Meeting the research infrastructure needs of micropolitan and rural communities

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Introduction
Communities that lack size and proximity to medical schools can enhance their access to the future biotechnology industry, to clinical primary care professionals or subspecialists who also perform research, and to research studies that benefit their populations. This article describes barriers to rural and micropolitan research and reviews steps that geographically remote communities in Wisconsin, and elsewhere in the United States, can take to optimize their potential for research growth. This article also presents a series of steps that university leaders or elected officials can take to advocate at the local, state, or national level for support of research in micropolitan and rural communities. Barriers to funding and performance of projects in these areas exist and could be reduced, better infrastructure and alliances could be developed, and new models for remote research could be encouraged.

Background
Presently, 10% of Americans live in micropolitan areas (towns with >10,000 residents and <50,000 residents) and an additional 7% live outside of core-based statistical census areas, predominantly in rural towns (<2500 residents) in rural states. Many of these areas have traditionally been manufacturing and agricultural areas. Smaller cities and towns are often remote from the major tertiary university medical centers and research facilities, especially in agricultural states. Achieving functional research relationships to address the health and economic needs of these rural and manufacturing communities has been a challenge.

Through federal and state funding and trial research initiatives aimed at understanding rural and micropolitan issues, policy changes can be implemented. These research endeavors stand to enhance economic growth, reduce health disparities, decrease youth exodus, and enhance research infrastructure. Taken together, these changes could improve micropolitan and rural health care, and health care recruitment.

Problem
At present, micropolitan and rural areas are not viewed as potentially viable research locations by many academic faculties and institutions. Ideally, federally fundable research should be achievable in all communities to meet the needs of these communities, yet this has not been the case.

Distribution of NIH Funding
From 2004 to mid-2007, principal investigators or their business or community partners with addresses located outside of the 2 major Wisconsin cities (and suburbs) of Madison or Milwaukee received <1% of Wisconsin’s National Institutes of Health (NIH) funding (including construction, research and development, training, fellowships, and research grants). Ironically, this represented a 323% increase over the prior 3 years. For research grants themselves, the numbers were even more bleak, with only 18 of 3776 NIH-funded research grants in the state going to non-metropolitan principal investigators or research institutions, according to the Computer Retrieval of Information on Scientific Projects (CRISP) database. Of the 18 awarded grants, most were for agricultural, biological, or genetic studies. Funding from the National Science Foundation (NSF) for Wisconsin’s smaller regional colleges has been quite limited as well, relative to total NSF health care funding for this state, and relative to the student populations at these colleges. Australia, with its 6 million remote rural citizens, has seen a similar paucity in federal funding to rural studies and projects.

There is likely an underestimation of rural funding, however, because the application process at the NIH has not allowed for the differentiation of performance site,
have highlighted the disparities in grams and projects. Recent articles resources for funding their pro-
researchers have had fewer external rural projects. In general, rural of grants were awarded in 2007 to Only 153 of 10,905 grants or 0.7% just 2 philanthropic organizations.
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of grants were awarded in 2007 to rural projects. In general, rural researchers have had fewer external resources for funding their programs and projects. Recent articles have highlighted the disparities in rural areas, including the plight of Native American health care, rural health care, rural war veterans, rural womens’ health, and the declining status of rural children in poverty, highlighting a need for investigation and program expansion.

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<th>Community Barriers</th>
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<tr>
<td>Individual inexperience in grant writing.</td>
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<td>Lack of access to university faculty partners.</td>
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<td>Adverse initial exposure to university-based individuals, facilities, or processes.</td>
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<td>Rural communities are often expected to have significant matching funds for projects, difficult for struggling communities with limited philanthropic access.</td>
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<td>Compiling statistics to support rural health care needs or to define priorities is challenging in communities with limited research infrastructure.</td>
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<td>Public health workers in these areas are often heavily committed to sustaining existing programs.</td>
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<tr>
<td>Medical libraries provide electronic article access only if the recipient is willing to pay $7 per article. Otherwise regular internet charges for articles run as high as $35 per article.</td>
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<th>University-based Barriers</th>
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<td>Very regimented university grant application protocols and timelines favor metropolitan applicants familiar with the university faculty, programs, and policies and able to commute to the medical school if problems arise in the submission process.</td>
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<tr>
<td>Appreciation among faculty for the skills of rural and micropolitan community research teams may be less than deserved, as is faculty willingness to take on remote partnerships.</td>
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<td>Micropolitan and rural citizens are underrepresented on advisory boards of many university granting programs.</td>
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<td>Successful models for rural and micropolitan research have not been showcased.</td>
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<td>Promotion and tenure policies may not support the commitment required for remote or rural academic partnering, or recognize nuances impacting career advancement for faculty working with rural community-based projects and programs.</td>
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Barriers and Consequences

The new electronic grants submission processes for the NIH, NSF and other agencies require research institutions to have significant infrastructure in place to support the relatively tight grant submission and revision timelines, the information technology data transfer, and the education of and communication to new investigators. It remains to be seen how well smaller remote universities and colleges adapt to these new requirements.

Few medical school academic faculties practice in micropolitan and rural areas. Off campus-based faculty and health care researchers can find themselves without basic necessities for research while working in remotely located cities of moderate size (50,000-100,000) as well as in rural areas. While it would seem logical that Wisconsin have a map of areas within this state that are not supported by cellular phone services or broadband access, such maps are not readily available. Producing such maps, and working toward full cell phone and broadband access would support rural research and programs. Other barriers are listed in Table 1.

Studies to better understand the rural experience with grant application and acquisition are few. New, well-funded grant programs have been established in Wisconsin through the 2 medical schools’ Blue Cross Blue Shield endowments, and will hopefully address some of these concerns. Yet even during the first 5 years of these programs, rural applications have gone down and not up, reflecting some of the barriers noted, including difficulty in finding willing faculty partners. New initiatives from Wisconsin medical schools are described in the next section of this article.

While distance learning courses have been made available, some function poorly and are overlooked despite often very relevant offerings (Table 2). Distance learning systems should be tested to see that they are functional on the receiving end. Often artificial barriers prevent easy internet access from non-university sites. Newer, more universal and inexpensive platforms (WebEX, YouTube, Skype, LinkedIn) might enhance the ability to connect from remote sites. The University of Wisconsin-Madison Family Medicine Program is utilizing the YouTube venue.

Distributive clinician-scientist networks deserve better analysis
of how they are built and maintained. One important issue is the lack of rural or micropolitan-based researchers. The lack of such researchers stands to undermine efforts to understand and to study rural populations and hence implement legislative policies that might reduce disparities and improve rural health. While research is found in at least 50% of rural family medicine programs, the heavy case load of many physicians often prevents substantial research project publication and dissemination. New models for rural research need to be developed, with an eye toward policy change. John Lavis has studied means of linking research to action in a way that leads to policy change. According to Lavis, governments need accurate information on which to effectively prioritize and to give greater attention to programs that would benefit the health of populations.\textsuperscript{15}

While bench research is unlikely to move to rural sites, only 60% of research is true bench research, and many other forms of research, especially biotechnology, clinical trials, or population-based research could be translated to rural and micropolitan areas.

**Opportunity**

Several studies have demonstrated the benefits of community-based participatory research (CBPR) models.\textsuperscript{16-18} CBPR is a collaborative research model in which the relevance and value of clinical research is enhanced by involving patients and community members at all stages of the research. Community-based academic health centers and hospitals in less populated regions of the United States have excelled in their ability to provide effective clinical research at low cost and high efficiency. Both Marshfield Clinic, in Marshfield, Wis, and the Mayo Clinic, in Rochester, Minn—located in relatively small and agricultural parts of the country—have been recognized for their prowess in performing clinical translational research studies, developing system-wide data infrastructure, and publishing outcomes studies that positively impact health care. This has been due to their ability to reach out and enlist community participants, which is largely due to their bidirectional capacity building and long-established community trust. Yet participation among rural residents in clinical trials is low elsewhere in this country.

Greater funding for research to uncover clinical trial barriers, greater availability of rural and micropolitan clinical trials, and policy changes that address access and reimbursement may improve these low participation rates. Currently, most communities lack the infrastructure that Marshfield or Mayo Clinic provide to their drawing areas. Some research studies can only be adequately performed in rural and micropolitan areas. The results of these studies may positively enhance the health of city dwellers as well as rural Americans. Examples include studying new animal-transmitted diseases, or the effects of environmental pollutants in young children.

The grants programs established at both medical schools as part of the conversion of Blue Cross Blue Shield United of Wisconsin in 2003 could summarize their experiences in supporting rural and remote partnerships. The Medical College of Wisconsin’s Healthier Wisconsin Partnership Program (HWPP) recently released its preliminary list of priorities for 2009-2014. The HWPP requirement for partnering with a full-time faculty member will be relaxed to include part-time faculty and liaisons, with greater administrative support provided to promote effective academic partnering for more remote community partnerships. The Wisconsin Partnership Program has established rural community projects in all 3 components of the

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<th>Table 2. Common Problems with Distance Learning and Web-based Offerings</th>
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<tr>
<td>No central Web-based catalog or distribution site</td>
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<td>Poor communication of available offerings</td>
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<td>Very limited or restricted offerings</td>
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<td>Firewall and connection problems or perceived barriers such as log-in account requirements</td>
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<td>Sender/receiver inexperience, often also linked to inadequate sender microphone, telephone, or camera placement</td>
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<tr>
<td>Outdated equipment</td>
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<td>Inadequate data transfer speed</td>
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<td>Lack of immediate information technology support</td>
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<td>Low buy-in to the need for such programs</td>
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<th>Table 3. Wisconsin’s Clinical and Translational Science Initiatives</th>
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<td>Provide regional research forums targeting rural and micropolitan researchers and groups interested in partnering</td>
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<tr>
<td>Promote functional links between rural and micropolitan communities and university community-based researchers</td>
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<td>Study new methods for improving health outcomes through community-based research</td>
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<tr>
<td>UW Institute for Clinical &amp; Translational Research has established the Center for the Study of Cultural Diversity in Healthcare and the Office of Continuing Professional Development/R&amp;D</td>
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Table 4. Action Steps to Facilitate Research in All Communities

Steps Universities Can Take

• Review the outcomes of the BCBS programs related to rural and micropolitan partnerships to define ways of making such partnerships more robust.
• Develop accessible all-remote electronic grants submission and grants administration processes. This would include paperless signatures.
• Simplify application processes for all grant types.
• Put in place facilitators to link rural and micropolitan research teams to appropriate faculty.
• Insure participation of non-metropolitan and rural citizens on university boards, grants committees, and in key leadership and advisory positions.
• Identify and eliminate barriers to non-metropolitan/rural access to distance education, research and researchers. Track grant applications, as well as grant success rates, for these distributive groups.
• Facilitate interface of community-based university researchers with advanced-level non-physician providers (nurses, physicians assistants, dentists, veterinarians, and emergency medical services providers) who presently publish much of the research in non-metropolitan and rural communities.
• Publish pioneering models of micropolitan and rural research infrastructure and achievements.
• Create incentives for faculty to establish and maintain research relationships with groups more than 50 miles from the university.
• Develop tenured faculty positions and faculty tracks in Rural, Distributive, and Global Academics. Include pre- and post-doctoral training in these programs.
• Support technologically sophisticated communication links. These links will be needed in this era of globalization, and establishing these first within the university’s own drawing area makes sense.
• Provide parking and VIP status to remote collaborators visiting medical and university campuses.
• Support conferences in remote locations from the campus.
• Coordinate Web-based portals for central access to distance training programs, lecture series, and linked Web sites.
• Make distance research training, institutional review board and other compliance training, and barrier-free distance educational opportunities a priority.
• Move away from costly teleconferencing in favor of inexpensive Web-based and desktop-to-desktop conferencing technologies. Test remote conferencing links “from the outside in” and on an ongoing basis.
• Make all classrooms remote conference-ready during remodeling. Record major lecture series for later distribution as distance learning opportunities.
• Provide summer student and pre- or post-doctoral stipends for rural and remote projects. Facilitate means by which rural medical and nursing students can identify and be linked to rural research teams.

Steps Rural and Micropolitan Communities Can Take to Enhance their Research Capacity

• Work closely with research university CTSI leaders.
• Advocate locally for leadership training, entrepreneurship, youth research opportunities, and locally directed philanthropy.
• Determine the preparedness of local community and technical colleges’ Grants and Contracts offices to succeed in new electronic federal grants application processes and grants administration.12

Steps Legislatures and Congress Could Take to Enhance Rural Research Infrastructure

• Monitoring of the number and success of federal grants may allow for future advocacy for policy change.
• Develop locally based strategic needs assessments and planning.22-23
• In partnership with the universities and area health care organizations, establish regional formal or informal community-based, research cores or groups of individuals. These ideally should have access to full electronic medical library infrastructure, information technology infrastructure, researcher networking pilot funds, distance graduate-level research trainees, provide student mentoring, and link in with university grants and contracts offices or CTSIs for grants facilitation and core research facilities. Such “rural cores” would promote a supportive research environment for clinical researchers living in the area, for early biotechnology start-ups, and for academic faculty working permanently or temporarily in these non-metropolitan or rural areas.
• See that local libraries have up-to-date materials for students who wish to pursue careers in the sciences, mathematics, and engineering.
• Larger non-metropolitan communities or cooperatives from several smaller communities could provide conference sites. Enhance the conferencing capabilities available through local hotels and rural conference centers.
• Encourage more non-metropolitan/rural publication of research through such methods as submission of area graduate nursing research papers to medical journals, and “team-prepared” submissions for publication.
• Advocate for federal and state funding to support growth of non-metropolitan/rural research.
• Demonstrate and publish the low cost of research from rural and micropolitan research models and research programs.
• Support state-based or rural journal publications (such as WMJ) through submission of community-based project manuscripts to these journals.

Advocate for new methods of tracking the funding from federal and state grants so that the locations of the project site and applicants (principal investigators and consultants), and not just the address of the university, can be later analyzed down to the Congressional district. This would better track rural and micropolitan research growth over time.
• Support entrepreneurial liaison groups assisting small businesses with federal grant applications at the state and local level.24
• Support upgrades to public libraries for science, math, and engineering, and use them as portals for free distance learning opportunities.
• Open public access to rural research articles using venues such as the National Library of Medicine.
• Increase NIH funding not just to underrepresented states as a whole, but to under-represented Congressional districts throughout the country.
• Support nationally funded infrastructure for unique team-based distributive rural and micropolitan research models, especially those that link to CTSIs.
• Provide nationwide broadband and cellular phone access to all communities.
program (research, education, and public health). Examples include studies on reduction in fall injuries, rural palliative care, and expanding clinical trials to rural areas through research collaborations. In 2006, the University of Wisconsin School of Medicine and Public Health established the Wisconsin Academy of Rural Medicine (WARM) program for medical school training, which emphasizes rural training for interested medical students with rural backgrounds. Presently there are 5 students in their second year, 13 in their first year, and 18 expected to enter in 2009. Yet the current demand for rural and micropolitan primary care providers is already 10 times this number. Beginning this spring (2009), these rural students will rotate through various rural electives for 2 years. Hopefully many will choose rural primary care residencies and practices in the future. The WARM off-campus teaching satellites could potentially serve as sites for community-based research. Both medical schools have developed the Healthy Wisconsin Leadership Institute (HWLI) to provide community teams with public health and collaborative leadership training to define and address their local health issues. In addition, the Wisconsin Medical Society Foundation has established Summer Fellowships in Government and Community Health professionals, public health workers, educators, community or technical college faculty, faith-based leaders, local community or government representatives, and entrepreneurs from these research-limited areas stand the best chance of identifying community problems and developing functional units for research advancement. By partnering with Wisconsin’s medical universities and developing better models for research in off-campus settings, these groups could provide a refreshing new functionality. For example, some of the most progressive programs for K-12 student health career exposure are presently in rural areas. Non-physician professionals write over half of all medical articles published from northern Wisconsin (personal Pubmed review, 1996-2007), emphasizing the importance of including a broad definition of the research team.

Suggestions for Change

The newest initiatives for dissemination of research to the community are the Clinical and Translation Science Initiatives of each of Wisconsin’s medical schools (Table 3). The CTSI in Madison has established regional sites and liaisons in the more geographically-remote sections of the state. These CTSIs are preparing for a bidirectional flow of information and hopefully will have adequate funding. In addition to the CTSIs at the medical schools, communities can work closely with their area colleges and technical schools for research infrastructure. The establishment of research in all communities will take effort by both the communities and universities. These steps will need to be augmented by policy changes. Table 4 outlines action steps that universities, communities, and policy makers can take to enhance research for all people.

Summary

In the 1800s, this country chose to establish land-grant colleges to see that the working class could attain higher education, and that the research needs of the agricultural and manufacturing segments of this country could be met. It seems contrary to our origins to see so little support at present for research infrastructure going to the very communities that need such research to sustain their populations, grow their economies, to attract physicians, to provide adequate health care, and to educate, retain, and employ their youth. Cities are viewed as sources for high-paying jobs, yet many of these same jobs could be translated to rural and micropolitan areas, provided that the resources are established to support it. One of the fastest growing economic periods in this country’s history was during World War II, when even the smallest and most remote towns contributed substantially to the innovations, manufacture, and production of goods benefiting our nation as a whole. Rural areas have always lagged somewhat behind metropolitan areas in acquisition of new technology. Rural electricity and rural phone access are examples from the past. Testing our universities’ abilities to grow distributive research networks beyond their campuses will create a competitive edge regionally, against global workplace, educational, and research competition, and will lay the groundwork for efficiency in research and for new innovation.

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References
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