Minnesota's Intergovernmental System: Perspectives of Local Officials

by Thomas R. Peek and Douglas S. Wilson

Several years of slowed economic growth, a financial crisis in state government, federal budget cuts, and other federal actions have significantly altered Minnesota's fiscal system including state-local relations. After struggling for better than two years through numerous special sessions to balance the state's budget, state officials now seem prepared to examine what has happened and the kind of fiscal reform necessary to proceed through the 1980s. A number of evaluations of Minnesota's fiscal system have been conducted or are now underway and many proposals for fiscal system reform have been advocated. In state government the focus of these efforts may be the Governor's Tax Study Commission, charged with making a comprehensive examination of Minnesota's fiscal system including the interrelationships of state and local governments.

The growing discussion of fiscal reform is of vital interest to Minnesota's local jurisdictions. In one way or another they receive and spend most of the revenue raised by state government. Reform of almost any part of the fiscal system will affect Minnesota's local jurisdictions. Understanding the perspectives of local officials thus becomes critical in comprehending the current conditions of state-local relations and the local implications of particular reforms.

To learn about local perspectives, CURA conducted a series of workshops with local officials during the summer of 1983. A representative sampling of officials was chosen from different regions to include county government, city government, and school districts. * Officials were interviewed from jurisdictions that varied in size, political makeup, and financial condition. In all, twenty-nine people were interviewed from the Twin Cities metropolitan area and seventy-one people from jurisdictions in other Minnesota communities. The Twin Cities interviews were conducted in three workshops, while the outstate interviews were conducted individually. Most of the officials had previously participated in CURA workshops or interviews during the winter of 1982 as part of CURA's assessment of the impact of state and federal budget cuts.

Demise of the Minnesota Miracle

The policies inaugurated in Minnesota during the late 1960s and early 1970s for financing local jurisdictions, particularly school districts, attracted extensive national attention. The state-local fiscal sys-

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*This drawing accompanying this article portray the three levels of local government surveyed in this study.
tem developed during those years became known as the “Minnesota Miracle” and was regarded as one of the most innovative undertakings in the state’s history.

The Minnesota Miracle sought three goals: 1) reduced dependence on property taxes for funding local services by substantially increasing aid and property tax relief funded by state revenue sources, 2) equalization of local tax burdens, educational opportunities, and public services through use of elaborate state aid formulas and limitations on local property revenue-raising, and 3) a state guarantee of adequate and stable revenue for local jurisdictions through its aid programs. The third goal, not a part of the initial legislation for the Minnesota Miracle, evolved as the first two goals were implemented. All of these goals have been substantially undermined by modifications during the intervening years.

During the CURA workshops and interviews local officials were asked to comment on the goals, how they were affected by modifications over the years, and on whether they are still appropriate. Comments from two officials reflect the frustrations of others over a system whose goals were accepted by many though it went awry in the face of legislative politics and economic change.

The Minnesota Miracle was a great idea... school people throughout the state lauded the idea with the exception of a few. But the reality is... it was somewhat of a myth; it never worked... Since the Minnesota Miracle was initiated the disparities just kept on getting greater and greater... That was primarily because the miracle was never allowed to work. They started patching it before it ever went into effect. The patching it because of local political issues and legislators who wanted to protect local turfs. So we got an insidious [sic] of amendments to the miracle that simply didn’t allow it to function.

Superintendent of a rural public school system.

When the state legislature imposed the state sales tax—and it made sense and I agreed one-hundred percent—it wasn’t necessary any longer to collect a personal property tax. It was much better to have the state levy a sales tax... and allocate that back to the local units of government (as) local government aid. Now, down the line, the state of Minnesota sits back and smugly says that local government aid is nothing more than money from the state being given to local units of government and local units of government should operate on their own and the state has nothing to do with real estate taxes—that’s up to local government. I feel like someone has stolen my billfold and is walking down the street and no one’s running after them saying “Hey, you’re a thief!”

Chair of an outstate County Board of Commissioners.

For more than a decade special provisions were added by the legislature which undermined the system’s equity goals and which increased its complexity. Later, as the economy slowed and state revenues diminished, state government cut aid programs and property tax relief to local jurisdictions. This made increased local property taxes necessary. The miracle’s dependence on strong economic performance could not be accommodated during the state’s economic difficulties and the old trade-off of higher state taxes for lower property taxes could not be maintained. Both increased substantially.

A few of the officials interviewed believe that when the economy recovers the miracle will be reestablished (or at least school and local government aids will be increased). But most reject this view, either because they do not expect economic performance to reach the levels it has in the past or because they believe the state will spend whatever revenue increases occur on tax relief or new programs, rather than on local aid programs.

The Role of Property Taxes

Despite recent substantial increases in local property tax rates, local officials suggest that without the Minnesota Miracle, reliance on property taxes to fund local jurisdictions would have been greater than it is today. But there is a basic disagreement over the degree to which property taxes are an appropriate source of local revenue, especially for schools.

Some agree with the miracle’s goal of diminishing reliance on property taxes, arguing that education, human services, and, to a lesser extent, the basic services provided by general purpose local governments should be paid for in large measure with state-wide taxes based on the individual’s ability to pay. They note that state government has the most effective means of tax collection and can better assure equity in tax burden for supporting the services that are provided to all citizens. Moreover, they argue that shifting political responsibility to the local level in tough economic times—when taxes and concern about “business climate” are rising—will depress local funding for services that cannot be readily cut. School and county officials argued this most strongly.

Others however, suggest that services provided locally should be funded locally to reflect local needs and to maintain the highest degree of government accountability. The officials holding this view say that state collection of taxes, which requires that the revenue then be transferred to local jurisdictions is inefficient, with state bureaucracies consuming too large a portion of the tax dollar. Local government officials express concern that local discretion in all areas—not just financial matters—is undermined by reliance on state sources. This is because, they say, the state feels it can intrude, through mandates and other regulations, in the affairs of local jurisdictions if it is providing substantial funding to them.

The perspective of local officials concerning the proper role of property taxes may relate, one school official asserted, to the wealth of the tax base. Those most strongly opposed to increased reliance on property taxes were usually from low property wealth areas.

The Goal of Equalization

While many local officials acknowledged the importance of the Minnesota Miracle’s goal of minimizing disparities in tax burden, educational opportunity, and public service levels, most expressed skepticism that it can be achieved. This reflects their belief that the more than decade-long attempt to serve that goal has been largely unsuccessful. They said that achievement of that goal is very difficult, if not impossible, because no aid or levy limitation formula can account for all the important individual characteristics of the local jurisdictions. There was more support for equalization of educational opportunity than equalization in other areas.

The Guarantee of Adequate and Stable Revenue

While major differences were found in the views of local officials about the first two goals of the Minnesota Miracle—reducing the role of property taxes and equalizing disparities among local systems—there was general agreement about the third goal—adequate and stable revenue.

The recent financial crisis left state and local jurisdictions with severe revenue shortfalls. State revenue shortfalls meant severe reductions in state aids to local jurisdictions which, in turn, meant local budget and personnel cuts, fee increases, and draining of local reserve funds. Local jurisdictions experienced severe cash flow problems which led local officials to wonder about the stability of the state-local fiscal system.

For local officials the delay or reduction of state aid payments in the middle of a budget year is one of their greatest fears. Most of those interviewed regard the stability of state aids as so important that they might even be willing to take overall reductions in aid if it meant predictable revenue sources. In their view, state aids must be stable and reliable enough to assure them of a revenue base for local programs when continuity is required.

Because of the critical need for stable and predictable state aids, local officials are critical of the state for its lack of sufficient
reserve funds. They see the need for a "rainy day" fund which could "account for the unexpected." This fund would be built up during periods of prosperity and used to cushion and stabilize revenues when the economy is distressed. Most favored a fund that is at least 5 percent of the budget (approximately $500 million) earmarked for only downturns in the economy, not for new programs or for tax relief.

Areas of Major Agreement
During the CURA interviews and workshops with local officials, diverse opinions were expressed concerning numerous aspects of Minnesota's intergovernmental system. The following represent points on which there was major agreement:
- The state-local system known as the Minnesota Miracle no longer exists. Its goals and structure have been undermined by more than a decade of modifications made by the legislature in response to lobbying by special interest groups and individual jurisdictions and by the financial constraints of the last several years.
- The current state-local intergovernmental system no longer reflects overarching goals. It inequitably distributes aid, property tax relief, and the local tax burden. It overregulates local jurisdictions, suffers from instability in state aid revenue, and is unduly complex. In addition, the present assignment of certain service responsibilities is no longer appropriate.
- School districts welcomed the fundamental reform of Minnesota's school finance system enacted in 1983. While this change does little to ameliorate educational disparities caused by variations in property wealth among districts (and may even exacerbate these), it is fairer than the old foundation program in that it provides more equal access to revenue through the formula.
- The current local government aid distribution is unfair because the formula, through grandfather clause provisions, is largely based on the past spending patterns of local jurisdictions. Because of continual piecemeal modification, the program no longer distributes aid in any systematic way.
- Minnesota's property tax system is unfair and unduly complex. It inequitably applies to specific groups of property owners because of its classifications, property tax relief programs, and valuation practices. The
The legislature has been overzealous in providing property tax relief to homeowners so that property taxes are now too low in some parts of Minnesota, considering the services provided, and the programs cost too much for state government.

- The state’s current $250 million reserve fund is probably insufficient to avoid the budget reductions to local jurisdictions which could occur in the event of unanticipated state revenue shortfalls. A “rainy day” fund of five percent of the total state budget, protected from future spending or tax relief, represents more responsible financial management and should be established.

- Local discretion over financial and programmatic matters needs to be increased. In particular, mandates should be reduced, especially if the state continues to provide insufficient funds to meet them. In addition, local revenue-raising authority should be increased even though by removing levy limits, local jurisdictions will no longer be protected from local pressures for increased spending and taxing, and the state may transfer additional funding responsibility to the local jurisdictions.

- Further state tax increases will damage Minnesota’s “business climate.” The dilemma is that holding down state taxes could require reductions in aid programs for local jurisdictions. If additional revenues are required, they should be obtained by expanding the sales tax to clothing and services.

- Before fiscal reform occurs, there should be a reexamination of the functions of local governments. It may make sense for some locally administered services, such as income maintenance programs and the county court system, to be transferred to the state, especially in view of the fact that local jurisdictions have little discretion in handling those responsibilities. In addition, city-county transfers of responsibilities may save costs, reduce unnecessary duplication of services, and improve efficiency. School consolidation and pairing may provide better program offerings in some districts as well as reduce costs.

- In view of the myriad of problems now apparent, Minnesota’s state-local system must undergo major reform. This should include changes in numerous aspects of the financial and regulatory relationships between state and local government as well as sorting out the functions of local jurisdictions. The state is the appropriate level for formulating and executing this kind of system-wide reform.

**Pressure for Reform**

Local officials are now calling for system-wide intergovernmental reform even though many of the problems of the system have existed for some time. It was apparently easier for local officials to accept those problems when state aid and property tax relief were increasing. But when the state’s budget crisis translated into reductions in these programs, local officials found it more difficult to accommodate to the problems of the system, particularly the lack of local flexibility, the instability of aid payments, and the various inequities.

It is significant that fiscal constraints have also caused local officials to raise the larger question of functional reform. Their call for a shedding of some local responsibilities to the state seems to reflect their unwillingness to assume increased local funding responsibility for programs over which they have little discretion. In addition, they believe that in this time of fiscal constraint transfer of some responsibilities
among local jurisdictions as well as consolidation and pairing of services—particularly schools—may save money or improve services without additional costs.

The interviews indicated potential local support for reform of Minnesota’s intergovernmental system although the Governor’s Tax Study Commission, which is charged with examining state-local relations as part of its study of the state’s fiscal system, has not, as of this writing, made this a major part of its evaluation. If not the Tax Study Commission, then some other state-level group should examine these relations which local officials say are badly in need of reform. While local officials generally desire increased flexibility for innovation by reducing state involvement in local matters, they see state government as the appropriate level for exploring and instituting major system-wide reform in state-local relations.

Advice to State Officials Eyeing Reform

While local officials believe a “big picture” examination of the system is needed, one that could be conducted as part of the work of the Governor’s Tax Study Commission, they express several concerns. They worry that special interest groups and other political pressures will unduly influence the commission and other state officials. They say most state officials don’t understand the current operations of local jurisdictions, the complex intergovernmental linkages between local and state government, or the local implications of state policies. As a result, they wonder whether state reform will only exacerbate current problems or unnecessarily add to the complexity of the system. They urge caution. The comment of one city official reflects the general view: “Handle it the same way you would handle a porcupine... very carefully.”

Local officials offered several observations and suggestions for the Governor’s Tax Study Commission and other state officials considering reform.

- **Defining the right questions is the most important task.** So many wrong solutions are applied to problems because the issues are not properly framed and the problems not fully understood. Talking with officials from local jurisdictions throughout the state can help state officials to develop a solid understanding of Minnesota’s intergovernmental system and the local implications of reform. State officials must also recognize the variety of problems faced by jurisdictions across the state.

- **The first step is to examine the current functions of local jurisdictions and develop goals for the intergovernmental system.** The state is the most appropriate level for reexamining these functions to determine the efficacy of current intergovernmental arrangements. This should be done before financial and regulatory relationships between state government and its local jurisdictions are modified.

- **Avoid giving in to the immediate pressures of special interests and particular jurisdictions who seek to protect or enhance whatever advantages they have in the current system.** Reform which unduly reflects those interests (through grand-father clauses and other special
provisions) will not significantly improve the overall system and may add to its problems. Changes which are perceived as reflecting fairness, consistency, and sound goals will probably be accepted by local officials even if some of their individual jurisdictions are hurt by those changes.

- **Involvement of the affected jurisdictions in reform deliberations makes formulating a "livable compromise" possible.** It is essential to get the diverse parties interested in intergovernmental reform talking to one another. To the extent that improving the state's business climate and providing adequate funding of local jurisdictions are at odds the parties representing those views should work together to come to some accommodation.

- **Long range state plans would be helpful.** The myriad of intergovernmental policies are constantly being modified, creating uncertainty in Minnesota's state-local relations. Longer range state policies, especially with respect to financing, would provide a higher degree of predictable direction on which local jurisdictions could plan.

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**Fiscal Constraints Project**

Since the Spring of 1981, CURA has pursued a special project in response to the fiscal constraints Minnesota is experiencing. The purpose of the project has been to construct an accurate picture of the situation in Minnesota and to explore constructive policy alternatives in response to the problems the state faces.

**Research Reports**

The major component of the project has been the development of a series of research reports, *Fiscal Constraints on Minnesota—Impacts and Policies.* To date the series includes:


- **Budget Cuts and Environmental Programs,** by Nancy Walters, 1983, 38 pp. The impact of federal budget cuts on Minnesota's environmental programs is examined by agency.

- **Proposals for Fiscal Reform,** by Thomas R. Peek and Douglas S. Wilson, March 1983, 58 pp. Major proposals for reform of Minnesota's fiscal system are presented along with a policy framework for examining them.

- **Local Perspectives on Minnesota's Intergovernmental System,** by Thomas R. Peek and Douglas S. Wilson, January 1984. Perspectives of local officials on Minnesota's intergovernmental system are summarized and proposals for its reform suggested.

- **Budget Cuts and Environmental Programs 1984-85,** by Deborah Karasov, forthcoming. The earlier report on budget cuts and Minnesota's environmental programs is updated here.

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**Joint Projects**

In addition to conducting its own examination, CURA has attempted to tie together a number of related projects and activities both inside and outside the University of Minnesota and to bring together a comprehensive examination of the current situation. CURA work being conducted in cooperation with others includes:

- **County and City Surveys.** Surveys are examining the exact budget changes occurring in Minnesota local government as a result of state and federal changes. The work is being done in cooperation with the Association of Minnesota Counties; the Minnesota Department of Energy, Planning, and Development; the Hubert H. Humphrey Institute of Public Affairs; and the League of Minnesota Cities. A report on the first two years of survey work is forthcoming.

- **AFDC Survey.** A longitudinal study was conducted during 1982 and 1983 of AFDC recipients whose benefits were either terminated or reduced as a result of recent federal and state policies associated with budget reductions. The impact of new AFDC policies on individual recipients was documented. This study, a joint research project with the Center for Health Services Research in the School of Public Health at the University of Minnesota, was carried out in cooperation with Hennepin County; additional outstate counties; and the Minnesota Department of Energy, Planning, and Development. A report of the initial results of the survey was presented in the CURA Reporter in May 1983. A second report will be forthcoming in the CURA Reporter this spring.

- **Emergency Services Survey.** CURA provided technical assistance to Catholic Charities in its ongoing survey of individuals and families using the emergency services of Branches I, II, and III; the Dorothy Day Center; and the emergency shelter referral office. Demographic characteristics of users of these services, changes in their situation, and the reasons for those changes were collected in the spring of 1982 to provide additional information on the effects human service reductions and economic conditions have had on these people.

- **General Assistance Survey.** With CURA's help, the Minnesota Chapter of the National Association of Social Workers conducted a survey of former General Assistance recipients who were cut from the program as of July 1, 1981, in Ramsey and St. Louis counties.

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Tom Peek is on the staff at the CURA Outreach Office. Doug Wilson, who recently completed his masters degree in Agricultural and Applied Economics at the University of Minnesota, is working as a consultant with the Office of the Legislative Auditor for the State of Minnesota. This article presents a summary of their new publication *Local Perspectives on Minnesota's Intergovernmental System.* It is the fourth in a series of reports on how new fiscal constraints are affecting Minnesota. Copies of the full publication may be obtained free-of-charge from CURA (1927 S. 5th St., Minneapolis, MN 55454) or by phoning 612/373-7833.

Drawings by Richard A. Perlich.
• **Action for Human Services.** Since the summer of 1982 CURA has provided a half-time staff organizer for Action for Human Services. This coalition of human service providers, advocacy groups, and funding organizations monitors and circulates information on the impacts of the government funding cuts on human services in order to educate member organizations and the broader public concerning these impacts and to provide a mechanism for joint action by member organizations on specific issues.

• **The Urban Institute Study of Nonprofit Organizations.** CURA is participating in a major, three year project directed by the Urban Institute of Washington D.C. The project is examining the scope and operations of the private, nonprofit sector in the United States and assessing the impact of recent changes in public policy on nonprofit organizations and those they serve. CURA is conducting surveys in the Twin Cities, which is one of sixteen local study areas throughout the country. Two progress reports from the Urban Institute have been issued to date and a report on the Twin Cities study will be released this winter.

• **Community-Based Facilities Study.** A joint project with the School of Social Work at the University has examined the impact of budget cuts on community-based facilities in Minnesota, giving special attention to fiscal and program changes for two vulnerable populations: the developmentally disabled and troubled adolescents. A report will be issued by CURA this spring.

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**New CURA Publications**


This is an updated version of the bibliography published two years ago and out-of-print for the past year. Literature on the Hmong has been growing rapidly and about 300 new entries have been included. The bibliography lists writings in eight subject areas: general works on Southeast Asia, general Hmong ethnography, specific aspects of Hmong ethnography, linguistic studies of Hmong and Mien, refugee resettlement (general resettlement and physical and mental health), journalism, Hmong language books, and bibliographies. In addition, a list of films on the Hmong has been added as well as a short list of readings for those who want an introduction to Hmong history and culture. Most of the works listed are available at the University of Minnesota.


A summary of this report is presented in this Reporter on pp. 1-6.

CURA publications may be ordered by phone (612/373-7833) or on the CURA Publications Order Form, p. 11 of this Reporter.

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**Students Assist Communities**

The Center for Community Studies (CCS) is a new program designed to link Minnesota communities seeking assistance with University of Minnesota students seeking ways to develop their knowledge and skills. Sponsored by CURA, the Landscape Architecture Program, the Urban Studies Program, and the School of Architecture, CCS opened for business at 200 North Hall on the St. Paul campus with the advent of the fall quarter.

CCS will offer learning opportunities to students from a wide variety of disciplines and professions under the direction of interested faculty. Contacts with communities are coordinated by Margaret Sand, program coordinator.

CCS is modeled to some extent after CURA's Urban Education Center which functioned from 1969 to 1977, providing student assistance to a large number of Minnesota communities. A recent survey indicated widespread interest in further student assistance. The CCS program will work closely with the Governor's design team, which provides the assistance of volunteer design professionals to communities upon request.

Ms. Sand is developing working relationships with many University departments. She is also identifying communities that would like to participate in the program. For more information about CCS or to discuss participation in the program, phone Ms. Sand at 612/373-0272.
Questions About Women in the Minnesota Economy
by William J. Craig

Women are in a tough place in the Minnesota economy. We know this because we see it every day. The U.S. Census of Population taken in April 1980 helps describe the situation in a more precise way, since census surveyors spoke with a valid sample of households across the state. This information is only now becoming available from the Census Bureau on computer tape. Printed results will follow and be less detailed.

A portion of the story about women in the Minnesota economy is noted here. The numbers are taken from Summary Tape File 3 (STF3) which contains nearly 100 tables of information for every county in the state (as well as for other geographic levels such as census tract and city). Unfortunately, this information raises as many questions as it answers. More detailed tables will be available soon in STF4; STF5 will be compiled eventually and released with even more complex and detailed tables. Researchers who are impatient, or who wish to manipulate data in ways not contemplated by the Census Bureau, may create their own tables of statistics from raw census returns which will be available soon as "Public Use Microdata Sample" (PUMS). This last data set has very limited geographic specificity and its complexity makes computer processing fairly expensive, but it gives enormous flexibility to analysts.

Labor Force Participation

An ever increasing number of Minnesota's women are participating in the labor force. In 1980, 54.0 percent of the women aged sixteen years or more were in the labor force. The comparable figure for men was 77.1 percent. Women already make up nearly half the labor force in the state—42.9 percent. In 1980, 61.1 percent of all families had more than one person working, resulting in a family income which averaged 37 percent higher than for families with a single worker.

Participation by women in the labor force is not uniform across the state (see Figure 1). Rates varied, in 1980, from a low of 35.9 percent in Cass County to a high of 63.3 percent in Dakota County. The median county (half of the counties higher, half lower), Jackson, was 46.6 percent. To help sort out the patterns in Figure 1 the counties have been shaded to indicate whether they are in the lowest one-third of counties, middle, or highest one-third. From this map it is clear that labor force participation by women is highest in the most urban counties and lowest in the rural counties. These varying rates may reflect both varying financial need and the availability of jobs.

No sex-specific information is available from STF3 on occupations or industry of employment, travel mode, or length of commute to work.

Percent of women age 16 or more in labor force

Map 2. Women and Young Children in Poverty, 1979
Percent female-headed families (no husband present) with children under age 6 only that had incomes below poverty level
Income

Information on earnings from work is not provided by STF3, but income from all sources is available; these sources include work, interest and dividends, pensions, and welfare. The information is not sex-specific. Only one table (number 86) is helpful for understanding the plight of women in the Minnesota economy and it contains significant information. This table classifies families by whether they are above or below poverty level, by whether or not the family is headed by a woman with no husband present and by age of children. In 1980, 11.8 percent of all Minnesota families with children were headed by women with no husband present.

In Minnesota in 1980, a woman heading a family with a child under school age stood a 50-50 chance of being in poverty. Twenty-six thousand families were in this situation in 1980 (actually 1979 income) and 49.8 percent of them were living below the poverty level.

The situation appears to improve for women heads of household as the children get older. In those families where all children are aged six through seventeen years, 20.7 percent were living below the poverty threshold in 1980. When all children were over age seventeen, only 5.9 percent were below poverty level.

Compared to all families with children, female-headed families are nearly four times (3.6) as likely to be living in poverty. Comparing families with at least one child under six years old, the risk climbs even higher; female-headed families are 4.5 times as likely to live in poverty as all families with children under six.

Women work part-time more than men; using a definition that includes both hours per week and weeks per year, only 36.5 percent of women workers were full time in 1980 compared to 61.7 percent of male workers.

Again, the patterns described above are not uniform across the state. Figure 2 displays the county by county pattern of poverty among female-headed families with children under age six only. The percent of such families in poverty ran the gamut from zero in Big Stone to 100 percent in Red Lake and Lake of the Woods counties. Norman County was at the median: 47.1 percent.

Unanswered Questions

This information about women in the current Minnesota economy raises many questions. Why do we see so many women heading households that live in poverty despite the high levels of women in the labor force and despite various public welfare programs, especially AFDC, Aid to Families with Dependent Children?

Half the families with female household heads and with children under age six are in poverty. What about the other half? What factors make the difference? Education? Occupation? Child support? Working full-time? Other sources of income? Location with respect to jobs? Willingness to accept AFDC? Number of children?

Another important factor may be differential wage levels. To what extent have the salaries of jobs traditionally held by women (such as secretary, nurse, and teacher) caught up with the salaries of male-dominated jobs requiring similar training and responsibility? To what extent have women moved out of their traditional jobs? When they have, to what extent have they achieved salaries comparable with their male counterparts? Women's labor force participation is largely part-time resulting in lower earnings. To what extent are women locked into part-time work by the nature of their occupation or industry of employment? To what extent does location in the state preclude access to better paying jobs?

More Research Required

Many of the questions raised here will be answered by the upcoming report of the Minnesota Commission on the Economic Status of Women.* Others can be answered by looking at tables extracted from STF4 or printed in detailed reports by the Census Bureau.** But the level of analysis will be restricted: 1) by a less detailed geographic breakdown in the report from the Minnesota Commission on the Economic Status of Women (metro and outstate only), 2) by less detailed tables in the Census Bureau's printed reports, 3) by the inability to understand the interactions among various explanatory census variables in all sources save the microdata sample (PUMS), and 4) by the absence of some potential explanatory variables in the original Census survey.

*A Factbook on Minnesota Women will be published by the Minnesota Commission on the Economic Status of Women in January 1984. A limited number of copies will be available from their office free of charge. Copies may be requested by phoning 296-6590 or (toll-free from outstate) 800-650-9747.
**Census Bureau data are available at the University of Minnesota through MAPS, Minnesota Analysis and Planning System, 612-376-7003.

Will Craig is the assistant director of CURA and director of CURA's Research Office.

Solving Real Engineering Problems

by David Potyondy

Editor's Note: Over the years CURA has encouraged University faculty to make use of their expert knowledge and skills in ways that will help solve real community problems. When students can be involved in the process too, serving while learning, it adds a relevance and excitement to the educational process that cannot be found in any other way. This kind of student-faculty-community interaction is currently being fostered in a new way in the University's Department of Civil and Mineral Engineering. CURA has not been involved in this project, but it is a good example of the kind of project CURA likes to encourage. We asked one of the participating students to write a short description of the new Civil and Mineral Engineering program because we thought Reporter readers would be interested. More information about the program can be obtained from Gerald Johnson, head of the honors program in Civil and Mineral Engineering.

Who would believe that twelve first year students among the crowd of thousands at the University of Minnesota, who began the year with virtually no knowledge of computing, would end the year by helping engineers from local companies solve real engineering problems on microcomputers? The Department of Civil and Mineral Engineering has begun an Honors Program that has allowed just this to happen.

How it Began

A committee in Civil and Mineral Engineering was formed three years ago to examine ways of improving the department's undergraduate program. "Many of the best students were being attracted to the more glamorous high-tech engineering disciplines," one professor noted. The committee realized that most undergraduates did not come in contact with faculty and with real engineering problems until their third year. To combat this, they decided to begin an honors program for talented first and
second year students that would expose them to real engineering problems immediately. Because of faculty interest in the applications of microcomputers to engineering problems, it seemed natural to tie the honors group into a microcomputing project. The group was also to serve as a kind of testing ground for ways of shifting the department’s curriculum to a more computer-oriented structure.

The Educational Experience

The first group of ten honors students began in the fall of 1981. By the second year, when twelve students entered the program, a workable pattern of operation seemed to have emerged. During the fall quarter, the students were taught how to program in PASCAL. Most of the learning occurred through hands-on experience rather than lectures. In place of tests, programming assignments were given and students were encouraged to work on them together in small groups. Student Kent Rohr comments, “The class was a much more fun way to learn than the large computer science course would have been.”

During winter quarter, the students were introduced to numerical techniques. Since the students did not yet have the necessary math background, the lectures were designed to give the students a feel for the power of mathematics and its many varied uses in engineering. Matrix manipulation was covered along with some mathematical modeling techniques.

The opportunity to see what real engineers are working on arose during the third quarter. At this point the honors group was combined with a recently established Microcomputer User’s Group. The user’s group was created by Civil and Mineral Engineering and a number of local engineering companies. In exchange for funding to help in purchasing the micro-computers, local engineers are being trained in using the microcomputers for engineering applications.

During the winter of ’83, engineers in the user’s group were taught how to program. By being present during these sessions and working with the engineers, the honors students were given a unique opportunity to assist the experienced engineers. This initial contact strengthened the faith of the engineers in the students’ abilities, and made it much easier when the engineers began teaching the students some of the necessary background they would need to work with them during the next phase of the interaction.

The engineers were asked to come up with a routine problem from their technical field that would lend itself to computing. The computer would be used to either solve the problem completely or simply simplify the process of solving it. The students broke up into groups of two or three to work with the engineers on solving and implementing their ideas on the computers.

What Kinds of Problems?

The students worked on a variety of problems. In one project a computer program was developed that could be used in evaluating formaldehyde concentrations in the air of newly constructed homes. The concentration must be monitored in order to meet government air quality standards. A computer program was developed that would translate daily readings made by a light spectrometer into a graph format. Computer calculations saved time and computer graphing was not only faster but also more accurate than the previous manual method of charting formaldehyde concentrations.

In another project, an engineer worked with honors students to develop a program that would estimate the total amount a sandy soil would settle under a particular footing. A student working on that project reports, “These calculations were very new to all of us students working on the program and in the beginning we were kind of lost among all the data. In the end we decided to break up the soil into layers and calculate the settlement for each layer separately... Previously, all of these calculations were done by hand and it was very time consuming. With the aid of this program the process should be much faster.”

Researching New Areas

Since microcomputers are still relatively new, there are many complex engineering problems that can not now be acceptably solved on them. In exchange for new personal computer facilities provided by IBM, the Department of Civil and Mineral Engineering has agreed to provide research reports and applications programs to IBM.
showing how microcomputers can best be used in tackling these engineering problems. The students in last year’s honors program were given the opportunity to work on some of these problems over the summer. Several agreed to work in small groups on various projects both for the department and for others. One group worked on a critical path analysis to aid in planning a large project. It was one of the twenty programs which the department agreed to provide for IBM. Another group worked on a project being done in conjunction with the University’s English department—creating an authoring system which will allow the computer to function not only as a word processor but also as an aid to the writer, guiding the writer through the

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- "1982 CURA Publications and Order Form," p. 11.


- "Looking at Public Education in Minnesota," Thomas R. Peek, pp. 8-11.

- "Where We Live," pp. 11.


- "Student Papers in the Public Administration Library," p. 11.

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creation process. Still another group of the honor’s students worked off campus in a half-time job with a consulting engineering firm that was creating an expert system program for Pillsbury. The program translated the experience of senior engineers in making cost estimates into a computer format that would be readily available to the entire engineering group.

Benefits for Students

In addition to creating some interesting summer work experiences, what else did the students get out of the honors program? The most obvious benefit is their familiarity with computers and their programming knowledge. But they have also come to know many of the faculty on a first-name basis, and all have a much better understanding of what an engineer does. “If I had not been in this program, I would still know very little of what an engineer actually does. I would think engineering is calculus,” says Rich Puglisi, one of the students. Another student, Brian Farm, feels that he has “become computer-literate enough to be able to tackle a wide variety of meaningful problems.” Other students mentioned the numerous contacts the program has given them, not only with the faculty and engineers, but with the other students as well. Steve Koehler comments, “It gave me people I could get to know immediately in a huge school.”

Photo by Robert Friedman.

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