical issue is what governmental efforts if any will be effective in addressing the problem of beach washups of medical wastes. As noted above, currently no comprehensive Federal requirements exist for the management of medical wastes (U.S. Congress 1988). The MWTA of 1988 passed by Congress was in part an attempt to address the problems of beach washups of medical wastes and illegal disposal of medical wastes.

It is not clear, however, in light of the sources which appeared primarily responsible for the beach washups of 1988, that the "cradle-to-grave" type of manifest tracking system established by MWTA will have a significant impact on the washups of medical wastes. Other actions, such as improved waste management handling at marine transfer stations and at landfills in marine areas may more directly address the problem. Increased enforcement efforts appear prudent in any case, given the need to ensure that incentives for illegal disposal do not increase if the handling, transportation, treatment, and disposal of medical waste are increasingly regulated.

The MWTA establishes a demonstration tracking system (MWTA, Sections 11001-11003) and directs the EPA and another Federal agency to undertake studies of certain medical waste management issues (Sections 11008 and 11009). The intent is to develop a basis for determining whether and in what ways the Federal Government should regulate medical wastes. The MWTA specifically applies to Connecticut, New Jersey, New York, and the Great Lakes States (Section 11001). Any of the Great Lakes States may opt out of the demonstration program and any state can opt in; Connecticut, New Jersey, and New York can petition out if they have a program at least as

stringent as that of the Federal Government. Civil penalties of up to $25,000 per day for each violation, criminal penalties of up to $50,000 per day per violation, and in addition, jail terms of up to 5 years may be imposed in states implementing the tracking system (Section 11005).

On 24 March 1989, EPA established the 2-year pilot Federal tracking program authorized by MWTA by publishing its "Standards for the Tracking and Management of Medical Waste; Interim Final Rule and Request for Comments" in the Federal Register (p. 12326-12395; 40 CFR Parts 22 and 259). Yet, as EPA points out in its press release of 13 March 1989:

> "Many of the suspected sources of last summer's beach wash-up problems will not be affected by the new tracking system. Preliminary analyses of last summer's beach washups and additional EPA studies underway indicate that likely sources of the washups included improper handling of ordinary trash and sewer overflows which contain wastes from home health care and illegal drug use. To the extent that all of these sources contribute to environmental degradation, the problems will persist despite the new regulations (EPA 1989a)."

The manifest will not track medical-related wastes emanating from a number of the primary sources identified by the NYSDEC investigation. Interestingly, the cost of compliance with the requirements of the MWTA, including the manifest system, is estimated by the EPA to increase the cost of medical wastes disposal by approximately $0.08/lb on average (EPA 1989b). According to EPA (1989b), average annual compliance costs per facility range from about $3,750 for hospitals to about $70 for dentists. These figures and the per pound figure are considered to be low estimates by some waste industry officials.

In any case, New York State and New Jersey cooperatively adopted a tracking system in August 1988. It is not clear, however, whether either state will petition to opt out of the Federal program. A number of other governmental actions, including an interagency Floatables Action Plan for the New York Bight and action programs by individual states (e.g., New York State), have been initiated to address the problem of floatable medical wastes and other floatable debris in the Greater New York Harbor area (Molinari 1989; Weisbrod 1989).

The New York Bight Floatables Action Plan, a multiagency effort led by EPA Region II, is part of the New York Bight Restoration Plan. It includes such actions as studies of floatables in 1987 and 1988 and continued surveillance, regular cleanups at "key locations," other cleanup as necessary, and a communication network (Molinari 1989). In addition to expanding its public information program, NYSDEC's response to control beach washups of floatables includes combined sewer overflow abatement, improved operation and maintenance at sewer treatment plants (STP's), stricter controls at MTS's for the handling of solid waste, more stringent regulation of medical waste, and enhanced enforcement of medical and all solid waste regulations (Weisbrod 1989).

The NYSDEC anticipates that when new state medical waste regulations become effective, a capacity shortfall for medical waste disposal may result (Markell 1989). Older facilities may close if they anticipate that it will be too expensive to meet new regulations and, given the difficulties of siting new waste facilities of any type, incentives for illegal dumping could indirectly be fostered. For this reason, the state increased the criminal and civil penalties for medical waste violations in 1988 and plans an aggressive enforcement program (Markell 1989). Brooklyn District Attorney Elizabeth Holtzman supports strong enforcement efforts in the NYC area and actively prosecutes violators of existing medical waste management laws (Holtzman 1987, 1988).

Congress amended the Ocean Dumping Act (formally known as the Marine Protection, Research, and Sanctuaries Act of 1972, 33 U.S.C. Sections 1401 et seq.) in 1988 to increase the penalties for illegal disposal of medical wastes by public vessels. Some medical waste discovered along the coast of North Carolina and a few other locations was traced to discharges from U.S. Navy vessels (Associated Press 1988). According to the new amendments, civil penalties of not more than $125,000 for each violation can be assessed by EPA for "engaging in activity involving the dumping of medical waste" as regulated by the law. Criminal penalties of not more than $250,000, or imprisonment of not more than 5 years, or both, and possible forfeitures of property can also be imposed.

CONCLUSION

The beach washups of the summer of 1988 had a range of impacts (aesthetic, social, and economic) which may not have been precisely calculated, but did generate governmental responses to the appearance of medical waste on our beaches. Medical waste along our coasts also drew attention to a broader range of issues associated with medical waste management. Some of the specific programs initiated by state and local governments to address the beach washups of floatables may be most effective in the near term. The importance of the Federal demonstration tracking program for medical wastes in abating medical waste floatables in beach washups is not clear. Its significance to the improved management of all medical waste will need to be evaluated in the light of future regulatory programs. Nonetheless, using experience gained in regulating the hazardous and solid waste streams, there is opportunity for government at all levels to proceed in devising programs to manage medical waste wisely and efficiently in order to alleviate public concern, protect human health, and provide environmental protection.

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