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Photochemical Transformation of Antibiotics in Minnesota Waters

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Antibiotic compounds, which are used to kill or retard the growth of bacteria, have saved millions of lives since they were first introduced in the 1930s. There is growing concern, however, about the release of antibiotic compounds into the environment and the possible long-term consequences this may have to human health and the ecosystem. The ecological risk posed by the complex, dynamic mixture of pharmaceuticals present in many lakes, rivers, and streams is poorly understood. More alarming, there is also concern that the human introduction of antibiotic compounds into the environment provides a possible source for the development and spread of antibiotic-resistant genes in bacteria. Both benign and pathogenic (disease-causing) strains of bacteria have the ability to exchange genes for resistance to antibiotics. The input of antibiotics into the environment may, in some cases, offer a wellspring of resistance genes, narrowing the future usefulness of the antibiotic drugs of today.

Antibiotic compounds used in human medicine and animal husbandry are present in lakes, rivers, and streams around the world. The U.S. Geological Survey conducted a nationwide survey and published their results in *Environmental Science and Technology* in 2002. The survey detected antibiotics and other pharmaceutical compounds in rivers throughout the United States, including the Mississippi River at Hastings, Minnesota.

A combination of agricultural and urban land uses characterizes the



Photo courtesy of William A. Arnold

watersheds surrounding many of the major bodies of water in Minnesota, including the Mississippi River. Because antibiotics that humans and livestock use persist in human and animal waste, both of these land uses can introduce antibiotic compounds to natural water bodies. Accumulated animal waste from livestock operations or animal manure spread on fields within the watershed can enter local bodies of water through leaching or runoff. Human waste passes through wastewater treatment plants, which discharge the treated water into local bodies of water. For example, treated wastewater from the Twin Cities flows into the Mississippi River; treated wastewater from Duluth is discharged into the St. Louis River and ultimately Lake Superior. Because the wastewater treatment process cannot completely remove antibiotics, the treated wastewater discharge can include antibiotic contamination.

The Fate of Antibiotics in Natural Waters: The Importance of Degradation by Sunlight

The assessment of the ecological and human health risks posed by the release of any given antibiotic into the environment requires knowledge of the fate of a given compound—that is, how the compound is transported and degrades over time. Determining the fate of an antibiotic compound in a natural body of water is a complex problem that requires assessing many factors, including the rate of addition of the compound to the water body, the tendency of the compound to bind with sediment, the movement of water, and the rate of degradation or

Cover photo: Photochemical experiments being conducted on the deck of the research vessel Blue Heron on Lake Superior. The water-sampling apparatus is shown at the rear of the vessel.

transformation of the compound. Degradation is the most poorly understood factor affecting the fate of antibiotics in the environment. Because antibiotics in general are designed to be stable with respect to biochemical processes, biodegradation—that is, transformation of a compound by bacteria and other microorganisms—may be limited. Many antibiotic compounds, however, are known to be *photo-labile*, meaning they become unstable and begin to break down when exposed to sunlight. For these compounds, photolysis is expected to be the major degradation process, if not the only one.

Direct photolysis refers to the degradation of a compound as a result of the energy gained by the absorption of light. The rapidness with which this process takes place depends on two factors: (1) how well the compound absorbs light and (2) the quantum yield, which describes the fraction of the compound that degrades upon light absorption. In a body of water, many naturally occurring organic chemicals, present in countless forms and structures, can absorb light. These chemicals, grouped together under the term *dissolved organic matter* (DOM), can be observed as the yellow, brown, or green color of the water in a lake or river. When the DOM absorbs sunlight in nature, the sunlight can have the effect of creating high-energy, reactive chemicals such as excited-state DOM, radicals (especially reactive molecules that have one or more unpaired electrons), and unstable forms of oxygen. Once generated, these short-lived reactive chemicals may encounter an antibiotic or other pollutant, leading to degradation of the pollutant. The combination of sunlight and DOM initiates this secondary degradation process referred to as *indirect photolysis*.

Goals and Methodology

The goal of this study was to determine the physical and chemical values required to predict the rate of photolysis of antibiotic compounds in the natural surface waters of Minnesota, including the Mississippi River, Lake Superior, and Lake Josephine (located in St. Paul, Minnesota). The compounds we chose to investigate are common representatives of six different classes of antibiotics:

1. tetracyclines (tetracycline and oxytetracycline);
2. fluoroquinolones (ciprofloxacin);
3. sulfa drugs (sulfamethoxazole, sulfadiazine, sulfathiazole, and sulfamethazine);
4. nitrofurans (furazolidone and nitrofurantoin);
5. macrolides (tylosin); and
6. benzyl pyrimidines (trimethoprim).

In addition to degradation by direct photolysis, we investigated the significance of indirect photolysis processes in samples from several Minnesota water bodies. The results of this study demonstrate a wide range of reactivities, both across antibiotic classes and within individual classes. Some drugs are therefore expected to be much more stable (and therefore persistent) than others in sunlit surface waters.

The antibiotics investigated in this study were chosen to represent the range of possible antibiotic introduction pathways from agricultural and urban watersheds into the environment. The uses of each antibiotic drug are listed in Table 1. Some of the antibiotics are used in both humans and animals, whereas others are exclusively used for one or the other. Each general antibiotic class listed, however, has compounds used in both human and animal medicine. For example, although ciprofloxacin is a drug with exclusively human medical uses, there are other fluoroquinolone antibiotics that are used in veterinary medicine. The third use indicated for many of the drugs in Table 1 is growth promotion. Growth promotion is the use of an antibiotic, often included daily in feed, to aid in the growth rate and feeding efficiency of swine, poultry, or cattle. Drugs that are fed as growth promoters are therefore used in a particularly high volume. Although some estimates may exist of the nationwide use of antibiotics for growth promotion purposes, accurate data are not publicly available.

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Researchers (from left to right) Ann M. McNally, Douglas E. Latch, Kristine H. Wammer, and Jeffrey J. Werner measure photochemical kinetics in samples arranged in a row of quartz test tubes on the deck of the Blue Heron.

Table 1. Antibiotic Compounds Investigated in This Study, Their Uses, and Their Photolysis Half-Life by Antibiotic Class

Antibiotic class	Compound	Uses*	Photolysis half-life [†]
Benzyl pyrimidines	Trimethoprim	H, A	17.5 days
Sulfa drugs	Sulfadiazine	H, A	5.5 days
	Sulfamethazine	A, GP	6.5 days
	Sulfamethoxazole	H	2.5 days
	Sulfathiazole	A, GP	3.5 hours
Tetracyclines	Tetracycline	H, A, GP	2 hours
	Oxytetracycline	H, A, GP	44 minutes
Fluoroquinolones	Ciprofloxacin	H	11 minutes
Nitrofurans	Furazolidone	A	27 minutes
	Nitrofurantoin	H	53 minutes
Macrolides	Tylosin	A, GP	1.5 hours

*H = human use, A = animal use, GP = growth promotion

[†]Predicted photolysis half-life assuming a 24-hour daily average of sunlight in July in Minneapolis, Minnesota.

We used the following experimental procedure to determine the chemical values needed to predict a photolysis rate. The antibiotic compounds were dissolved in water, placed in quartz test tubes, and exposed to sunlight in Minneapolis, Minnesota. We then took samples from the test tubes at various times to measure the concentration of the unreacted antibiotic remaining in solution, allowing us to characterize the photolysis reactivity of the compounds. We also monitored sunlight intensity

during the experimental photolysis using a chemical with a known quantum yield dissolved in water. By varying the experimental conditions (e.g., pH and water source), we were able to calculate the factors needed to describe the rate of direct photolysis of each antibiotic compound in nature.

Direct Photolysis and Reactivity of Antibiotics

Table 1 presents the results of this study as a comparison of the average

photolysis reactivity of the antibiotic compounds investigated under a standard set of conditions. The photolysis half-lives indicate the time it would take for one-half of the original substance to degrade in sunlit surface water assuming a 24-hour daily average of sunlight in July and water with a pH value of 8 (a common pH for the Mississippi River). The compounds with a longer half-life are, by definition, the compounds that degrade more slowly. The antibiotics in Table 1 show a vast range of half-life values, from more than 17 days for trimethoprim to only 11 minutes for ciprofloxacin.

Trimethoprim, along with the four sulfa drugs listed in Table 1, were the most stable of all the antibiotics we investigated. Figure 1 presents a simulation of the degradation profiles of these five longer-lived antibiotic drugs under the same standard set of conditions. In the simulation, it was assumed that an initial quantity of the antibiotic compounds dissolved in water was exposed to full, unobstructed July sunlight in Minnesota for four days. All the other drugs listed in Table 1 photodegrade more quickly than sulfathiazole and thus would have degraded below 1% of their original concentration in less than one day in this simulation. The striking differences in stability demonstrated in Figure 1 are notable not only because a wide range of reactivity was observed, but also because the four sulfa drugs, which are chemically similar and within the same structural class, might have been expected to have similar rates of degradation. Based on the difference in stability of sulfathiazole and sulfamethazine when exposed to sunlight, however, the contamination of a sunlit body of water with sulfathiazole might be expected to pose less risk than contamination with sulfamethazine.

The simulation presented in Figure 1, of course, does not consider all the complications of a real environmental system, such as inflow or outflow of water or contaminants, the reduction of light as water depth increases, and cloudy weather. These complications are all physical variables that can be measured or estimated for any given system. There are many other important variables relating to the chemistry of the water whose effects are more difficult to estimate without additional chemical data.

Variables Affecting Photo-Stability

Although the list of possible chemical

Figure 1. Four-Day Simulation of the Expected Degradation of Five Antibiotics Exposed to Sunlight in Mid-July in Minnesota

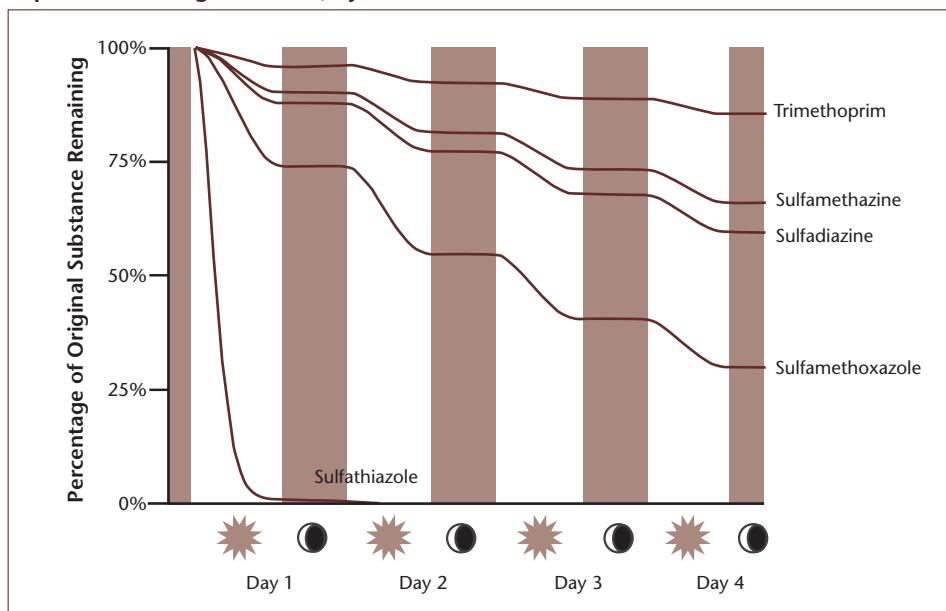


Table 2. Indirect Photolysis Reactants and Other Variables Affecting Antibiotic Degradation Rate, by Antibiotic Compound

Antibiotic compound	Indirect photolysis reactants	Other variables
Sulfadiazine	Excited-state DOM*	pH
Sulfamethazine	Excited-state DOM	pH
Sulfamethoxazole	—	pH
Sulfathiazole	—	pH
Trimethoprim	Radicals	pH
Ciprofloxacin	—	pH
Tetracycline	—	pH, water hardness
Oxytetracycline	—	pH, water hardness

*DOM = dissolved organic matter

variables that affect photolysis may be limitless, the ones observed to be significant in this study include water pH, water hardness, and indirect photolysis as a result of the presence of the short-lived reactants that DOM and sunlight create. The important chemical variables for each compound are listed in Table 2 and are discussed below.

Water pH. The half-lives listed in Table 1 and the degradation profiles shown in Figure 1 are only applicable in water with a pH value of 8. The pH value is a measure of the acidity

or alkalinity of a substance on a scale from 0 (acidic) to 14 (alkaline or basic). Most antibiotics are designed to be acid/base compounds that exist in two different forms at a pH value of 7.4, which is the pH of the human body. This is important for drug effectiveness. The pH of various natural waters fluctuates near this same pH value. There are, therefore, two or more forms of most antibiotic compounds to consider when predicting environmental fate. The average rate of light absorption and quantum yield of an

antibiotic will depend on the ratio of these various forms to each other, which is dependent on pH. It is not surprising, then, that most of the antibiotics investigated in this study showed a variation in degradation rate as a function of pH.

The sulfa drugs we investigated showed a variation in half-lives of up to a factor of 10 depending on the pH value. The degradation rates of ciprofloxacin and the tetracyclines were even more variable. This study has determined the technical information necessary to incorporate pH as a variable in photolysis predictions for the antibiotics investigated. Further research is still needed to determine the pH-dependence of other degradation pathways (such as hydrolysis and oxidation/reduction reactions on mineral surfaces) available to antibiotic compounds to determine if these processes are important. These additional data would give a more complete picture of the environmental degradation of antibiotic compounds.

Water Hardness. The tetracycline drugs, used commonly in growth promotion, animal medicine, and human medicine, are all relatively photo-labile. The prediction of how quickly tetracyclines will degrade in the environment, however, is confounded by their complex chemical behavior. A tetracycline compound can exist in many different forms, including five acid/base forms, and can bind strongly with sediment and dissolved or suspended metals.

This study took into account the forms of tetracycline associated with dissolved metals, in addition to all the acid/base forms. *Water hardness* refers to the presence of dissolved calcium and magnesium ions. It was found that in hard water, such as Mississippi River water, the significant metals associated with the tetracyclines are calcium and magnesium. One or two calcium or magnesium ions can bind to three of the five acid/base forms of tetracycline, resulting in a total of fifteen possible forms to consider for each drug. We observed that either an increase in pH or an increase in water hardness resulted in an increase in the light absorbed by the tetracyclines, as well as an increase in the rate at which they were degraded by photolysis. We calculated the chemical constants required to predict which dissolved forms of tetracycline will be present in a water body from knowledge of the

pH and the calcium and magnesium concentrations.

An accurate prediction of tetracycline or oxytetracycline degradation will require additional knowledge of other chemical degradation pathways. The tetracyclines show significant chemical instability without exposure to light, especially at high or low pH values, which adds further poorly defined degradation processes to the rapid photodegradation process we observed. The tetracyclines also have been shown to bind with sediment and mineral surfaces. The chemical degradation and photolysis of tetracycline drugs when bound to a sediment or mineral surface is also a subject in need of further research.

Indirect Photolysis. Indirect photolysis is one of the more difficult photolysis processes to characterize and predict because it depends on a possible interaction with many unstable reactants whose concentrations are interrelated. A series of experiments where the individual unstable chemicals are quenched is necessary to identify the important reactant. Then, independent laboratory experiments can be performed to measure a quantitative rate for the reaction of the unstable reactant with the given antibiotic.

The degradation of a contaminant by indirect photolysis will occur much more slowly than it will by direct photolysis for the shorter-lived compounds listed in Table 1. For compounds that undergo direct photolysis quickly, indirect processes are slow enough to be ignored. This observation makes sense because, in nature, the unstable reactants that the absorption of light by DOM create are present at very low concentrations. This means that indirect photolysis is significant for only the three slowest-degrading compounds in this study: trimethoprim, sulfamethazine, and sulfadiazine. Table 2 lists the indirect photolysis pathways that are significant for each of these three compounds. The degradation rates of sulfamethazine and sulfadiazine were enhanced by about a factor of 2 via a reaction with excited-state DOM. The degradation rate of trimethoprim was enhanced by a factor of 8 via a reaction with radicals. The other two sulfa drugs we studied also were observed to react with singlet

oxygen and hydroxyl radicals, but this process was not fast enough to be significant under the natural conditions we employed.

Conclusions

The results of this study suggest that the longer-lived sulfa drugs and trimethoprim have more potential to pose an environmental risk than less persistent antibiotics. However, this study has focused only on the degradation of the parent compounds and has ignored the products formed by photolysis. Identifying the many products resulting from the environmental photolysis of a single compound is a difficult task, and it is one worthy of further research. Many questions arise concerning the nature of the photolysis products. What are the products? Are they toxic? Do they have antibiotic activity? Do they degrade quickly, or are they long-lived? Other research in our laboratory has begun to investigate these questions. Some of the products of the photolysis of sulfa drugs have been identified in a 2004 study published by Anne L. Boreen et al. in *Environmental Science and Technology*, as well as an additional study currently in press. Another finding published in 2003 by Douglas E. Latch et al. in *Photochemistry and Photobiology A: Chemistry* showed that the photolysis of the common antimicrobial compound triclosan yields a member of the dioxin family of compounds, which are of great environmental concern, demonstrating the importance of considering the photolysis products.

The importance of photolysis to the degradation of antibiotic compounds in the environment suggests other possible subjects of research. The use of photolysis as a treatment process to remove pharmaceuticals from wastewater is not currently feasible, but new innovations may make it possible. Also, the wide range of stabilities of the antibiotics investigated in this study suggests that it may be useful to consider the environmental fate of an antibiotic, including its photochemistry, when deciding which antibiotic to prescribe. If two antibiotics have the same method of action and efficacy, the one with the shorter environmental half-life should be used. Environmental persistence should also be included as a factor in the design of future pharmaceuticals.

The levels of antibiotics in surface waters, wastewaters, and drinking waters are not currently regulated. Given the recent attention generated by the detection of antibiotics in surface waters, policy decisions regarding acceptable levels of antibiotics are likely to be necessary in the near future. Research such as that presented in this study will provide a basis for performing comprehensive assessments of the risks antibiotics pose to human and ecosystem health. Thus, research such as this provides a rational starting point for discussions on the necessity of regulations and for the determination of acceptable levels of antibiotic compounds if regulations are deemed necessary by the appropriate regulatory agencies.

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Somali Families and Parent Involvement in Schools

by *Evangeline Nderu*

Since the early 1990s, Minnesota has been one of the most popular destinations for Somali immigrants and refugees. According to the Minnesota State Demographic Center, the largest groups of Somali immigrants to Minnesota between 1990 and 2000 were those aged 4 to 16 and those aged 25 to 44. The influx of Somali immigrants to Minnesota has and will continue to have a direct impact on the state's school system because the majority of immigrants are either school-aged children or young adults of childbearing age.

The percentage of students enrolled in the Minneapolis Public Schools' English Language Learner program has increased by 550% during the last 10 years, including 5,734 Minnesotan students who reported speaking Somali at home during the 2003–2004 school year, up from only 242 students in the 1996–1997 school year (Figure 1). This has created dire problems for schools and school districts because a lack of English comprehension is an impediment to providing basic services to immigrant students and a barrier to higher academic achievement for these students.

The majority of recent Somali immigrants do not fully understand the English language or educational norms in the United States, and cultural differences can easily result in misunderstandings. For example, in the United States, parental support is informally assessed by “showing up” behavior: supportive parents engage in volunteer activities, attend school performances and events, and are available for parent-teacher conferences. By this measure, immigrant parents may appear disinterested in their children's performance even when they believe that they are doing their utmost to encourage their children's success in school.

This article presents the results of a study conducted in the Twin Cities area between 2003 and 2004 that attempted to understand the perceptions Somali parents had about their children's schooling and their own roles in their children's education.



Photo courtesy of Evangeline Nderu

More than 5,000 students in Minnesota reported speaking Somali at home during the 2003–2004 school year.

The purpose of the study was to determine whether differing perceptions among teachers and Somali parents about Somali parent involvement are rooted in cultural differences. The study was partially funded through a New Initiative grant from CURA, which supported data collection and analysis.

Methodology

The study involved five focus groups and six individual interviews with Somali parents, for a total of 32 participants. The number of participants in each focus group varied from three in the smallest group to eight in the largest. All the groups except one consisted of females, and all the interviewees except one were women. Additionally, I engaged in informal conversations with people who worked with Somali immigrants in different capacities, including a teacher, a school administrator, a school counselor, and a social worker. Twenty-eight of the participants lived in Minneapolis and St. Paul, whereas the others lived in a suburb just outside the Twin Cities.

Where necessary, interpreters were used during focus groups and interviews.

Participants were parents of school-aged children in kindergarten through sixth grade. Parents had to report that they had been in the United States for 10 years or less before they were eligible to participate. The assumption was that the longer they have been in the country, the more likely they would have “learned” cultural definitions of parent involvement in the United States and learned to conform to local norms. The option of selecting parents through schools, although simpler than asking for volunteers in the community, was deliberately avoided to reduce bias or a sense of pressure on the parents' part to say what they felt the school would expect of them.

Parents as Supporters of Education

Somali parents in the study overwhelmingly described themselves as responsible for providing out-of-school support for learning, but emphasized some kinds of support more than others.

Peripheral Support. All participants felt that they were an integral part of their children's education and actively participated in the educational process. They described themselves as encouraging and supporting children to do well and behave in school. Twenty-six participants identified specific activities associated with their role as teachers in the home. This included teaching children to respect their elders, authorities, teachers, and parents through such behaviors as listening, not talking back, not being rude, and responding appropriately.

Participants identified taking care of their child's basic human needs as a key ingredient of their support. One mother stated that they are behind their children "100% and buy them books." Parents reported that they feed children, buy them whatever they need, wash their clothes, get their bags ready for school, make sure they are on time, and take them to the library. Mothers do everything they need to make sure students are successful.

It was clear from this study that fathers were not as involved as mothers with their children's education. When participants were questioned about the lack of apparent involvement by fathers, reasons included fathers having been killed or gone missing during the Somali civil war, working long hours, not wanting to be embarrassed at their own lack of knowledge, and holding to traditional beliefs that educating children is the mothers' domain.

Direct Academic Support in the Home. Twenty-five participants indicated that they help children with homework. In some cases, the parents

reported that they did not understand exactly what was needed to complete homework assignments, although they always asked for some demonstration that academic progress was being made. One mother said that although she may not fully understand the content of her children's work, she always checked to see who has an "A" grade and who has a "B." Her children are then aware that they are accountable to her for their performance in school. Another parent asked her children's teacher for notes outlining the homework her children could expect to get for the entire week.

Role of the Larger Community. The larger Somali community was referred to throughout interviews and focus groups as playing an important role in the education of participants' children. Participants referred often to members of the Somali community as resources that facilitated their children's education. When parents need extra help with their children's homework, they seek out friends and other community members and advise their children to ask other students for help. Somali community centers and other support organizations arrange after-school programs and tutoring that supplement students' schoolwork.

Visibility in School. Many Somalis do not understand why they are expected to come into the schools and, as they put it, "do the teachers' work for them," when they consider their role is primarily to encourage their children to work hard, help them with homework, and take care of their physical needs so they can perform at their peak. Parents may stay away from the school to avoid interfering with the work

of professionals. Only three participants said they were often visible at their children's schools. These parents attended meetings at the request of teachers and administrators. They also volunteered to carpool or chaperone school field trips and organize other parents who were interested in special activities. It is important to note that these three participants had been in the United States for at least eight years, had tertiary education, and had good command of English. Two had also received some formal education in the United States.

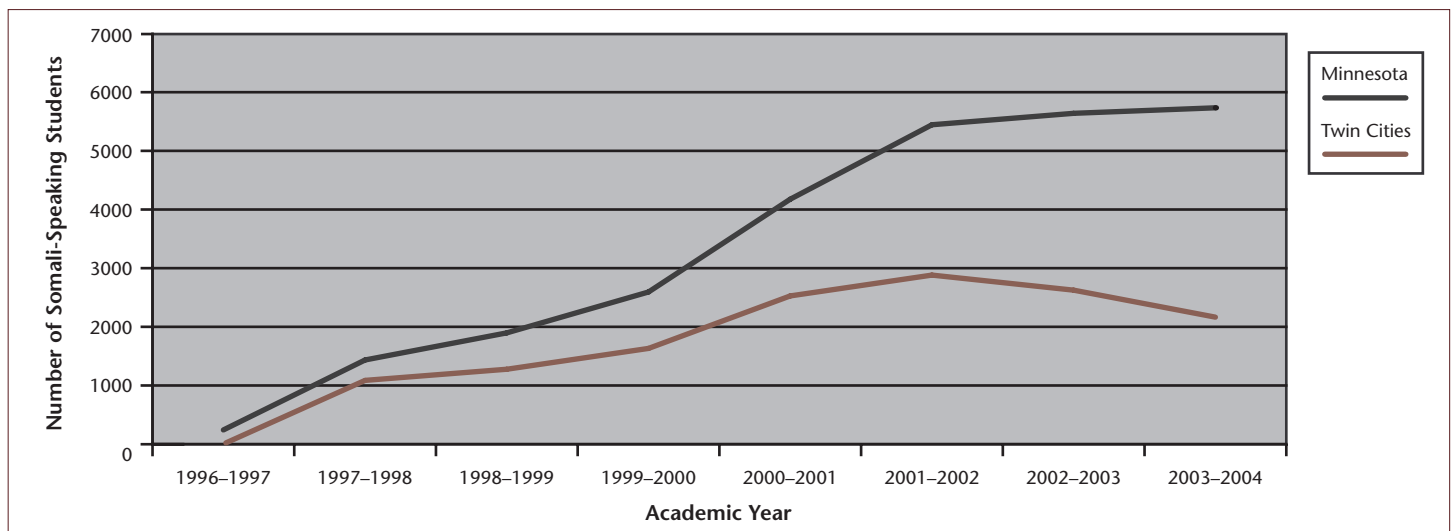
Barriers to Involvement

[W]e come from a community where the teacher is like the father and he takes care of everything. And here it is not the same because they want you to get involved. Really [that is] what they are thinking—they don't tell you that. . . . You know, it's hard to know sometimes because we are from a different world culture.

—study participant

Many of the difficulties Somali parents face make them appear unwilling to be involved in their children's education, but reflect confusion over expectations and appropriate behavior. Parents often do not understand what they are supposed to do to demonstrate their support and enthusiasm for education. One participant noted that no one told her what is expected of parents. She felt that she had received no help from schools about how to create a successful learning environment in her home, and was thrown back on her

Figure 1. Number of Students Reporting Somali as the Primary Language Spoken at Home



Source: Minnesota Department of Children, Families, and Learning



The larger Somali community plays an important role in educating children. Community centers and other support organizations arrange after-school programs and tutoring that supplement students' schoolwork.

own experience, which was outside of the United States. Another parent felt confused, and worried that she was not doing enough for her children.

When schools communicate that they would like parents to be more actively involved in their child's education, they inadvertently send mixed and incomplete messages. The father I interviewed illustrated this confusion with the following scenario:

Parents are always being told, "Please, please, come in to the school." But then as soon as you come in the school, the next thing is, "Well, wait a minute. You have to write your name down, give you a badge. . . and then we have to get security to escort you." Or, "You can't go anywhere. We have to call your children from the class." And then the parent you may see sitting or standing there a long time, sometimes because they are waiting for their son to [be] brought down, and you see a parent who is maybe late for work. It's good because of safety, but still also you see that there is a different territory.

This statement hints at a problem of trust between immigrant parents, particularly recent refugees, and schools. Because of negative experiences while immigrating to the United States,

many recent refugees are afraid of social services and law enforcement, an attitude that is reinforced by the assumption that the authorities are always ready to convict or deport refugees. A mother explained that when they experience trouble among themselves, they prefer to "deal with it themselves" rather than involve authorities. These experiences help to explain why security measures at schools bemuse them, and why they become easily discouraged from visiting.

Cultural Differences. In Somali culture, relationships with teachers *outside* of the school are important. Teachers and parents who encounter one another in a store or at places other than the classroom engage in informal conversations, although they may occasionally talk about a child. These informal relationships strengthen communication and make it easier for teachers to talk with the parent if there are concerns about a student's academic performance. In Minnesota, in contrast, parents said that teachers rarely acknowledged them when they saw each other outside the school. Because being ignored violated their cultural expectations, they became uncomfortable about going into the teacher's territory to discuss their child's academic progress.

Differences in managing time also interfere. One participant explained

that Somali immigrants have a very strong oral tradition and tend to memorize things. For instance, when a person needs to get household items, she would commit the items to memory until she reached the store. The memory is short-lived, and once she has bought the items, she does not have to think about them further. In Minnesota, appointments are made days, and sometimes weeks, ahead of time. Because of their reliance on short-term memorization, it is easy for Somali immigrants to forget a date in the face of more immediate events and daily chores. This means that when teachers make appointments that are a week or more away, as they often do, parents tend to forget. A Minneapolis social worker I interviewed concurred with this observation and said that one of her goals is to stress to the Somali refugee women with whom she works the importance of time-management and appointment-keeping.

English language proficiency is clearly an impediment to parental participation in schools. All the participants in this study mentioned difficulties arising from their poor ability to communicate in English. Those who were fluent English speakers and were involved in their children's education expressed concern for those who were non-English speakers. Those who were unable to communicate in English expressed their frustration and sense of helplessness, not only in the context of their children's education but also with reference to life in general in the United States.

Communication. Communication between the home and the school is more complicated because it usually arrives in written form. When asked about letters that were sent home, 14 participants admitted that they ended up throwing away letters. They gave various reasons for this, including not understanding English, not realizing the importance of the letter, and feeling overwhelmed by all the information that came in the mail, including letters and notes from the school. One mother said, "[My] difficulty was understanding what was important among all the literature [I] received from the school. There is lots of paper to return and [I am] not sure which to return and which to ignore."

Those parents who reported attending parent-teacher conferences were frustrated when they asked about their child's progress and were told their

performance was “OK.” This was a term they said was used for a broad range of academic outcomes. For example, a mother stated that her son was getting a C-average grade in his classes and she thought that this was very poor work, but each time she asked about his progress she got what she called the standard answer, “OK.” Another mother said that her daughter’s teacher used this answer on several occasions, so she was not sure if the teacher was unwilling or unable to discuss her child’s progress in more depth.

A final issue these parents raised was the fact that teachers tended to contact them primarily when their children were in academic crisis. They stated that they would have preferred to know when they were performing well; at the very least, the parents expressed the desire for earlier notification of their children’s academic decline so that they could address the situation before it became a crisis.

Other Concerns

All parents I interviewed expressed concern that their children were losing touch with their culture. Many spoke of their efforts to maintain their cultural norms in their homes, and by having their children attend Quranic schools, which are an essential part of their academic education and a link to their culture. Fear of negative peer pressure undermining Somali culture was mentioned in most of the focus groups, particularly by those parents who spoke little or no English. Children had to act as translator of all communications, including any letters from the school, leading them to act like they were the head of the household and their parents were inferior to them. One mother worried that the increase of drug and alcohol abuse among young Somalis was also contributing to the problem.

Praise for Schools

All interview and focus group participants had good things to say about their children’s schools in general. When they were asked if they were “happy” with the schools, all said that they were, in spite of the problems that they had outlined during other parts of the interviews. The father interviewed said,

[There are] free things here—free education, free transportation, free food for the kids, from kindergarten to high school seniors. The parents need these things which are free.

The curricular system is very good. We don’t have any problem with curriculums here.

In Africa, fees are attached to all aspects of schooling, so this is a welcome change.

A female participant echoed this sentiment when the same question was posed to her. Reasons she gave for why she was happy with the educational system included the safety and security it provided to children. In particular, school buses picking up and dropping off students at their homes ensured their well-being. Furthermore, schools provide safe havens for children, particularly for girls, who often live in crowded housing conditions and have many chores and responsibilities in the home. At school, they can be children, enjoying play and learning.

Suggestions for Schools

The parents I interviewed felt that schools should be more active in adult education. For example, parents were interested in formal instruction to teach them what their roles should be as active parents in their children’s education. One of the focus groups discussed the possibility of having a monthly meeting at their school with translators present. The purpose of the meeting would be to explain upcoming events at the school and suggested activities for parents who wish to be more involved. The parents saw themselves as willing

students who needed guidance, but who did not know how to ask to participate. Parents also saw schools as a possible source of learning English. One woman welcomed the idea of teachers stopping by her house at their convenience. This idea was greeted with enthusiasm by other participants.

Recommendations and Conclusions

Although Somali parents firmly laid responsibility for increasing parent involvement at the door of the schools, I believe that the Somali community could use its existing infrastructure to help parents take more initiative to become actively involved. For example, Somali community centers could encourage regular parent gatherings at which those who are more experienced in the expectations of U.S. schools could educate their peers. There are opportunities for Somali community organizations to play a more active role in bridging the cultural gap between schools and Somali parents. Because Somali community leaders comprehend social and cultural norms in Minnesota better than newcomers, leaders are in a position to act as guides for both Somali parents and Minnesota educators as they struggle to further understand each other’s expectations with regard to Somali children’s education. Furthermore, leaders in the Somali community who are well-versed in U.S. laws should conduct workshops for parents in which they explain laws to recent immigrants



Photo courtesy of Evangeline Nderu

Parents interviewed for this study felt schools could be more active in adult education by providing formal instruction on how to become involved in their children’s education or by offering adult English language classes.

to reduce parents' misperceptions and fears. Understanding the legal system would greatly reduce parents' need to rely on interpretation by their young children, thereby removing the age-inappropriate authority of decision making from immigrant children and restoring it to their parents.

In this study, parents mentioned wanting to meet with teachers in a more relaxed setting, rather than in the formal school environment, so that they could discuss their children's progress as well as learn more about Minnesota culture. Educators should strive to create a comfortable environment and invite parents for social meetings between adults. For example, because community centers are frequent gathering places for the cohesive Somali community, they might offer a comfortable space where educators and parents could gather and discuss expectations about the role parents and educators should play in Somali immigrant children's schooling. Educators could answer questions regarding what role parents should play and how to fulfill school expectations, while learning new skills and gaining new understanding of Somali culture from parents. Schools could enhance this activity by providing regular workshops or other events at

local Somali community centers, where information could be disseminated about upcoming school events. The distancing of such events from the formal school bureaucracy and the easy availability of translation services in the community center context would facilitate participation.

Somali parents arrived in the United States with skills established before they immigrated. Some immigrants and refugees were practicing professionals in their country of origin and were forced to take on whatever jobs they could find in Minnesota because their skill sets were not recognized or because parents themselves did not know where to begin applying for jobs to match their skills. For example, one participant who was a professional seamstress now works in childcare. Another who is a trained dentist works as a teacher's assistant. Educators are in a position to recognize and utilize parents' skills in the academic arena by inviting parents to contribute their opinions and capabilities when making decisions regarding students' education.

Parents, in turn, could use workshops to expose teachers to Somali culture and to share with educators their own knowledge and skills in a nonthreatening environment. The

broader community would benefit from such interactions by learning how it can help support both schools and parents, particularly parents who are not fluent in English or parents who are less well-educated.

Information from this study can be used as a basis for further study into ways of incorporating aspects of both Western and Somali cultures while developing parent involvement programs in schools. As Somali immigrants continue to increase in number, it is crucial that new immigrants and established members of the community learn how best to work together for a shared sense of community.

Evangeline Nderu recently earned a Ph.D. from the Department of Educational Policy and Administration at the University of Minnesota, and is undergraduate associate for a minority engineering program at the University.

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Residential Development Impacts in Two Minnesota Regions

by Laura Kalambokidis and Bob Patton

New homes and new residents often bring to local governments both increased tax revenues and increased government service costs. Whether the development is a contributor to or a drain upon the local budget depends on the development's "net fiscal impact"—the difference between the revenues flowing from the development and the costs of providing services to new residents.

Some state departments of agriculture and other organizations have used fiscal impact analysis to analyze the effects of development on farmland. For example, the Minnesota Department of Agriculture (MDA) has studied the fiscal impacts of compact development patterns, which can protect farmland while still accommodating growth. With funding provided by the Minnesota Future Resources Fund based on a recommendation by the Legislative Commission on Minnesota Resources (LCMR), the MDA conducted studies in 1989 and 1999 that compared the fiscal impact of residential development within city boundaries with more scattered development outside cities. In a 1999 report titled the *Cost of Public Services Study*, the MDA concluded that, in general, "the fiscal impact of new residential development is more favorable for all branches of local government when it occurs within or adjacent to cities where appropriate infrastructure and services are available."

The 1999 project produced a computer program, *Development Impact Assessment Model: A Technical Resource (DIAMaTR™) for Local Governments*,¹ that was designed to analyze the fiscal impacts of residential development resulting from local land-use policy decisions. Rather than looking at one development in one location at one point in time, DIAMaTR examines the cost and revenue implications of all residential development occurring in a jurisdiction over a number of years.

¹ ©1999 Michael L. Siegel, Public and Environmental Finance Associates.



Photo by Steve Schneider

The MDA and the University of Minnesota Department of Applied Economics, with funding from a CURA Faculty Interactive Research Program grant and the Minnesota state legislature,² recently used DIAMaTR to complete fiscal impact studies in two regions of Minnesota: (1) the City of Oronoco, the adjacent township of Oronoco, and Olmsted County; and (2) the City of Pine Island, the adjacent township of Pine Island, and Goodhue County. Both studies also evaluated the impact of development in the school district they share, Independent School District 255.

Pine Island (population 2,337 in 2000) and Oronoco (population 883 in 2000) are small cities situated on opposite sides of a county line—Pine Island in Goodhue County, and Oronoco in Olmsted County (Figure 1). The cities are five miles apart. Both cities are adjacent to U.S. Highway 52, which connects the Twin Cities to Rochester. Pine Island lies 62 miles to the south of the Twin Cities metropolitan area, and Oronoco lies 9 miles north of Roch-

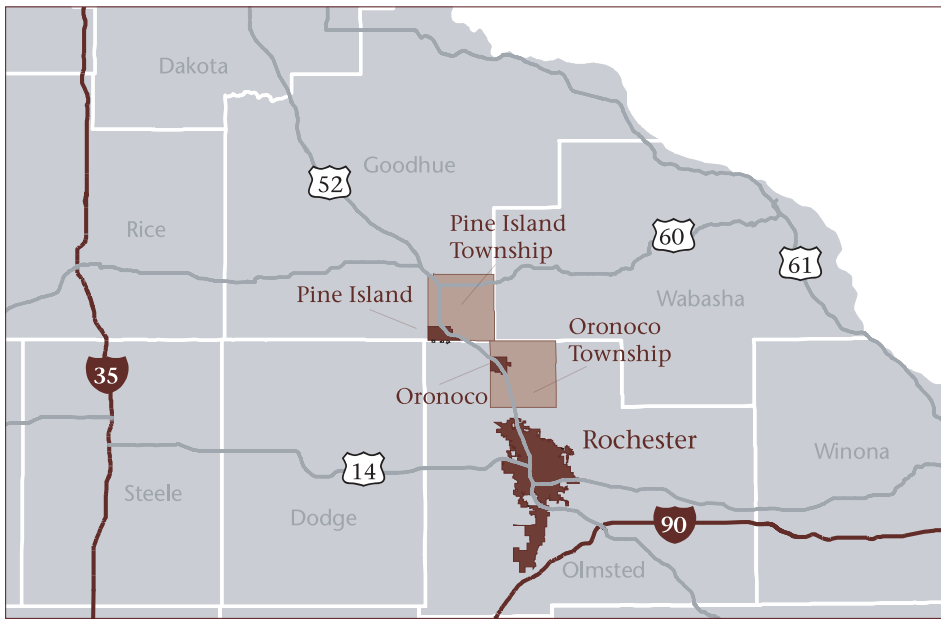
² Funding for this project was provided by the Minnesota Environment and Natural Resources Trust Fund, as recommended by the LCMR.

ester. Historically farming towns, today the cities are experiencing growth as a result of their proximity to Rochester, and both cities have conducted comprehensive planning efforts in anticipation of that growth. A 2003 draft comprehensive plan for Pine Island projected the population to reach 4,000 people by 2023, whereas Oronoco's 2002 draft comprehensive plan projected a population of more than 7,000 people by the year 2027.

The adjacent townships of Pine Island and Oronoco are rural in nature with populations of 628 and 2,239, respectively, in the year 2000. One of the choices facing the cities and townships is whether to grow by concentrating development in the cities and annexing land in the adjacent townships as needed, or by permitting large-lot residential development in nearby townships.

The MDA and University of Minnesota research teams estimated the net fiscal impacts of three future development scenarios in each region. Scenario 1 assumed that high levels of growth would occur in the city, and that the township would see little new development. Scenario 2 assumed low growth in the township, but a

Figure 1. Location of Jurisdictions Included in the DIAMaTR Fiscal Impact Study



moderate amount of growth in the city. Scenario 3 assumed a more scattered development pattern, with low growth in the city and high growth throughout the rest of the county.

For each scenario, the fiscal impact studies calculated local government revenues and expenditures in a base year, and projected the fiscal effect of growth on each jurisdiction in a future “horizon” year (2027 for the Oronoco study, and 2023 for the Pine Island study). The impact on each jurisdiction was measured by the net government revenue (expenditure) attributable to residential property, calculated per resident in the jurisdiction in the horizon year. (The effect on the share of each government’s budget attributable to commercial, industrial, or agricultural property was not estimated.) For example, if the per-resident value is positive, residents in the jurisdiction are projected, on average, to make a net positive contribution to the residential property share of the government’s horizon year budget. If the per-resident estimate is negative, residents are, on average, projected to impose net costs to the jurisdiction.

The qualitative results of the studies for the counties, cities, and townships are shown in Table 1. The three development scenarios are ranked in order of their fiscal impact on each jurisdiction, with scenarios generating per-resident net revenue appearing in the top half of each column, and those resulting in per-resident net expenditures in the bottom half. The distance from the

middle of the column (the break-even point) indicates the relative degree of the fiscal impact.

In 13 out of 18 cases, the development was projected to result in a net expenditure per resident in the jurisdiction. Of the three development schemes, the scattered-development scenario (Scenario 3) resulted in the largest per-resident net expenditure for both counties and both townships. In contrast, the scattered-development scenario generated net revenue for both cities. However, that scenario provided the least net revenue of the three scenarios for Oronoco, and the most net revenue of the three scenarios for Pine Island. In the Oronoco study, the high city growth scenario (Scenario 1) provided the most net revenue of all the scenarios for the county, city, and township. In the Pine Island study, the results among the jurisdictions were more mixed, and there was no consensus scenario that benefited all jurisdictions.

Differences in the results for the growth scenarios across the six jurisdictions are attributable to observations about public service expenditures that are built into the model. Those observations arose from the original *Cost of Public Services Study* by the MDA, which included a statistical analysis of the budgets of jurisdictions in 29 Minnesota counties, interviews with local officials and public finance experts, and testing of the model in five counties. For example, based on the *Cost of Public Services Study* finding

that counties provide more services for development outside cities than within cities, the model generally shows higher net expenditures for residents outside cities. Additionally, because per capita road operation and maintenance costs were observed to be inversely proportional to population density, the model tends to show lower net revenues and higher net expenditures from lower density development.

Variations from these expected patterns are also apparent in the model results. For example, results for the City of Pine Island show higher net revenue for the scattered-development scenario than for the moderate and high city growth scenarios. This is because the model calculated sharply higher capital costs (based on inputs of base year debt service and “pay as you go” capital outlays) for new residents than for existing residents. Because a smaller proportion of new residents are assumed to live in the city in the scattered-development scenario, that scenario generated lower per capita expenditures than the other scenarios. Adjustments to assumed capital costs likely would have changed the results significantly.

Overall, the results of this analysis indicate that changing the location and density of new residential development within a region changes the impact of the development on local governments’ budgets. In addition, development that spans jurisdictions can have differing effects on the budgets of those jurisdictions. Therefore, local and regional governments considering a development should carefully consider the location and density of the development and work together with other affected jurisdictions.

The MDA is available to assist local or regional governments with fiscal impact analysis using DIAMaTR. If you are interested in these services, please contact Bob Patton, Minnesota Department of Agriculture, at 651-296-5226 or bob.patton@state.mn.us.

Laura Kalambokidis is assistant professor in the Department of Applied Economics at the University of Minnesota. Her teaching and research are focused on a variety of topics related to government finance. **Bob Patton** is local government outreach coordinator at the Minnesota Department of Agriculture. He is lead staff member for the state’s agricultural

Subprime Lending and Foreclosure in Hennepin and Ramsey Counties: An Empirical Analysis

by Jeff Crump

Increasing homeownership among low-income and minority communities is a major goal of housing policy at national, state, and local levels. In particular, policies intended to open up mortgage markets to underserved populations have helped to increase homeownership in neighborhoods that previously had little access to financial resources. Although policy makers and community leaders applaud gains in homeownership, the high rate of subprime lending in low-income and minority neighborhoods threatens to undo hard-won gains. The high cost of subprime loans may put many families in financial jeopardy and increase the risk of foreclosure. Foreclosures in turn threaten the viability of entire neighborhoods, as the increase in vacant homes lowers property values, encourages crime, and discourages business development.

This article reports on a study to determine the prevalence of subprime lending in Hennepin and Ramsey Counties, and the potential links between subprime lending and foreclosure. The project was supported by grants from CURA's Faculty Interactive Research Program and the Saint Paul Foundation's Pan-African Community Endowment Fund. The foreclosure data on which the study is based were collected jointly with the Federal Reserve Bank of Minneapolis.

The first section of this article provides a brief overview of subprime lending, including the economic impacts and geographic distribution patterns associated with subprime loans. The second section describes the data and methodology used for this study of subprime lending in Ramsey and Hennepin Counties. The third section describes the findings of the study, including the relationship between subprime lending and foreclosures. The final section offers public policy recommendations for addressing some of the problems associated with subprime lending.



Photo by Robert Friedman

The high rate of subprime lending in low-income and minority neighborhoods threatens to undo hard-won gains in homeownership among these groups.

Subprime Lending and Homeownership: American Dream or Nightmare?

This introductory section defines subprime lending and distinguishes it from predatory lending, discusses the costs of subprime lending to consumers, and considers various explanations for the “geography” of subprime lending.

What Is Subprime Lending? To understand subprime lending in Hennepin and Ramsey Counties, an operational definition is needed. The first point is that subprime loans are more expensive than those obtained in the prime market. Subprime loans generally have higher rates of interest, smaller loan amounts, and greater origination costs. The second point is that the subprime lending market is associated with certain “predatory” practices that are not justified by an applicant’s lack of credit-worthiness. According to Deborah Goldstein,

author of *Understanding Predatory Lending*, predatory loans are usually distinguished from subprime loans by the sales practices of the lenders. Predatory lending is characterized by sales practices that mislead borrowers by withholding information or purposefully hiding the costs associated with a loan, and selling loans that the lender knows the borrower will not be able to pay back. Although we know that predatory lending exists, there is little information about how prevalent the practices are.

It is important to recognize that it is not easy to distinguish between a subprime loan and predatory lending. Not all subprime loans are predatory, but some are. What is known is that for borrowers with predatory loans, the financial burdens can be heavy.

The Costs of Subprime Lending. Subprime lending expanded rapidly during the 1990s, growing from \$35 billion in 1994 to \$160 billion in

1999. Subprime lenders often charge high interest rates, and a subset of lenders may practice predatory and unscrupulous business practices such as loan flipping, excessive fees and charges, lending without regard to the borrower's ability to repay, and various forms of home improvement fraud and abuse. According to a 2001 report published by the Coalition for Responsible Lending titled *Quantifying the Economic Cost of Predatory Lending*, such practices cost American consumers roughly \$9.1 billion a year. Because approximately 50% of those borrowing in the subprime market could qualify for a prime loan, the cost to consumers is not easily justified.

The costs of subprime loans can be considerable because the higher interest rates typical of subprime loans add a substantial amount to the price of a home. For example, at an interest rate of 5%, the total interest on a 30-year fixed-rate mortgage would be \$153,198. By comparison, if the same loan were obtained at a higher interest rate of 7%, an additional \$81,519 in interest would be paid over the course of the 30-year loan for a total of \$234,717. (It should be noted that these figures are for the purpose of comparison only.) Furthermore, higher interest rates are only one of the expenses associated with subprime lending. Subprime lenders also charge consumers loan initiation fees, credit insurance premiums, and prepayment penalties.

An example of how these charges can increase the cost of a loan was documented by the Minnesota Attorney General's Office in the 1998 case *State of Minnesota v. First Alliance Mortgage Company* (Court File No. C9-98-11416). Evidence introduced during the trial indicated that Ramsey County borrowers paid First Alliance Mortgage Company origination fees that were 18% of the total loan amount, and total loan fees that comprised an average of 23.3% of home equity. To put this in concrete terms, for a homeowner with \$100,000 in equity, the total loan fees would be \$23,300.

The Geography of Subprime Lending. A 2000 report by the U.S. Department of Housing and Urban Development and the U.S. Department of the Treasury, *Curbing Predatory Home Mortgage Lending*, found that relatively high numbers of subprime loans are found in low-income and minority neighborhoods. Instead of promoting the financial independence symbolized

by homeownership, some subprime lenders use sophisticated marketing techniques that may undermine the financial health of many homeowners by stripping them of their home equity. As the report notes, "an unscrupulous subset of . . . lenders . . . engage in abusive lending practices that strip borrower's home equity and place them at increase risk of foreclosures. . . . Predatory lending has contributed to the rapid growth in foreclosures in many inner-city neighborhoods and foreclosures can destabilize families and entire neighborhoods" (p. 13).

From the perspective of lenders, subprime loans play an important role in providing individuals with less-than-perfect credit records with the funds needed to purchase a home. According to the mortgage industry, the costs associated with subprime loans simply reflect the greater risk associated with borrowers with low incomes, high debt loads, or blemished credit records. This explanation might lead one to conclude that the spatial pattern of subprime lending mainly reflects the individual characteristics of borrowers, and is not the result of targeting by subprime firms.

In contrast to the explanations put forth by the subprime mortgage industry, critics argue that subprime lenders target vulnerable low-income and minority communities. From this perspective, subprime lenders target neighborhoods that are historically underserved by conventional lenders; neighborhoods that are populated by minorities who have suffered from systematic discrimination in the mortgage market and who may be reluctant to approach depository banks or savings and loan institutions; and neighborhoods with aging housing stock that is in need of repair (i.e., places where home improvement loans are easily marketed).

Data and Methodology

The data used here to describe and analyze the spatial distribution of subprime lending in Hennepin and Ramsey Counties come from publicly available information contained in the Home Mortgage Disclosure Act (HMDA) dataset for the years 1996 to 2002. The HMDA data used include individual and census-tract information on all the loan applications for home purchases, home improvements, and refinance loans for Hennepin and Ramsey Counties.

Although it is the most comprehensive publicly available data, HMDA data

present some real challenges. The most significant concern is that subprime loans are not explicitly identified in the HMDA data. Therefore, to identify which loans are subprime, I used the list of subprime lenders that the U.S. Department of Housing and Urban Development (HUD) issues yearly to categorize each loan in the HMDA data set. An important limitation to this method of identifying subprime loans is that if HUD classifies a lender as subprime, then all loans from that lender were categorized as subprime loans for the purpose of this study. The reverse is true of lenders HUD classifies as prime; all their loans were placed into the prime loans category. Although this is an important limitation of the HMDA data set, this methodology is employed in nearly all studies of subprime lending. To address this limitation, the most recent HMDA data include the interest rate for the loan; unfortunately, these data sets were not available at the time of this study.

A second concern with the HMDA information is the increased incidence of missing data pertaining to the racial and ethnic identity of applicants. A study in the April 2002 issue of the journal *Economic Geography* titled "The Disappearance of Race in Mortgage Lending" found that racial information is most likely to be missing for African American applicants. What this means in practice is that the analysis presented here likely underestimates the prevalence of subprime lending in African American neighborhoods.

To understand the spatial distribution of foreclosures and analyze the relationship between subprime lending and foreclosure, the address, lender, and date of sale for each foreclosure was collected from publicly available sheriff's records. To the best of my knowledge, all foreclosure sales that occurred in Hennepin and Ramsey Counties in 2002 were included in this analysis. To help accomplish the time-consuming task of gathering these data, I entered into an informal data-sharing agreement with investigators at the Federal Reserve Bank of Minneapolis. Because researchers at the Federal Reserve Bank were collecting foreclosure data for Ramsey County, rather than duplicating their efforts, it was agreed that I would compile the information for Hennepin County and combine it with the Ramsey County data the Federal Reserve Bank researchers collected.

Subprime Lending and Foreclosures in Ramsey and Hennepin Counties, 1996–2002

This section presents an analysis of subprime lending and foreclosures in Ramsey and Hennepin Counties. I analyze subprime lending in these counties from 1996 to 2002, as well as the spatial distribution of subprime loans and foreclosures in these counties. The section concludes with a discussion of the relationship between subprime lending and foreclosure in Ramsey and Hennepin Counties.

Subprime Loan Applications and Originations, 1996–2002. Between 1996 and 2002, housing markets in Hennepin and Ramsey Counties were very active. Of the 1.2 million loan applications made in Hennepin and Ramsey Counties between 1996 and 2002, more than one-fifth (21.4%) were to lenders that HUD classified as subprime.

From 1996 to 2002, there were a total of 587,852 loan originations (Table

1). Subprime loans comprised 7.1% (41,541) of the total. In comparison to the prime mortgage market, a smaller proportion of subprime loans were actually originated (Figure 1). Whereas nearly two-thirds (63.3%) of prime loans were originated, less than one-quarter (22.7%) of subprime loans were actually originated.

Loan denial rates were much greater for subprime applicants. More than one-fourth of subprime applicants were denied loans, compared to 10% of prime applicants. Because the subprime market is said to include many less credit-worthy applicants, it would stand to reason that denials would be higher. One finding that is intriguing is that more than 25% of the subprime loan applications were withdrawn by borrowers themselves, compared to just 4.3% among prime originations. It is possible that education programs currently under way in Hennepin and Ramsey Counties may have convinced

some borrowers to withdraw their subprime loan applications. Another potential explanation is that the high cost associated with such loans led to applicants withdrawing their loan applications.

Subprime Lending and Race. Nearly one-half (53.0%) of subprime loan originations went to White borrowers, and subprime loans accounted for 4.9% of all mortgages received by Whites between 1996 and 2002 (Table 1). These figures indicate that although Whites account for the largest absolute number of subprime loan originations, the vast majority of Whites receive prime loans, with their concomitant lower costs.

The relative balance between prime and subprime loans is different for Latinos and African Americans. For example, Latinos receive 1.5% of all prime loans and 2.0% of subprime loans. The results indicate that slightly less than 10% of all home loans originated for Latinos were from subprime lenders.

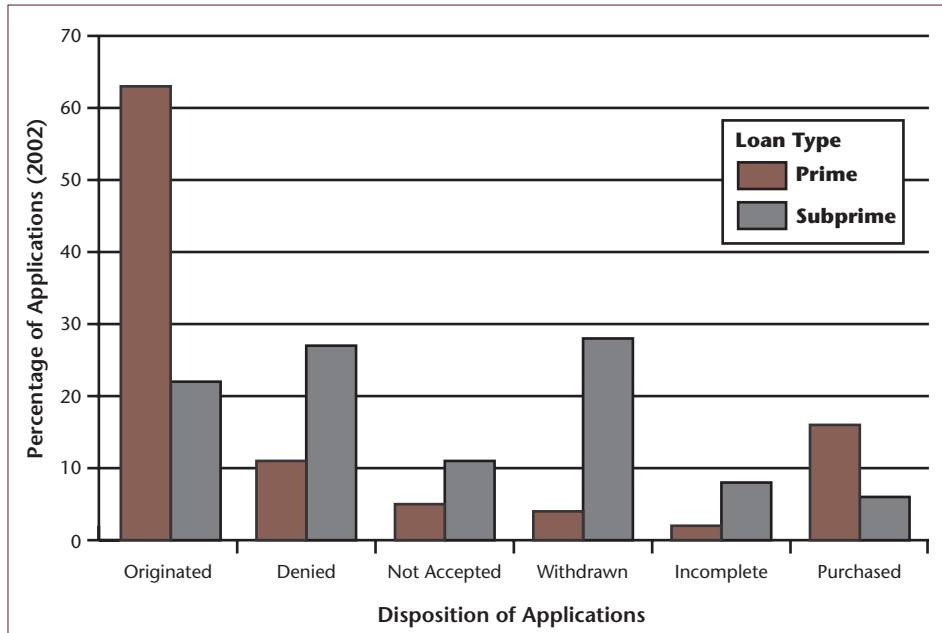
Table 1. Mortgage Loan Originations in Ramsey and Hennepin Counties by Race/Ethnicity, 1996 to 2002

Race/Ethnicity	Percentage of all prime loans originated	Percentage of all subprime loans originated	Percentage of all loans originated	Percentage of loans that are subprime	Likelihood of receiving a subprime loan*
American Indian	0.3% (1,831)	0.8% (332)	0.4% (2,163)	15.3%	22%
Asian/Pacific Islander	3.1% (16,789)	2.4% (991)	3.0% (17,780)	5.6%	8%
African American	2.5% (13,498)	11.3% (4,697)	3.1% (18,195)	25.8%	34%
Latino	1.5% (8,188)	2.0% (842)	1.5% (9,030)	9.3%	13%
White	78.2% (424,434)	53.0% (22,008)	76.5% (449,442)	4.9%	10%
Other	1.1% (5,839)	1.1% (464)	1.1% (6,303)	7.4%	—
Information not provided	12.7% (69,235)	29.2% (12,117)	13.8% (81,352)	14.9%	—
Not applicable	0.6% (3,497)	0.2% (90)	0.6% (3,587)	2.5%	—
Total	92.9% (543,311)	7.1% (41,541)	100% (587,852)	7.1%	—

Source: Author's calculations from Home Mortgage Disclosure Act data set, 1997–2003

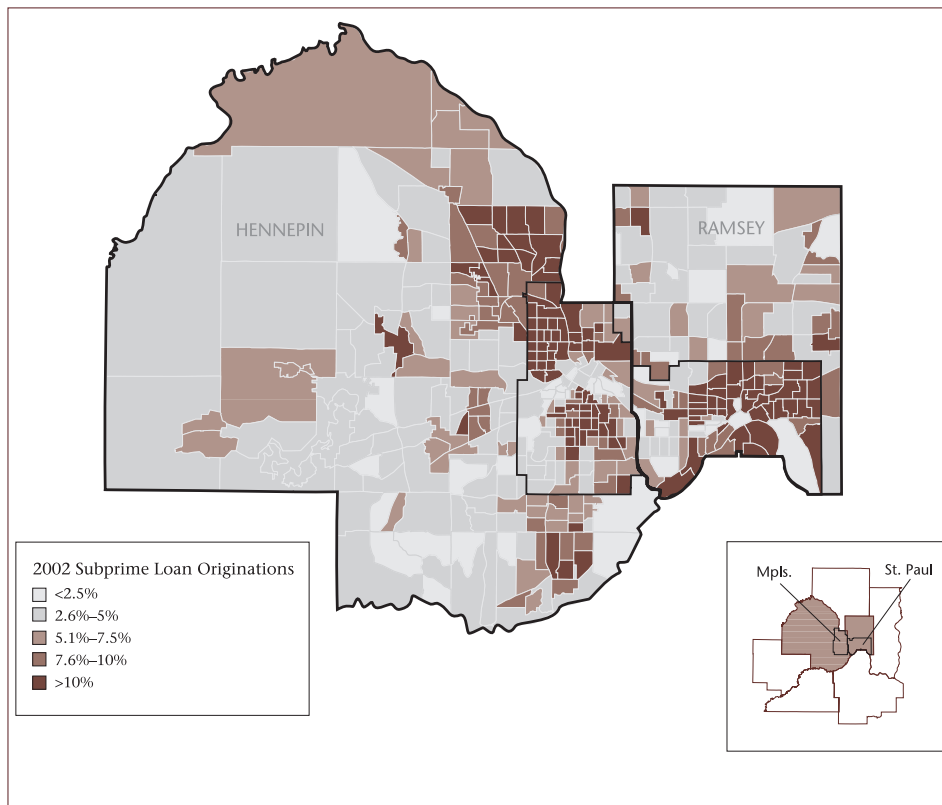
*The likelihood of receiving a subprime load was calculated with income held constant.

Figure 1. Disposition of Prime and Subprime Loans in Hennepin and Ramsey Counties, 2002



Data Source: Home Mortgage Disclosure Act data set, 1996–2002

Figure 2. Rate of Subprime Loan Originations in Hennepin and Ramsey Counties by Census Tract, 2002



Data Source: Home Mortgage Disclosure Act, 2002

The highest proportion of subprime loan originations is found among African American borrowers. Between 1996 and 2002, African Americans obtained 2.5% of all prime mortgages. At the same time, they received 11.3% of all subprime loans. Because of the

high proportion of subprime loans in the African American community, more than one-fourth (25.8%) of all mortgages originated for African Americans were subprime. The rate of subprime lending among African Americans is 3.6 times the overall rate for Hennepin

and Ramsey Counties during the period 1996 to 2002.

To further substantiate these findings, additional statistical analyses were used. In this case, logistic regression analysis was employed to calculate the likelihood that an individual would receive a subprime loan. One advantage of this technique is that it is possible to hold certain factors constant. In this case, I held income constant, meaning the analysis eliminated the effects of income on the likelihood of obtaining a subprime loan. The results of the logistic regression analysis are illuminating. The statistical analysis indicates that African Americans have a 34% likelihood, regardless of income, of receiving a subprime loan (Table 1). This is 3.4 times greater than the likelihood that a White resident of Hennepin or Ramsey County will receive a subprime mortgage.

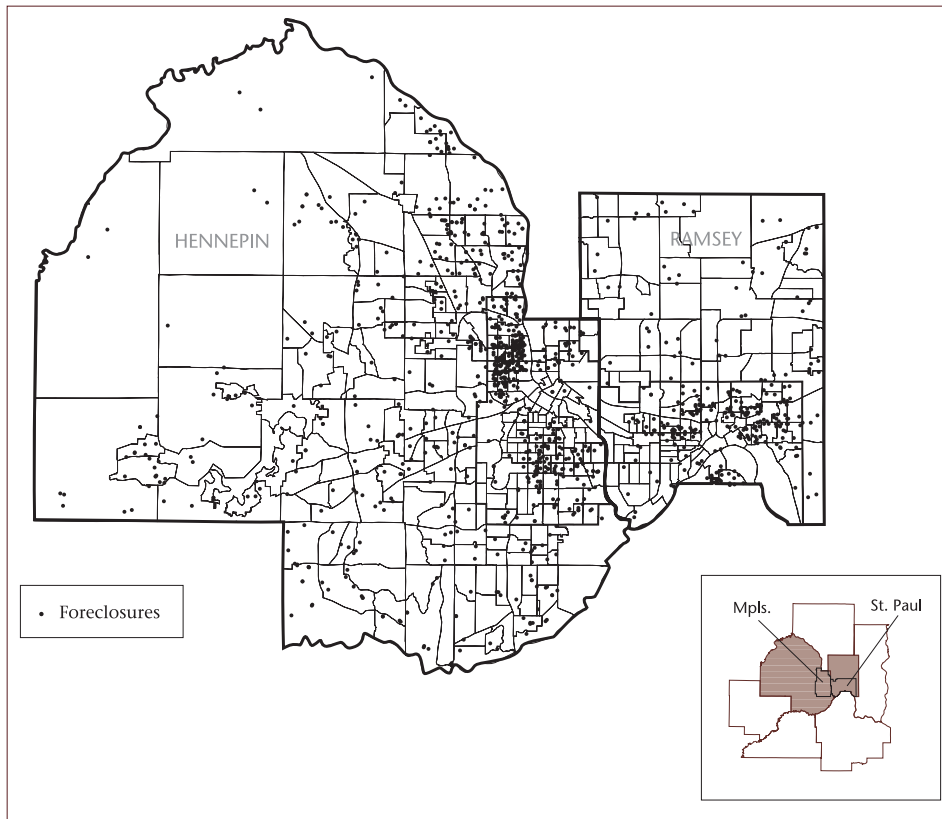
The Geography of Subprime Lending in Ramsey and Hennepin Counties, 1996–2002. To analyze the geography of subprime lending in Hennepin and Ramsey Counties, maps at the census-tract level were compiled for each year from 1996 to 2002. Because there was very little year-to-year variation in the geographic distribution of subprime loans, the distribution map for 2002 (Figure 2) is used here to illustrate the spatial patterns of loans.

Given the foregoing analysis—which shows that a large number of subprime loans are going to African Americans—as well as the segregated nature of housing in Hennepin and Ramsey Counties, it is no surprise that relatively high proportions of subprime loans are found in neighborhoods where significant numbers of African Americans live.

For Hennepin County, which encompasses the city of Minneapolis, subprime loan concentrations are clearly evident in Figure 2. Both north and south Minneapolis have large African American populations. In every census tract in north Minneapolis, more than 10% of all home loans fall into the subprime category. A similar pattern is evident in south Minneapolis.

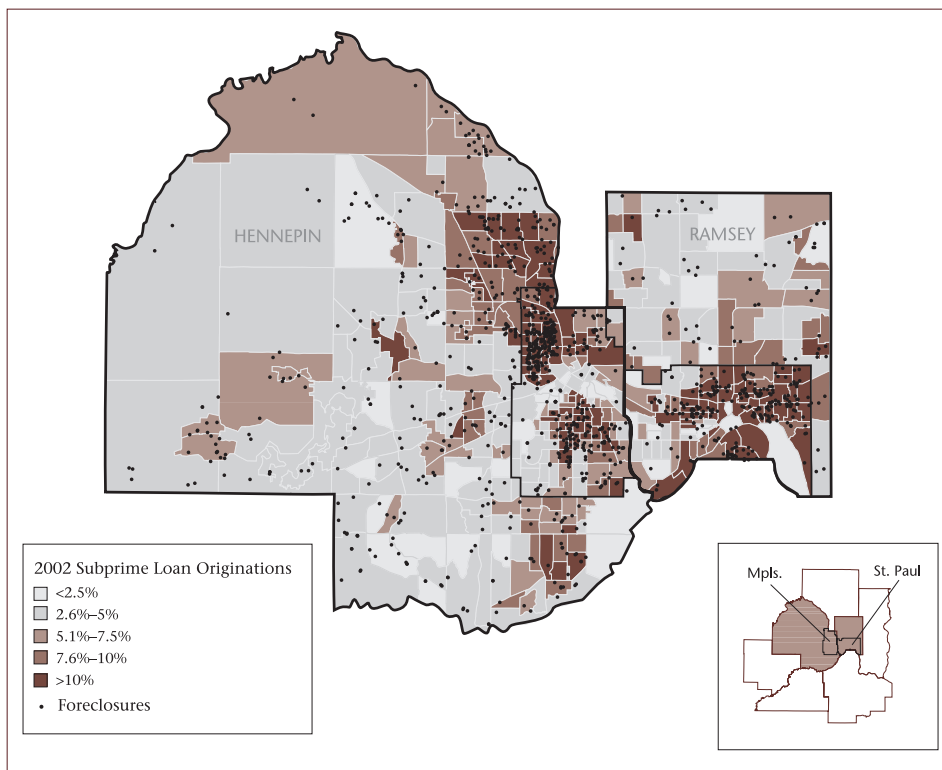
The association of subprime lending with minority neighborhoods is apparent in St. Paul as well. Here, the predominantly minority Latino West Side, which lies across the Mississippi River from downtown St. Paul, and the ethnically diverse Frogtown neighborhood, which is just northwest of the State Capitol, exhibit relatively large numbers of subprime loans. Clusters

Figure 3. Location of Home Mortgage Foreclosures in Hennepin and Ramsey Counties by Census Tract, 2002



Data Source: Hennepin and Ramsey Counties, 2003

Figure 4. Rate of Subprime Loan Originations and Location of Home Mortgage Foreclosures in Hennepin and Ramsey Counties by Census Tract, 2002



Data Source: Home Mortgage Disclosure Act, 2002; and Hennepin and Ramsey Counties, 2003

of subprime loans are also found in predominantly minority census tracts of St. Paul; particularly in the area between University and Lexington Avenues and on the mainly Hispanic west side.

The results of this spatial analysis indicate that subprime loans in Hennepin and Ramsey Counties are concentrated in African American and Latino communities. Therefore, it is reasonable to expect that problems often associated with subprime lending, namely foreclosure, should also be concentrated in these neighborhoods.

Subprime Lending and Foreclosures in Ramsey and Hennepin Counties, 2002. An examination of the spatial pattern of foreclosures in 2002 reveals a striking cluster of foreclosures in north Minneapolis, and a lesser grouping in south Minneapolis (Figure 3). Although patterns in St. Paul are not as obvious, there still appears to be a high correlation between areas in the city with high concentrations of subprime lending and the locations of foreclosures.

Overlaying the locations of foreclosures on the map showing concentrations of subprime lending (Figure 4) bolsters the conclusion that there is a relationship between subprime lending and foreclosure. Foreclosures are found predominantly in minority neighborhoods. In particular, north Minneapolis has a large number of foreclosures. To further examine the link between foreclosure and subprime lending, the HUD list of subprime lenders for the period 1996 to 2002 was compared to the list of mortgage holders on foreclosed properties in Hennepin and Ramsey Counties in 2002. Of the 1,290 foreclosures, 505 of the properties had mortgages held by subprime lenders. Although subprime lenders account for only 7.1% of all home mortgages, borrowers with subprime loans account for 40% of all foreclosures.

Conclusion

This article has presented the results of an analysis of subprime lending and foreclosure in Hennepin and Ramsey Counties. The findings indicate that African Americans, in comparison to other racial groups, are more likely to have a subprime loan. Latinos also have a relatively high level of subprime mortgages. Because race and neighborhood are highly correlated in Hennepin and Ramsey Counties, high proportions of subprime loans are found in Latino and African American neighborhoods.



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Organized efforts to educate consumers about the risks of subprime loans, such as the "Don't Borrow Trouble" campaign currently under way in Minnesota, are one means to address the growing problem of subprime lending.

Lenders, homeowners, public policy makers, and community activists all have a common interest in preventing foreclosure.

It is important that policy makers continue to extend the opportunities associated with homeownership to traditionally underserved communities. To withdraw from efforts intended to promote homeownership among minorities would be a significant step backward, and would only lead to the exacerbation of urban problems such as crime and poverty. Although subprime lending has opened the doors of homeownership to some, predatory abuses associated with subprime lending may ultimately threaten the policy goal of increasing homeownership.

There are two potential solutions to the challenges associated with subprime lending. First, consumers need to be educated about subprime lending. Currently active efforts are

under way through the "Don't Borrow Trouble" campaign to educate home buyers about the risks associated with subprime lending.

Regulation is another way to address the challenges associated with subprime lending. Several states, notably North Carolina, have passed laws that regulate aspects of the home mortgage industry. Nationally respected organizations such as the American Association of Retired Persons (AARP) support consumer protection legislation. However, there is widespread opposition to regulation of the subprime lending industry in some sectors, and the federal government has recently promulgated regulations that override local and state laws.

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interests include public housing policy, housing markets and finance, and labor geography.

The author would like to thank Jessica Deegan (formerly of the Minneapolis Neighborhood Information System) and the Federal Reserve Bank of Minneapolis for their assistance in data collection and analysis.

This study was supported by a grant from CURA's Faculty Interactive Research Program. The program was created to encourage University faculty to carry out research projects that involve significant issues of public policy for the state and that include interaction with community groups, agencies, or organizations in Minnesota. These grants are available to regular faculty members at the University of Minnesota and are awarded annually on a competitive basis. Additional support was provided by the Saint Paul Foundation's Pan African Community Endowment fund.

Supporting the Career Aspirations of American Indian Youth

by Annette E. Alliman-Brissett and Sherri L. Turner

We all have the freedom to dream—about life and career goals, wishes for our children's future, or personal aspirations. In American Indian culture, dreams are a valued part of daily life and often symbolize hope. Many American Indian youth have great dreams about graduating from high school, attending college, and obtaining a personally valued and satisfying career, but many face the stark realities of not finishing high school or obtaining the job they want. According to the Bureau of Labor Statistics' 1997 *Annual Demographic Survey*, dropout rates among American Indian young people are greater than 50% in some places in the country. In addition, the rate of unemployment and underemployment among American Indians still far exceeds that of the majority population, despite affirmative action and other parity-seeking policies. A 1997 report by the Bureau of

Indian Affairs titled *Indian Labor Force Report: Portrait 1997* concludes that adult American Indians are overrepresented in primarily unskilled occupations, and the 1990 U.S. Census found that unemployment rates ranged from 25% to 80% on all American Indian reservations and among the 25 largest tribes in the nation.

According to the 2000 U.S. Census, 4.1 million American Indian people live in the United States, and more than 50,000 live in Minnesota. Approximately half of the American Indians in Minnesota live in urban areas. Census trends indicate an influx of American Indians migrating to large urban areas. These trends highlight a critical need to provide career planning and development interventions that are culturally relevant and address the unique career challenges of American Indian young people. These challenges include moving from a rural reservation residence to

an urban setting, competing for jobs in which values and social customs might be different than one's own, constructing relationships with ethnically different people, and searching for educational and occupational opportunities that are available in larger metropolitan areas.

Career education is one way to help young people set career goals, make plans to reach those goals, and overcome career barriers early in life. However, few tested career education programs are designed to meet the specific career development needs of American Indian young people. To help fill this gap, we developed a career education curriculum called "Two Feathers: A Career Education Curriculum for American Indian Adolescents," which is described in this article. Our efforts were supported by a New Initiative grant from CURA, and by a grant from the College of Education and



Photo courtesy of Sherri L. Turner

There is a critical need to provide culturally relevant career planning and development interventions to address the unique career challenges of American Indian young people in Minnesota.

Human Development at the University of Minnesota.

The Two Feathers Curriculum

The Two Feathers curriculum was developed in consultation with American Indian parents, educators, and community leaders. Upon completion, we believed that we had a culturally rich educational tool. The curriculum features well-researched cooperative learning activities that promote social skill building, decision making, visual and artistic expression, problem solving, and goal setting. It also emphasizes the importance of family and community support throughout the career decision-making process, and helps American Indian youth become more proactive in identifying personal and social barriers that may hinder them from pursuing their career goals. The curriculum is infused with valuable career and life skill building exercises that promote tribal wisdom and traditions, such as group work and storytelling as a medium for instruction and information sharing.

The Two Feathers curriculum consists of the following:

- ▶ exploration of a wide range of jobs that young people may not have considered previously;
- ▶ exploration of career interests, with particular attention paid to exploring career interests that are more nontraditional for American Indian people;
- ▶ exploration of barriers that young people could encounter while pursuing their educations and careers (e.g., poverty, pregnancy, feeling poorly prepared academically);
- ▶ identification of individuals in the young people's environment—such as parents and other extended family members, teachers, peers, school counselors, and members of the American Indian community—who can support their career aspirations;
- ▶ study of relationships between educational opportunities and career possibilities; and
- ▶ instruction and practice in decision making and goal setting.

The Two Feathers curriculum is unique in that cultural traditions and beliefs drawn from a number of American Indian tribes are embedded in the curriculum. For example, the curriculum emphasizes honoring elders and seeking their opinions when

making decisions, and teaches career exploration and goal-setting strategies through story telling. The curriculum is also unique in that American Indian teachers, school administrators, and community members serve as role models and instructors whenever possible.

Study Methodology

The curriculum was presented twice a week for approximately 30 minutes per session, for a total of 10 weeks. In all, 53 American Indian young people participated in the Two Feathers lessons. They came from several different tribes, but primarily identified themselves as Ojibwe, Dakota, and Chippewa.

To measure the effects of this intervention, three pre/post survey instruments were used: *Mapping Vocational Challenges*,¹ the *Missouri Comprehensive Guidance Survey*,² and the *Career Decision-Making Self-Efficacy Scale*.³ These instruments measure career interests, the valuing of various careers, perceptions of social supports pursuant to obtaining various careers, and expectations that specific careers can be attained, as well as career exploration confidence, confidence in knowledge of self and others, and educational and career decision making. *Mapping Vocational Challenges* is a career assessment inventory that helps young people explore their interests, confidence, perceived parent support, and valuing of careers and career-related activities. The other two instruments are paper and pencil surveys that were developed for use with adolescents. Each of these three instruments was administered during the first week and the last week of the intervention. We then compared scores gathered before and subsequent to participation in the Two Feathers curriculum.⁴

Findings

Prior to their participation in the Two Feathers curriculum, many of the

American Indian youth had limited career exposure but heightened hopes and dreams about their future. Their initial career interests ranged from more easily obtainable careers (becoming a hair stylist) to those that were harder to obtain (becoming an actor or a player in the National Basketball Association). By the end of their lessons, participants had considered a broad spectrum of career interests and opportunities, had increased their self-confidence and expectations related to a number of different careers, and had demonstrated heightened awareness of diverse career prospects and perceptions of cultural and social support. They also gained valuable problem-solving and decision-making skills that assisted many of them to develop backup plans for secondary career interests in the face of barriers or obstacles to their first career choice.

Specifically, after one semester of career development education using the Two Feathers curriculum, American Indian youth did not express greater interests in pursuing careers typically requiring a high school diploma compared to their responses during the first week of curriculum presentation. However, they did express greater interests in pursuing careers typically requiring a bachelor or graduate degree such as veterinarian, astronomer, attorney, speech pathologist, fiber optics technician, medical illustrator, athletic coach, broadcast journalist, agricultural scientist, and screen play writer (Table 1). In addition, they expressed greater valuing of library science careers, veterinary science careers, astronomy careers, coaching careers, and writing careers (Table 2); and participants perceived greater social support for careers such as medical illustrating, coaching, and writing (Table 3).

Participants also expressed greater confidence in knowing how to explore careers in which they were interested, knowing how to select extracurricular activities that would help them meet their interests and future goals, knowing how to engage in problem solving related to educational and career goals, and deciding what kind of education they would need to achieve their career goals (Table 4). Participants expected the same number of challenges to their career development as they had before completing the Two Feathers curriculum, but they expected fewer difficulties in overcoming those challenges.

¹ R.T. Lapan and S.L. Turner (1999). *Mapping Vocational Challenges*. Software program. All rights reserved.

² N.C. Gysbers, K.D. Multon, R.T. Lapan, and L. Lukin (1992). *Missouri Comprehensive Guidance Survey*. Jefferson City, MO: Missouri Department of Elementary and Secondary Education.

³ N.A. Fouad, P.L. Smith, and L. Enochs (1997). "Reliability and Validity Evidence for the Middle School Self-Efficacy Scale." *Measurement and Evaluation in Counseling and Development* 30 (1): 17-31.

⁴ Pre-test and post-test scores were compared using Omnibus F and paired-samples t-tests.

Table 1. Interest in Occupations Before (Pre-Test) and Subsequent to (Post-Test) Participation in the Two Feathers Curriculum

Occupation	Pre-test interest		Post-test interest	
	Mean*	SD†	Mean*	SD†
Veterinarian	1.53	0.99	1.98	0.88
Astronomer	1.38	0.98	1.57	0.76
Attorney	1.75	1.13	2.34	0.68
Speech pathologist	1.30	0.85	1.89	0.84
Fiber optics technician	1.35	0.92	1.66	0.64
Medical illustrator	1.40	0.98	2.05	0.68
Athletic coach	1.50	1.01	2.23	0.68
Broadcast journalist	1.35	0.86	1.82	0.62
Agricultural scientist	1.38	0.93	2.05	0.65
Screenplay writer	1.45	0.93	2.05	0.71

Note: $F = 11.64$; $p < 0.05$.

*Participants were asked to rate occupations on a three-point Likert scale, where 1 = low interest and 3 = high interest.

†SD = standard deviation, a statistical measure of the spread of scores around the mean of the sample.

Table 2. Valuing of Occupations Before (Pre-Test) and Subsequent to (Post-Test) Participation in the Two Feathers Curriculum

Occupation	Pre-test valuing		Post-test valuing	
	Mean*	SD†	Mean*	SD†
Library science careers	0.00	0.00	0.08	0.27
Astronomy careers	0.00	0.00	0.08	0.27
Veterinary science careers	0.09	0.16	0.26	0.44
Coaching careers	0.11	0.31	0.33	0.48
Writing careers	0.00	0.00	0.20	0.31

Note: F range = 3.83 to 8.76; $p < 0.05$.

*Participants were asked to rate how they valued occupations on a dichotomous scale, where 0 = low value and 1 = high value.

†SD = standard deviation, a statistical measure of the spread of scores around the mean of the sample.

Finally, compared to their responses prior to completing the Two Feathers curriculum, American Indian young people expressed greater expectations that they would work in careers requiring a bachelor or graduate degree than in careers that typically required a high school or community college degree (Table 5). For example, they more often expressed expectations that they would be office managers than that they would be office workers, that they would be veterinarians than that they would be animal caretakers, that they would be nuclear engineers than that they would be engineering technicians, that they would be attorneys than that they would be paralegals, that they would be marketing managers than that they would be phone sales agents, and that they would be mechanical engineers than that they would be mechanics.

Conclusion

In our experience, career education and development methods have limited application to the unique needs of American Indian young people, as well as limited sensitivity to American Indian cultural values, traditions, and beliefs. These methods have not brought about the educational or career development gains that educators of American Indian young people have hoped for. Based on our findings, we believe it is imperative that career education curriculum intended for use with American Indian youth incorporate the cultural values, cultural expressions, and cultural traditions of American Indian people.

By using career education interventions that are culturally focused, educators can help American Indian young people gain a greater understanding of and appreciation for their own culture and how it impacts their career plans and goals. Providing culturally based curricula can contribute to American Indian young people's positive expectations that they can overcome potential barriers that might limit their pursuit of high school diplomas and more advanced college degrees, and that can help them discover information about careers that will be in greater demand during the next 50 years, such as math- and science-based careers, or careers they might otherwise overlook, such as medical illustrating or writing.

Table 3. Perceived Social Support Before (Pre-Test) and Subsequent to (Post-Test) Participation in the Two Feathers Curriculum

Occupation	Pre-test social support		Post-test social support	
	Mean*	SD†	Mean*	SD†
Medical illustrating	0.09	0.28	0.13	0.34
Coaching	0.17	0.38	0.37	0.49
Writing	0.04	0.20	0.23	0.43

Note: F range = 5.16 to 7.85; $p < 0.05$.

*Participants were asked to rate perceived social support on a dichotomous scale, where 0 = low social support and 1 = high social support.

†SD = standard deviation, a statistical measure of the spread of scores around the mean of the sample.

Table 4. Confidence in Career-Related Activities Before (Pre-Test) and Subsequent to (Post-Test) Participation in the Two Feathers Curriculum

Occupation	Pre-test scores		Post-test scores	
	Mean*	SD†	Mean*	SD†
Explore careers	4.80	1.32	5.86	1.25
Extracurricular activities	5.50	1.35	6.36	1.00
Problem solving	5.44	1.33	6.29	0.85
Educational decisions	5.80	1.40	6.50	0.67

Note: F range = 4.09 to 5.52; $p < 0.05$.

*Participants were asked to rate confidence on a seven-point Likert scale, where 1 = low confidence and 7 = high confidence.

†SD = standard deviation, a statistical measure of the spread of scores around the mean of the sample.

Table 5. Expectations that Participants Would Work in Careers Requiring a Bachelor or Graduate Degree Rather than an Associate Degree Before (Pre-Test) and Subsequent to (Post Test) Participation in the Two Feathers Curriculum

Occupation*	Frequency Pre-test†	Frequency Post-test†
Office managers/Office workers	31/22	36/17
Veterinarians/Animal caretakers	22/31	27/26
Nuclear engineers/Technicians	20/33	27/26
Attorneys/Paralegals	39/14	49/4
Marketing managers/Sales agents	31/22	40/13
Mechanical engineers/Mechanics	20/33	22/31

Note: $F = 11.64$; all scores are significant at $p < 0.05$.

*For each pair of occupations, participants were asked which career they expected they might work in. The first occupation listed in each pair typically requires a four-year bachelor degree or a graduate degree, whereas the second occupation listed typically requires a high school degree or a two-year associate degree.

†Data in columns 2 and 3 show the ratio of students choosing each of the paired professions listed in column 1.

For educators who wish to implement a culturally based career curriculum, we have some suggestions based on our collaboration with American Indian parents, educators, and community leaders.

1. Display pictures of American Indian adults engaging in various types of job activities.
2. Bring into the classroom American Indian adults who are working in various types of occupations so they can share their employment experiences, as well as how they prepared for and obtained the jobs they have.
3. Create service learning opportunities that emphasize culture as well as learning about the various kinds of jobs that are available.
4. Provide job shadowing opportunities with American Indian employers.
5. Find American Indian mentors who take a special interest in young people's career development.
6. Involve American Indian parents and extended families, including grandparents, aunts, and uncles.
7. Create opportunities to help American Indian youth who have dropped out of school to return to school for further education and training.
8. Whenever possible, find American Indian counselors and teachers who can provide either direct services for American Indian young people or who can consult with teachers and school administrators about the best ways to provide education and support for American Indian youth.
9. Integrate culturally based career curricula into regular classroom experiences to enhance diversity training for youth of all ethnicities and cultures.

A need exists for career development programs that focus on the specific needs of American Indian youth. We suggest that in today's culturally diverse and technologically driven society, it will become increasingly important for career counselors and educators to prepare young people from all ethnic groups to achieve their academic and occupational potential. Making the commitment to increase the effectiveness of career education curricula for American Indian young people can assist them to creatively and proactively manage the career challenges they may face, and place them in a more advantageous position to create satisfying,

productive, and self-fulfilling life structures across their life spans.

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Sherri L. Turner is a faculty member in the Department of Educational Psychology at the University of Minnesota. Her research and teaching interests focus on the career development and assessment of urban and American Indian youth.

The research upon which this article is based was supported in part through a New Initiative grant from CURA. These grants support projects that are initiated by faculty, community organizations, government agencies, or students and that are not appropriate for consideration under another CURA program. Additional funding was provided by a grant from the College of Education and Human Development at the University of Minnesota.



Photo courtesy of Sherri L. Turner

Effective career education curricula can provide American Indian young people with greater confidence to explore career options, help them manage career challenges, and place them in a more advantageous position to find productive and satisfying employment.

Project Funding Available from CURA

The Center for Urban and Regional Affairs supports community-based research projects through several different programs. If you are unsure which program listed below is most suitable for your project proposal, you can complete a general Community Program Application form at www.cura.umn.edu/application.html and we will route your request to the appropriate program.

■ **The Communiversity Program** funds quarter-time graduate student assistantships for one semester to help community-based nonprofit organizations or government agencies with a specific project. Priority is given to organizations that serve diverse constituencies. The application deadline for fall semester 2005 assistantships is July 11, 2005. For more information, visit www.cura.umn.edu/programs/communiversity.html, or contact Communiversity program manager Ed Drury at 612-625-6045 or drury001@umn.edu.

■ **The Community Assistantship Program (CAP)** matches community-based nonprofit organizations, citizen groups, and government agencies in Greater Minnesota with students who can provide research assistance. Eligible organizations define a research project, submit an application, and if accepted, are matched with a qualified student to carry out the research. The deadline for applications for fall semester 2005 projects is July 11, 2005. For more information, visit www.cura.umn.edu/programs/CAP/cap.html, or contact CAP coordinator Will Craig at 612-625-3321 or wrcraig@umn.edu.

■ **Neighborhood Planning for Community Revitalization (NPCR)** provides student research assistance to Minneapolis and St. Paul community organizations involved in neighborhood-based revitalization. Projects may include any issue relevant to a neighborhood's needs and interests,

including planning, program development, or program evaluation. Priority is given to projects that support and involve residents of color. Applications from organizations collaborating on a project are encouraged. Applications are due July 11 for fall 2005 assistance. For more information, visit www.npcr.org or contact NPCR program director Kris Nelson at nelso193@umn.edu or 612-625-1020.

■ **The University Neighborhood Network (UNN)** links community organizations to course-based neighborhood projects that students carry out as part of course requirements. For more information about support for course-based projects, visit www.unn.umn.edu, or contact UNN coordinator Julie Bluhm at 612-625-5584 or unn@umn.edu.

Project Awards

To keep our readers up-to-date about CURA projects, each issue of the *CURA Reporter* features a few capsule descriptions of new projects under way. The projects highlighted in this issue are made possible through CURA's Faculty Interactive Research Program, which was created to encourage University faculty to carry out research projects that involve significant issues of public policy for the state and that include interaction with community groups, agencies, or organizations in Minnesota. These grants are available to regular faculty members at the University of Minnesota, and are awarded annually on a competitive basis. These projects represent only a portion of those that will receive support from CURA and its partners during the coming year.

■ **Utility Rates for Reverse-Metered Electricity: A Key Obstacle to Renewable Energy Technology Adoption?** With its substantial wind and agricultural resources, Minnesota is well-positioned to develop renewable sources of energy. Advances in the science and engineering of renewable energy technologies continue to increase efficiency ratings and reduce capital costs. However, the transition to a renewable energy economy ultimately depends on well-designed competitive and regulatory structures that allow renewable and nonrenewable energy sources to compete on a level playing field. The 1978 Public Utility Regulatory Policy Act (PURPA) provided an important step in this direction. The act requires utilities to buy back electric power from certain qualifying utilities (primarily non-utility energy generators using renewable energy technologies), providing direct access to the electric grid. It also requires utilities to pay these facilities for "avoided costs"—that is, all costs that the qualifying facilities' electricity production enabled the utility to avoid. Unfortunately, avoided costs are easy to obfuscate, and a clear incentive exists for utilities to underreport these costs. To the extent that utilities' offer-rates to buy back electricity are based on calculations that understate the true avoided costs, the renewable energy

industry is placed at a decided disadvantage. The forestalled transition to renewable energy sources, therefore, might be traceable to a poorly designed regulatory structure rather than a failure in the economics of renewable energy per se.

Arne Kildegaard (**Economics and Management, University of Minnesota at Morris**) will analyze how Minnesota utilities calculate avoided costs in practice and how these costs should be calculated as a matter of fair managerial accounting practice (considering capital costs, peak demand costs, congestion, and distribution costs). Based on these analyses, Kildegaard will assess the potential economic viability of renewable energy technologies, and provide recommendations regarding the level of fair pricing in Minnesota. Sources of information will include interviews with community partners from the renewable energy research and advocacy community, regulatory personnel from the Minnesota Public Utilities Commission, and marketing and engineering personnel from Minnesota utility companies.

■ **Analysis of the Impact of Class Size on Student Achievement in Minnesota's Elementary Schools.** Parents, educators, and public officials in Minnesota have long been concerned about children's academic achievement in the state's elementary schools. The issue has become particularly acute as tight budgets at the federal, state, and local levels have forced Minnesota public schools to reduce spending. One possible consequence of the current budget situation is larger class sizes, because keeping class sizes small requires more teachers for a given student population and is therefore quite expensive. Although it is widely believed that small class sizes enhance learning, isolating the impact of class size alone on educational achievement is extremely difficult, and no credible study on this issue has been conducted in Minnesota.

Using a research method recently introduced by Harvard University economics professor Caroline Hoxby, Paul Glewwe (**Applied Economics**) will examine the impact of class size

on academic performance in elementary schools in Minnesota using data provided by the Minnesota Department of Education. The research approach Glewwe will use is based on natural variations in birth rates in a given school district, which allows for more precise estimates of the impact of class size on student academic performance. The research project may also include various community groups in the state that work on education issues.

■ **Impacts of Bus Rapid Transit on West Broadway Neighborhoods in North Minneapolis.** Traffic in the Highway 81 corridor northwest of downtown Minneapolis has grown considerably in recent years, and congestion is only likely to worsen given the population increases expected in this area. To help alleviate congestion, a bus rapid transit (BRT) system is being constructed along Highway 81 that will offer transit service from downtown Minneapolis through the communities of Robbinsdale, Crystal, Brooklyn Park, Osseo, Hassan Township, Dayton, Maple Grove, and Rogers. The BRT system will run through the West Broadway area in North Minneapolis. Juxtaposition Arts—a youth-focused, minority-directed, urban visual arts center in North Minneapolis—is developing ideas for the redevelopment of West Broadway to create a more vibrant and people-focused pedestrian district. However, the organization lacks the expertise and resources to evaluate how BRT's physical qualities relate to local design visions for redevelopment of the West Broadway area.

Kristine F. Miller (**Landscape Architecture**) will conduct interviews with decision makers and community members on BRT's potential benefits to the West Broadway community and BRT's fit with visions for future development; analyze the potential impacts of BRT on pedestrian systems, traffic speeds, and sidewalk widths; evaluate the proposed location and design of BRT stations relative to existing transit infrastructure and commercial nodes; and develop alternative design scenarios for BRT based on community input. The project will result in a report that includes an analysis of how BRT might impact the West Broadway community,

and recommendations for revising BRT in light of community concerns.

■ **Analyzing the Effectiveness of the Alternative Urban Areawide Review (AUAR) as an Environmental Review and Planning Tool.** Minnesota's Alternative Urban Areawide Review (AUAR) is a unique and innovative environmental review tool that provides responsible governmental units (RGU) the opportunity to conduct a comprehensive analysis of potential environmental impacts associated with future development. The AUAR allows for the identification of mitigation requirements for a range of possible development scenarios, and facilitates ecosystem-based environmental planning and regional approaches to addressing development impacts and environmental mitigation. Thus, the AUAR represents not only a useful method for environmental review, but also an effective planning tool. Given the increasing use of the AUAR tool, and growing concerns among state agencies and other organizations that the AUAR is being misapplied and inadequately utilized, an analysis of the tool seems warranted.

Carissa Schively (Humphrey Institute of Public Affairs) will analyze the effectiveness of the AUAR as an environmental review tool, assessing the appropriateness of its application and the quality of environmental analysis and mitigation that it produces. Using four to six recent AUAR processes as case studies, Schively will collect data through interviews with AUAR participants, analysis of AUAR documents, and reviews of documentation related to development and policy changes in AUAR areas. The research will inform policy makers about the value of AUAR as an environmental review and planning tool, will provide guidance to relevant agencies as they undertake or participate in AUAR processes, and may point to recommendations for AUAR policy changes.

■ **Assessing the Barriers and Potential for Wetland Restoration in an Agricultural Watershed.** During the last 150 years, more than 50% of the historical wetlands in southern Minnesota have been drained to make way for human settlement and agricultural activities. Minnesota derives great economic benefit from the state's

agricultural sector, which depends on a well-drained landscape, but society also has come to place increasing value on wetlands for the ecological benefits they provide. Although many farmers are interested in restoring wetland areas, overlapping—and sometimes conflicting—state and federal programs designed for this purpose make conservation work difficult and seldom practiced.

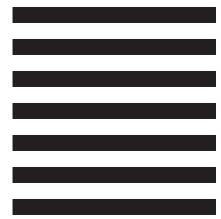
Gary R. Sands (Biosystems and Agricultural Engineering) will work with a graduate student in Water Resources Science to investigate the barriers and obstacles to wetland restoration in the Seven Mile Creek Watershed in Brown, Nicollet, and Cottonwood Counties in southern Minnesota. Using historical documents dating back to 1854, physiographic data, and interviews with conservation agency staff and cooperating farmers, the researchers will identify potential locations for restored wetlands in the watershed, assess the ecological benefits of these wetlands, and identify the barriers to and potential solutions for achieving increased wetland restoration in the watershed.

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New Publication from CURA

Directory of Nonprofit Organizations of Color in Minnesota, fifth edition.

Edited by Michael D. Greco. Minneapolis: Center for Urban and Regional Affairs, 2005. CURA Publication 05-1. 173 pp. Free.

CURA is pleased to announce the publication of a new print edition of the *Directory of Nonprofit Organizations of Color in Minnesota*. Traditionally one of CURA's most popular publications, the directory lists more than 600 not-for-profit organizations in the state of Minnesota that primarily serve communities of color. For each organization listed, the directory provides contact information, the main activity

the organization engages in, and a brief description of the organization's mission and the programs or services it provides. The publication is indexed by organization, by main activity, and by community served, and includes preformatted mailing label matrices for each community of color.

The directory is also available on the Web as a searchable database at www.cura.umn.edu/publications/npoc.html. Visitors can search for specific organizations by community served, main activity area, and keyword, and can generate customized mailing labels based on the results of their search. Visitors can also limit their search to only those

organizations whose listings have been added or updated since the print version of the directory was published in January 2005. We will attempt to update information in the database at regular six-month intervals.

To request a print copy of the *Directory of Nonprofit Organizations of Color in Minnesota*, simply detach, complete, and mail the attached postcard (no postage is required). Orders will also be accepted by e-mail at cura@umn.edu or by fax at 612-626-0273. Be sure to include complete mailing information and phone number with your order. *Orders are limited to one copy of the directory per address.* Please allow 4 to 6 weeks for delivery.

Please send one copy of the *Directory of Nonprofit Organizations of Color in Minnesota* (5th edition, 2005) to the individual listed below. I understand that the directory is sent free of charge, and that the mailing information I provide below will not be shared with others.

Name: _____

Organization: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: (_____) _____ - _____ ext. _____

For what purpose(s) will you or your organization use the directory? (check all that apply)

- As a phone book of nonprofit organizations in Minnesota
- To locate organizations that provide specific programs or services
- To locate organizations that work with specific groups or communities of color
- To mail information about grant opportunities or requests for proposals
- To mail information about educational or not-for-profit services
- To mail information about commercial or for-profit services
- Other _____
- Other _____

The logo for CURA REPORTER features a stylized graphic of a person's head and shoulders on the left, with the text "CURA REPORTER" in a bold, serif font to its right.

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