Appendix A

SOURCES OF FIRE LITERATURE

This appendix is divided into two sections. The first part discusses the sources used in searching the fire literature for papers to review. The second contains the names and addresses of the institutions whose publications are reviewed in this report and are provided as a guide to the readers wishing to order these documents.

LITERATURE SEARCH

The main initial sources of literature were the following: the card catalog of the National Fire Protection Association Library and an unpublished bibliography of that organization, and a list of documents published by The Joint Fire Research Organization in England as well as a set of bibliographies published by that group. A number of other sources were used and are listed below. As the search progressed, the references in documents received led us to many others. Also we contacted many organizations and individuals directly, and they provided lists of publications. We also sent letters requesting papers to more than 50 organizations (many of these were listed in the Directory of Fire Research in the United States published by the National Academy of Sciences). We also published a "Call for Papers" in a number of journals and newsletters.

Bibliographies


Dissertation Abstracts, University Microfilms, Ann Arbor, Michigan.


Libraries

College of Insurance
123 William Street
New York, New York

National Fire Protection Association
470 Atlantic Avenue
Boston, Massachusetts 02210

211
New York City Fire Department
110 Church Street
New York, New York

Computer Searches

Municipal Fire Protection, a search prepared by the National Technical Information Service (NTIS), Springfield, Virginia.
Prevention of Burn Injuries, A MEDLINE Search, National Library of Medicine, Bethesda, Maryland

ORGANIZATIONS PUBLISHING OR DISTRIBUTING FIRE LITERATURE

American Insurance Association
85 John Street
New York, New York 10038

Battelle Memorial Institute
11000 Cedar Avenue
Cleveland, Ohio 44106

Building Research Establishment
Distribution Unit
Garston
Watford WD2 7JR, England
(Publications of the Joint Fire Research Organization should be ordered from this address.)

Defense Documentation Center
Department of Defense
Alexandria, Virginia 22314

Factory Mutual Research Corp.
1151 Boston-Providence Turnpike
Norwood, Massachusetts 02062

Federal Fire Council
7th and D Streets, N.W.
Washington, D.C. 20407

Her Majesty's Stationery Office
49 High Holborn
London WC1V 6HB, England
U.S. agent:
Pendragon House
899 Broadway Avenue
Redwood City, California 94063

Home Office Scientific Advisory Branch
Horseferry House
Dean Ryle Street
London S.W.1, England

Illinois Institute of Technology
Fire Protection Engineering Department
Chicago, Illinois 60604

Illinois Institute of Technology Research Institute
10 W. 35 Street
Chicago, Illinois 60616

International City Management Association
1140 Connecticut Ave., N.W.
Washington, D.C. 20036

Johns Hopkins University
Applied Physics Laboratory
8621 Georgia Avenue
Silver Spring, Maryland 20910

Joint Fire Research Organization
(part of the Building Research Establishment)
Borehamwood,
Hertfordshire WD6 2BL, England

National Bureau of Standards
(Fire Technology Division)
U.S. Department of Commerce
Washington, D.C. 20234

National Fire Protection Association
470 Atlantic Avenue
Boston, Massachusetts 02210
National League of Cities
1620 Eye St., N.W.
Washington, D.C. 20006

National Research Council
National Academy of Sciences
2101 Constitution Avenue
Washington, D.C.

National Research Council of Canada
Montreal Road
Ottawa, Ontario, Canada

National Technical Information Service (NTIS)
U.S. Department of Commerce
Document Department
5285 Port Royal Road
Springfield, Virginia 22151

New York Academy of Medicine
2 East 103 Street
New York, New York 10029

Public Safety Systems, Inc.
5385 Hollister Avenue
Santa Barbara, California 93105

Public Technology, Inc.
1140 Connecticut Avenue
Washington, D.C. 20036

The Rand Corporation
1700 Main Street
Santa Monica, California 90406
(Including publications of the New York City-Rand Institute)

Southwest Research Institute
8500 Culebra Road
San Antonio, Texas 78284

Stanford Research Institute
Fire Research Staff
333 Ravenswood Avenue
Menlo Park, California 94025

Systems Development Corporation
2500 Colorado Avenue
Santa Monica, California 90406

U.S. Government Printing Office
Washington, D.C.

University of Maryland
Fire Protection Curriculum
College Park, Maryland 20742

University of North Carolina
School of Public Health
Chapel Hill, North Carolina 27514

University Microfilms
(Dissertations)
300 North Zeeb Road
Ann Arbor, Michigan 48104

The Urban Institute
2100 M Street, N.W.
Washington, D.C. 20037
Appendix B

FIRE PROBLEMS QUESTIONNAIRE:
THE PROBLEMS AND NEEDS OF THE FIRE SERVICE

Instructions
To some extent, the answers to the three questions below may depend upon the fire department being considered, as the problems and needs of different departments will vary. The questions should be answered from the point of view of the department or city you know best. In the space provided for discussion, you may wish to indicate how your answers would differ for other departments.

Respondent's name:  

Designated Fire Department:  

(Please specify the department of which you are a member or the department you know best)
(1) In general, the goal of the fire department is to minimize loss of life and property and to minimize injuries. To achieve this goal, an attempt is made first to prevent fires and, if a fire occurs, to make the time until extinguishment as short as possible. Listed below are various factors which relate to the achievement of this goal.

(a) For each item listed below, assign a number from 1 to 4 to indicate the priority you believe should be given to that area in order to achieve the fire department's goal (1=highest priority, 2=high priority, 3=moderate priority, and 4=low priority).

(b) Rank each of the factors from highest priority to lowest priority (1=highest priority, 2=2nd highest priority, 3=3rd highest priority, ..., 10=lowest priority). Note: each factor should be assigned a different number from 1 to 10.

(c) For each factor, indicate whether you think research in that area would be useful (1=very useful, 2=useful, 3=of little or no use).

<table>
<thead>
<tr>
<th>Eliminating hazards through codes and standards</th>
<th>Priority</th>
<th>Rank</th>
<th>Usefulness of Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building inspections</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Sprinklers</td>
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<tr>
<td>Early detection devices</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Dispatching office operations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The number &amp; location of fire companies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tactics on the fire-ground</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire-fighting equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training of fire-fighters and officers</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(d) Please discuss briefly your answers to (a)-(c).
(2) In attempting to meet its goal, the fire department is faced with a number of managerial issues and decisions.

(a) For each of the issues listed below, and for any others you wish to list, assign a number from 1 to 4 to indicate the priority you give to that issue (1=highest priority, 2=high priority, 3=moderate priority, and 4=low priority). An issue may have a high priority because it is important to the goal of minimizing loss of life, property and injuries; because it involves high dollar expenditures or savings, or because it is important to the management and operations of the fire department.

(b) Rank each of the issues from highest priority to lowest priority (1=highest priority, 2=2nd highest priority, 3=3rd highest priority, ..., etc.). Note: each issue should be assigned a different number.

(c) For each issue, indicate whether you think research related to that issue would be useful (1=very useful, 2=useful, 3=of little or no use).
<table>
<thead>
<tr>
<th>Priority</th>
<th>Rank</th>
<th>Usefulness of Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deciding how many men to assign to each fire company</td>
<td></td>
<td></td>
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<tr>
<td>Deciding how often to replace equipment</td>
<td></td>
<td></td>
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<tr>
<td>Scheduling inspections</td>
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<tr>
<td>Developing education programs</td>
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<td></td>
</tr>
<tr>
<td>Deciding how many fire companies are needed and where they should be located</td>
<td></td>
<td></td>
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<tr>
<td>Specifying relocation or moveup policy</td>
<td></td>
<td></td>
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<tr>
<td>Determining firemen's work schedules</td>
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<td></td>
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<tr>
<td>Determining how many and which units to dispatch to alarms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing fire-ground tactics</td>
<td></td>
<td></td>
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<tr>
<td>Developing personnel policies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other issues (please specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(d) Please discuss briefly your answers to (a)-(c).
(3) The fire department is faced with a number of problems.

(a) For each of the problems listed below, and for any others you wish to list, assign a number from 1 to 4 to indicate the seriousness of that problem (1=extremely serious problem, 2=a serious problem, 3=a somewhat serious problem, 4=not a serious problem). A problem may be serious if it prevents the achievement of the goal of minimizing loss of life, property and injuries, if it results in increased costs, or if it interferes with the operations of the department.

(b) Rank each of the problems from most serious to least serious (1=most serious, 2=2nd most serious, 3=3rd most serious, ..., etc.). Note: each problem should be assigned a different number.

(c) For each problem, indicate whether you think research related to that problem would be useful (1=very useful, 2=useful, 3=of little or no use).

<table>
<thead>
<tr>
<th>Fire-ground safety</th>
<th>Priority</th>
<th>Rank</th>
<th>Usefulness of research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management-labor relations</td>
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<tr>
<td>High-rise safety</td>
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<tr>
<td>False alarms</td>
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<tr>
<td>Delays in processing alarms</td>
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<tr>
<td>Arson</td>
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<td></td>
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<tr>
<td>Fire company workload</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor fire-fighting apparatus</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Community relations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inadequate breathing apparatus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low fire-fighter morale</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor fire data collection and reporting systems</td>
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<td></td>
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</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(d) Please discuss briefly your answers to (a)-(c).
Appendix C

COMPUTER-AIDED DISPATCHING SYSTEMS

This appendix describes computer-aided dispatching systems that are planned or operating in 13 cities. In each case, we give the city involved and some of its characteristics, the computer manufacturer (if known), whether the system is joint with other agencies (police, ambulance), a description of the functions handled by the computer, an estimate of the cost, the status of the system as of late 1974, and the name of an appropriate person to contact.

City: Albany, New York.
Population: 130,000.
Fire Department: 15 companies, 3,000 fire alarms per year.
Computer System: Xerox 530.
Computer Functions: Automatic display of assigned companies given typed-in street address. The initial version of the system will not perform any record keeping operations.
Cost: About $400,000 for hardware.
Status: Planning.
Contact: Mr. Tom Cellery (618-463-1234).

City: Boston, Massachusetts.
Population: 640,000.
Fire Department: 73 companies, 53,000 fire alarms per year.
Computer System: Main computer: IBM system with IBM system 3 interface.
Computer Functions: Automatic display of assigned companies given typed-in geographical location. Automatic dispatch and automatic status-keeping of companies.
Cost: $32,000 for software, $57,000 per year hardware, machine, and maintenance.
Status: Planning phase.
Contact: Mr. John Murphy (617-536-1100).

City: Citrus Heights, California. Combined system with South Placerville, California.
Population: 25,000 (combined).
Fire Department: 13 companies, 3,300 fire alarms per year.
Computer System: Main computer: Xerox 530.

City: Denver, Colorado.
Population: 575,000.
Fire Department: 46 companies, 21,800 fire alarms per year.
Computer System: IBM system 3 and IBM system 7.
Computer Functions: Automatic display of closest available companies given typed-in street address. Automatic dispatch to stationhouses. Automatic record keeping.
Cost: $1,000,000 including all hardware and software; maintenance by fire department personnel.
Status: Planning stage.
Contact: Laurence C. Way (303-297-2411).

City: Houston, Texas.
Population: 1,500,000.
Fire Department: 200 companies.
Computer System: Not yet determined.
Computer Functions: Automatic display of assigned companies given typed-in street address or box numbers. Automatic dispatch of companies.
Cost: Not yet determined.
Status: Planning stage.
Contact: Mr. Paul Carr, Public Information (713-222-4643).
City: Huntington Beach, California. (Dispatching center serves three other cities also.)

**Population:** 300,000 (4 cities).

**Fire Department:** 22 companies, 12,000 alarms per year.

**Computer System:** Joint police-fire system. Main frame is a PDP 1115, interfaced with a Burroughs 2500 (which belongs to the city).

**Functions:** Dispatches closest available company given a typed-in street address. Computer performs all record keeping.

**Cost:** $500,000 but partly funded through LEAA and shared with police department. Maintenance is $20,000 per year shared by police and fire.

**Status:** In use.

**Contact:** Lt. Vic Subia (714-536-5411).

City: Las Vegas, Nevada; joint city/county system; join: police/fire system.

**Population:** 370,000.

**Fire Department:** 43 fire companies, 12,800 fire alarms per year.

**Computer System:** Main computer: IBM 370-145.

**Functions:** Automatic display of assigned companies given typed-in street address. Might add status-keeping of companies and record keeping at a later date.

**Cost:** Unknown cost of computer. Hardware maintenance is $10,000 per year for fire department.

**Status:** Final planning stages.

**Contact:** Tom Rogers (P.O. Box 510, Las Vegas, Nevada 89101).

City: Los Angeles, California.

**Population:** 2,900,000.

**Fire Department:** 191 companies, 60,000 fire alarms per year.

**Computer System:** SEL main computer with PSSI interface. Joint system of fire/ambulance dispatch.

**Functions:** Automatic display of closest available companies given typed-in street address. Computer keeps track of status of companies. Will eventually dispatch companies by teleprinter to stationhouse.

**Cost:** Over $3,500,000, including $800,000 software.

**Status:** Pilot system is operating.

**Contact:** Asst. Chief Henry Haggard (213-485-5971).

City: Los Angeles County, California.

**Population:** 2,000,000.

**Fire Department:** 172 companies, 80,000 fire alarms per year.

**Computer System:** Not yet determined.

**Functions:** Automatic display of assigned companies given typed-in street address. Status-keeping of companies.

**Cost:** Not yet determined.

**Status:** Preliminary planning.

**Contact:** Asst. Chief Bob Simpson (213-267-2426).

City: Memphis, Tennessee.

**Population:** 620,000.

**Fire Department:** 81 companies, 21,000 fire alarms per year; also dispatches ambulances.

**Computer System:** Two PDP-1140s. One will be used for backup.

**Functions:** Automatic display of assigned companies given typed-in geographical locator. Automatic dispatch of companies. Status-keeping of companies.

**Cost:** Total procurement cost is $8,000,000.

**Status:** Planning stages.

**Contact:** Capt. Dick Adelman (901-458-8281).

City: New Orleans, Louisiana.

**Population:** 600,000.

**Fire Department:** 66 companies, 4,000 fire alarms per year.

**Computer System:** Currently have Motorola 2000, with future change to PDP 1100.

**Functions:** Automatic display of assigned companies and of any special hazards given typed-in street address. Automatic dispatch by teleprinter.

**Cost:** $200,000 (hardware, software, and teleprinters).

**Status:** Final planning.

**Contact:** Mr. Elton Viola (504-522-7650).


**Population:** 7,900,000.

**Fire Department:** 386 companies, 300,000 fire alarms per year.

**Computer System:** Not yet determined.

**Functions:** When completed, this system will be the first automated computer dispatch system (as opposed to computer-assisted dispatch systems, which retrieve the assigned dispatch and recommend a dispatch from the first available units on the card). In this system the computer will recommend how many and which units to
dispatch and relocate on the basis of response time, coverage, and the probability that an incoming alarm signals a serious fire.

Cost: $9,500,000 + (estimated).
Status: Not yet determined.
Contact: Neal Anderson (212-566-3195).

City: San Francisco, California.
Population: 750,000.

Fire Department: 80 companies, 30,000 fire alarms per year.
Computer System: PDP 1140.
Cost: $2,000,000 for hardware.
Status: Final design phase.
Contact: Chief Robert E. Rose (415-861-8000, X. 271).
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Each citation gives author, title, publisher, date, and review number.


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RELATED RESEARCH SUPPORTED BY THE NATIONAL SCIENCE FOUNDATION

This evaluation of policy-related research on Fire Protection is one of 19 in a series of projects on the Evaluation of Policy-Related Research in the Field of Municipal Systems, Operation, and Services, funded by the Division of Social Systems and Human Resources in the Research Applied to National Needs (RANN) Program of the National Science Foundation.

A large body of research on municipal systems, operations, and services has been created over the last quarter century. However, its usefulness to decisionmakers has been limited because it has not been evaluated comprehensively with respect to technical quality, usefulness to policymakers, and potential for codification and wider diffusion. In addition, this research has been hard to locate and not easily accessible. Therefore, systematic and rigorous evaluations of this research are required to provide syntheses of evaluated information for use by public agencies at all levels of government and to aid in the planning and definition of research programs.

Recognizing these needs, the Division of Social Systems and Human Resources issued a Program Solicitation in January 1973 for proposals to evaluate policy-related research in 17 categories in the field of municipal systems, operations, and services. This competition resulted in 19 awards in June 1973.

Each of the projects was to (1) evaluate the internal validity of each study by determining whether the research used appropriate methods and data to deal with the questions asked; (2) evaluate the external validity of the research by determining whether the results were credible in the light of other valid policy-related research; (3) evaluate the policy utility of specific studies or sets of studies bearing on given policy instruments; (4) provide decisionmakers, including research funders, with an assessed research base for alternative policy actions in a format readily interpretable and usable by decisionmakers.

Each report was to include an analysis of the validity and utility of research in the field selected, a synthesis of the evidence, and a discussion of what, if any, additional research is required.

The following is a list of the awards showing the research area evaluated, the organization to which the award was made, and the principal investigator.

1. Fire Protection—Georgia Institute of Technology, Dept. of Industrial and Systems Engineering, Atlanta, Georgia, 30332; D. E. Fyffe.
3. Emergency Medical Services—University of Tennessee, Bureau of Public Administration, Knoxville, Tennessee, 37916; Hyrum Plaa.
5. Formalized Pre-Trial Division Programs in Municipal and Metropolitan Courts—American Bar Assoc., 1705 DeSales St., N.W., Washington, D.C., 20036; Roberta Rovner-Pieczenik.
(6) Parks and Recreation—National Recreation and Park Assoc., 1601 North Kent St., Arlington, Va., 22209; The Urban Inst., Kent St., Arlington, Va., 22209; The Urban Inst., 2100 M St., N.W., Washington, D.C., 20037; Peter J. Verhoven.


(8) Solid Waste Management—Massachusetts Institute of Technology, Dept. of Engineering, Cambridge, Mass., 02139; David Marks.


(10) Citizen Participation: Municipal Sub-systems—The Univ. of Michigan, Program in Health Planning, Ann Arbor, Michigan, 48104; Joseph L. Falsone.


(12) Goal of Economic Development—University of Texas-Austin, Center for Economic Development, Dept. of Economics, Austin, Texas, 78712; Niles M. Hansen.

(13) Franchising and Regulation—University of South Dakota, Dept. of Economics, Vermillion, South Dakota, 57069; C. A. Kent.


(15) Municipal Growth Guidance Systems—University of Minnesota, School of Public Affairs, Minneapolis, Minnesota, 55455; Michael E. Gleeson.

(16) Land Use Controls—University of North Carolina, Chapel Hill, Center for Urban and Regional Studies, Chapel Hill, North Carolina, 27514; Edward M. Bergman.


(19) Personnel Systems—Georgetown University, Public Services Laboratory, Washington, D.C., 20037; Selma Mushkin.

A complementary series of awards were made by the Division of Social Systems and Human Resources to evaluate the policy-related research in the field of Human Resources. For the convenience of the reader, a listing of these awards appears below:

(1) An Evaluation of Policy Related Research on New Expanded Roles of Health Workers—Yale University, School of Medicine, New Haven, Connecticut, 06520; Eva Cohen.

(2) An Evaluation of Policy Related Research on the Effectiveness of Alternative Allocation of Health Care Manpower—Interstudy, 123 East Grant St., Minneapolis, Minnesota, 55403; Aaron Lowin.


(4) An Evaluation of Policy Related Research on Trade-Offs between Preventive and Primary Health Care—Boston University Medical Center, Boston Univ. School of Medicine, Boston, Massachusetts, 02215; Paul Gertman.

(6) An Evaluation of Policy Related Research on Effects of Alternative Health Care Reimbursement Systems—University of Southern California, Dept. of Economics, Los Angeles, California, 90007; Donald E. Yett.

(7) An Evaluation of Policy Related Research on Alternative Public and Private Programs for Mid-Life Redirection of Caregivers—The Rand Corporation, 1700 Main Street, Santa Monica, California, 90406; Anthony H. Pascal.


(10) An Evaluation of Policy Related Research on Productivity, Industrial Organization and Job Satisfaction—Case Western Reserve University, School of Management, Cleveland, Ohio, 44106; Suresh Srivastva.


(13) An Evaluation of Policy Related Research on Projection of Manpower Requirements—Ohio State University, Center for Human Resource Research, Columbus, Ohio, 43210; S. C. Kelley.

(14) An Evaluation of Policy Related Research on Effectiveness of Alternative Pre-Trial Intervention Programs—Abt Assoc., Inc., 55 Wheeler St., Cambridge, Massachusetts, 02138; Joan Mullen.

(15) An Evaluation of Policy Related Research on Standards of Effectiveness for Pre-Trial Release Programs—National Center for State Courts, 725 Madison Place, N.W., Washington, D.C., 20005; Barry Mahoney.


(20) An Evaluation of Policy Related Research on Post Secondary Education for the Disadvantaged—Mercy College of Detroit, Dept. of Sociology, Detroit, Michigan, 48219; Mary Janet Mulka.

Copies of the above cited research evaluation reports for both Municipal Systems and Human Resources may be obtained directly from the principal investigator or from the National Technical Information Service (NTIS), U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia, 22151, (Telephone: 703/321-8517).

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It is a policy of the Division of Social Systems and Human Resources to assess the relevance, utility, and quality of the projects it supports. Should any readers of this report have comments in these or other regards, we would be particularly grateful to receive them as they become essential tools in the planning of future programs.

John Surmeier
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Division of Social Systems
and Human Resources