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Environmental Monitoring

By J.S. Hunter
Princeton University and Committee on National Statistics

In June 1973 the Subcommittee on Agriculture, Environmental, and Consumer Protection of the Appropriations Committee of the U.S. House of Representatives held extensive hearings on the activities of the Environmental Protection Agency (EPA), and the ensuing appropriations bill for fiscal year 1974 directed the agency to contract with the National Academy of Sciences for a series of analytical advisory studies. EPA and the Academy agreed upon a program that would respond to the congressional intent by exploring two major areas: the process of acquisition and use of scientific and technical information in environmental regulatory decisionmaking: and the analysis of selected current environmental problems. A series of reports resulted. One of them, *Environmental Monitoring,*[1] was undertaken by a study group sponsored by the Committee on National Statistics in collaboration with the Numerical Data Advisory Board and the Environmental Studies Board.

The study group consisted of a Steering Group chaired by Professor John W. Pratt, Department of Statistics, Harvard University, and three panels:

(1) Panel on Ambient Monitoring
Chairman, Morris DeGroot (Carnegie Mellon University)
(2) Panel on Source Monitoring
Chairman, Walter A. Lyon (Pennsylvania Department of Environmental Resources)
(3) Panel on Effects Monitoring
Chairman, Marvin Kuschner (State University of New York, Stoney Brook)

Each panel was augmented by additional scientists with specialized backgrounds primarily from academia and government. The project staff was directed by Dr. Miron Straf.

This short article discusses some of the statistical problems faced by the Agency. We begin with a brief description of the three general classes of monitoring identified by the study groups: source monitoring, ambient monitoring and effects monitoring.

Source Monitoring

Source monitoring plays an important role in the establishment and enforcement of environmental standards and regulations. It is concerned with the nature and the amounts of "residuals" (materials or energy left over from an industrial, agricultural or natural activity) that may be said to pollute. Other pollutants include noise, radiation, solid wastes, and depending upon their use, pesticides and hazardous substances. Point sources of pollution (industrial stacks, sewage discharge pipes) require inventories to establish the kinds and amounts of residuals being emitted, and audits to ensure that regulations are met. Nonpoint sources, such as cities, farm lands, feed lots, mines and forests must also be inventoried and monitored. Mobile sources, such as motor vehicles, barges and trucks form additional sources of pollution requiring surveillance.

One of the first requirements of source monitoring is the establishment of an inventory. Both the location and character of point sources must be determined along with the amounts and types of residuals emanating from each source. This information is needed to establish where the heaviest stresses on the environment occur, to establish bench marks for the writing of regulations, and as a means to check for compliance. Inventories of nonpoint sources of pollution require careful geographic and demographic studies. Mobile source inventories are often

based upon motor vehicle registrations and traffic surveys.

The inventory of sources of pollution have benefitted by the requirement, established in the Water Pollution Control Act of 1972, that every discharger of pollutants into the Nation's waters obtain a National Pollution Discharge Elimination System (NPDES) permit. In late 1976 approximately 60,000 NPDES permits had been issued, one-third to municipalities operating sewage disposal plants. It is estimated that approximately 99% of the major water pollution sources are now covered by this permit system. Each permit requires that regular samples be taken and analyzed, that records be kept and reports made to the EPA or other authorities testifying to performance. One objective of the permit system is to force compliance with Federal timetables for achieving the best possible water treatment control technology by 1983. To help meet these goals an $18 billion construction program for wastewater treatment is now being administered by the EPA, and a projected $150 billion may be required to meet the 1983 objectives.

The monitoring of point sources of air pollution is less formally organized, although extensive reporting systems for monitoring emissions from industrial stacks and vents does exist for each State within separate air quality control regions. To handle these and other air pollution data, the EPA maintains a national emissions data system (NEDS).

The transportation of toxic or hazardous substances is also subject to regulation by the EPA under the Resource and Recovery Act of 1976. The monitoring of spills, their types, causes and location, particularly of oil and hazardous substances, is shared with other Federal agencies such as the Department of Transportation and the U.S. Coast Guard.

Ambient Monitoring

The major objectives of ambient monitoring are to determine base levels and background concentrations for pollutants, to measure how well environmental standards are being met, and to estimate trends in environmental quality. Much of the work in ambient monitoring is analogous to many of the activities of the Weather Bureau, or the U.S. Geological Survey (USGS).

An extensive ambient air monitoring program is supported by EPA as the result of the Clean Air Act Amendments of 1970. National Ambient Air Quality Standards (NAAQS) have been established for six "criteria" pollutants (SO_2, CO, NO_2, Oxidants, total suspended particulates, and hydrocarbons) and for many other "non-criteria" air pollutants such as sulphur, ozone and lead. Several thousand air monitoring stations are in operation throughout the United States. The data from these stations help form the basis for State implementation plans (SIP) for achieving the NAAQS. EPA regulations require the attainment of NAAQS within 3 years of the approval of an SIP, with a 2-year extension period possible.

Several Federal agencies, for example the U.S. Geological Survey, maintain approximately 10,000 stations for monitoring ambient surface water quality. Ground water monitoring, another important ambient activity, is supported by some 3000 ground water surveillance sampling stations. Much of this water data finds its way into various EPA data storage banks, in particular STORET.

Inherent to ambient monitoring is the establishment of monitoring or surveillance networks. The organization of a network of environmental sensors, coupled to a model useful for forecasting, is of great importance in controlling pollution over a region. The modeling problem is complicated. For example, to construct models capable of simulating air pollution levels over a region it is important to consider the mixing in the atmosphere of pollutants emanating from both stationary and moving sources, all influenced by the geography of the region being modeled. Such models must also consider the changing chemical composition of many air pollutants caused by sunshine, and changes in temperature and weather.

Coupled to problems of modeling are the various strategies for sample collection (spot, continuous, mobile, fixed) and measures of cost effectiveness. Remote sensing, particularly from satellites, provides additional means for monitoring the environment, particularly land use, water resources, and changes in industrial and agricultural development. The evaluation of trends in environmental quality is a natural consequence of ambient monitoring, most trend analyses making extensive use of retrospective

studies of ambient data records. For example, the Council on Environmental Quality (CEQ) uses data on the percentage of time ambient standards have been exceeded as a rough measure of an improving environment.

Effects Monitoring

The health effects of environmental pollutants are particularly difficult to quantify. One extensive investigation of the relationship of human health to air pollution was CHESS (the Community Health and Environmental Health System), a series of epidemiological studies of eight U.S. communities. Investigated were the role of particulates, sulfur-oxides and other air pollutants on the health of children, asthmatics and the elderly. Although several of the inferences drawn from this study were later seriously criticized, the study did point out the need for far better data than were then, or are now, available.

The problem of effects monitoring is complicated by the many-variate and dynamic aspects of both the cause and effect variables. Measuring actual human exposure has stimulated interest in personal dosimeters. The careful historical surveillance of plants and animals has also provided a partial means for measuring long-term, low dosage effects of pollutants on humans. In a national inventory of efforts to monitor biological effects, compiled by the Oak Ridge National laboratory, only a few programs were found to involve air pollutants. Recent investigations of drinking water quality, particularly the identification of possible carcinogens in drinking water, has evoked widespread concern.

By its very nature the monitoring of health effects requires the EPA to collaborate with many other organizations, in particular the National Institute for Occupational Safety and Health, the National Cancer Institute, and the National Center for Health Statistics.

Role of Statistics in Monitoring

The EPA faces diverse statistical problems. Many of these statistical problems are related to the measurement of physical, chemical and biological characteristics, to the construction of models to elucidate these natural phenomena, and to the establishment of networks designed to monitor environmental responses. At present, of course, all matters concerned with the improved gathering, compiling, analyzing, publishing and dissemination of statistical information come under the surveillance and guidance of the Office of Federal Statistical Policy and Standards, U.S. Department of Commerce. The diverse nature of the statistical problems described here will add materially to the responsibilities faced by this office.

It is interesting to note that each datum obtained by today's statistician may be classified into one of three possible forms: categorical (size of city), nominal (sex), or quantitative (tons). And usually, when the measure is quantitative, there is little concern over the actual measurement itself, whether it be a mile, gallon, kilowatt, ton, a second of time, or a degree Celsius. Such physical measurements are commonly taken for granted; that is, they are defined, precise, stable, and under control. Said another way, these observations have the same meaning and value whether recorded in Maine or in Hawaii (thanks in large part to the considerable efforts of the National Bureau of Standards). We now note an important aspect of many of the statistical problems faced by the EPA. Individual observations (for example, the amount of SO_2 in the atmosphere in parts per million) may be subject to considerable uncontrolled measurement variability. That is, laboratories A and B, even though measuring a standard sample of atmospheric SO_2, may come up with dramatically different observed values. It is not widely recognized that many measurements commonly employed in sensing the environment have a coefficient of variation (the ratio of their standard deviation divided by their mean) in excess of 20% even when the observations are recorded within a single laboratory by the same individuals utilizing the same instrument. (In much scientific work a coefficient of variation in excess of 10% is considered poor). When the additional interlaboratory biases are included in the estimate of the variability of measurements, it is common to conclude that the measurement process is unstable or not under control. Thus in addition to all the other statistical problems faced by the EPA, physical *measurement methods* must also be established and maintained.

A portion of *Environmental Monitoring* discusses the problems of establishing dependable measurement *methods* and measurement *processes* for environmental responses. A measurement method is defined to be the unique

physical-chemical system used to quantify the amount of a substance in a sample. The measurement process is defined to include all the activities associated with the generation of data, beginning with sampling the environment, the use of a standard measurement method to quantify the response, the application of quality assurance activities to guarantee homogeneous measurements across laboratories and regions, and finally the care and handling of the resultant data.

A good measurement method should be a) traceable to national reference standards, b) specific to the environmental characteristic under study, c) compatible with other measurement methods for the same characteristic and d) simple and inexpensive. Of course, both the precision and bias of the method should be well-documented. The standardization of measurement methods is essential in all scientific work. To this end the EPA has established *reference* measurement methods, and in addition, manufactures many of its own *reference standard materials.*

There are many statistical problems associated with the development of a measurement method. The physical measurement system (for example, the chemiluminescence of a chemical reaction or the color intensity of a liquid , must have statistically stable characteristics; the mathematical relationship necessary to produce the final measurement should be studied and its components of variance determined; the sensitivity of the measurement method to slight variations in analysis protocol must be determined; and the variabilities due to operators must be estimated. In addition, the nature of the distributions of repeated observations should be well-documented. Unfortunately, there are many environmental reference measurement methods for which no estimates of either precision or bias are available, or for which no studies of sensitivity or components of variance have ever been made. The EPA is working to determine the precision and accuracy of its more important pollutant measurement methods. It has also adopted selected measurement methods developed by other organizations, for example, by the ASTM (the American Society for Testing Materials) or agencies (the USGS).

The establishment of a measurement *process* involves additional statistical problems. For example, to obtain an environmental measurement, a sample must either be isolated and brought to a measuring instrument, or the instrument placed in the environment to obtain an *in-situ* sample. The sample location, timing, size and type (grab, composite, intermittent, continuous) must be determined. Protocols are required for documenting the chain of responsibility for handling the sample, and for recording the sample's observed responses. It is important to note that much environmental sampling, particularly of point sources, is not performed by the agency itself but by the States, municipalities, and by industry itself.

Once the measurement method and sampling protocols have been determined, the measurement process next requires extensive programs of interlaboratory comparison. For example, laboratories are asked to measure one or more responses on some "unknown" sample. The laboratories' results are then gathered together, analyzed and published, thus providing each laboratory with a check of its performance against that of other laboratories (confidentiality is maintained). In addition to these programs of measurement quality assurance, the agency has also inaugurated a national program of certification for laboratories performing drinking water analyses.

In establishing hundreds of reference measurement processes, the agency has acquired a responsibility for good measurement analogous to that of the National Bureau of Standards. As a consequence, the Agency is becoming a major user, and advocate, of statistical practices applied to measurement in the natural sciences and engineering.

The Agency must also provide for data processing and information handling. *Environmental Monitoring* noted that EPA's data systems were quite heterogeneous with respect to both hardware and software with perhaps too much emphasis on data storage and retrieval and too little emphasis on data analysis and quality assurance.

Establishing regulations for the control of environmental pollutants is another responsibility of the EPA. Regulations have been based upon historical data, when available, combined with the best theoretical and experimental information available. Many regulations have their critical upper boundaries based upon three stand-

ard deviation limits constructed from historical data. The important task of establishing environmental regulations based upon the statistical control of Type I and Type II errors, or other analogous cost-benefit criteria, lies ahead. The multivariate aspects of most environmental control activities have only been touched.

Perhaps the greatest need for statistical expertise within the EPA comes in its attempt to monitor health effects. Long-term epidemiological studies appear to be the only way to resolve the problems of determining pollution thresholds, and for establishing valid quantitative pollution dose-response relationships. The compatibility of data resources drawn from various health agencies (NIH, OSHA, NIOSH, NCHS) and environmental agencies (EPA, USGS, NOAA) offers additional statistical problems. Since many pollutants that can affect one's health are found in or near an industrial environment, a well designed system of occupational health statistics is needed. The present OSHA-Bureau of Labor Statistics survey on occupational illness or injuries does not go far enough in providing information on incidence rates of disease, particularly of environmental effects. The sampling of physicians' records, workmen's compensation claims, social security disability insurance claims and employer records should be planned. At the very least, employers' records bearing on the health of workers should not be destroyed. Underlying all statistical problems associated with health effects modeling is, of course, the need to protect confidentiality.

The agency also faces other statistical problems familiar to the readers of *Statistical Reporter*. Of great importance is the definition and use of statistical terms. A consistent statistical language is only beginning to be used by the agency The additional lack of standardization of definitions of an industrial unit, or pollution outfall, complicates the taking of inventories of point sources of pollution, and the establishment of audits. For example, the suggestion has been made that the Standard Industrial Classification (SIC) code should be used so that inventories of pollutants and other industrial characteristics could be easily compared.

Statisticians also recognize that the handling of vast amounts of numerical data requires the standardization of forms and data processing protocols. A quality assurance and audit procedure of recordkeeping activities, such as those associated with the NPDES permits system, will require stratified sampling plans to ensure major sources of pollution are properly included.

Statistical Recommendations

The Study Group made many recommendations in its report to EPA. Perhaps the major recommendation was that an "Office of Science" be established within EPA with the objective, in part, "to improve data collection by more scientific influence and direction." Here, briefly paraphrased, are some of the other recommendations of interest to statisticians.

It is recommended that:

- the design of ambient monitoring networks be based upon prototype studies, to include consideration of the kinds of data needed (physical, meteorologic, chemical), the types of data analysis (forecasting, determining trends, developing models), the strategies for data collection (inventories, sampling), and how the data are to be used in decision making;
- careful planning begin for long-term multicity studies of the effects of pollution on human health;
- the agency relate its data to data on environmental effects collected by other agencies;
- plans be made for the coding of data for the calculation of measures of occupational mortality to involve the 1980 census, that employee work records be maintained over long enough periods to permit epidemiological studies, and that there be a National Death Index;
- a continuing certification program be established for laboratories performing measurements;
- EPA, in contemplating changes in data handling systems, develop prototypes to ensure that data collection procedures and computer systems meet specific needs; and
- EPA develop talent of sufficient quantity and character to meet its many statistical responsibilities, and establish at least one senior statistician to advise EPA manage-

ment on the entire range of the agency's statistical concerns.

It is good news to note that the Agency has already proceeded to implement the last recommendation by setting up a statistics group within the EPA's Office of Planning and Management. Essential to the success of this group will be its ability to coalesce the arts and sciences of both statistics and the environment.

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[1]Copies of the report *Environmental Monitoring* are available from the Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418, for $7.75. The report also contains several appendices:

1. Monitoring Genetics Effects in Man (John V. Neel)
2. The Maumee Estuary, A Case History (Michael Shapiro and Myron Fiering)
3. Incorporating Uncertainty into Environmental Guidelines (J.S. Hunter)
4. Directories of Monitoring Programs and Monitoring Information Centers.

Also available are abstracts of several working papers:

(1) Quality Assessment of Measurement Methods (J.S. Hunter)
(2) Ambient Air Monitoring Methods (John Kinosian)
(3) Personal Air Quality Minitors (Lance Wallace)

These papers are reproduced in full in *Environmental Monitoring Supplement*, available on request from the Committee on National Statistics, 2101 Constitution Avenue, Washington, D.C. 20418.

CURRENT DEVELOPMENTS

1978 EMPLOYMENT AND TRAINING REPORT OF THE PRESIDENT

President Carter's first employment and training report to the Congress—published May 25—details an overall employment strategy aimed at assuring jobs for all Americans willing and able to work. The 16th annual *Employment and Training Report of the President* was prepared by the Department of Labor, and the Department of Health, Education, and Welfare, as required by the Comprehensive Employment and Training Act (CETA).

Secretary of Labor Ray Marshall, in a preface to the report, outlines the Carter Administration's employment strategy for the next 3 years, guided by five basic objectives:

—Reduce the severe structural elements of general unemployment, particularly the problems of minorities, youth, and distressed areas.

—Address the factors that affect the supply and demand for labor and impede the achievement of full employment.

—Provide a mechanism for the employment of the long-term unemployed during recessions.

—Build a stronger and simpler employment and training delivery system.

—Improve the quality of working life.

Marshall pointed out that the expenditure of billions of dollars in Federal funds on employment, training, and other social programs since the 1960's has not succeeded in narrowing the disparity between the rate of unemployment for blacks and other minorities and the rate for the general population. He called for targeting of the training and employment provisions of CETA to assure that these services are geared to meet the needs of economically disadvantaged Americans.

The first section of the report is an account of the employment, unemployment, labor force participation, wages, and productivity trends during calendar year 1977.

The second section reviews the Labor Department's activities during fiscal 1977, with emphasis on those programs mandated by the CETA legislation.

The next two sections focus specifically on the special employment-related problems of youth and older workers.

The fifth section examines the labor market impacts of immigration to the United States since the late 19th century, with special emphasis on current proposals for reducing the flow of undocumented aliens into the U.S.

The sixth section describes the employment opportunity component of the administration's welfare reform proposal, summarizing the goals, advantages, and costs of a job approach.

About half of the 342-page report is devoted to an updated statistical appendix containing historical and projected data on the size, characteristics, and work experience of the labor force, as well as CETA program data and other economic indicators.

The 1978 *Employment and Training Report of the President* may be obtained for $5.25 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, stock no. 029-000-00305-0. (BETSY SCHMIDT, EMPLOYMENT AND TRAINING ADMINISTRATION, U.S. DEPARTMENT OF LABOR, telephone (202) 376-6620.)

FRB REDUCES STATISTICAL REPORTING BURDEN ON BANKS

On June 2, 1978, The Board of Governors of the Federal Reserve System approved two actions reducing the burden on commercial banks of statistical reporting to the Board.

The Board discontinued the annual collection of data from all the nation's 14,683 banks on their outstanding loans to customers other than dealers made for the purpose of buying or carrying securities (Form U-4A). It also discontinued monthly collection from a sample of 72

banks of data on such loans (Form U-4M). The Board found that these reports lend little value since such bank credit varied little from year to year and other sources of relevant information are now available.

The Board further reduced bank statistical reporting by reducing from monthly to four times yearly the reporting by some 240 member banks on interest rates charged on various types of consumer loans (FR 835b). These reports (renumbered FR 2835) will be based on data for August, November, February and May. The final monthly report—for June 1978—is schedule to be published in July.

This consumer finance rate report was initiated in 1971 in response to a request from the President's Committee on Interest and Dividends (since expired), as a means of monitoring consumer interest rates at banks. The Board has recently collected the data from a volunteer sample of member banks—including most of the Nation's 150 largest banks—published monthly as statistical report G. 10. The report provides data of use in evaluating trends in consumer loan interest rates in relation to general credit flows. Consumer finance rate data are furnished upon request for individual reporting banks.

With a view to continuing to provide the public with the information in this report on consumer interest rates and preserving the analytical base the report furnishes, while at the same time minimizing the burden of bank statistical reporting, the Board:

—reduced the frequency of the report from once a month to once each three months;

—released from the reporting panel six banks with less than $70 million assets; and

—combined into one item separate reports on "other" loans for consumer goods and on personal expenditures.

The revision will call for only about one third as much reporting as previously. (GALEN D. BURGHARDT, telephone (202) 452-3757 and JAMES A. PFLUEGER, DIVISION OF RESEARCH AND STATISTICS, FEDERAL RESERVE BOARD.)

FOOD STAMP PARTICIPATION OF HIRED FARMWORKER FAMILIES

The Economics, Statistics, and Cooperatives Service in the U.S. Department of Agriculture recently released a report entitled *Food Stamp Participation of Hired Farmworker Families.*

This report presents a socioeconomic profile of approximately 207,000 hired farmworker families (including 9,000 migrant families) participating in the Food Stamp Program in November 1975 and identifies various factors related to program participation. These families contained approximately 1.1 million family members, averaging 5.3 members per family. Hired farmworker families were almost twice as likely to participate in the Food Stamp Program as all U.S. families. Family income and size, ethnicity, and region were highly associated with farmworker family participation. In addition, the socioeconomic characteristics of farmworker food stamp families differed considerably from those of all hired farmworker families and all U.S. families receiving food stamps.

Single copies of the report (AER No. 403) are available free upon request from Leslie W. Smith, Economics, Statistics, and Cooperatives Service, U.S. Department of Agriculture, Washington, D.C. 20250, or telephone (202) 447-8911. (LESLIE W. SMITH, ECONOMICS, STATISTICS, AND COOPERATIVES SERVICE, U.S. DEPARTMENT OF AGRICULTURE, telephone (202) 447-8911.)

MARITAL STATUS AND LIVING ARRANGEMENTS

The Bureau of the Census recently released a report entitled "Marital Status and Living Arrangements: March 1977." This report presents data on the marital status of persons 14 years old and over, family relationship, presence of parents for persons under 18 years old, and household living arrangements of the noninstitutional population of the United States.

In comparing data from the 1977 survey with data from earlier surveys, it was found that (1) more adults are remaining single or postponing first marriage; (2) the number of households composed entirely of unrelated persons is increasing; (3) the estimated level of divorce is rising; (4) a greater number of families are being maintained by persons without a spouse; and (5) the youthful population is decreasing but the number of children living with only one parent is increasing.

These and other trends discussed in this report reflect the changing behavior of adults regarding marriage, divorce, and living arrangements and have important bearing on the direction and content of current and future social and economic programs.

Copies of this report, "Marital Status and Living Arrangements: March 1977," *Current Population Reports,* Series P-20, No. 323 (60 pages, $2.30), may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. (ARLENE F. SALUTER, BUREAU OF THE CENSUS, DEPARTMENT OF COMMERCE, telephone (301) 763-5189.)

COUNTY VETERAN POPULATION

The Veterans Administration has recently released Research Monograph No. 12 entitled, "County Veteran Population, March 1977". This monograph presents estimates of living veterans in civil life as of March 31, 1977, in each of the 50 states and the District of Columbia and in each of the 3,096 counties and 46 independent cities according to their most recent period of military service. Also appearing in the monograph is a table showing the estimated number of veterans in civil life, by State and age as of March 31, 1977, and a list of the ten counties in the United States with the largest estimated veteran population.

The State and county estimates contained in this monograph utilize the results of the 1970 Census of Population. State, county and independent city estimates are the product of veteran geographic distribution factors, as of April 1, 1970, extended to March 31, 1977, by applying appropriate demographic techniques to the Veterans Administration's independent estimates of the veteran population by period of service as of March 31, 1977.

A limited number of copies of this Research Monograph are available. Copies may be obtained from the Reports and Statistics Services (042A1), Controller, Veterans Administration, Washington, D.C. 20420. (WILLIAM A. MALOY, REPORTS AND STATISTICS SERVICE, CONTROLLER, VETERANS ADMINISTRATION, telephone (202) 389-3012.)

GEOGRAPHIC DISTRIBUTION OF VA EXPENDITURES

The Veterans Administration has recently released a publication entitled *Geographic Distribution of VA Expenditures - Fiscal Year 1977.* This report provides estimates of the impact of VA programs on every state, county, and congressional district in the United States. Expenditures are shown for the following six categories: compensation and pension, readjustment and vocational rehabilitation, insurance and indemnities, direct loans, construction and related costs, and regional office and hospital operating costs. The agency total for FY 1977 was over $19 billion. Amounts for individual states ranged between California's $2 billion and Alaska's $23 million.

Single copies of the "Geographic Distribution of VA Expenditures" are available from Reports and Statistics Service (042B2), Office of Controller, Veterans Administration, Washington, D.C. 20420 (ROBERT W. SCHULTZ, VETERANS ADMINISTRATION, telephone (202) 339-3677.)

VOTING AND REGISTRATION IN THE ELECTION OF NOVEMBER 1976

The Bureau of the Census recently released a detailed report entitled "Voting and Registration in the Election of November 1976." This report continues the *Current Population Reports,* Series P-20, biennial reports on voting and registration begun in 1964.

The report documents the continuing decline in voter turnout and attributes much of the decline to the changing age structure of the American electorate. Comparisons of voter turnout in 1976 are made with turnout in the 1964 and 1972 Presidential elections.

New data in this report show voting and registration by single years of age, household relationship, congruence of husband and wife voting, voting in the primaries, and some data for Divisions and States.

Copies of this report, "Voting and Registration in the Election of November 1976," *Current Population Reports,* Series P-20, No. 322 (134 pages, $3.00) may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. (JERRY T. JENNINGS, BUREAU OF THE CENSUS, DEPARTMENT OF COMMERCE, telephone (301) 763-5050.)

VETERANS BENEFITS UNDER CURRENT EDUCATIONAL PROGRAMS

The Veterans Administration has released an information bulletin entitled *Veterans Benefits*

under Current Educational Programs—Fiscal Year 1977. This publication provides statistical data and analysis on the three educational programs administered by the VA Department of Veterans Benefits. Emphasis is placed on training during fiscal year 1977 under the post-Korean conflict GI bill—in particular Vietnam era veterans.

The current GI bill went into effect on June 1, 1966. GI bill training is not just a payment to a veteran while he is in college. It includes in addition, vocational training, high school training, on-job training, flight training and training by correspondence. the trainee is eligible for educational loans, tutorial assistance, remedial or deficiency training, and additional assistance for dependents. This bulletin discusses the various aspects of training; in addition to the narrative, this 68 page pamphlet includes almost 50 tables, charts and graphs.

Single copies of *Veterans Benefits under Current Educational Programs—Fiscal Year 1977* (IB 04-78-1) are available from Reports & Statistics Service (042A3), Office of Controller, Veterans Administration, 810 Vermont Avenue, N.W., Washington, D.C. 20420. (MICHAEL L. FACINE, VETERANS ADMINISTRATION, telephone (202) 389-2458.)

TRENDS IN HIGHER EDUCATION INSTITUTION FINANCES

In a preliminary report NCES recently published selected data from its Survey of the Financial Statistics of Institutions of Higher Education for the Fiscal Year 1977.

An examination of the data led to the following findings:

1. Despite a 1.5% enrollment decline and an inflation rate (Higher Education Price Index) of only 6.4%, both the current funds revenues and the expenditures of the institutions increased at a rate of 9.7% over the preceding year.
2. For the first time since 1962, publicly controlled institutions had a slower rate of growth (as measured by current funds expenditures) than did privately controlled institutions.
3. The recent trend of the 2-year colleges to expand at a faster pace than universities and other 4-year colleges ended in 1977. Expenditures by 2-year colleges were up 8.7% above the preceding year's total; those for universities were up 9.2% and those for other 4-year colleges increased 10.5 percent.

Other trends established in preceding years continued in 1977. Revenues from tuition and fees continued to supply only 13 percent of total revenues for publicly controlled institutions and 37 percent for privately controlled institutions. The market value of college and university endowment investments increased for the third consecutive year following the big drop in 1974.

The report with the complete and final data from the survey will be available in the fall. Single copies of the preliminary report of the 1977 data, entitled "Financial Statistics of Colleges and Universities, 1977, Preliminary Tabulations" are available at this time from the author, Norman J. Brandt, National Center for Education Statistics, Room 3055, 400 Maryland Avenue, Washington, D.C. 20202, telephone (202) 245-8392. (O. JEAN BRANDES, NATIONAL CENTER FOR EDUCATION STATISTICS, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, telephone (202) 472-5026.)

CLASSIFICATION OF EDUCATIONAL SUBJECT MATTER

The National Center for Education Statistics has just completed Handbook XI, *A Classification of Educational Subject Matter*. The publication of this document represents the culmination of a 2-year effort to produce a single comprehensive recording and reporting scheme that is designed to serve the needs of educational agencies and institutions throughout the United States.

The handbook includes a categorization and definitions for subject matter elements for all levels of education—from pre-elementary through postdoctoral. It provides a single, standardized classification which will facilitate the recording, reporting, and exchange of data about subject matter. The handbook includes an index, glossary, bibliography, and appendices.

Copies of the document, entitled *A Classification of Educational Subject Matter*, Stock Number 017-080-01876-4, may be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. (QUENTIN M. HILL, NATIONAL CENTER FOR

EDUCATION STATISTICS, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, telephone (202) 245-8125.)

DIGEST OF EDUCATION STATISTICS

The National Center for Education Statistics has recently issued the 1977-78 edition of the *Digest of Education Statistics*. The new *Digest* is the 16th in a series of annual publications initiated by this office in 1962. It provides an abstract of statistical information encompassing the broad field of American education from preprimary through graduate school. While emphasizing the survey data and estimates of the National Center for Education Statistics, it utilizes materials from numerous sources, both governmental and nongovernmental.

The *Digest* traditionally has provided statistics on a variety of subjects within the field of education, including the number of schools and colleges, enrollments, teachers, graduates, educational attainment, finances, Federal funds for education, libraries, international education, and research and development. In addition to continuing and updating these basic series, the present edition contains a number of innovations. Included among the new statistics are the following: Data from the National Assessment of Educational Progress concerning the social and political attitudes of 13- and 17-year-olds; the ages for compulsory school attendance in each State; trends in the verbal and mathematical scores on the Scholastic Aptitude Test; college dropout rates for the high school graduating class of 1972; trends in degrees conferred in the behavioral sciences; participation in and expenditures for the school lunch program; and the collections, personnel, and operating expenditures of public school libraries.

Copies of the *Digest* are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for $4.00 each. The stock number is 017-080-01872-1. (W. VANCE GRANT, NATIONAL CENTER FOR EDUCATION STATISTICS, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, telephone (202) 245-8511.)

ALCOHOLISM: A STATISTICAL REVIEW OF VA HOSPITAL PATIENTS

The Veterans Administration has recently released a report entitled *Alcoholism and Problem Drinking: 1970-1975, A Statistical Analysis of VA Hospital Patients.* The purpose of the report is to present data concerning the population of the VA hospital patients who were classified, either by diagnosis or special annual census definition, as alcoholics or problem drinkers in the period 1970-1975. Trends in the size and composition of this diagnositc group are identified over the 6-year period.

Discharges for principal or associated diagnoses of alcoholism increased steadily from approximately 105,000 in 1970 to 168,000 in 1975. The proportion of patients with a principal or associated diagnosis of alcoholism in the annual one-day patient census was 13% in 1970, 15% in 1973, and 15% in 1975. Special census questions elicited information on whether the patient could be classified as an alcoholic or problem drinker irrespective of his/her diagnosis for current hospital episode. In 1970, 15% of the patients were identified as alcoholics, 19% in 1973, and 17% in 1975. Problem drinkers comprised an additional 5% in each of these three years.

Data are also presented on the composition of the hospitalized veteran population classified as alcoholics. Variables such as age, marital status, period of military service and attained stay are included.

Single copies of *Alcoholism and Problem Drinking: 1970-1975, A Statistical Analysis of VA Hospital Patients* are available from Reports and Statistics Service (042A2), Office of the Controller, Veterans Administration, Washington, D.C. 20420 (LOUIS MESARD, VETERANS ADMINISTRATION, telephone (202) 389-3458.)

VA STUDY OF SPINAL CORD INJURY SURVIVAL

A unique modification to standard actuarial techniques was developed to analyze the survival experience of 2,323 veterans who sustained traumatic spinal cord injury in a 10-year period. This study by the Veterans Administration, "Survival After Spinal Cord Trauma: A Life Table Analysis," was published in *Archives of Neurology* February 1978.

Approximately 85% of the paraplegics and 73% of the quadriplegics survived the first month after their injury. This rate is probably higher than the true survival rate of patients who suffer spinal cord injury, because our study does not account for those persons who died at

the scene of the trauma and those who died before being admitted to the VA hospital. The high mortality of the first three months exists regardless of age at injury and level of lesion, but is less pronounced in young persons and the less severely injured. However, of those paraplegic and quadriplegic patients who survived the first three months after injury, the ten year survival rates are quite similar, 86% and 80% respectively.

Single reprints of "Survival After Spinal Cord Trauma: A Life Table Analysis" are available from Reports and Statistics Service (042A2), Office of the Controller, Veterans Administration, Washington, D.C. 20420. (Louis Mesard, Veterans Administration, telephone (202) 389-3458.)

NCHS REIMBURSABLE WORK PROGRAM

In FY 1977 an expanded Reimbursable Work Program RWP was established in NCHS for the purpose of collecting and analyzing health data primarily for other PHS agencies, other DHEW components, and other Federal agencies. A limited number of RWP projects may be accepted from agencies such as State and local governments, universities, public institutions, and non-profit organizations.

For copies of a brochure which gives more detailed information on the RWP contact: Office of Program Development, Room 2-12, Center Building, 3700 East-West Highway, Hyattsville, Maryland 20782. (Louise Kirby, National Center For Statistics, Department of Health, Education, and Welfare, telephone (301) 436-8500.)

RECENT NSF REPORTS

The following *Science Resources Studies Highlights* have been recently released by the National Science Foundation:

"Graduate Science Enrollment Stabilized in 1977" (NSF 78-307) presents information from the fourth annual NSF Quick Response Survey of all 1977 graduate science and engineering enrollment coupled with the final results of the fall 1976 Survey of Graduate Science Student Support and Postdoctorals.

Data are given on graduate students in doctorate-granting institutions by full- and part-time enrollment, sources of support, sex, and citizenship. Characteristics of postdoctorals in these institutions are also discussed. Included for the first time, are data on master's-granting institutions.

"Federal Obligations to Universities and Colleges Rose 19% in FY 1976, Mostly in Nonscience" (NSF 78-308) summarizes information from the annual survey directed to 14 Federal agencies with large programs in support of academic science. These agencies accounted for over 99% of all Federal obligations to universities and colleges for research and development, and 95% of all Federal obligations to academic institutions for all purposes.

Data are given by agency, type of activity, and field of science. A table showing the 100 universities and colleges receiving the largest amounts is also included.

"Industrial R&D Spending Reaches $26.6 Billion in 1976" (NSF 78-306) reports on data from an annual survey of research and development in industry conducted for NSF by the Bureau of the Census. R&D funds are shown by industry, source, and character of work. Special discussions on energy and pollution abatement research and development, R&D funds/net sales, and R&D performed outside the United States by domestic companies are included, as well as information on R&D scientists and engineers.

"National R&D Spending to Exceed $50 Billion in 1979" (NSF 78-304) highlights information from the annual series, *National Patterns of R&D Resources: Funds & Manpower in the United States.* Projections to 1979 are given for both R&D funds and manpower. R&D funds are discussed in terms of source and by character of work.

Copies of the four *Science Resources Studies Highlights* are available gratis upon request from the Division of Science Resources Studies, National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550. (Charles E. Falk, Division of Science Resources Studies, National Science Foundation, telephone (202) 634-4622.)

SECOND MOLDS CONFERENCE

The second conference sponsored by the North American Institute for Modernization of Land Data Systems (MOLDS) will be held October 5-7, 1978, at the Shoreham Americana Hotel in Washington, D.C. The theme will be "Implementation of a Modern Multipurpose

Land Data System." MOLDS is a nonprofit corporation organized exclusively to foster the improvement of Government-operated land data systems. Their first conference was held in 1975.

The conference program will consist of an in-depth exploration of the proper means of implementing a series of interactive land data systems involving at least four subsystems: juridical, fiscal, environmental, and geographic. Each subsystem will be addressed as to administration, operation, and financing. The objective of this multipurpose approach is to provide all the data required by both Government and the public for proper development, utilization, and conveyance of land and its resources.

Specific conference sessions will address the technical, legal, and administrative problems in the implementation of a multipurpose land data system. General discussion forums will also be provided as part of the program.

For more information on the Second MOLDS Conference, registration or housing, please contact: Linda Longest, MOLDS Registration Center, P.O. Box 17413, Dulles International Airport, Washington, D.C. 20041.

PAN AMERICAN STATISTICAL DAY

May 12, the day when the Inter-American Statistical Institute was founded, is celebrated in many countries of the Americas as Pan American Statistical Day. At the VII Inter-American Statistical Conference held in Santo Domingo in November 1977, the delegation from the Dominican Republic introduced a resolution requesting all countries to celebrate Pan American Statistical Day, to give greater emphasis to the importance of statistics in the Americas. The celebration included selecting pioneers in the development of statistics whose life and contributions to statistics should be made known to others in the field. (Maria Elena Gonzalez, Office of Federal Statistical Policy and Standards, Department of Commerce, telephone (202) 673-7953.)

PERSONNEL NOTES

FEDERAL RESERVE BOARD

Division of Research and Statistics: Paul Boltz, formerly of the Banking Section, has been transferred to the Government Finance Section.

UNITED STATES POSTAL SERVICE

Richard E. Deighton has been appointed Manager of Operations Statistics. He was formerly Principal Mathematical Statistician in the Statistical Analysis Division.

AWARD

DEPARTMENT OF HEALTH EDUCATION AND WELFARE

National Center for Health Statistics: Dorothy Rice, Director, National Center for Health Statistics has received an award from the Jack C. Massey Foundation for outstanding achievement in the health sciences. She is cited for having "provided outstanding leadership in the development and management of an indispensable nationwide health care information system which is accepted, utilized, and participated in by the entire health field, in both public and private sectors."

SCHEDULE OF RELEASE DATES FOR PRINCIPAL FEDERAL ECONOMIC INDICATORS

August 1978

Release dates scheduled by agencies responsible for the principal economic indicators of the Federal Government are given below. *These are target dates* that will be met in the majority of cases. *Occasionally agencies may be able to release data a day or so earlier or may be forced by unavoidable compilation problems to release a report one or more days later.*

A similar schedule will be shown here each month covering release dates for the following month. The indicators are identified by the title of the releases in which they are included; the source agency; the release identification number where applicable; and the *Business Conditions Digest* series numbers for all BCD series included, shown in parentheses. Release date information for additional series can be found in publications of the sponsoring agencies.

(Any inquiries about these series should be directed to the issuing agency.)

Date	*Subject*	*Data For*
August 1	Construction Expenditures (Press release), Census, C-30 (69)	June
2	Manufacturers' Shipments, Inventories, and Orders, Census, M3-1 (65)	June
2	Open Market Money Rates and Bond Prices, Federal Reserve Board (FRB), G.13	July
2	Condition Report of Large Commercial Banks, FRB, H.4.2 (72, 112)	Week Ending July 26
3	Money Stock Measures, FRB, H.6 (85, 102, 107, 108)	Week Ending July 26
3	Factors Affecting Bank Reserves and Condition Statement of Federal Reserve Banks, FRB, H.4.1 (93, 94)	Week Ending August 2
4	The Employment Situation (Press release), Bureau of Labor Statistics (BLS) (1, 21, 37, 40-44, 91, 340, 442, 444-448, 451-453	July
4	Consumer Credit, FRB, G. 19 (66, 113)	June
8	Manufacturers' Export Sales and Orders, Census, M4-A	June
9	Monthly Wholesale Trade (Press release), Census, BW	June
9	Condition Report of Large Commercial Banks, FRB, H.4.2 (72, 112)	Week Ending August 2
10	Money Stock Measures, FRB, H.6 (85, 102, 107, 108)	Week Ending August 2

Date	*Subject*	*Data For*
August 10	Factors Affecting Bank Reserves and Condition Statement of Federal Reserve Banks, FRB, H.4.1 (93, 94)	Week Ending August 9
10	Producer Price Indexes (Press release), BLS, (330-334)	July
10	Crop Production, Agriculture	August 1
10	Advance Monthly Retail Sales (Press release), Census (54)	July
11	Supply Demand Estimates, Agriculture	Current Marketing Season
15	Food Assistance Programs Results, Agriculture	June
15	Yields on FHA Insured New Home 30-Year Mortgages, HUD (118)	August 1
15	Industrial Production and Related Data, FRB, G.12.3 (47,73-76)	July
16	Manufacturing and Trade: Inventories and Sales, (Bureau of Economic Analysis (BEA (31, 56, 71)	June
16	Housing Starts (Press release), Census, C-20 (28, 29)	July
16	Condition Report of Large Commercial Banks, FRB, H.4.2 (72, 112)	Week ending August 9
17	Money Stock Measures, FRB, H.6 (85, 102, 107, 108)	Week ending August 9
17	Factors Affecting Bank Reserves and Condition Statement of Federal Reserve Banks, FRB, H.4.1	Week ending August 16
17	Personal Income, BEA (223)	July
17	Output, Capacity, and Capacity Utilization, FRB, G.3 (82, 84)	July
18	Corporate Profits, BEA (16, 22, 68)	2 Q '78
18	Gross National Product (Revised), BEA (200, 205, 210)	2 Q '78
22	Federal Receipts and Expenditures, NIPA Basis, BEA (500, 501, 502)	2 Q '78
22	Advance Report on Durable Goods, Manufacturers Shipments and Orders (Press release), Census M3-1 (6, 24, 25, 96, 548)	July
23	Average Yields of Long-Term Bonds, Treasury Bulletin (115, 116)	June
23	Condition Report of Large Commercial Banks, FRB, H.4.2 (72, 112)	Week Ending August 16
24	Money Stock Measures, FRB, H.6 (85, 102, 107, 108)	Week Ending August 16
24	Factors Affecting Bank Reserves and Condition Statement of Federal Reserve Banks, FRB, H.4.1 (93, 94)	Week Ending August 23

Date	Subject	Data For
August 25	Export and Import Merchandise Trade, Census, FT-900 (602, 612)	July
28	Productivity and Costs in Nonfinancial Corporate Sector, BLS	2 Q '78
28	Work Stoppages (Press release), BLS	July
29	Consumer Price Index (Press Release), BLS (320-332)	July
29	Real Earnings (Press release), BLS (341)	July
30	Composite Indexes of Leading, Coincident and Lagging Indicators (Press Release) BEA	July
30	Labor Turnover in Manufacturing (Press release), BLS (2, 3, 4)	July
30	Manufacturers' Shipments, Inventories, and Orders, Census, M3-1 (65)	July
30	Condition Report of Large Commercial Banks, FRB, H.4.2 (72, 112)	Week Ending August 23
31	Money Stock Measures, FRB, H.6 (85, 102, 107, 108)	Week Ending August 23
31	Factors Affecting Bank Reserves and Condition Statement of Federal Reserve Banks, FRB, H.4.1 (93, 94)	Week Ending August 30
31	Agricultural Prices, Agriculture	Mid-August

AGENCY REPRESENTATIVES FOR DISTRIBUTION AND NEWS ITEMS

		Telephone
Agriculture:	Donald W. Barrowman Economics, Statistics & Cooperatives Service	447–6201
Commerce:	Tim Coss Office of Publications	377–4233
Census:	Harold Nisselson	763–2562
	Jeffrey Hall (news items)	763–7454
BEA:	Ago Ambre	523–0777
	Ann Winkler (personnel notes)	523–0890
Defense:	Mary Frances White, OSD Comptroller	695–6365
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BLS:	Henry Lowenstern	523–1327
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	Bernard Rein	376–7356
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NSF:	Charles E. Falk, Div. of Science Resources Studies	634–4634
	Mary M. Boyden	634–4622
U.S. Civil Serv. Comm.		
	Philip Schneider	632–6808
USPS:	Richard E. Deighton, Statistical Analysis Division	245–4195
VA:	Howard J. Sharon, Director of Reports and Statistics Service	DU9–2423

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