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**EFFECTIVENESS OF THE U. S.
PUBLIC HEALTH SERVICE
OCCUPATIONAL ILLNESS AND
INJURY CONTINGENCY MANAGEMENT
PROCESS (OPTICOMAP) IN NATIONAL
OCEANIC AND ATMOSPHERIC ADMINISTRATION
FLEET OPERATIONS**

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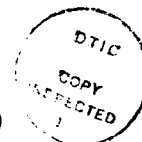
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OCCUPATIONAL ILLNESS AND INJURY CONTINGENCY MANAGEMENT PROCESS (OPTICOMAP)
IN NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION FLEET OPERATIONS**



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SUMMARY

Problem

Workers' compensation benefit payments to U.S. employees exceeded \$22.5 billion in 1985. With higher costs estimated for the future, the Navy, Public Health Service, and other governmental and private agencies have become increasingly aware of the need to implement procedures and programs that not only will reduce these costs but will alleviate the human suffering associated with occupational illness and injury. In the mid-1980s, the Public Health Service funded the development of an occupational illness and injury contingency management process (OPTICOMAP) that would encompass cost containment, care coordination, and case management. The Naval Health Research Center was funded to design and conduct an evaluation study of the efficacy of OPTICOMAP.

Objectives

The objectives were (a) to summarize the philosophy, development, and roles of the key participants in OPTICOMAP; (b) to describe the three levels of the evaluation program; (c) to identify the criteria used to assess the effectiveness of OPTICOMAP or a case management process; (d) to apply the methodological approach to 100 new cases of occupational injury and illness recorded during 1985-86 at two locations of the National Ocean Service, Office of Marine Operations; and (e) to analyze the efficacy of OPTICOMAP on the evaluation criteria during the 12 months of OPTICOMAP implementation (123 cases from 1987-88) as contrasted with the 100 cases from before OPTICOMAP.

Approach

Evaluation instruments were developed to assess occupational illness and injury cases on criteria and subcriteria of the three levels of evaluation (process, impact, and outcome). Mean ratings were computed on process and impact evaluation criteria, and mean monetary costs and time in days were compiled from case records for the outcome evaluation criteria. Comparative analyses on these variables were conducted: between the Atlantic Marine Center (AMC) and Pacific Marine Center (PMC) for 1987-88, between the pre- and post-OPTICOMAP time frames (1985-86 and 1987-88) in the PMC, and between the two time frames in the AMC. Univariate methods of analysis, either a t test or a chi square, were conducted on comparisons of means and proportions between locations and across years; a two-tailed test of significance was used.

Results

With OPTICOMAP implementation, significant improvements in effectiveness were noted for the process criteria of implementation of and adherence to OPTICOMAP and return-to-work plan initiation. The impact of OPTICOMAP was reflected by more effective ratings on criteria of timeliness and role fulfillment of the key participants. Forms were filed in a more timely fashion and cases were closed without excessive delays, paperwork, or key participant involvement. Significant reductions in lost time and labor costs were reported with OPTICOMAP implementation. Medical costs declined for back injuries and increased for injuries to the lower extremities; the percentage of cases treated by the onsite physician increased across time frames and between basins. All injured employees in the PMC returned to work.

Conclusions

Results of this study provide strong support for the implementation of OPTICOMAP and light duty return-to-work plans. With OPTICOMAP, efficiency is achieved in all aspects of the case management process. With provision of light duty, not only are the psychosocial needs of injured workers addressed, while promoting rehabilitation endeavors and human rights, but also such cost containment goals as reductions in lost time and labor costs. Substantial savings also accrue as a consequence of an increased use of the onsite occupational medicine physician. Although the checklists proved effective for increasing familiarity with OPTICOMAP, training programs should be developed for each of the key participants in the case management process.

Recommendations

Results of this study support the following recommendations: implementation of a case management process, such as OPTICOMAP; implementation of return-to-work plans, particularly a plan for light duty; promotion of adherence to FECA deadlines for claims forms filings; initiation and maintenance of contact with the injured worker during his or her convalescence; increased reliance on the attending physician for treatment of injured workers; and provision of training in effective case management for the attending physician, case manager, and line supervisor.

**Effectiveness of the U.S. Public Health Service
Occupational Illness and Injury Contingency Management Process (OPTICOMAP)
in National Oceanic and Atmospheric Administration Fleet Operations
Anne Hoiberg and Jack F. White**

Workers' compensation benefit payments to U.S. employees exceeded \$22.5 billion in 1985. This figure, an underestimate of total expenditures, only includes direct medical and disability payments and not such indirect costs as those associated with replacement training and lost productivity (Tramposh, 1989). In examining civilian injury compensation costs of the four branches of the armed forces, the totals almost doubled during the 1980s, from \$235 million in 1980 to \$405.9 million in 1988. Workers' compensation benefit payments in the U.S. Navy civilian community alone have been projected to reach almost \$200 million for medical care, compensation, and continuation of pay in 1989 (Van Stone, 1989). With higher costs estimated for the future, the Navy, Public Health Service, other governmental agencies, and private organizations have become increasingly aware of the need to implement procedures and programs that not only will reduce these costs but will alleviate the human suffering associated with occupational illness and injury.

During this decade, several solutions have been proposed, primarily those centering on the development and implementation of prevention and safety programs. Although numerous traditional and innovative programs have been initiated, the vast majority have not been totally successful in fulfilling their designated objectives--that of preventing the occurrence of injuries. For example, even with the initiation of training programs for appropriate back care and lifting procedures, back injuries are the most frequent cause of workers' compensation claims--and are among the most expensive (Fletcher, 1987). Thus, while striving for an injury-free industrial setting through safety training and initiatives, accidents continue to occur, which suggests a need to persevere with various programs and to evaluate their effectiveness.

To reduce health care expenditures, many large corporations, such as Honeywell ("Honeywell's Case," 1986)) and Chrysler ("Health Data Help Chrysler," 1986), have implemented cost containment and case management programs. At the end of three years of its cost containment program, Chrysler

reported a savings of more than \$100 million. Intracorp, the nation's largest medical care management service, reported saving companies from \$8 to \$13 for each dollar of expenditure for its case managers' services (Zeldis, 1987). Utilization review programs, as one specific example, have proven effective in lowering costs for hospital use and medical expenditures (Feldstein, Wickizer, & Wheeler, 1988). Another indirect savings in compensation costs would occur if examining physicians or specialist review boards were trained to be as unbiased as possible (Kurt, 1984; Bradford, 1987). Modifications to the work environment as well as improved relationships between the employee and employer also have been examined as steps to take in reducing losses from employees' injuries (Fletcher, 1987). While these savings did not accrue at first, case management was found to be less expensive than hospitalization in the long term ("Case Management Alternatives," 1987).

According to Eshelman (1986), effective case management includes the following: preadmission certification; reviews of all accidental causes of hospitalization both on and off the job; balanced and cost-controlled selection of alternatives during treatment and convalescence; monitoring of inpatient hospital stays to avoid unnecessary testing, surgery, and extension of the hospitalization; implementation of a discharge plan; the use of a qualified second opinion; an auditing of hospital bills; and utilization of data analyses. Future trends include an expansion of case management programs, preadmission certifications in areas other than inpatient care such as psychiatric treatment and substance abuse programs, and preferred providers and health maintenance organizations.

For injured employees, an effective case management process should be designed to respond to their care and needs, a process that provides appropriate and immediate occupational injury and illness medical care. Immediate intervention is essential, but equally important to the recovery process is the need for follow-through. Contact with an attending physician is necessary to determine what the injured worker can do as well as when and under what conditions. Probably of greatest importance is that of establishing an immediate return-to-work plan for the injured employee (Hoiberg, 1989a). Through this plan, workers are motivated to use their capabilities and skills either in their former job, a modified version of that job, or in a different

job for which they have been trained ("Return to work," 1987; Hoiberg, 1989b). For individuals with physical limitations, the employer should provide limited or light duty work. Increases in the numbers of light duty assignments have been shown to support the new rationale in rehabilitation endeavors which is that bed rest and inactivity produce deconditioning, whereas activity and prescribed exercise promote restoration of well-being (Delisa, Godar, & Mooney, 1988). Decreases in the utilization of medical services also have been reported for patients who received psychological intervention (Hoiberg, 1988a; Fagin, 1983). The crucial factor is that of care and concern—and providing the opportunity for the injured employee to return to work as soon as possible.

Also of particular concern has been the issue of engendering greater cooperation between industry and medicine in order to reduce the number of workers who have experienced what has been labeled as fragmented medical care and to address the needs of the employer, which rarely are considered. This fragmented care occurs as a result of the number of physicians who may be involved in an occupational injury case: physician at the work site, treating physician, referral physician, and examining physician (Bunn & Berte', 1988). Enhancing cooperation between industry and medicine would be expected to strengthen internal controls and to improve prevention programs, injury surveillance endeavors, job and work site analyses, job modifications, and worker placement efforts. A review by medical care providers of the compilation of data from the job and work site analyses would increase their understanding of the process of more effective worker placement, especially that of assigning injured workers to light duty jobs (Ratliff & Grogan, 1989). A greater awareness on the part of medical care providers of the cost containment requirements placed on industrial organizations also would promote cost savings through their initiation of return-to-work plans for injured employees as well as follow-up examinations. All of these endeavors to unite industry and medicine can be subsumed under the rubric of effective medical case management, which has as its purpose the provision to the injured worker of appropriate and timely medical care in order to resolve the occupational illness or injury in an efficient, cost-effective manner.

In the mid-1980s, the U.S. Public Health Service contracted with Watchcare Corporation (1987) in Seattle to design a comprehensive occupational illness and injury case management process that would encompass all aspects of cost containment, care coordination, and claims management. During the planning stages of this project, the initial goals included not only the development of the Occupational Illness and Injury Contingency Management Process (OPTICOMAP) but also its evaluation program. The Naval Health Research Center, San Diego, was tasked with designing and conducting a baseline and an evaluation study. The baseline study centered on assessing the case management procedures that were in place from October 1985 through September 1986 at two federal maritime locations. The evaluation program measured the efficacy of OPTICOMAP in achieving the aforementioned objectives as well as restoring injured employees to their full potential and successfully enacting return-to-work plans. In October 1987, OPTICOMAP was implemented at one of the two federal maritime locations, which signaled the beginning of the testing and evaluation phase. The other federal maritime operational setting served as the control group.

The following three phases of this study will be described: OPTICOMAP development, design of the evaluation program, and compilation of results of the 12-month evaluation project. To be specific, the objectives are (a) to summarize the philosophy, development, and roles of the key participants in OPTICOMAP; (b) to describe the three levels of the evaluation program; (c) to identify the criteria used to assess the effectiveness of OPTICOMAP or a case management process; (d) to apply the methodological approach to 100 new cases of occupational injury and illness recorded during 1985-86 at two locations of the National Ocean Service, Office of Marine Operations; and (e) to analyze the efficacy of OPTICOMAP on criteria subsumed under the three levels of evaluation during the 12 months of implementation (123 cases) as contrasted with evaluations of the 100 cases from the pre-evaluation period.

OCCUPATIONAL ILLNESS AND INJURY CONTINGENCY MANAGEMENT PROCESS

OPTICOMAP is based on the philosophy that a management process, first, should strengthen the personal aspects of managing an injured employee case ("Watchcare Corporation," 1987). Implicit in the service provision events of OPTICOMAP, for example, is the conviction that a human voice and face are

essential in effectively managing each injury case. The human voice and face typically are personified by the case manager or, in the case of OPTICOMAP, the care coordinator-case facilitator (CC-CF). As the key person in the successful operation of OPTICOMAP, the CC-CF combines all of the "claims" functions, such as facilitation of claims paperwork and provision of claims information to the injured employee, with such "care" functions as collection of information from the attending physician, coordination of the return-to-work activity, and a medical services quality control watch. In other words, the CC-CF's role goes beyond claims issues and extends into the realm of care issues.

Second, the other aspect of the underlying philosophy of OPTICOMAP is that an effort should be made to incorporate an increased understanding of the significance of psychosocial factors with respect to the healing process. OPTICOMAP emphasizes the importance of returning injured employees to the work place as soon as possible--and, in particular, before they manifest symptoms of delayed recovery syndrome. This disorder is denoted in cases in which an injury has occurred, and sufficient time has passed to enable a satisfactory recovery. The injured employee has not returned to work, although there is no apparent physical reason for the delayed recovery, thereby defining the term, delayed recovery syndrome.

This two-pronged approach (the strengthening of the personal aspects of case management and increasing the understanding of the psychosocial factors associated with the healing process) should produce a balance in the management process and in the healing partnership between the physician and the injured employee. Such a management process promotes close cooperation and a coordinated effort between the medical care process and the workplace, claims process, and injured employee.

In addition to the CC-CF, another key participant in the successful operation of OPTICOMAP is the attending case managing physician (ACMP). The role of the ACMP requires a commitment to the injured employee's overall recovery and to his or her expeditious return to work. The ACMP assumes responsibility for completing a physician's report which includes the projected return-to-work dates for light and regular duty. Another form to be

completed details the extent of the injured employee's work capacity, impairment, or duty status. The ACMP's attention also should be directed toward identifying and resolving delayed recovery issues, which specifically are addressed in several OPTICOMAP series.

The third key participant is that of the line supervisor whose role is to arrange for the immediate medical care of the injured employee and to notify the CC-CF of the injury. Other duties include the filing with the CC-CF of appropriate forms specified by the Department of Labor, Office of Workers' Compensation Programs (DOL OWCP), ensuring that ongoing care is provided if needed, and monitoring the return-to-work plan for both light or limited duty as well as regular or modified duty.

The roles of these key participants and those of the other three participants are outlined in the three service tracks of OPTICOMAP: operational, clinical, and environmental. The operational service track consists of the three principal service providers of the line supervisor, the CC-CF, and a medical consultant. The clinical service track includes the primary care provider and the ACMP. And the third service track, the environmental, is defined by the work of the responsible environmental manager--another term for a safety manager. The role of each of these six service providers is presented in 28 separate series, as listed in Table 1. Computerized versions of the series for each of the six providers also have been created. Each comprehensive series identifies the events to be performed to ensure an effective management of each case from date of injury to date of case closure.

OPTICOMAP EVALUATION PROGRAM

Evaluation Design and Criteria Creation

As stated at the outset, the first phase of this study was dedicated to the creation of OPTICOMAP, which involved the coordination of the 28 series of service provision events into a cohesive process. With its completion, the evaluation program was designed to center on three levels of evaluation: process, impact, and outcome (Green & Lewis, 1986). All relevant aspects of OPTICOMAP were subsumed under these three evaluation levels, as listed in Table 2.

TABLE 1

**Occupational Illness and Injury Contingency Management Process (OPTICOMAP):
A Process of 28 Series in Three Service Tracks**

Operational Service Track:

Line Supervisor (LS):

- Series L100. Initial Response (Day 1)
- Series L200. Ongoing Care (Days 2 - 14)
- Series L300. Ongoing Claims (Days 1 - 2)

Care Coordinator-Case Facilitator (CC-CF):

- Series C100. Initial Response (Days 1 - 2)
- Series C200. Initial Care (Days 2 - 3)
- Series C300. Early Return to Work (RTW)--"Wait and See" on Early RTW Prognosis Cases (Days 3 - 7)
- Series C400. Later RTW--7 or More Days after Date of Injury (Days 7 - 9)
- Series C500. "Conflict at Work" and "General Ability to Perform" (Days 7 - 10)
- Series C600. Continue RTW Support (Days 10 - 14)
- Series C700. Continue Support for Mitigation of Disability Effects/ Job Site Modification (Days 10 - 14)
- Series C800. Long-term Monitor Responsibility (Days 183 - 3,650)
- Series C900. Initial Traumatic Injury Claims (Days 3 - 4)
- Series C1000. Initial Occupational Illness Claims (Days 4 - 10)
- Series C1100. Ongoing Claims Series (Days 10 - 365)

Medical Consultant (MC):

- Series M100. Ongoing Care
- Series M200. Ongoing Claims

Clinical Service Track:

Primary Care Provider (PCP):

- Series P100. Initial Response (Days 1 - 2)

Attending Case Managing Physician (ACMP):

- Series A100. Initial Care (Days 3 - 7)
- Series A200. Ongoing Care--Medical (Days 8 - 14)
- Series A300. Ongoing Care--Psycho/"Wait and See" (Days 3 - 7)
- Series A400. Ongoing Care--Psycho/Initial Screen (Days 8 - 10)
- Series A500. Ongoing Care--Consider Psycho Support (Day 10)
- Series A600. Ongoing Care--RTW Plan (Days 10 - 14)
- Series A700. Ongoing Care--Job Mod. or Voc. Rehab. (Days 10 - 14)
- Series A800. Post Medical Closure Activity (Days 183 - 3,650)

Environmental Service Track:

Responsible Environmental Manager (REM):

- Series R100. Initial Response (Days 1 - 2)
- Series R200. Ongoing Care (Days 1 - 10)
- Series R300. Ongoing Claims

TABLE 2

Three Facets of an Evaluation Program

<u>Process Evaluation</u>	<u>Impact Evaluation</u>	<u>Outcome Evaluation</u>
<u>Implementation of and Adherence to Process:</u> initial response, initial care, ongoing care	<u>Timeliness:</u> follow-up of case; case management; Department of Labor, Office of Workers' Compensation Programs (DOL OWCP)	<u>Case Closure:</u> obstacles (e.g., hospital/clinic, physician, case manager, DOL OWCP, injured employee)
<u>Return-to-work Plan:</u> implementation of light and/or regular duty plan	<u>Return-to-work Plan:</u> light or limited duty, regular or new job duty	<u>Return-to-work Plan:</u> number of workers on the job
	<u>Role Fulfillment:</u> line supervisor	<u>Work Time Lost:</u> number of days (e.g., continuation of pay, sick or annual leave, compensation)
	<u>Role Fulfillment:</u> case manager	<u>Costs:</u> expenditures for medical care, reasonableness of medical care costs
	<u>Role Fulfillment:</u> attending physician	<u>Costs:</u> expenditures for disability/compensation
	<u>Role Fulfillment:</u> injured employee	<u>Costs:</u> days for form filing
	<u>Role Fulfillment:</u> DOL OWCP	<u>Costs:</u> adherence to process (e.g., letters, telephone calls, excessive involvement)
	<u>Role Fulfillment:</u> responsible environmental manager	
	<u>Role Fulfillment:</u> primary care provider	
	<u>Role Fulfillment:</u> medical consultant	

Process evaluation assessed the extent to which OPTICOMAP or a case management process and the return-to-work plan had been implemented and followed. Impact evaluation pertained to the impact that OPTICOMAP or a case management process had on enhancing timeliness, returning workers to the job, and improving each participant's role in case management. Outcome evaluation measured duration of time to effectuate case closure; number of case closures that were delayed; number of injured employees who were returned to work and days lost from work; number of injured employees manifesting delayed recovery syndrome; and costs charged to the organization for medical care, lost wages, and compensation and disability. Also assessed were costs of adhering to OPTICOMAP or a case management process, as measured by recording the numbers of letters and telephone calls logged for cases.

METHOD

Procedure

The two maritime operational settings included the work forces of wage marines of the National Ocean Service, Office of Marine Operations: one the Pacific Marine Center (PMC) serving the Pacific basin, and the other, the Atlantic Marine Center (AMC) in the Atlantic basin. Recorded during the time period from October 1985 through September 1986, the baseline or pre-OPTICOMAP cases of occupational illness and injury included 68 from the PMC and 32 from the AMC. The number of participants in the post-OPTICOMAP period were 93 from the PMC and 30 from the AMC. These 223 cases occurred either onboard one of 23 vessels, on liberty in a port of call, or at a shore facility while the ship was in port. Information extracted from these records provided the data on which to conduct a series of comparative analyses: (a) between the two federal maritime locations of PMC and AMC for 1987-88, (b) between the two time frames (1985-86 and 1987-88 or pre- and post-OPTICOMAP) for the PMC cases, and (c) between time frames for the AMC cases.

Instruments and Analyses

Evaluation instrument. An instrument was created to assess the criteria and subcriteria of the process and impact evaluation levels. A rating system was devised to evaluate the extent of OPTICOMAP implementation as well as fulfillment and timeliness of each criterion and subcriterion. The subcriteria were scored according to the Likert-style values of "1" for non-

effective to "5" for effective with "3" as neither effective nor noneffective. After rating each subcriterion, the values were weighted according to their contribution to the overall objective "worth" of the specific criterion. Means for each criterion, which also ranged from "1" to "5," were computed across the subcriteria scores.

The two criteria of process evaluation included implementation of and adherence to case management or OPTICOMAP and return-to-work plans, with three and two subcriteria identified for each criterion, respectively. Impact evaluation criteria consisted of OPTICOMAP timeliness (with the three subcriteria of case follow-up by the CC-CF and line supervisor, nine phases of the case management process, and responsiveness to CC-CF submissions by the Department of Labor, Office of Worker's Compensation Programs (DOL OWCP)); opportunities for light and regular or modified duty; and role fulfillment of the CC-CF, ACMP, and line supervisor. To measure the extent of role fulfillment of the line supervisor, for example, the case record was examined to determine whether or not the supervisor had arranged for medical care within 24 hours of the injury, which would yield an effective rating of "5"; if 48 hours had elapsed before treatment was provided, the rating dropped to "4," and so forth. Other ratings were recorded for the line supervisor's signing and forwarding of the appropriate injury/illness forms within a set time period as required by the DOL OWCP. Also evaluated was the extent of the line supervisor's participation in the injured employee's return-to-work plan. Similarly, the other two key participants were evaluated in accordance with fulfillment of their roles as specified in the OPTICOMAP service provision events. The 223 cases were evaluated by two individuals who independently examined data contained in the case record, followed by a third individual's review of the raters' evaluations. When the ratings differed, a compromise or mean rating was assigned. Mean scores on each criterion were computed, and comparisons on these values were conducted between pre- and post-OPTICOMAP phases and across time frames.

Costs in time and monetary expenditures instrument. For the outcome evaluation criteria, the numerical variables of monetary costs, time in days, and time involved in communications were computed and/or compiled on the costs instrument. These criteria included the amount of costs charged to the

facility for medical care, compensation and disability, and mean wages for lost work time; number of days lost from work and continuation of pay days; duration of time to effectuate case closure; number of days tabulated for filing of DOL OWCP forms; costs attributable to OPTICOMAP adherence in terms of numbers of letters mailed and telephone calls logged as well as excessive involvement of key participants (also determined by numbers of letters and telephone calls); number of case closures that were delayed by 30 or more days and the participant(s) or hospital/clinic causing the delay; number of injured employees who were returned to light duty; and number of injured employees manifesting symptoms of delayed recovery syndrome.

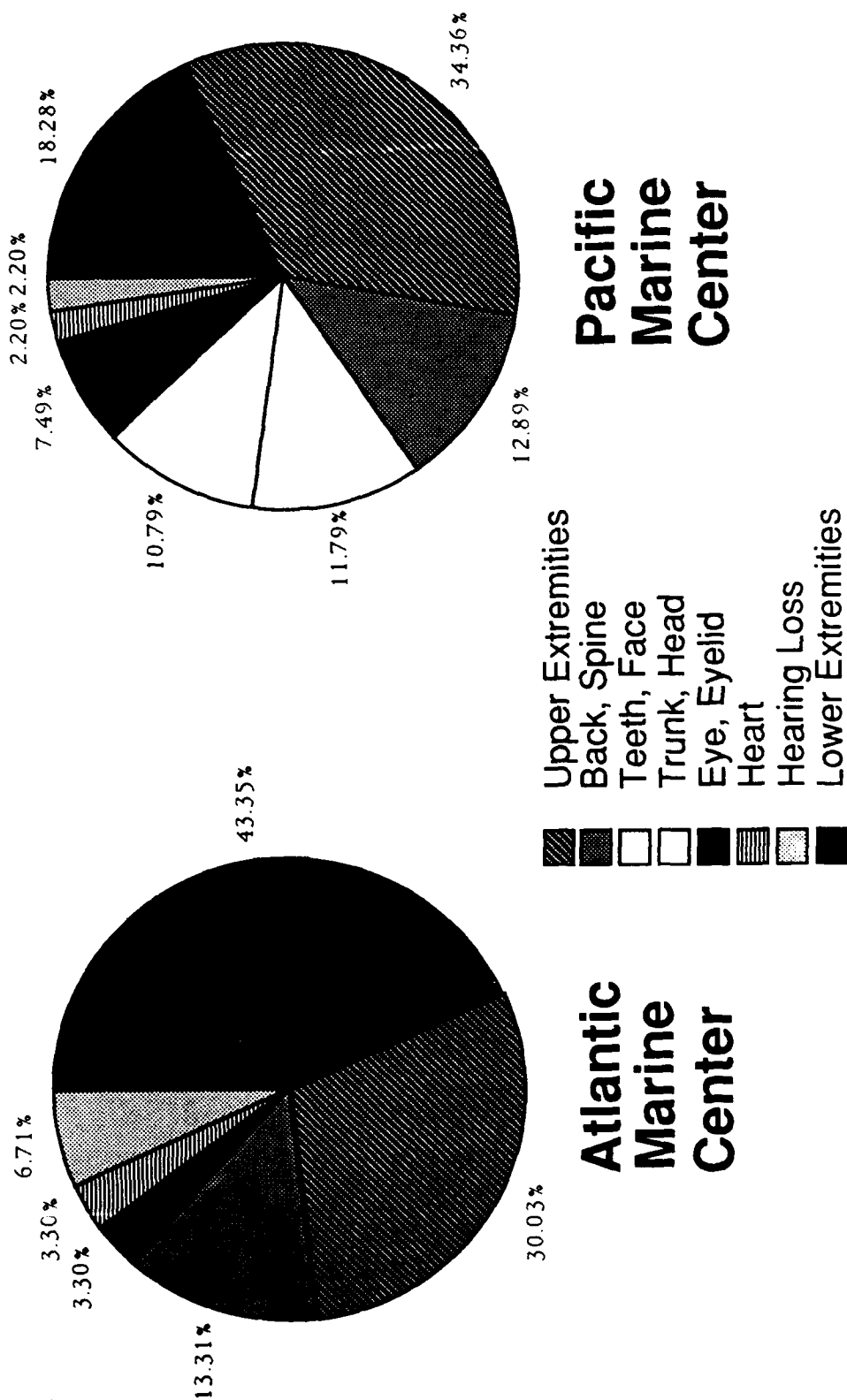
Analyses. Using records of occupational illness and injury cases collected from the AMC and PMC during two time periods, data were extracted and compiled on each criterion and subcriterion of the three evaluation levels. Comparative analyses were conducted between the PMC and AMC for 1987-88, pre- and post-OPTICOMAP implementation (1985-86 versus 1987-88) for the PMC cases, and 1985-86 and 1987-88 (no implementation) for the AMC cases. Results of comparisons of data from the AMC between 1985-86 and 1987-88 determined whether or not changes had occurred as a function either of time, policy initiatives, or experience, regardless of the formalized implementation of a case management process. Univariate methods of analysis were conducted on comparisons of means and proportions between locations and across years: a t-test value was computed to determine the level of statistical significance between means, and a chi square was calculated to test the level of significance between proportions. A two-tailed test of significance was used.

RESULTS

Occupational Illness and Injury

Figures 1 through 3 illustrate the percentage distributions of the body part categories involved in occupational illness and injury cases between basins for 1987-88 (Figure 1), across the two time frames in the PMC (Figure 2), and across time frames in the AMC (Figure 3). The major differences between basins were noted for the larger proportion of injuries to the lower extremities in the AMC and the larger proportions in the PMC of injuries to the teeth and face (primarily chipped teeth) and trunk and head (Figure 1). No difference in percentages of back injuries was observed between basins.

Figure 1. Percentage Distribution of Occupational Illness and Injury among Wage Marines by Basin, 1987-88



**Figure 2. Percentage Distribution of Occupational
Illness and Injury among Pacific Marine Center
Wage Marines by Year**

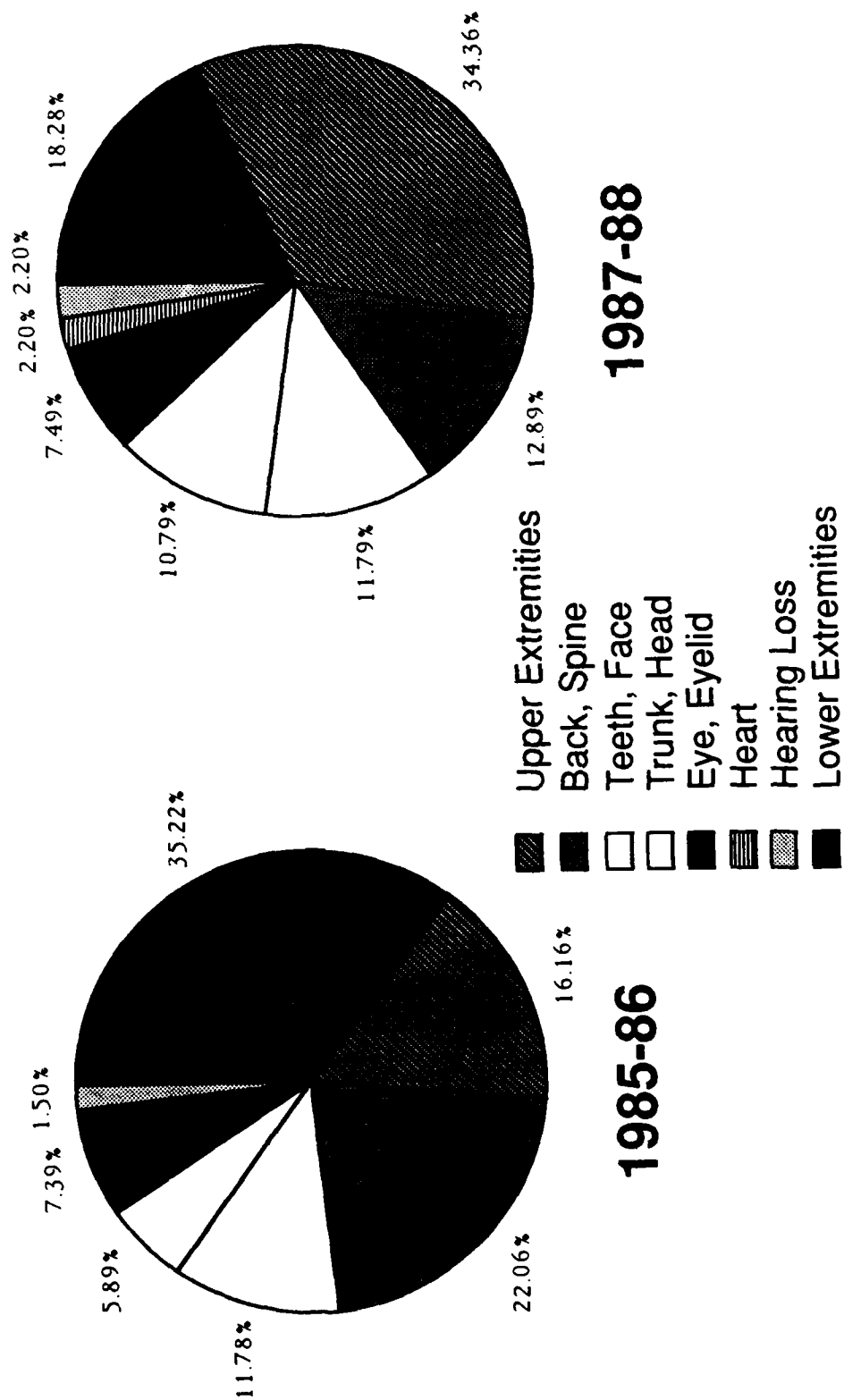
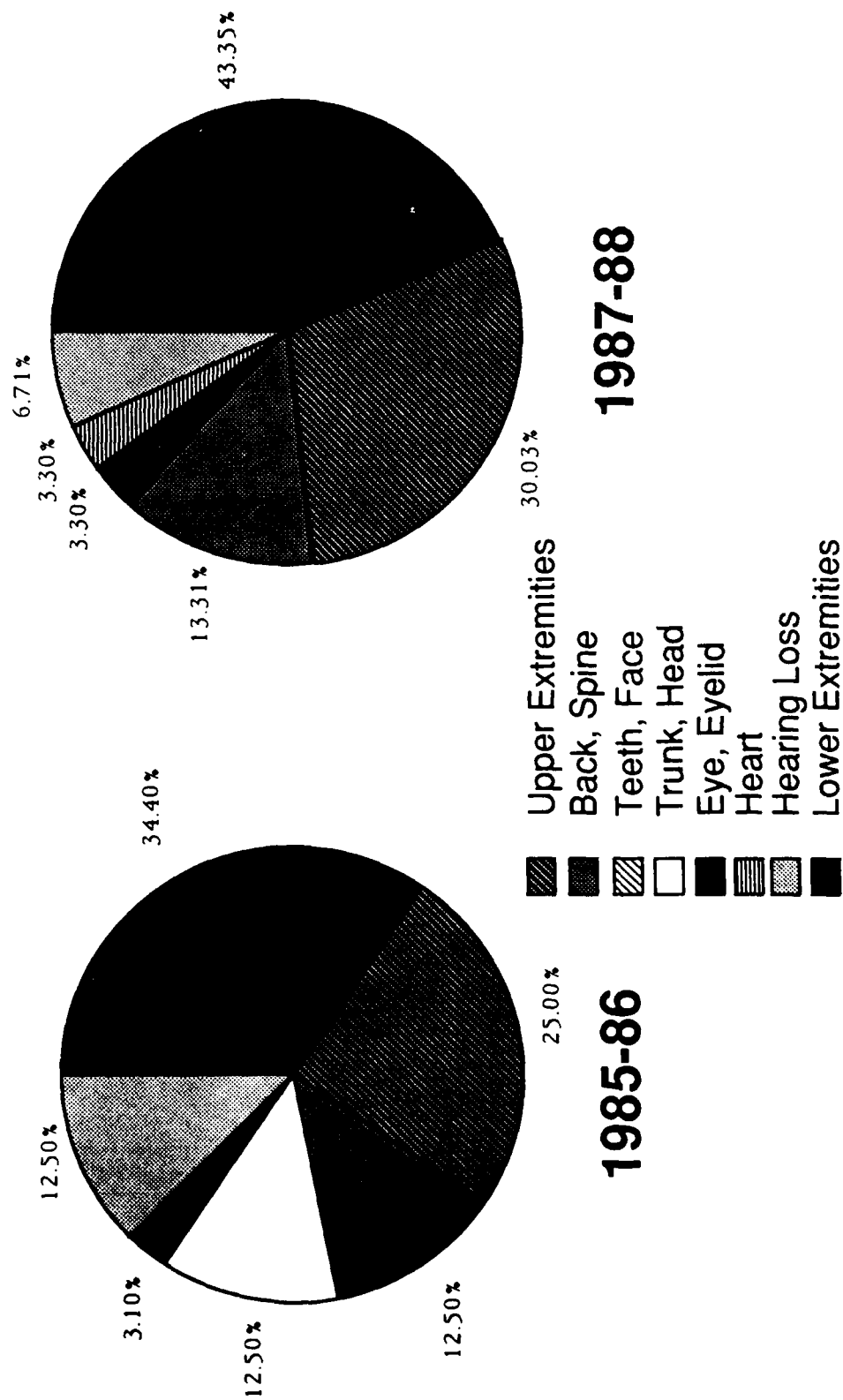


Figure 3. Percentage Distribution of Occupational Illness and Injury among Atlantic Marine Center Wage Marines by Year



The largest shifts in proportions across time frames occurred in the PMC which showed a reduction in the percentage of injuries to the back and lower extremities and an increase in injuries to the upper extremities, as can be seen in Figure 2. Other findings from the PMC 1987-88 data identified the relatively high percentages (10.8%) of injuries associated with environmental conditions (i.e., rough sea) and such recreational activities as basketball, baseball, and surfing (6.4%). In looking at the values in Figure 3, changes with time in the AMC included an increase in the proportion of injuries to the lower extremities and a decrease in injuries to the trunk and head.

Process Evaluation

Implementation of and adherence to case management and return-to-work plans. In Table 3 are presented the means, standard deviations, and t-test results for comparisons of process evaluation criteria and subcriteria between the PMC and AMC for 1987-88. Results indicated that overall adherence to a case management process (OPTICOMAP) in the PMC was evaluated as significantly more effective than in the AMC, especially for the subcriterion of provision of initial care within 24 hours of the injury. No significant differences between basins were observed for the other two adherence subcriteria. High mean values were recorded for the variable of ongoing care received, which reflected the high degree of concern in both basins for providing follow-up care. Implementation of an overall timely return-to-work plan as well as adherence to plans for return to light and regular work were rated as significantly more effective in PMC than AMC cases.

As shown in Table 4, significant improvements in process ratings were observed between pre- and post-OPTICOMAP implementation in the PMC for both criteria and almost all subcriteria. Most notable were the significant increases after OPTICOMAP implementation in effectiveness ratings for initial care, ongoing care, and opportunities for light duty; values for these variables approached the highest level of effectiveness. Initial contacts with the line supervisor and CC-CF, however, were rated at a somewhat noneffective level which reflected the difficulties inherent in these operational seagoing settings of ensuring immediate contacts with an injured employee.

TABLE 3
Means and Standard Deviations of Process Evaluation Variables
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, FY1988

Criterion/Subcriterion	<u>PMC</u>		<u>AMC</u>		t	p
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Implementation of and Adherence to Process (OPTICOMAP)	3.55	0.97	2.93	0.83	3.12	.002
Initial care within 24 hours	4.56	1.18	3.71	1.74	2.39	.022
Initial contact with supervisor/ case manager	2.50	0.86	2.60	0.68	-0.58	NS
Ongoing care received	4.68	0.94	4.43	1.23	1.13	NS
Return-to-work Plan	4.18	1.05	3.18	1.14	3.54	.001
Return to light work	4.36	1.06	3.00	1.83	2.19	.037
Return to regular work	4.41	1.02	3.50	1.06	3.37	.001

Note. The two fleet operation centers of the National Ocean Service, Office of Marine Operations, are abbreviated to PMC for Pacific Marine Center and AMC for Atlantic Marine Center.

TABLE 4

Means and Standard Deviations of Process Evaluation Variables
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, Pacific Marine Center

Criterion/Subcriterion	<u>1985-86</u>		<u>1987-88</u>		t	p
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Implementation of and Adherence to Process (OPTICOMAP)	3.07	1.12	3.55	0.97	2.86	.005
Initial care within 24 hours	4.08	1.66	4.56	1.18	1.93	.057
Initial contact with supervisor/ case manager	2.55	0.83	2.50	0.86	-0.34	NS
Ongoing care received	3.88	1.47	4.68	0.94	3.16	.003
Return-to-work Plan	3.58	1.53	4.18	1.05	2.09	.041
Return to light work	2.95	1.87	4.36	1.06	2.98	.006
Return to regular work	3.90	1.62	4.41	1.02	1.70	NS

Note. The time periods represent pre- and post-OPTICOMAP (case management process) implementation (1985-86 and 1987-88, respectively).

In contrast to the significant findings reported in Table 4, the values presented in Table 5 revealed no significant changes with time in the AMC for all variables except for a significant increase observed for initial contact with the injured employee. This increase, however, represented a change in means from somewhat noneffective to a mean that was less than the mid-point of neither effective nor noneffective.

Impact Evaluation

Timeliness and role fulfillment. The values compiled in Table 6 indicated that implementation of OPTICOMAP in the PMC had a significant impact on improving the overall timeliness of case management as well as enhancing the efficiency of case follow-up and meeting the specific steps of case management. Other impact evaluation variables included fulfilling the role specifications for each of the PMC key participants, all of whom were rated as being significantly more effective than their counterparts in the AMC.

The results presented in Table 7 pointed up that the ratings on all impact evaluation variables, except line supervisor role fulfillment, increased significantly from the pre- to post-OPTICOMAP time frame. Such findings indicated that OPTICOMAP had a significant impact on improving the timeliness of almost all aspects of care and claims management. With regard to role fulfillment, both the CC-CF and ACMP were evaluated as significantly more effective during the post- than pre-OPTICOMAP period.

As shown in Table 8, only two significant differences, one of which was considered marginally significant and the other pertained to the responsiveness of the DOL OWCP, were observed for the impact evaluation variables in comparisons across time periods in the AMC. Also noted in this table were the relatively low ratings for the line supervisor and ACMP roles.

The impact of OPTICOMAP on the return of injured employees to work also can be inferred from results of comparisons between basins and across pre- and post-OPTICOMAP time periods. By the end of the follow-up period, all 93 injured employees in the PMC had returned to work, which did not occur for the pre-OPTICOMAP period and in the AMC during 1987-88.

TABLE 5

Means and Standard Deviations of Process Evaluation Variables
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, Atlantic Marine Center

Criterion/Subcriterion	<u>1985-86</u>		<u>1987-88</u>		t	p
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Implementation of and Adherence to Process	2.66	1.10	2.93	0.83	1.12	NS
Initial care within 24 hours	4.07	1.68	3.71	1.74	-0.78	NS
Initial contact with supervisor/ case manager	2.00	1.03	2.60	0.68	2.69	.009
Ongoing care received	4.38	0.77	4.43	1.23	0.12	NS
Return-to-work Plan	2.71	1.86	3.18	1.14	0.93	NS
Return to light work	1.44	1.33	3.00	1.83	1.74	NS
Return to regular work	3.06	1.95	3.50	1.06	0.84	NS

TABLE 6

Means and Standard Deviations of Impact Evaluation Variables
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, FY1988

Criterion/Subcriterion	<u>PMC</u>		<u>AMC</u>		t	p
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Timeliness of Process	3.74	0.88	3.20	0.92	2.89	.005
Follow-up of case	3.94	1.21	3.07	1.28	3.33	.001
Case management	3.70	1.01	3.17	1.02	2.51	.014
DOL OWCP	3.81	1.12	3.37	1.01	1.80	NS
Role Fulfillment:						
Line supervisor	3.26	1.02	2.50	1.04	3.52	.001
Case manager	3.97	0.81	3.50	0.90	2.67	.009
Attending physician	3.75	1.23	2.63	1.24	4.03	.000

Note. The two fleet operation centers of the National Ocean Service, Office of Marine Operations, are abbreviated to PMC for Pacific Marine Center and AMC for Atlantic Marine Center.

TABLE 7
Means and Standard Deviations of Impact Evaluation Variables
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, Pacific Marine Center

Criterion/Subcriterion	<u>1985-86</u>		<u>1987-88</u>		t	p
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Timeliness of Process	3.28	1.09	3.74	0.88	2.97	.003
Follow-up of case	2.95	1.50	3.94	1.21	4.04	.000
Case management	3.18	1.29	3.70	1.01	2.77	.006
DOL OWCP	3.05	1.41	3.81	1.12	3.22	.002
Role Fulfillment:						
Line supervisor	3.13	1.21	3.26	1.02	0.71	NS
Case manager	3.63	1.04	3.97	0.81	2.22	.028
Attending physician	3.16	1.39	3.75	1.23	2.66	.009

Note. The time periods represent pre- and post-OPTICOMAP (case management process) implementation (1985-86 and 1987-88, respectively).

TABLE 8
Means and Standard Deviations of Impact Evaluation Variables
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, Atlantic Marine Center

Criterion/Subcriterion	<u>1985-86</u>		<u>1987-88</u>		t	p
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Timeliness of Process	2.81	1.03	3.20	0.92	1.56	NS
Follow-up of case	2.50	1.60	3.07	1.28	1.41	NS
Case management	2.59	1.29	3.17	1.02	1.93	.058
DOL OWCP	2.63	1.30	3.37	1.01	2.38	.021
Role Fulfillment:						
Line supervisor	2.84	1.17	2.50	1.04	-1.22	NS
Case manager	3.12	1.01	3.50	0.90	1.54	NS
Attending physician	2.10	0.94	2.63	1.24	1.85	NS

Outcome Evaluation

Costs: Case closures, light duty, and excessive involvement. The percentages presented in Table 9 indicated that the key participants who delayed the closing of a case by 30 or more days were more likely than others to be the line supervisor and the ACMP in the Atlantic basin. No difference between basins was obtained in percentages of cases delayed by the CC-CF. The DOL OWCP was determined to be less responsive in PMC than AMC cases. Other findings pointed up that significantly more injured employees in the PMC (29.0%) than AMC (10.0%) were returned to light duty work. The extent of excessive involvement by the CC-CF, DOL OWCP, and the line supervisor was significantly greater in the AMC than PMC.

The findings presented in Table 10 suggested that significant improvements in closing cases occurred after OPTICOMAP implementation, as can be inferred from the lower percentages of cases delayed by the CC-CF and ACMP. A significant increase in the number of injured workers who were returned to light duty work also was noted after OPTICOMAP implementation.

As shown in Table 11, few significant changes on these outcome variables were noted across time periods in the AMC. The line supervisor and the ACMP delayed cases by 30 or more days in 43.3% of the cases. The DOL OWCP was determined to be significantly more responsive in 1987-88 in that only 3.3% of the cases, as contrasted with 25.0% in 1985-86, were delayed by at least 30 days.

Costs: Time in days. When the percentages of days lost from work were plotted in Figure 4, two very distinctive differences in percentages between basins were obtained. First, 57.0% of the injured employees in the PMC, as contrasted with 23.3% in the AMC, did not lose any time from work because of an occupational injury or illness in 1987-88. Second, also noteworthy was the large difference between basins in the proportions of injured workers who lost seven or more days from work. A significantly higher proportion of AMC than PMC workers, 46.4% and 16.1%, respectively, remained off the job for more than seven days. All workers in the PMC returned to work whereas 6.7% in the AMC had not returned to work by the end of the follow-up period. When comparisons were conducted by body part category, as presented in Figure 5, injuries to

TABLE 9
Frequency and Percentage Distribution of Outcome Evaluation Variables
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, FY1988

Criterion/Subcriterion	<u>PMC</u>		<u>AMC</u>		χ^2	p
	No.	%	No.	%		
Delayed Case Closure:						
Line supervisor	93	11.8	30	43.3	12.76	.000
Case manager	93	5.4	30	13.3	1.88	NS
Attending physician	93	10.8	30	43.3	13.99	.000
DOL OWCP	93	15.1	30	3.3	3.65	.056
Hospital/clinic	93	10.8	30	13.3	0.15	NS
Injured employee	93	12.9	30	16.7	0.26	NS
Return to Light Duty:						
Injured employees	93	29.0	30	10.0	5.10	.024
Costs: Excessive Involvement:						
Attending physician	93	6.5	30	3.3	0.46	NS
All other participants	93	15.1	30	36.7	5.97	.015

Note. The two fleet operation centers of the National Ocean Service, Office of Marine Operations, are abbreviated to PMC for Pacific Marine Center and AMC for Atlantic Marine Center.

TABLE 10

Frequency and Percentage Distribution of Outcome Evaluation Variables
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, Pacific Marine Center

Criterion/Subcriterion	<u>1985-86</u>		<u>1987-88</u>		χ^2	p
	No.	%	No.	%		
Delayed Case Closure:						
Line supervisor	68	1	2	11.8	0.62	NS
Case manager	68	1	2	5.4	5.09	.024
Attending physician	68	2	4	10.8	8.97	.003
DOL OWCP	68	19	1	15.1	0.46	NS
Hospital/clinic	68	20	6	10.8	2.96	NS
Injured employee	68	13	2	12.9	0.00	NS
Return to Light Duty:						
Injured employees	68	13	2	29.0	5.91	.015
Costs: Excessive Involvement:						
Attending physician	68	14	7	6.5	2.95	NS
All other participants	68	23	5	15.1	1.84	NS

Note. The time periods represent pre- and post-OPTICOMAP (case management process) implementation (1985-86 and 1987-88, respectively).

TABLE 11,
Frequency and Percentage Distribution of Outcome Evaluation Variables
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, Atlantic Marine Center

Criterion/Subcriterion	<u>1985-86</u>		<u>1987-88</u>		χ^2	p
	No.	%	No.	%		
Delayed Case Closure:						
Line supervisor	32	28.1	30	43.3	1.57	NS
Case manager	32	28.1	30	13.3	2.09	NS
Attending physician	32	46.9	30	43.3	0.08	NS
DOL OWCP	32	28.1	30	3.3	7.99	.005
Hospital/clinic	32	25.0	30	13.3	1.37	NS
Injured employee	32	6.2	30	16.7	1.72	NS
Return to Light Duty:						
Injured employees	32	3.1	30	10.0	1.26	NS
Costs: Excessive Involvement:						
Attending physician	32	46.9	30	3.3	17.80	.000
All other participants	32	59.4	30	36.7	3.23	NS

Figure 4. Percentage Distribution of Work Days Lost among Occupationally Injured Wage Marines by Basin

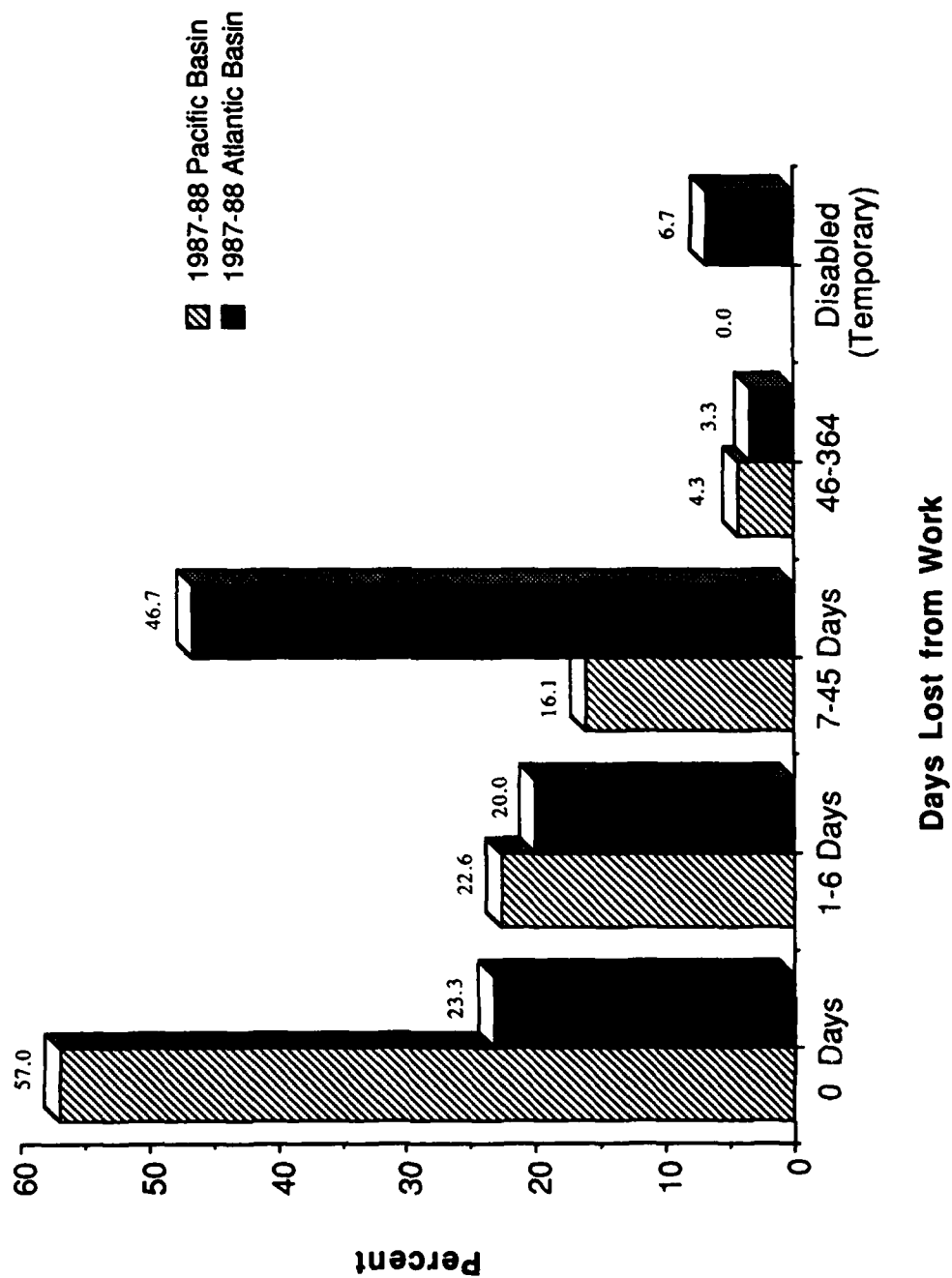
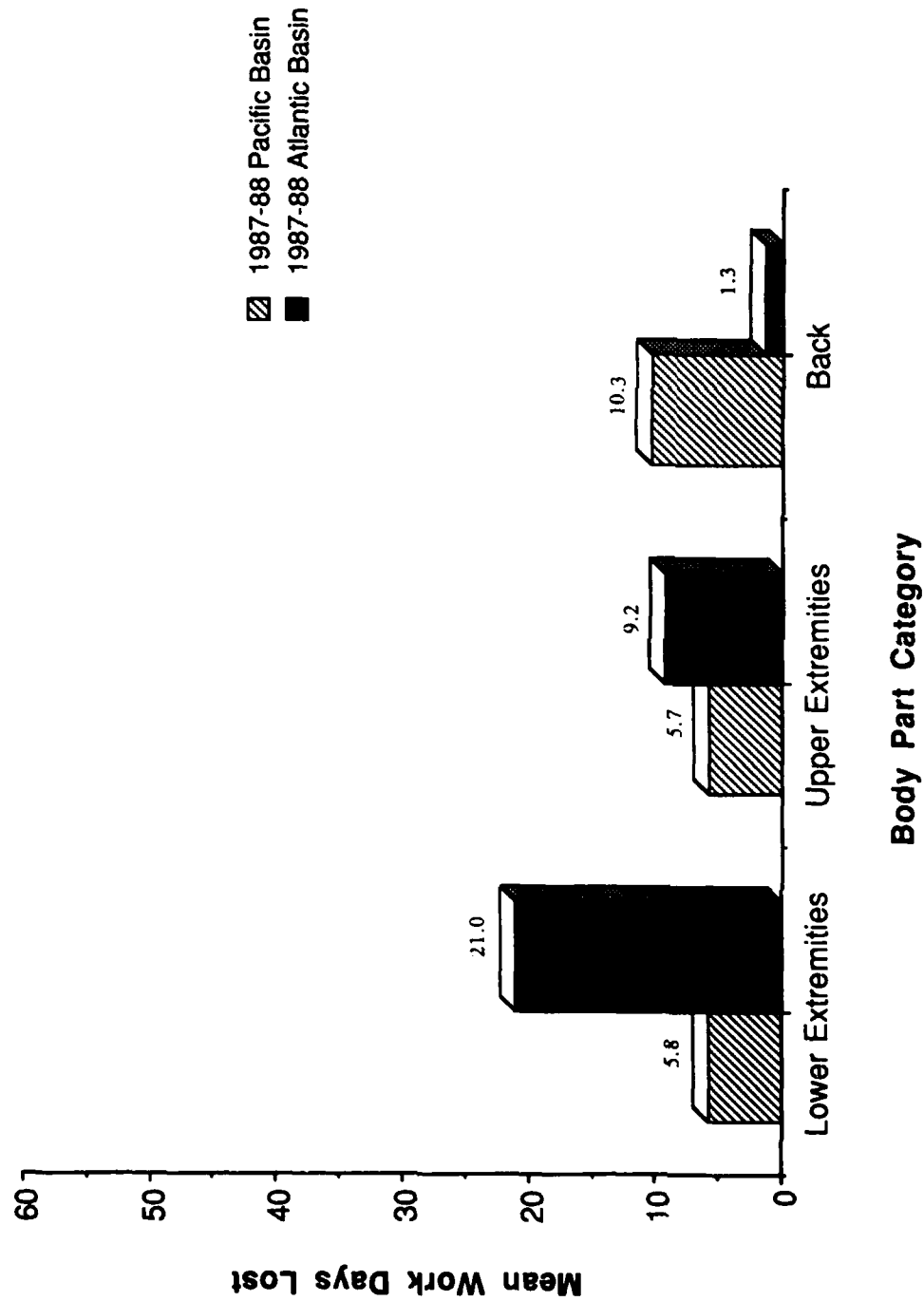


Figure 5. Mean Work Days Lost by Body Part Category across Basins, 1987-88



the lower extremities accounted for the highest mean number of work days lost (21.0) in the AMC while the highest mean in the PMC (10.3) was noted for back injuries.

Table 12 is a presentation of the mean days computed by basin for the criteria of work time lost, case duration from date of injury to date of case closure, and filing of claims forms. Results of the t-test comparisons indicated that with OPTICOMAP implementation in the PMC significant decreases in mean values were obtained for case duration, days lost from work, and days recorded for the ACMP's processing of the medical report or CA-20. Of considerable interest was the significantly lower mean number of days of case duration or the "life" of occupational injury cases in the PMC than AMC.

The values presented in Figure 6 revealed a large increase in the percentage of injured employees who did not lose any time from work after OPTICOMAP implementation in the PMC. Such findings clearly reflected the impact that an increase in opportunities for light duty had on reducing the numbers of days lost from work. As shown in Figure 7, decreases in mean work days lost were observed in the PMC for the three body part categories with significant decreases observed for back injuries.

Results of comparisons across time frames in the PMC can be seen in Table 13. The values presented indicated that significant decreases in mean work days lost, case duration, and days involved in filing of ACMP forms occurred with OPTICOMAP implementation.

By way of contrast, results obtained in the AMC during 1987-88 were not in a favorable direction. Figure 8 shows the high proportion of cases (46.7%) that accounted for a lost time period of 7 to 45 days away from work. Also observed is the finding that 6.7% of the cases had not returned to work at the end of the follow-up period. As shown in Figure 9, the major reason for this increase in mean number of days lost from work was the increase in the number of days recorded for recovery from injuries to the lower extremities (from a mean of 5.5 to 21.0 days). Other comparisons in this illustration recorded the decrease in the mean number of work days lost for injuries to the upper extremities and back.

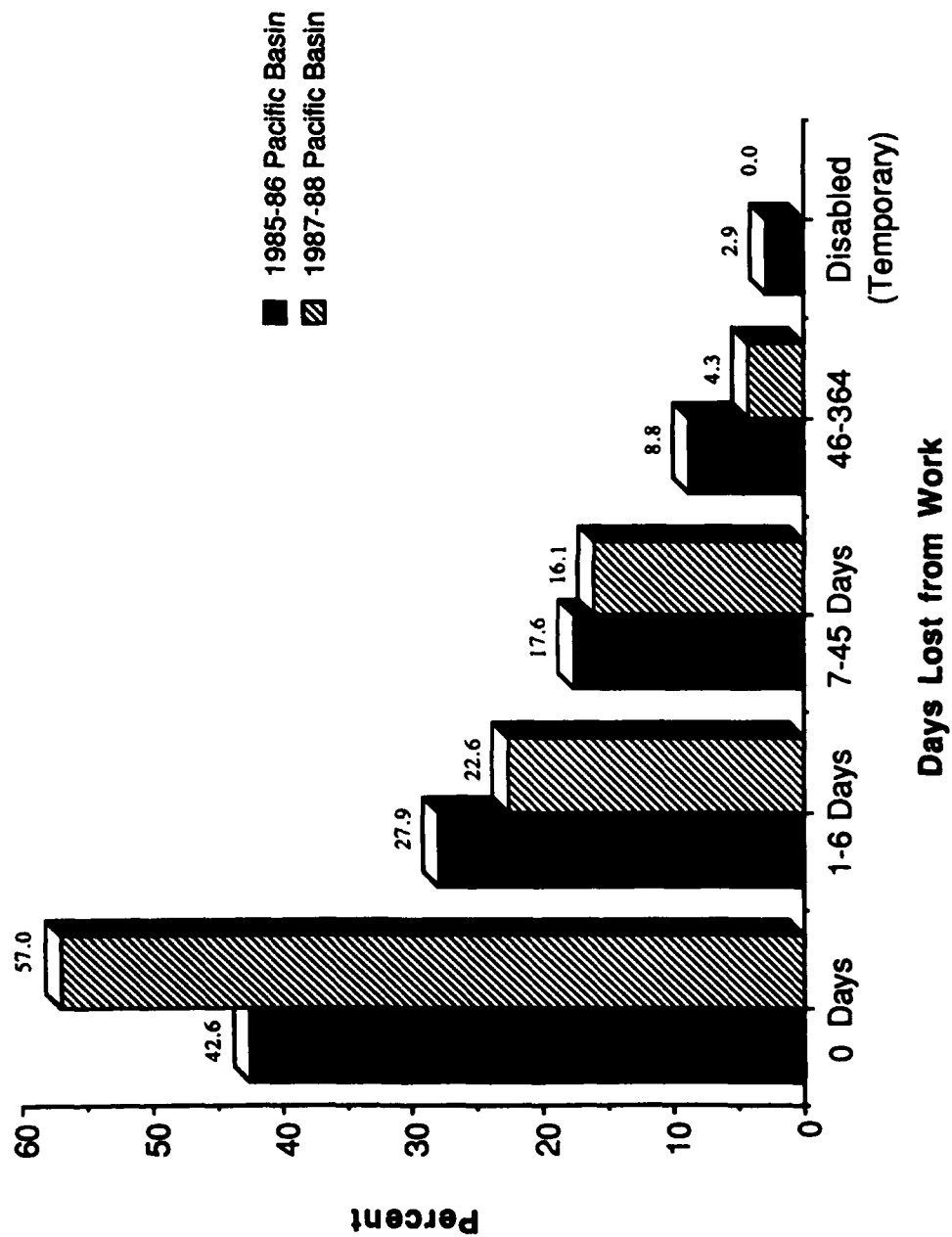
TABLE 12

Means and Standard Deviations of Outcome Evaluation Variables (Time)
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, FY1988

Criterion/Subcriterion	<u>PMC</u>		<u>AMC</u>		t	p
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Work Time Lost:						
Days lost from work	6.61	14.48	12.71	14.89	-1.94	.055
Days of continuation of pay	5.62	12.16	10.59	14.54	-1.83	NS
Duration of Case:						
Days from injury to closure	68.53	63.64	124.70	83.56	-3.87	.000
Claims Form Filing:						
Days of CA-1 to DOL OWCP	25.57	37.05	28.43	16.91	-0.58	NS
Days of CA-20 with ACMP	6.38	11.33	17.67	27.64	-1.95	.063

Note. The two fleet operation centers of the National Ocean Service, Office of Marine Operations, are abbreviated to PMC for Pacific Marine Center and AMC for Atlantic Marine Center.

Figure 6. Percentage Distribution of Work Days Lost among Occupationally Injured Wage Marines by Year



**Figure 7. Mean Work Days Lost by Body Part Category
across Time Frames, Pacific Marine Center**

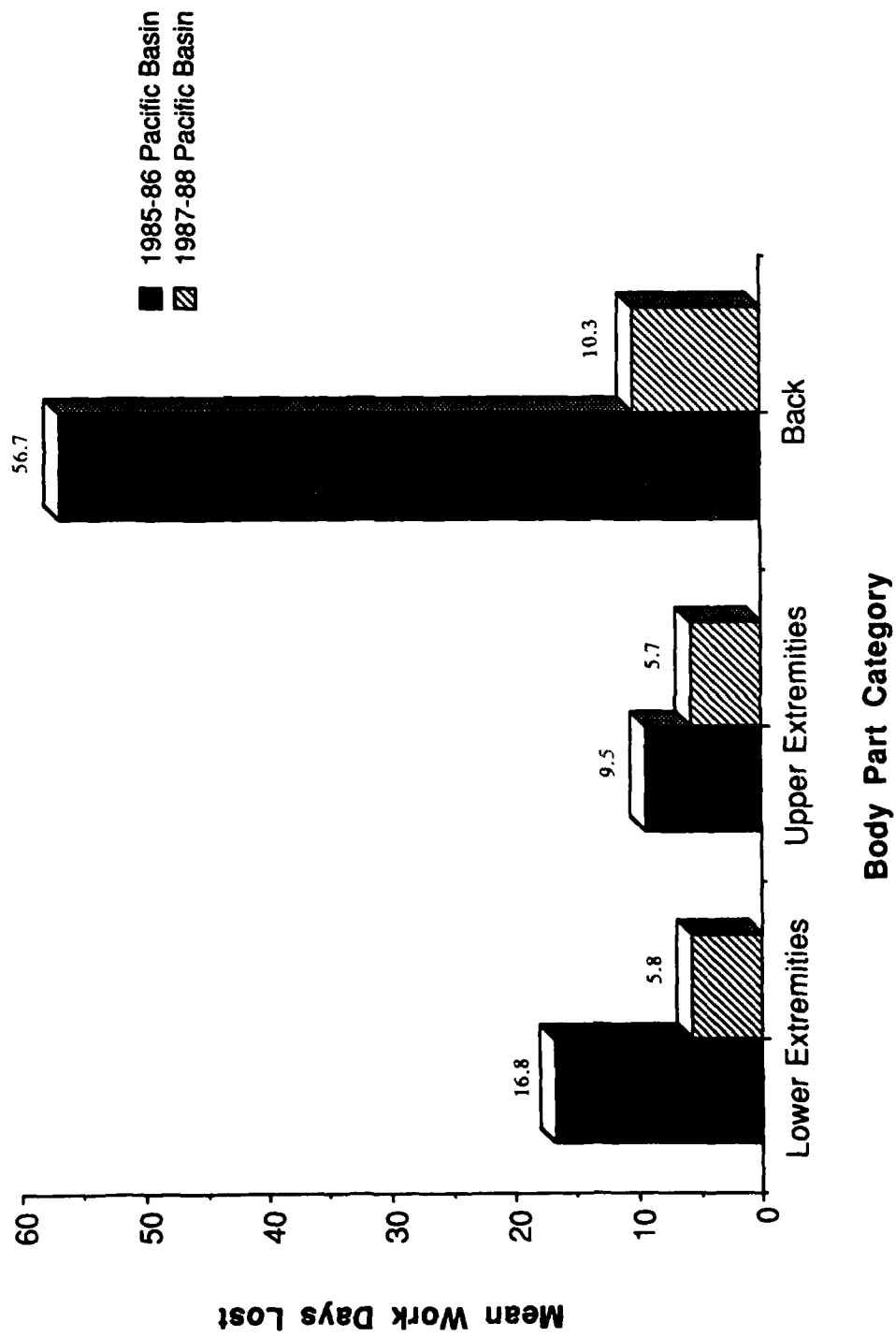


TABLE 13

Means and Standard Deviations of Outcome Evaluation Variables (Time)
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, Pacific Marine Center

Criterion/Subcriterion	<u>1985-86</u>		<u>1987-88</u>		t	p
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Work Time Lost:						
Days lost from work	21.51	63.91	6.61	14.48	-1.89	.063
Days of continuation of pay	7.90	14.49	5.62	12.16	-1.08	NS
Duration of Case:						
Days from injury to closure	112.18	123.43	68.53	63.64	-2.65	.009
Claims Form Filing:						
Days of CA-1 to DOL OWCP	24.61	34.68	25.57	37.05	0.16	NS
Days of CA-20 with ACMP	14.88	22.38	6.38	11.33	-2.64	.010

Note. The time periods represent pre- and post-OPTICOMAP (case management process) implementation (1985-86 and 1987-88, respectively).

Figure 8. Percentage Distribution of Work Days Lost among Occupationally Injured Wage Marines by Year

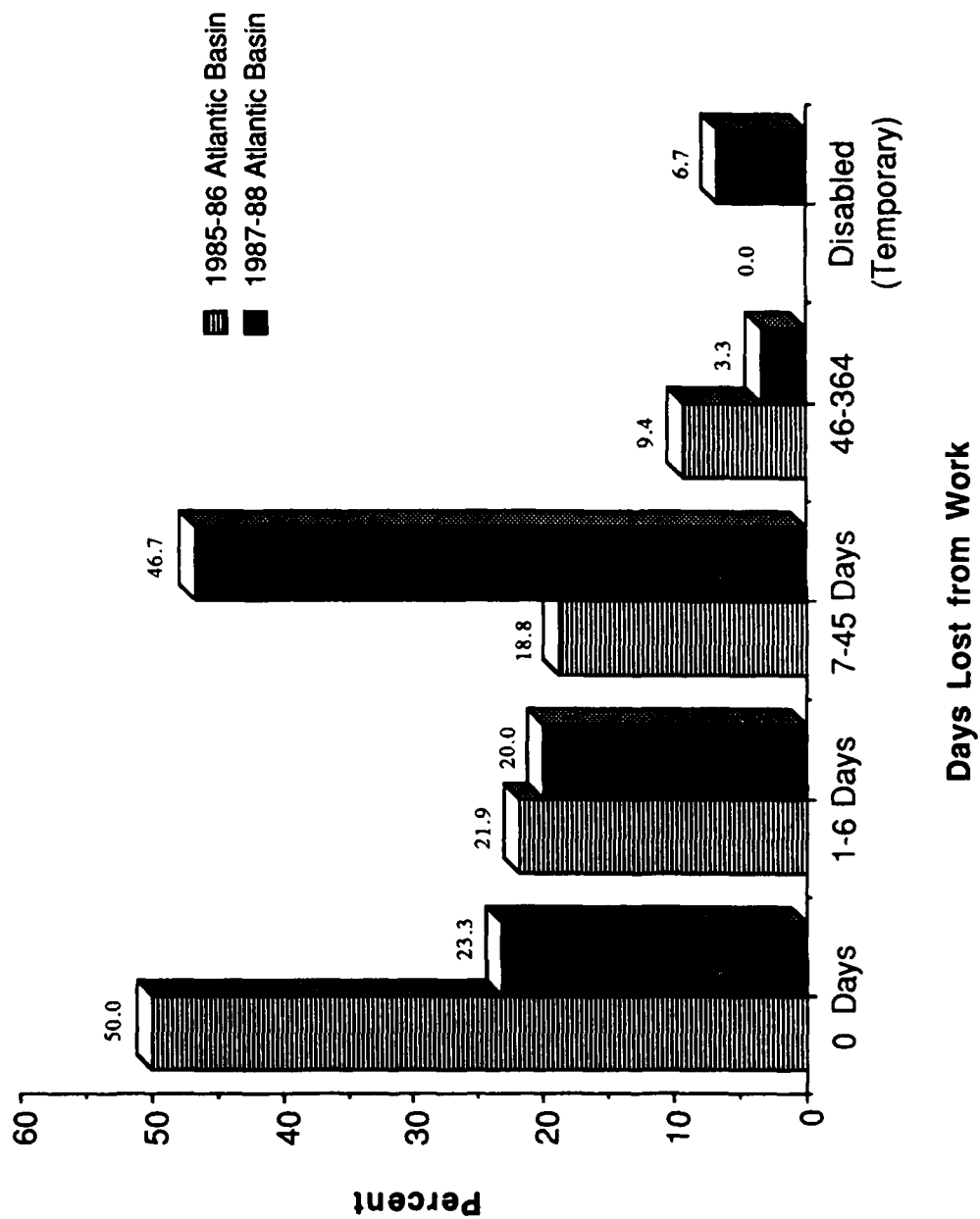
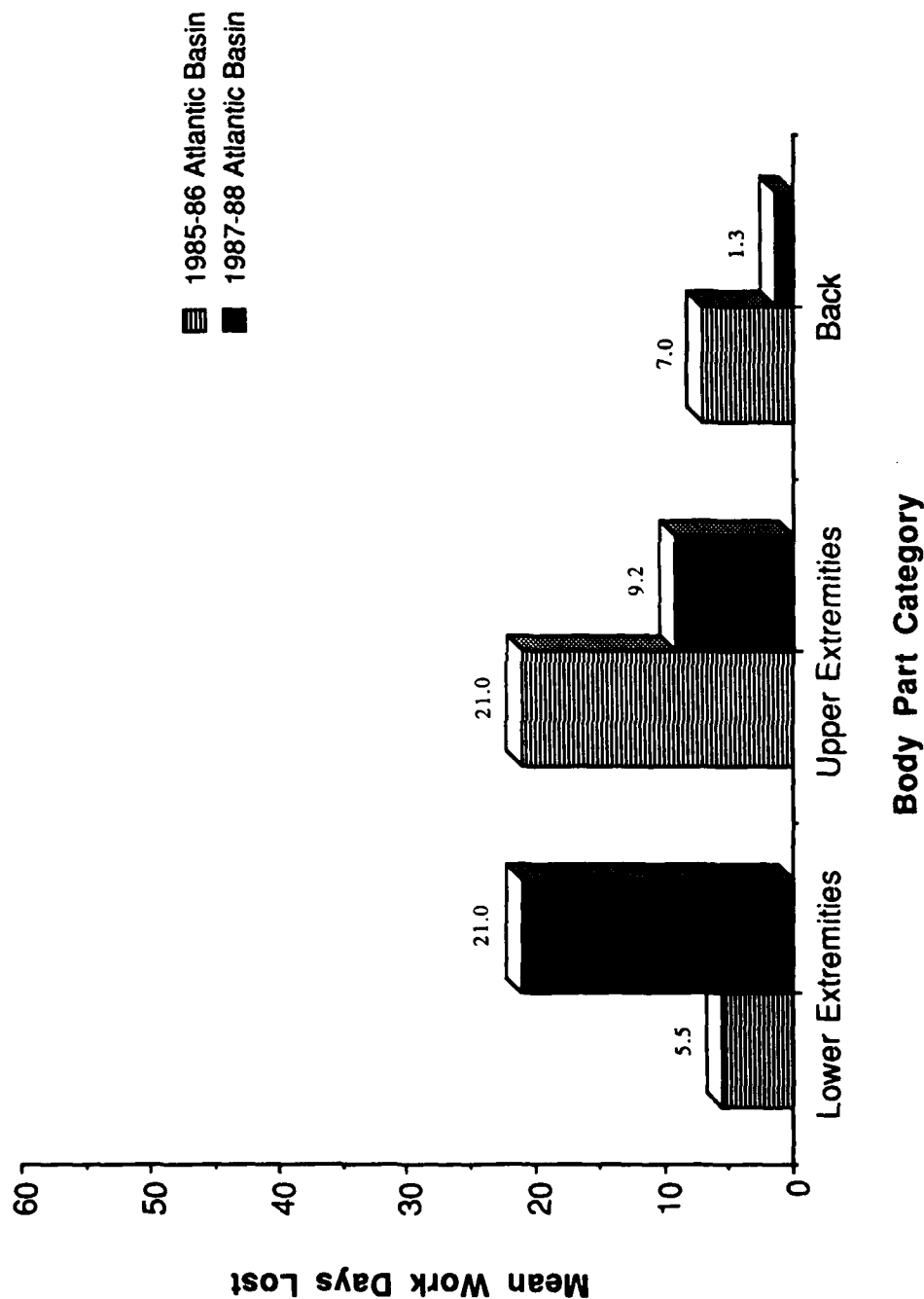


Figure 9. Mean Work Days Lost by Body Part Category across Time Frames, Atlantic Marine Center



In Table 14 are presented the mean number of days computed for work time lost, case duration, and forms filing in the AMC. The only significant decrease in means was noted for case duration, a decrease from a mean of 183.5 to 124.7 days. Although the mean number of days recorded for forms filing decreased across time frames, the differences were nonsignificant. In contrast with the decrease reported in the PMC, an increase in the mean number of continuation of pay days was observed in the AMC.

Costs: Mean lost wages. The monetary values for mean wages lost were obtained by multiplying the number of work days away from the job by the average daily wage for each injured worker. Results of comparisons of costs presented in Figure 10 indicated that means for wages lost increased in the AMC and decreased in the PMC across time frames. These changes with time are delineated in comparisons by body part category, as shown in Figures 11 through 13. In Figure 11, the largest differences between basins in mean costs for lost wages were observed for injuries to the lower and upper extremities, with higher costs recorded for the AMC in 1987-88. Mean lost wages for back injuries, on the other hand, were considerably higher for cases in the PMC than AMC. However, the PMC mean value for lost wages because of back injuries in 1987-88 represented an almost tenfold decrease in such costs from the pre-OPTICOMAP time frame, as can be seen in Figure 12. Other results shown in Figure 12 are the mean lost wage costs for injuries of the lower and upper extremities, both of which decreased across time frames. The mean costs for lost wages presented in Figure 13 also identified the large increase with time in mean wages paid in the AMC because of injuries to lower extremities.

Costs: Medical care. A sizable proportion of injured employees in each basin did not incur any medical expenses, a finding that reflected the relatively frequent use of the ACMP in both the PMC or AMC. For the former, the percentages of no medical costs were 47.1% in 1985-86 and 51.6% in 1987-88 while those for the latter were 40.6% and 43.3% by respective year intervals. An inspection of the records indicated that when the ship was at sea or in port away from home base, medical treatment typically was provided by the ship's medical care provider or in a hospital emergency facility. When the ship was in the home port, the majority of injured employees received treatment from the onsite ACMP rather than their own physician.

TABLE 14
Means and Standard Deviations of Outcome Evaluation Variables (Time)
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, Atlantic Marine Center

Criterion/Subcriterion	<u>1985-86</u>		<u>1987-88</u>		t	p
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Work Time Lost:						
Days lost from work	13.06	30.82	12.71	14.89	-0.06	NS
Days of continuation of pay	6.91	13.22	10.59	14.54	1.04	NS
Duration of Case:						
Days from injury to closure	183.50	130.01	124.70	83.56	-2.13	.038
Claims Form Filing:						
Days of CA-1 to DOL OWCP	53.06	78.23	28.43	16.91	-1.74	NS
Days of CA-20 with ACMP	42.06	49.06	17.67	27.64	-1.85	NS

Figure 10. Mean Lost Wage Costs among Occupationally Injured Wage Marines by Basin

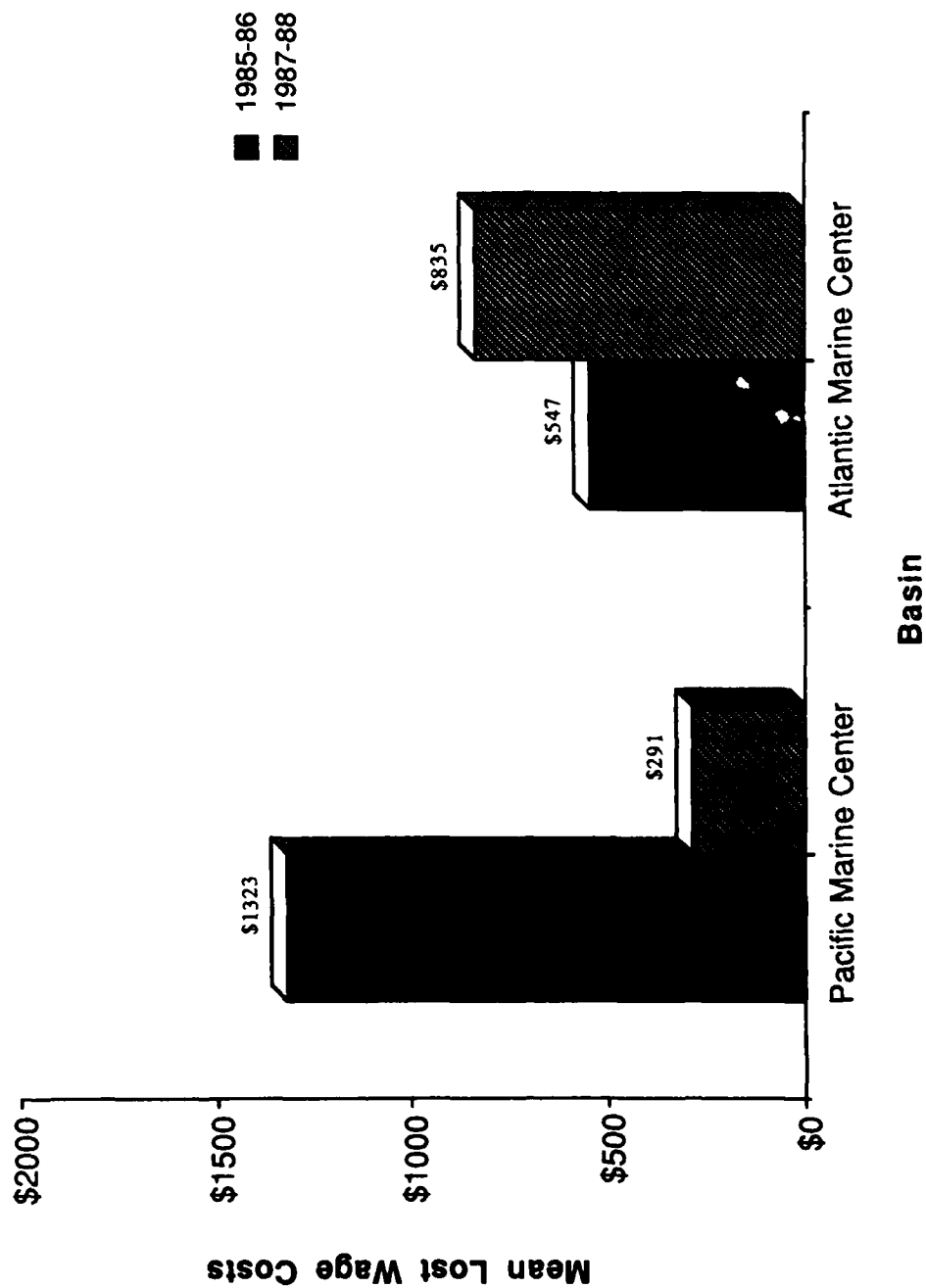


Figure 11. Mean Lost Wage Costs by Body Part Category across Basins, 1987-88

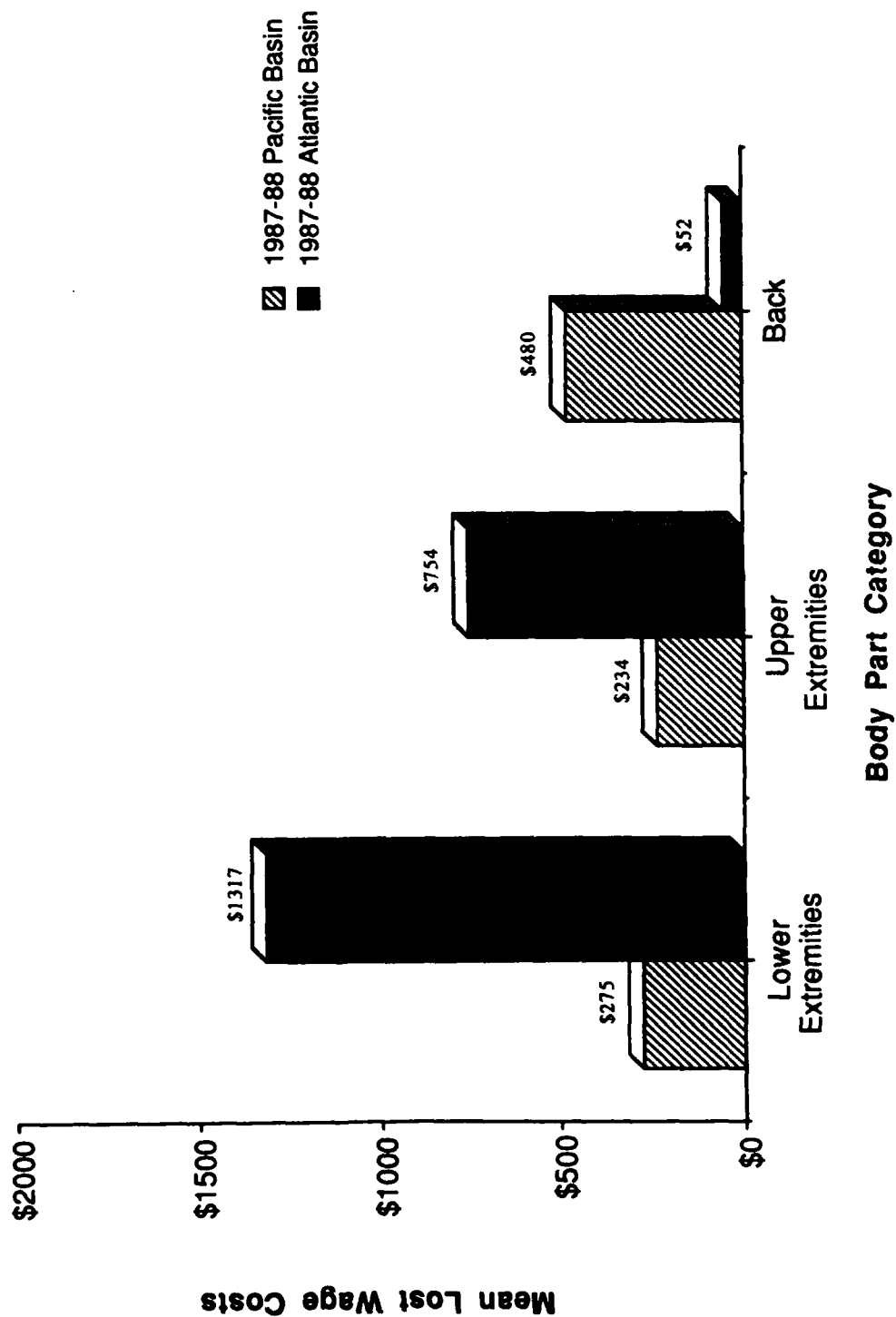
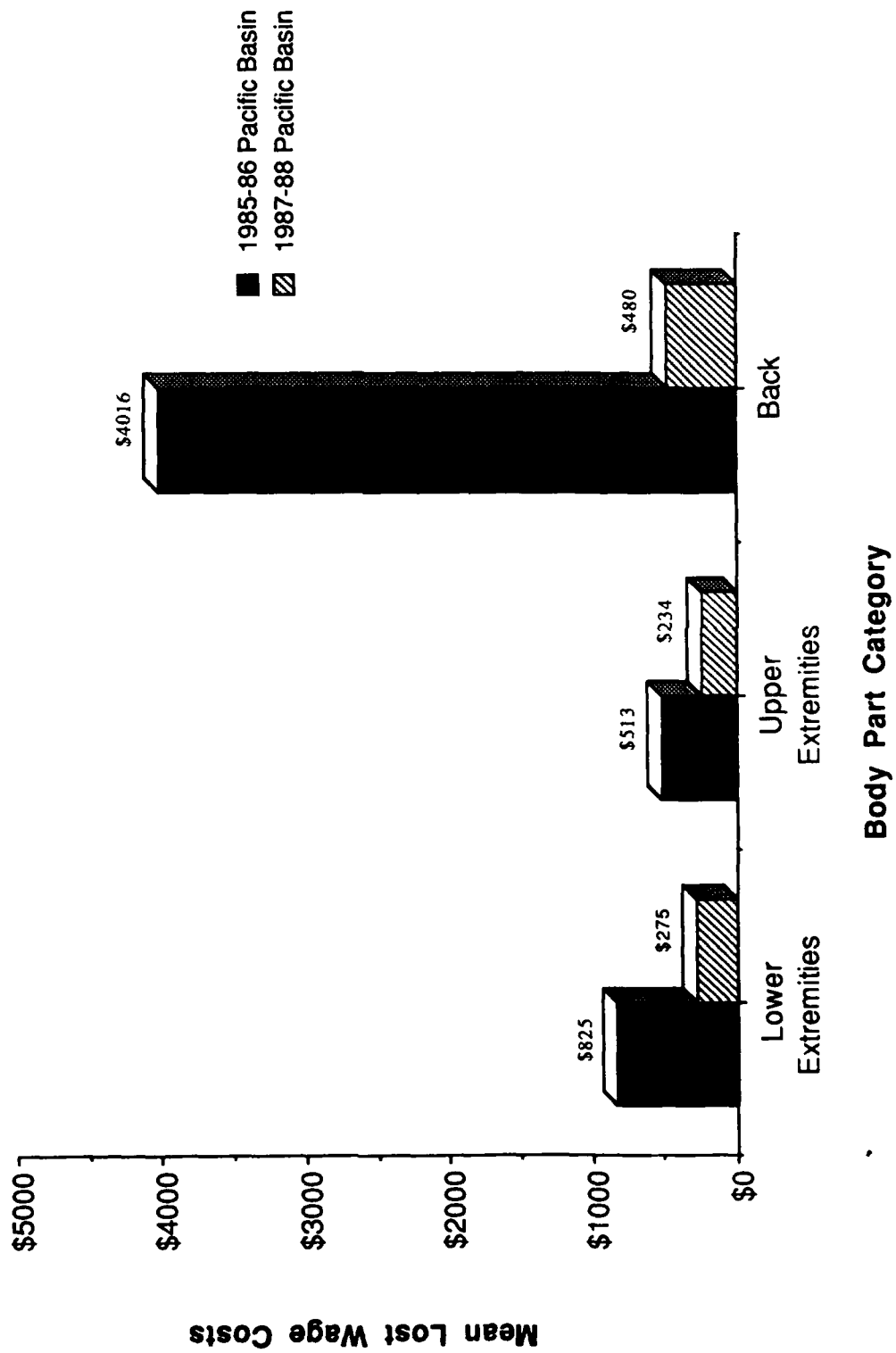
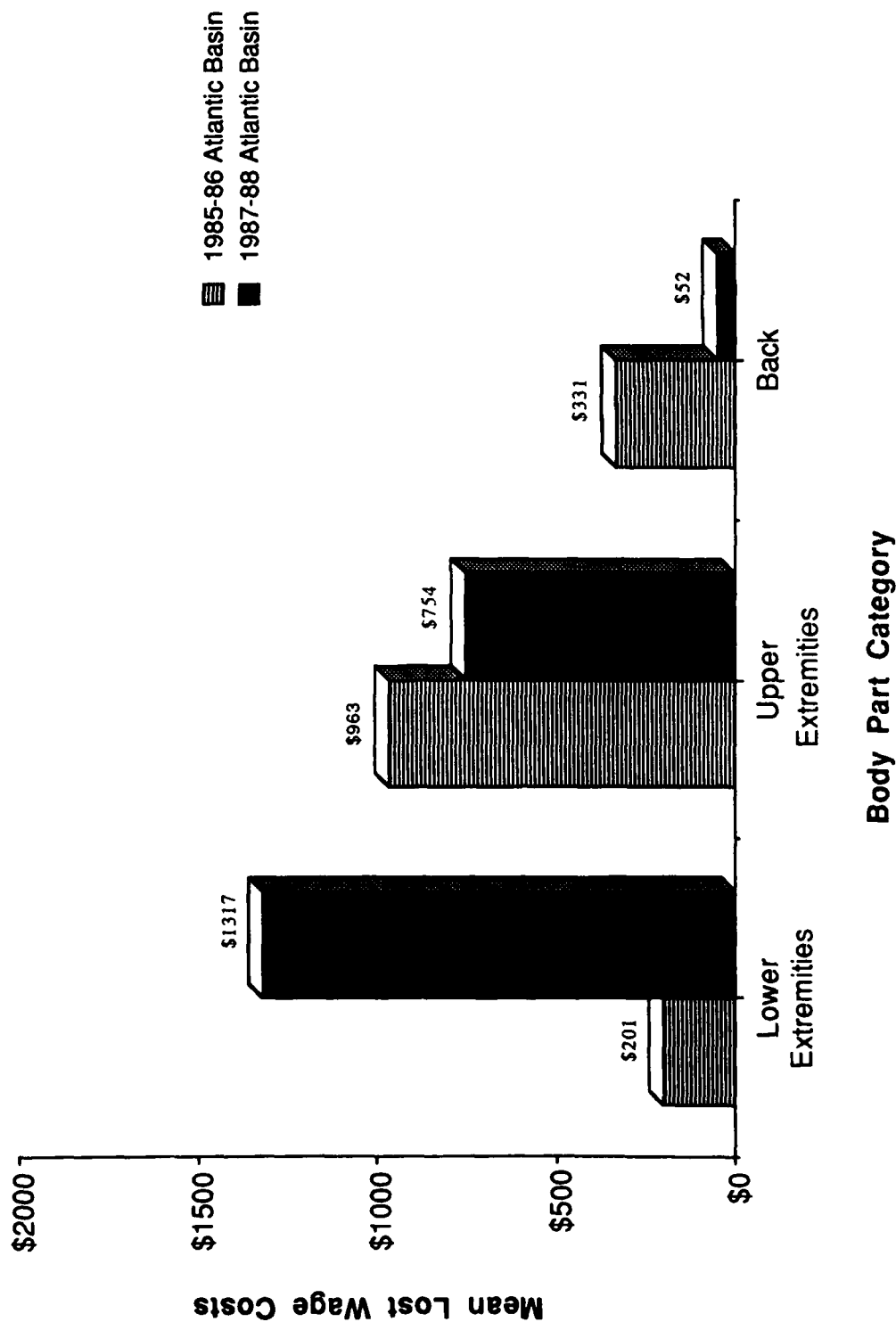


Figure 12. Mean Lost Wage Costs by Body Part Category across Time Frames, Pacific Marine Center



**Figure 13. Mean Lost Wage Costs by Body Part Category
across Time Frames, Atlantic Marine Center**

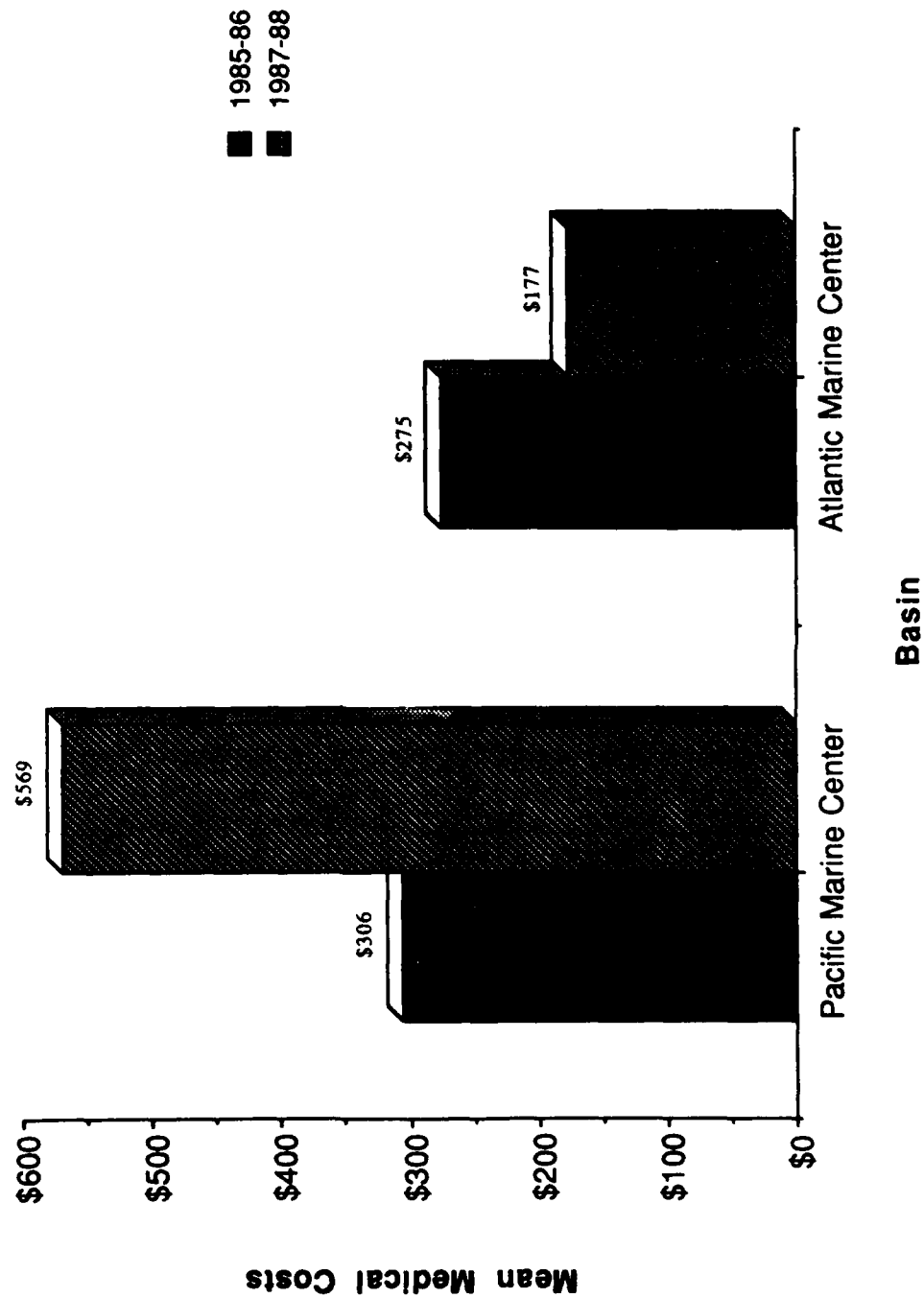


Mean medical costs by basin and time frame are presented in Figures 14 to 17. As shown in Figure 14, overall mean medical costs decreased across time frames in the AMC whereas an increase from a mean of \$306 to \$569 was noted in the PMC. When compared across basins by body part category for 1987-88 alone (Figure 15), mean medical costs were higher in the PMC than AMC for each of the three body part categories. In the PMC, as can be seen in Figure 16, only one large increase in mean medical costs from pre- to post-OPTICOMAP implementation was reported—for injuries to the lower extremities; a decrease occurred for back injuries. Similarly in the AMC (Figure 17), an increase in mean medical costs with time was noted for injuries to the lower extremities. Decreases with time were seen for comparisons of the other body part categories.

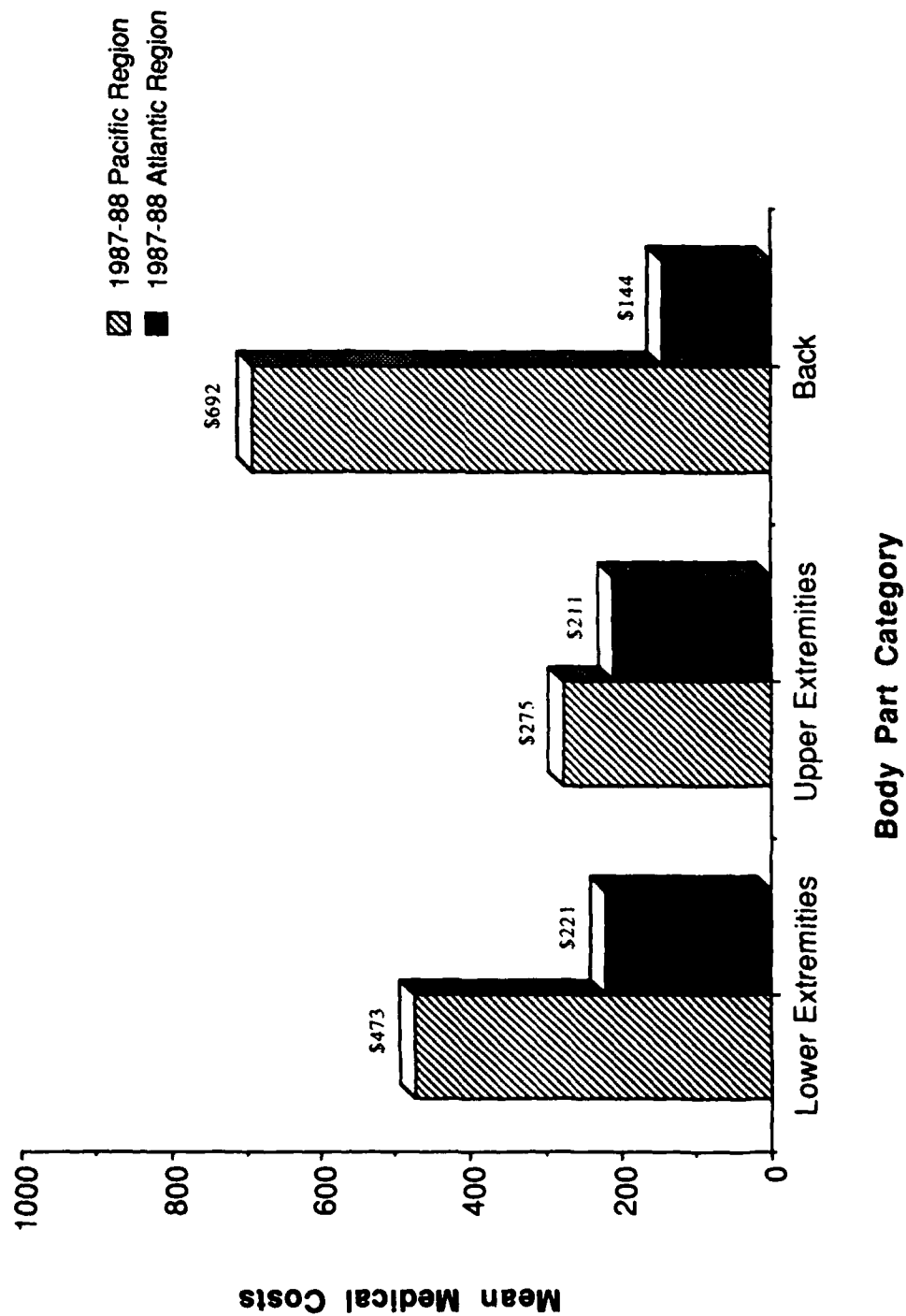
These mean medical and lost wage costs are summarized in Table 15, as are the mean compensation payments for each basin and time frame. The highest mean compensation costs (\$14,336.) were paid in 1987-88 in the AMC.

Costs: Adherence to OPTICOMAP. The values presented in Table 16 suggested that the PMC was evaluated as being significantly more expeditious than the AMC in adhering to a case management process or OPTICOMAP. Sub-criteria in support of that higher rating included the significantly lower number of letters from the DOL OWCP and the significantly higher number of telephone calls recorded in PMC case records. The higher mean number of telephone calls logged in the PMC represented a greater adherence to the CC-CF's service provision events which stipulate frequent personal contacts between the CC-CF and the line supervisor, ACMP, and injured employee. Comparisons of pre- and post- OPTICOMAP time frames in the PMC revealed similar results, as can be seen in Table 17, with an overall rating of effectiveness significantly higher with implementation of OPTICOMAP. The values presented in Table 18 suggested that the case management process in the AMC was rated as significantly more effective in 1987-88 than 1985-86, findings that indicated an improvement across time frames without the formalized implementation of OPTICOMAP. The number of telephone calls recorded, however, decreased significantly between time periods.

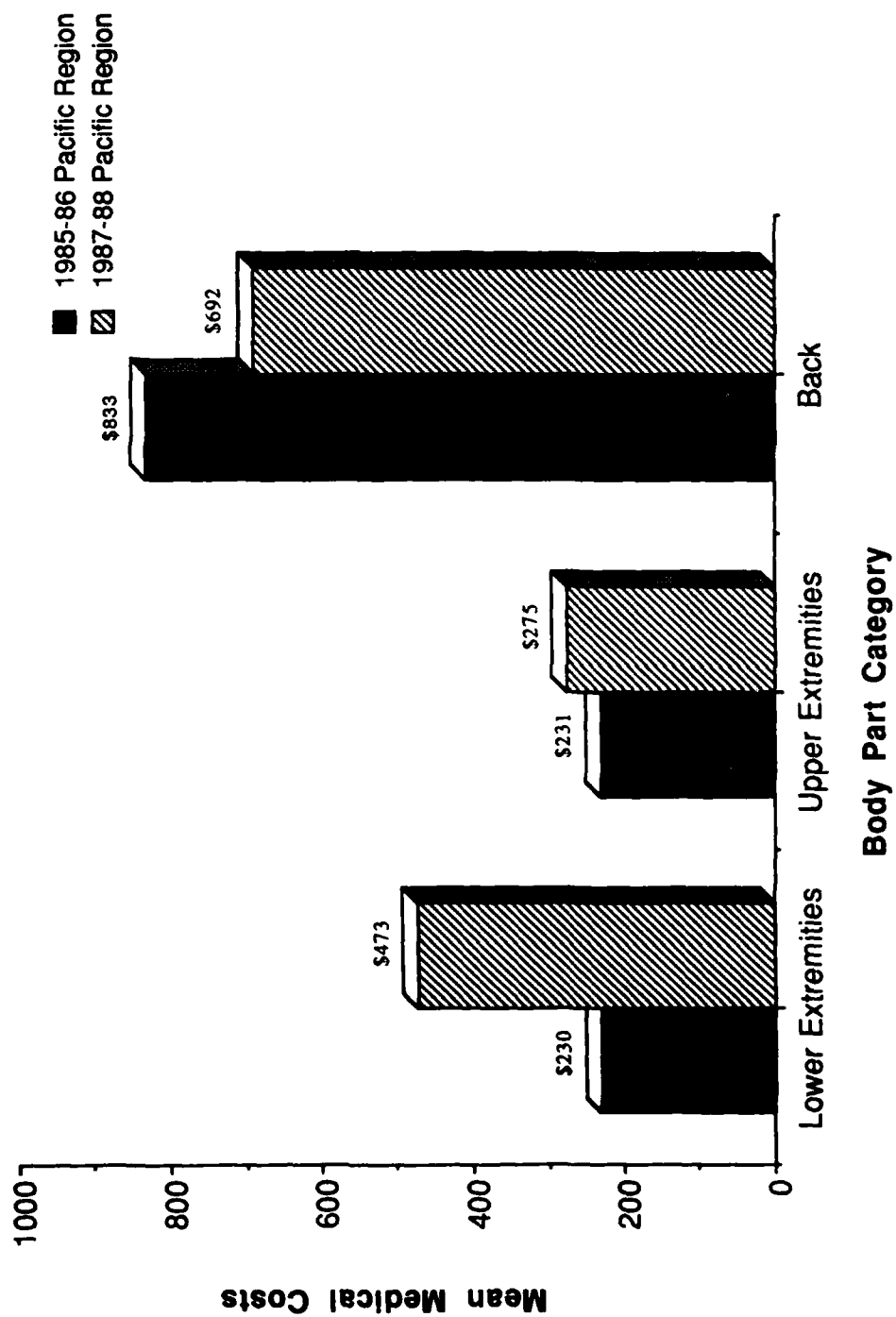
Figure 14. Mean Medical Costs among Occupationally Injured Wage Marines by Basin



**Figure 15. Mean Medical Costs by Body Part Category
across Time Frames, 1987-88**



**Figure 16. Mean Medical Costs by Body Part Category
across Time Frames, Pacific Marine Center**



**Figure 17. Mean Medical Costs by Body Part Category
across Time Frames, Atlantic Marine Center**

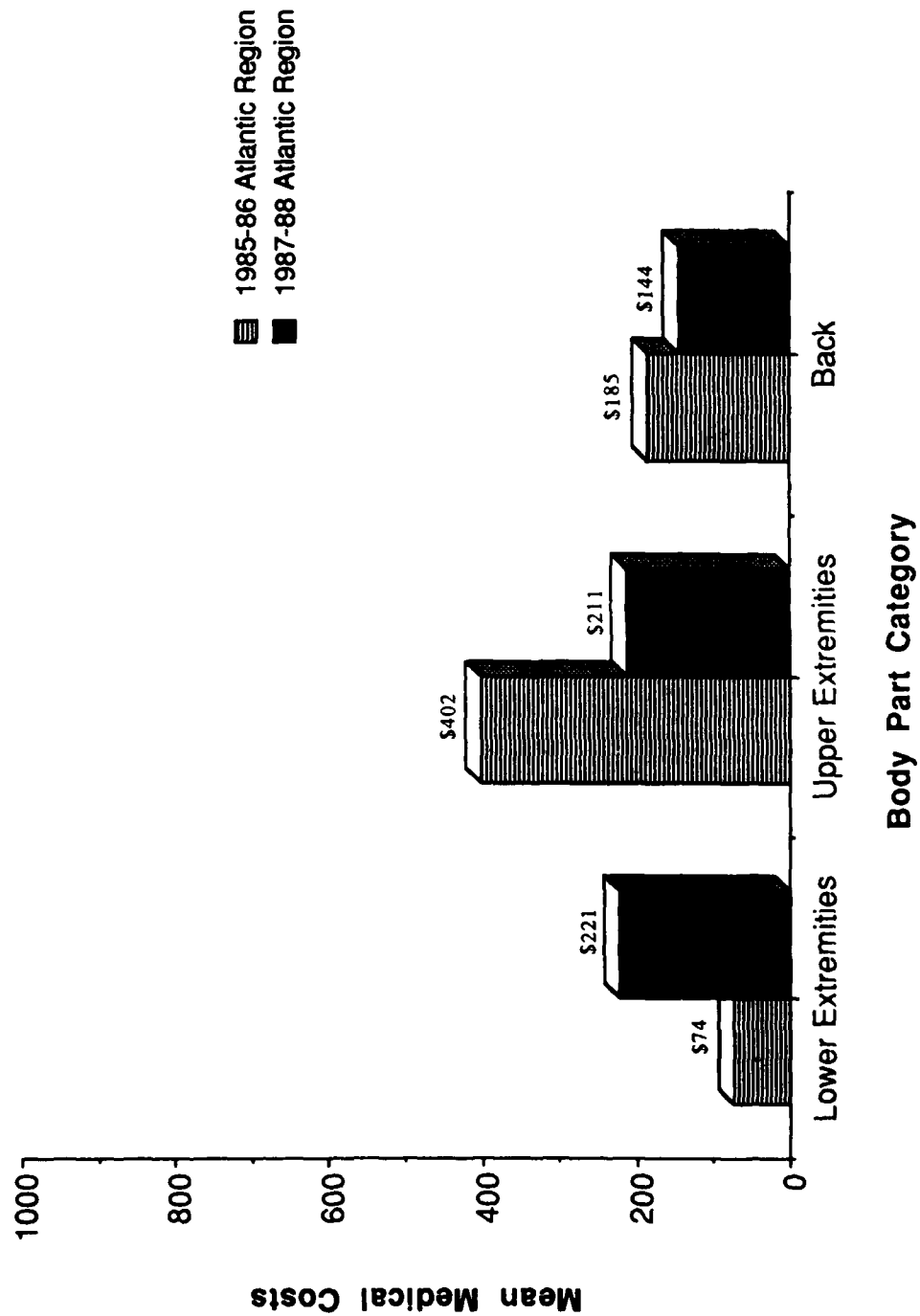


TABLE 15
Means of Outcome Evaluation Variables (Costs)
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force

Criterion	<u>PMC</u>		<u>AMC</u>	
	<u>1985-86</u>	<u>1987-88</u>	<u>1985-86</u>	<u>1987-88</u>
	<u>M</u>	<u>M</u>	<u>M</u>	<u>M</u>
Costs: Medical care	\$306.	\$569.	\$275.	\$177.
Costs: Compensation payments	\$5,036.	\$6,035.	\$6,380.	\$14,336.
Costs: Mean wages per occupational injury or illness	\$1,323.	\$291.	\$547.	\$835.

Note. The two fleet operation centers of the National Ocean Service, Office of Marine Operations, are abbreviated to PMC for Pacific Marine Center and AMC for Atlantic Marine Center.

TABLE 16
Means and Standard Deviations of Outcome Evaluation Variables
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, FY1988

Criterion/Subcriterion	<u>PMC</u>		<u>AMC</u>		t	p
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Costs: Adherence to Process	4.15	1.12	2.18	1.26	-8.29	.000
Letters to/from case manager	3.76	3.74	4.77	2.78	1.35	NS
Letters from DOL OWCP	1.41	1.69	2.10	1.83	1.91	.058
Telephone calls: Logged by case manager	2.86	4.86	0.60	1.10	-4.17	.000

Note. The two fleet operation centers of the National Ocean Service, Office of Marine Operations, are abbreviated to PMC for Pacific Marine Center and AMC for Atlantic Marine Center.

TABLE 17

Means and Standard Deviations of Outcome Evaluation Variables
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, Pacific Marine Center

Criterion/Subcriterion	<u>1985-86</u>		<u>1987-88</u>		t	p
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Costs: Adherence to Process	3.17	1.50	4.15	1.12	4.50	.000
Letters to/from case manager	4.66	4.47	3.76	3.74	-1.39	NS
Letters from DOL OWCP	1.50	2.11	1.41	1.69	-0.29	NS
Telephone calls: Logged by case manager	1.03	3.54	2.86	4.86	2.77	.006

Note. The time periods represent pre- and post-OPTICOMAP (case management process) implementation (1985-86 and 1987-88, respectively).

TABLE 18
Means and Standard Deviations of Outcome Evaluation Variables
of Occupational Illness and Injury Cases
in the National Ocean Service Wage Marine Force, Atlantic Marine Center

Criterion/Subcriterion	<u>1985-86</u>		<u>1987-88</u>		t	p
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Costs: Adherence to Process	2.19	1.26	3.07	1.14	2.88	.006
Letters to/from case manager	4.81	2.88	4.77	2.78	-0.06	NS
Letters from DOL OWCP	2.50	2.59	2.10	1.83	-0.70	NS
Telephone calls: Logged by case manager	2.56	3.45	0.60	1.10	-3.05	.004

DISCUSSION

The conclusions to be drawn from these results will be subsumed under the three evaluation levels of process, impact, and outcome. Process and impact criteria will be examined according to mean ratings across time frames and between basins. The outcome evaluation variables will be discussed in terms of the "bottom line" issues of costs in monetary expenditures and time as assessed by number of days and extent of involvement in the case management process.

In examining ratings of process criteria and subcriteria, significant improvements in effectiveness are noted for both of the criteria of implementation of and adherence to OPTICOMAP and return-to-work plans. Specific results of OPTICOMAP compliance point up that while the provision of both initial and ongoing medical care was shown to be highly effective, efforts to initiate contact with the injured employee by the line supervisor and the CC-CF could be further encouraged. However, one of the difficulties in meeting OPTICOMAP's role specifications and time requirements is that the vessels are at sea or in port away from the home base almost all of the time, which makes it impossible for the CC-CF to contact the injured worker. Also, the seagoing nature of fleet operations can prevent immediate emergency hospital or ongoing specialist care and a timely processing of DOL OWCP forms. Another factor is that many injuries, such as a chipped tooth, do not require immediate care nor further case management attention. For these reasons, OPTICOMAP probably should be implemented primarily in cases involving lost time and/or more serious types of injuries or illnesses. The ratings for this study, however, are recorded for all cases, and many of these cases might have been evaluated too rigidly in terms of meeting OPTICOMAP's specifications.

Ratings on the process criteria and subcriteria of implementation of and adherence to return-to-work plans show a significant increase in effectiveness across time frames and between basins. The most important contribution to this improvement in efficacy is the significant expansion in opportunities for light duty in the PMC. The implementation of return-to-light-work plans occurs as a result of the combined efforts of the CC-CF, ACMP, and operational supervisor. Because work in the PMC requires able-bodied employees to fulfill its seagoing mission, the provision of light duty reflects highly on the

ingenuity of operational personnel not only in creating light duty positions but also in considering both the worker's and the agency's needs. For injured employees, working in light duty positions enables them to maintain their ties with the organization which ensures their place in a social support system composed of coworkers and reduces the risks of delayed recovery syndrome. Moreover, adherence to return-to-work plans promotes rehabilitation endeavors that are based on the rationale of emphasizing activity and prescribed exercise as crucial to the recovery process (Delisa et al., 1988). Also, providing light duty positions protects the employer from accusations of denying injured workers their employment, re-employment, and retraining rights. The provision of light duty opportunities, therefore, not only addresses the psychosocial needs of injured workers by maintaining their support system in the work place but it also promotes their rehabilitation efforts and protects their human rights.

In evaluating the impact of OPTICOMAP, results of this study point up the significantly more effective ratings on criteria and subcriteria of timeliness and role fulfillment subsequent to OPTICOMAP implementation. Results of comparisons reveal significant improvements in ratings on these criteria; however, the post-OPTICOMAP values also suggest a need to expand efforts in these areas. An emphasis on promoting the timely filing of forms, adhering to return-to-work plans, and fulfilling follow-up procedures for both medical care (which is rated as effective in both basins) and claims management would prove beneficial in further expediting the case management process. Timeliness in returning injured employees to work also is crucial in that only 5 to 15% of these individuals will return to work if they have been off work for a year or more ("Getting the Injured Worker Back," 1987).

Closely related to the issue of timeliness is that of role fulfillment, as specified by OPTICOMAP for key participants. During the implementation phase, the service provision events of OPTICOMAP for each of the six key participants were compiled into checklists to be used to "track" each case and to serve as training aids in increasing familiarity with OPTICOMAP. As an example of the probable influence of the checklist and/or a greater understanding of OPTICOMAP is the significant decrease in the mean number of days recorded for the processing of forms by the PMC ACMP. By way of contrast, not

all of the PMC line supervisors received copies of their checklist, which may explain their lower role fulfillment ratings, especially when compared with those of the CC-CF and ACMP. A training program on OPTICOMAP for line supervisors would increase their awareness of the procedures to follow in caring for injured employees and helping them to return to the work site as soon as possible. Improvements also could be made in increasing the levels of CC-CF and ACMP effectiveness through training programs developed for them. These recommendations, however, can be tempered somewhat in view of the fact that all PMC injured employees returned to work, which reflects highly on the impact and level of dedication of the CC-CF, ACMP, supervisor, and injured employee.

In interpreting results of comparisons on outcome evaluation criteria, the findings also highlight the contributions made by PMC key participants in preventing lengthy delays in the closure of cases and in engaging in efforts to decrease excessive involvement in case management. Their contribution to the significant reduction in case duration consists of the enabling of a more expeditious return of injured employees to work and the more efficient processing of appropriate forms and billing statements without the need for additional requests for needed information. The more efficacious managing of cases also lessens the need to "track" cases and contact physicians, which in turn frees up time for the CC-CF to participate in the review of older cases and the development of a plan to return long-term injured employees to the work place. The costs of implementing OPTICOMAP, therefore, would be offset by the savings realized from more efficient case management.

In addition to the psychosocial ramifications of light duty, the increase in opportunities for light duty is an example of a cost-containment outcome in support of OPTICOMAP implementation. The ACMP, who provides the necessary expertise in determining impairment and assessing physical limitations, also is aware of the types of jobs to be performed in maritime fleet operations. His or her prescription of a return-to-light-work plan, which is promoted by the CC-CF and enacted by operations personnel, contributes to substantial savings in time and money because injured employees are working rather than remaining off duty while continuing to receive their full pay. In other words, the impact of light duty assignments is reflected by decreases in

numbers of days lost from work and mean wages paid; results of this study point up the considerable savings realized by reductions in lost time and labor costs. Other probable savings accrue from reductions in the number of physician's visits and replacement and retraining expenditures, a conclusion that corresponds with findings reported by other authors (Ratliff & Grogan, 1989). Associated with the decrease in number of physician's visits is the finding that more than 51% of injured workers in the PMC select the onsite physician for their medical care which results in considerable savings to the agency. Also related to the cost-containment benefits of the ACMP's prescription of light duty are the contributions that the ACMP makes by serving as a liaison between the injured worker and the work place as well as between the medical community and industry.

In contrast to the significant declines in mean days lost from work and mean wages paid after OPTICOMAP implementation in the PMC, the following medical cost breakdowns are reported: an increase in mean medical costs for injuries to the lower extremities and a decrease in back injury treatment costs. The majority of reported medical care costs are attributed to emergency care away from home port, specialist care, and physical therapy. Expenditures for physical therapy, for example, account for approximately 10% of the actual medical care costs charged to the PMC in 1987-88. These costs would be expected to increase as more injured employees seek the care of sports medicine providers. To contain such costs, many large industrial facilities have begun to hire physical therapists to provide onsite care for their injured workers. Other cost-containment endeavors include the employment of an onsite occupational medicine physician and occupational health nurses. In the PMC, for example, more than 51% of medical care is provided by the ACMP, which does not add to the reported medical costs. While the provision of services from the onsite ACMP or Public Health Service physician seems to be an effective means of containing medical costs, the Federal Employees' Compensation Act stipulates that an injured employee can select the medical care provider of his or her choice, which contributes to the medical costs reported in this study, although the proportion of such cases is small.

A final consideration to raise is that accidental injuries will continue to occur regardless of the types of safety programs and case management processes that have been initiated. It is to be hoped, however, that the decline in back injuries reported in this study is associated with implementation of a back safety program. Other factors that influence the incidence of occupational illness and injury are associated with shifts in initiatives and environmental conditions (Hoiberg, 1988b). For example, almost 7% of injuries reported in the PMC during 1987-88 are attributed to such recreational activities as basketball and baseball games. Agencies will have to determine whether or not the enhancement of the crew's morale outweighs the costs associated with recreational injuries. Second, environmental conditions also contribute to the incidence of accidental injuries; for example, the consequences of a ship's "taking a roll" while a worker is trying to walk down a ship's ladder or passing through a hatch are reflected in a sizable proportion of PMC's total injuries. Therefore, while the occurrence of "lightning bolt" accidents cannot be prevented and the circumstances of some accidents will not be changed, a case management process, such as OPTICOMAP, can reduce medical care and labor costs and promote a quick return to work for the injured employee.

In conclusion, results of this study support the following recommendations: implementation of a case management process, such as OPTICOMAP; implementation of return-to-work plans, particularly a plan for light duty; promotion of adherence to FECA deadlines for claims form filing; initiation and maintenance of contact with the injured worker during his or her convalescence; increased reliance on the ACMP for treatment of injured workers; and provision of training in case management processing for the ACMP, CC-CF, and line supervisor. Other aspects of cost containment and case management, which should be considered in the future, are the auditing of bills submitted from hospitals and private health care providers and the attaining of information from a second opinion. Such efforts would be expected to result in cost benefits. With the incorporation of these recommendations, the objectives of cost containment and restoration of injured workers to their full potential and to the work force will have a greater probability of being met.

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