

APPLICATION OF DOMESTIC INFORMATION DISPLAY SYSTEM TO ALABAMA  
INFANT MORTALITY

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I. Introduction

Alabama has one of the highest infant mortality rates among the states in the United States, ranking 49th in 1976 with a rate of 20.0 per 1000 live births compared to 15.2 for the United States. Although the rate among non-whites (28.7) is almost double the rate among whites (15.2) in Alabama, both segments of the population rank poorly among the other states. In 1976 Alabama's infant mortality rate among whites ranked 45th compared to that of whites in other states, while that for non-whites ranked 46th among the states. Alabama is a predominantly rural state with 42 percent of its population being classified as rural in the 1970 census. Eleven of Alabama's 67 counties were 100 percent rural, with an additional 37 counties being more than 50 percent rural.

Infant mortality rates vary considerably from county to county in Alabama. This partially is a reflection of their diverse racial composition; in 1970 this ranged from less than one percent non-white in one county to over 80 percent non-white in another county. Infant mortality rates in many of Alabama's rural counties are as high as those in less developed countries in the third

world. For the five year period 1973-77, sixteen Alabama counties had rates higher than that of Thailand, for example. In 32 of 67 counties non-white (primarily black) babies had rates higher than those of Brunei, Jamaica, or Cuba. Clearly, the benefits of an advanced society are not reaching a large part of Alabama citizenry.

Infant mortality has been found by international economists to be the most useful single indicator of the status of a country's socio-economic development as well as its health care delivery system. In addition to being a good index of general conditions, infant mortality should be given priority in health planning for other reasons. First, it is a solvable problem; the rate in Sweden where health services are high in quality and reach everyone was 8.7 in 1976. Second, if not dealt with effectively, its cost multiplies many times over. Many of the babies damaged from lack of adequate prenatal care before and at the time of delivery or later during infancy from untreated malnutrition or disease do not die, but survive with mental retardation, congenital defects, or other handicaps. Survivors of our negligence, these victims will require life time support by society at tremendous cost. Not only the severe and obvious cases are costly; many of our huge burden of welfare recipients were children minimally brain damaged during gestation or infancy from toxemia, malnutrition, or other treatable illnesses. By one estimate, each family in the United States is paying \$80 in federal taxes annually because of inadequate care to pregnant women and children.

Alabama's infant mortality rate has been and continues to be a key target for federal and state health planning and programs. The resulting programs have however, failed to solve the problem in many rural counties. The majority of funds do not always reach the areas of greatest need. There are many reasons for this, but one important reason is ineffective presentation of data to decision-makers. This paper describes the use of the Domestic Information Display System (DIDS) to present data on a county basis.

## II. Material and Methods

The Domestic Information Display System (DIDS) is an experimental, color graphic, computer mapping system located at the Goddard Space Center. The hardware (equipment) was originally designed by NASA to visually display meteorological data obtained by satellite and is still primarily used for this purpose. The system has been adapted by NASA in cooperation with the Bureau of the Census and other federal agencies to produce colored maps of demographic and socio-economic data for the United States.

The Domestic Information Display System (DIDS) consists of a mini-computer which supports the necessary software and drives a number of peripheral hardware devices, including hard disk for data storage, a CRT for interactive communication, and a high resolution (512 by 512 matrix) color television screen for visual display of the maps. The system queries the operator concerning a variety of options for producing maps. Data may be displayed for the whole United States, for an individual state, or for one of 21 Standard Metropolitan Statistical Areas (SMSA). If the United States map is used, the data may be presented at the state or county level. If a state map is desired, the data may be shown on a county or congressional district level. Census tract data may be displayed for the SMSA's only.

Data have been provided by a number of governmental agencies. It must be considered as test data at this time since it has not been edited. The operator is given a "menu" of data to select from which includes data from the following agencies: Bureau of the Census, Department of Treasury, Bureau of Labor Statistics, Environmental Protection Agency, Community Services Administration, Economic Development Administration, Department of Energy, Veterans Administration, and Geological Survey. Single variables or combinations of two variables may be mapped. Category boundaries are established automatically by the system so that there are an equal number of counties in the United States in each of six categories. The colors are also automatically set. The operator may override the system to choose more desirable categories and color combinations. More than 60 shades of colors are available, including grays, greens, blues, reds, browns, and yellows.

After all parameters have been defined by the operator, a map appears almost instantaneously on the screen in very brilliant colors with titles, units of measure, and a color key for the categories. If a map of the whole United States is obtained first, but only a particular region of the country is of interest, this region may be selected by positioning a square overlay on that region and requesting a new map. In a matter of seconds, the new map for the selected region appears on screen. At this point colors and categories may be easily and quickly adjusted to revise the maps. When a satisfactory product is obtained, the only hard-copy capabilities currently available are to take Polaroid or 35mm photographs of the screen.

To study the infant mortality problem in Alabama, the DIDS data base was supplemented from several state data sources. In particular, data from the Division of Vital Statistics, Alabama Department of Public Health were used to calculate five-year (1973-77) total infant, total fetal, white infant, and non-white infant mor-

tality rates at the county level. Five-year rates were used because they tend to smooth out the sometimes large fluctuations seen in small populations from year-to-year. Data were also obtained concerning the percent of population who are Medicaid eligible in each county and also the number of physicians per county providing direct patient care. The only DIDS file utilized was per capita health funds data provided by the Community Services Administration.

The data were used during a three-hour session with DIDS to produce several maps. A considerable amount of time was spent becoming familiar with the system's capabilities and experimenting with a number of color schemes. The maps finally produced should be considered as preliminary because of the newness of the system to the investigator and the lack of time to make appropriate refinements in the categories chosen. The maps will be projected at the AUTO-CARTO IV conference, but cannot be appended to the printed version of the paper, due to lack of space and color reproduction. However, a number of preliminary results will be presented and applications to health planning will be discussed. The advantages, disadvantages, and potential of DIDS will also be described.

### III. Results

Single variable maps of 1973-77 infant mortality rates and fetal mortality ratios utilized five categories ranging from low to high. Both maps show a concentration of the problem in a band of counties with high rates across the lower central portion of the state. This region is sometimes referred to as part of the Black Belt stretching through portions of Mississippi, Alabama, and Georgia. The term Black Belt comes from the particularly rich soil of the region. These counties are predominantly rural, with the exception of Montgomery County. Maps such as these vividly display the area of greatest need and impact upon decision-makers much more quickly than would a table of numbers.

A map of 1977 Medicaid eligibility provides an excellent indicator of poverty. Comparing counties with a higher percentage of the population eligible for Medicaid to those with higher infant and fetal mortality rates, a high degree of correlation is clearly evident when using the DIDS system. The two variables (infant mortality rate and Medicaid eligibility) may be displayed on a map simultaneously as a bivariate distribution. Such a map shows directly the correlation between the two variables. With the dichotomous category boundaries used, none of the higher poverty counties have lower infant mortality rates.

With health care delivery problems concentrated in the rural counties of the Black Belt, there ought to be a corresponding concentration of federal health funds in those same areas. At first glance, a map of 1977 per capita federal health funds seems to indicate this to be the case; per capita health funds are more available in the Black Belt area. On closer inspection, however, targeting of these funds is less than satisfactory. Montgomery County, an urban area, receives a high concentration of funds, as is true of Jefferson County where Birmingham is located. One might explain this as funds directed toward urban referral centers or medical schools. Yet neither Huntsville, Mobile, or Tuscaloosa, all urban areas with medical schools active as referral centers, have such a flow of funds. Conversely, counties such as Barbour, Henry, Chilton, and Coosa, which had among the highest infant mortality rates, received only moderate funds for health. An approach more sensitive to local conditions and thus better able to direct federal funds and programs to areas which both need and can effectively utilize them is clearly required. The proposed office of Rural Health Affairs for Alabama, which would bring federal planning decision-making and monitoring to the state level, is such an approach.

In addition to problems in targeting funds, however, rural health problems are different in their basic nature, as well as in degree, from urban areas. A map of white versus non-white infant mortality shows counties where non-white rates are very high, while white rates are low. There are more counties like this than there are counties with both high non-white and high white rates. This indicates that factors other than mere availability of adequate services are operative.

Lack of physicians has been touted as the critical deficiency in rural health. It is evident from a map of non-white infant mortality versus persons per physician, however, that many counties with a relatively adequate supply of physicians still have extremely high infant mortality rates among the non-white population. One county is a good example. With two hospitals and six physicians, it ought to be adequately served. Yet the overall infant mortality rate was 28.6 which is 69 percent above the overall state rate and more than twice the national rate. The rate among its non-white population is 38.2.

#### IV. Discussion

The Domestic Information Display System (DIDS) provides a vivid and dramatic technique for providing data to health planners and decision-makers. The visual, color format quickly imparts an extremely large amount of information. The ability to map two vari-

ables simultaneously is invaluable in illustrating associations as well as exceptions to the rules. The greatest advantage of DIDS is in being able to do all of these things in matters of minutes in an interactive capacity rather than laboriously constructing colored maps over a period of days with conventional techniques.

As stated earlier, DIDS is currently experimental and is in a developmental stage. As a user of the system, a number of needs are apparent. A major need is a hardcopy capability other than photographic that will capture the intensity of the colors as seen on the screen. Other needs include expanded, up-to-date, edited data bases, easier variable transformation software, development of statistical analysis software, and greater availability of the system to users.

As with any mapping technique, the potential for misuse is ever present. With DIDS, category boundaries and colors can be quickly and easily manipulated to promote one's biases, and in doing so, misrepresent the actual data.

The Domestic Information Display System (DIDS) has a fantastic potential for use by not only those in health planning, but also in many other areas as well. This preliminary application of the system to rural Alabama health problems is merely a case in point.

#### References

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