

*Dr. Patricia A. Grady became director of the NIH's National Institute of Nursing Research (NINR) in 1995. Her prior position was acting director of the National Institute of Neurological Disorders and Stroke, which she joined in 1988. An internationally recognized researcher, Dr. Grady's focus has been on stroke, with an emphasis on arterial stenosis and cerebral ischemia. Before NIH, she held academic positions, including at the University of Maryland, where she had obtained a master's degree in nursing and a doctorate in physiology. She was elected to the Institute of Medicine in 1999.*



### What's the role of nursing research in global health?

In September 2000, the UN highlighted eight objectives known as the Millennium Development Goals for the world community. Nurses and nursing science play an important role in virtually all of these. However, our impact is most obvious in reducing child mortality, improving maternal health, and combating HIV/AIDS, malaria and TB, along with the prevention and management of chronic conditions. Particularly in low- and middle-income countries, nurses and nurse scientists can help fill a critical need for the education and training of health workers, as well as designing and testing solutions to common health problems.

Approximately 1 billion people across the world have zero access to trained health workers. Many projects we support have shown that low-tech, local health care solutions—such as sari cloth filtering of water in Bangladesh—can be more beneficial than high-tech treatments.

### What are examples of NINR's global health success?

NINR-supported researchers are integrating depression screening into HIV care in Southern India. UNAIDS estimates that 2.5 million of the 34 million people living with HIV are in India. Connecting this population to mental health resources and interventions to treat depression could lead to improved quality of life for those dealing with the multiple burdens of HIV. In Bangladesh, NINR co-funded a study that aims to reduce postpartum hemorrhage, the leading worldwide cause of maternal death and disability. We also support studies in community-based outreach that show promise to lower the incidence of childhood diarrhea. As I mentioned, an NINR-funded study involved the use of a sari cloth filter to decrease the incidence of waterborne cholera. This is a sustainable intervention that elegantly utilizes readily available, low-cost material while empowering women. NINR is the lead NIH institute for research in advancing end-of-life care, which presents

some of the most critical challenges in clinical care today. An NINR-funded end-of-life bereavement study conducted in South Africa showed the remarkable resiliency of adolescents who have lost a loved one to AIDS.

### How is NINR engaged in research training?

NINR partners with Fogarty on a number of research training projects. One example is the University of Illinois at Chicago's School of Public Health and College of Nursing's AIDS International Training and Research Program. This multidisciplinary effort fosters long-term scientific capacity to address the AIDS epidemic in Chile, Indonesia and Malawi through hands-on training. Another example is a new interdisciplinary project working with local health care workers in Argentina to study the efficacy of a text messaging intervention to improve medication adherence in TB patients.

### What are NINR's global health plans looking forward?

Nursing science has always been based on interdisciplinary collaborations. The WHO has acknowledged the importance of international research collaborations through the designation of Nursing Collaborating Centers, which focus on team-based research of regional or global significance. NINR will continue to facilitate global training partnerships, promote earlier entry of nurses into research training programs, and strengthen the scientific basis for clinical practice. We will also work to integrate technology and advanced interdisciplinary research methods. Data science will remain vital, including use of "big data" from electronic health records, wearable devices, mHealth, point-of-care diagnostics, data visualization and various non-health specific data such as GPS, Google Maps and social media. NINR will continue partnering with Fogarty and other members of the global health community to identify areas in need of research, disseminate scientific findings and foster international relationships among investigators.

## Nursing research and training spur global health gains

**N**o profession is more integral and essential within every level of global health care than nursing. Because of their close relationship with patients, nurses are ideally positioned to design and drive scientific discoveries that can be implemented directly into clinical practice. Since 1986, the NIH's National Institute of Nursing Research (NINR) has been supporting critical investigations to advance disease prevention, patient self-management, end-of-life care and treatment innovations, as well as funding training for nurse scientists.

The results of nursing research help build the knowledge base and provide the evidence to guide interventions by nurses and other health care workers. From studying approaches to prevent HIV/AIDS in Jamaican girls, to assessing water filters that could reduce cholera outbreaks in Bangladesh, or identifying how to lessen depression caused by HIV/AIDS, NINR-funded nurse investigators are producing scientific evidence that improves health around the globe.

These advances are particularly important for developing countries, where doctors are scarce and there are many hard-to-reach and underserved populations. Nurses and nurse scientists help fill the gaps, including training essential health care workers. Developing expertise in low-resource settings has never been more critical, since diseases such as Ebola can quickly move from a child in a West African jungle to a nurse in Texas.

"In an increasingly interconnected and mobile world, global health threats such as tuberculosis, SARS, Ebola and influenza, among others, can spread at the speed of a jet plane," NINR Director, Dr. Patricia A. Grady, commented.

*Nurse scientists play a vital role in improving clinical care, especially in developing countries.*



Photo by Victoria A. Smith, courtesy of PhotoShare

"Nursing science is at the forefront of designing programs that promote wellness, prevention and, not coincidentally, lower health care costs."

Rapid advances in technology and genomic science, as well as significant changes in demographics and health care policies and practice, have placed new demands and created opportunities for nursing to find fresh approaches and interventions to improve health. With the increasing prevalence of mobile phones in even the poorest countries, there are new avenues to develop technological tools, such as the lab-on-a-chip (see page 7), and find innovative ways to communicate health information.

NINR has supported studies in more than a dozen developing countries over the past decade in such critical areas as reducing maternal and infant deaths related to childbirth, studying text messaging to improve patient drug adherence to combat tuberculosis, and finding more effective methods to limit the spread of HIV/AIDS. More recently, NINR has begun to address the rising tide of noncommunicable diseases by supporting the development of the research expertise needed among nurses in Thailand and elsewhere.

NINR also invests in global health research training for early-career nurse investigators, in collaboration with Fogarty. For instance, the agency has supported participants in Fogarty's Global Health Program for Fellows and Scholars, which has provided mentored training in HIV/AIDS, tuberculosis and tropical disease research for nurses working in countries such as Argentina, Thailand, Malaysia and India (see related article on page 4).

The seeds of NINR-funded global research are spreading as researchers share discoveries and other developing countries recognize the value of these more effective and economical interventions. For instance, in a South-South collaboration, researchers in Chile are building on an NINR-supported model developed in Botswana and Malawi to mobilize health care workers to drive HIV/AIDS prevention patient education.

In these and similar projects around the world, NINR is working to identify areas in need of research, disseminate scientific findings and form global partnerships to improve the health and well-being of all the world's citizens.

Articles by Cathy Kristiansen

### RESOURCES

<http://bit.ly/nurselinks>, [www.ninr.nih.gov](http://www.ninr.nih.gov)

## Sari cloth can filter cholera from water, research shows

A simple method of using readily available sari cloth to filter pond and river water successfully reduced the incidence of cholera by nearly half in a study conducted in Bangladesh. Funded by the NIH's National Institute of Nursing Research, the findings may have applications in other low-resource settings. More than 1 billion people worldwide lack access to safe drinking water and over 5 million die each year from waterborne illness, according to the WHO.

In many rural areas of Bangladesh, women use surface water for their household since it may be safer than well water, which can contain arsenic. The research team took its cue from a local practice to rid drinking water of insects and leaves by pouring it through sari cloth. Lab tests supported by the Thrasher Research Fund showed that a filter made of four layers of worn cotton material held back more than 99 percent of all cholera bacteria—using more layers or newer cloth slowed water collection too much.

“The filter is unique and useful,” said investigator Dr. Anwar Huq who has collaborated on the project with University of Maryland colleague Dr. Rita Colwell. “It doesn't require any money or sophisticated training and the women bringing water to the house enthusiastically used the filtration, once the benefit was explained to them.”

To test the filter's effectiveness, Huq and his colleagues studied about 45,000 residents, all in households with children under age five, who are typically more vulnerable

Photo courtesy of Dr. Anwar Huq/University of Maryland



A simple method of filtering water through sari cloth can reduce cholera incidence by nearly half.

to cholera. They showed the women how to use sari cloth to filter water that would be consumed or used to clean teeth, food and tableware. They followed up by visiting the village every two weeks to encourage compliance. An additional group of villages served as controls, adopting no interventions. In the households that were filtering water, cholera incidence was about half the level of the control participants and infections arising were milder, the scientists reported in *Proceedings of the National Academy of Sciences*. The study also showed the practice benefited neighbors who did not filter their water, by reducing the overall incidence of cholera in the community.

In a follow-up study five years later, researchers discovered about one-third of participants continued to filter water as trained. Huq suggested repeated training and messages on TV and the radio could improve usage. He added he hopes to investigate if the filter blocks other waterborne pathogens as well, such as *E. coli*.

## Lab-on-a-chip provides speedy disease diagnoses

Co-infection with syphilis or genital herpes can compound the spread of HIV, but these diseases are all treatable—if they are diagnosed. Many global health systems struggle to pay for costly laboratory tests, so researchers have developed a potentially inexpensive, portable diagnostic tool, ideal for remote locations without electricity.

The lab-on-a-chip prototype, mChip, can detect HIV and syphilis in only a few drops of blood from a finger prick. It is powered by a nine-volt battery and takes less than 20 minutes to provide clear-cut results. The NIH's National Institute of Nursing Research and other funders



supported the development and testing of the tool. Dr. Samuel Sia, of Columbia University, led the research.

In Rwanda field studies, mChip detected HIV and syphilis with lab-standard accuracy. Test results from this device can be transmitted by cell signal or satellite to medical records databases.

The researchers plan to continue refining the new tool, for instance by finding ways to reduce its temperature sensitivity and lower its cost to enable widespread availability in developing countries.

In a report in *Nature Medicine*, they suggest the technology could be adjusted to identify markers for other infections such as gonorrhea and Chlamydia as well, leading to treatment and lessening the global burden of sexually transmitted diseases.

# Research aims to curb mental, emotional pain of HIV

The emotional, mental and social consequences of HIV/AIDS are often left untreated in developing countries, where resources are scarce. So, for instance, women experiencing stigma may withdraw from daily chores, children grieving for a parent or sibling can flounder in school, while caregivers may become overwhelmed and fall into depression.

The NIH's National Institute of Nursing Research (NINR) has supported a number of global health studies on these aspects of HIV/AIDS, with researchers assessing the burden and testing low-cost interventions to relieve suffering. These studies also build local capacity by training nurses and health care workers to conduct research and apply findings to improve care. Scientific discoveries made in one country can often be adapted for use elsewhere, guiding worldwide strategies to improve health.

In Thailand, where the UN estimates half a million people are living with HIV/AIDS, NINR has collaborated with the National Institute of Mental Health to fund studies on reducing depression and improving quality of life among people with the virus and their family members. Research has shown this is important not only to lessen misery but also curb another problem in Thailand: concealing an HIV diagnosis, which in turn adds psychological stress, reduces treatment adherence and promotes spread of the disease.

Scientists devised a 13-week program based on Thailand's culture of close-knit families, which teaches coping skills to caregivers and children, and fosters connections with others facing the same issues. Sessions focus on how to mitigate negative emotions linked to HIV/AIDS by, for instance, projecting feeling intensity onto a thermometer illustration, practicing relaxation techniques and, in group sessions, airing negative experiences and discussing possible approaches to manage them. Participants also used role-play to practice revealing an HIV-positive status to relatives and work colleagues.

The team tested the curriculum with 813 participants and then gauged their emotional health for another two

years. The intervention worked best for those with low or no depressive symptoms, the study showed. Based on its overall success, other hospitals in Thailand have begun adopting the program.



*Coping strategies can benefit children experiencing the stress of living with HIV-positive relatives.*

“This study makes a contribution to the current field of family interventions in demonstrating not only the feasibility, but also the efficacy of such a model that has the potential to be adapted to different cultures with a family-oriented tradition,” said co-investigator, Dr. Sung-Jae Lee, of the University of California, Los Angeles.

For more than a decade, NINR has been funding similar research in China. Many projects have focused on children, who can suffer deeply when a family member has HIV. Research on early childhood development has shown that if children in adverse environments build resistance, they fare better then and later in life.

In one NINR-funded study, researchers developed a program that combined peer-group activities, skills training and community advocacy. For instance, a turtle puppet, stickers and feelings chart were used to

help children control aggression. Meanwhile, adults had lessons on positive parenting skills and received individual counseling. Dr. Xiaoming Li, of Wayne State University, and his colleagues are now assessing the intervention's impact.

In another study, Li's team investigated how orphans fare in different types of care environments. Using a trauma symptom checklist, the researchers measured anxiety, depression, anger, post-traumatic stress, dissociation and sexual concerns in orphaned children in rural locations. The results showed community-based group homes had better outcomes than those in AIDS orphanages and especially those in kinship care. Small homes permitted a closer child-caregiver relationship, higher quality of caregiving and less stigmatization. The findings could help inform government programs, the researchers suggest.

Other NINR global studies in this realm of health include a psychosocial intervention targeting Zimbabwean teens with an HIV-positive family member, as well as a project to improve the mental and physical health of women living with HIV/AIDS in rural India.

# Study finds mothers can help reduce daughters' risk of HIV infection

Adolescent girls in Jamaica have more than twice the risk of contracting HIV than other groups, based on a range of social, cultural and economic influences. Studies in the U.S. have shown that enlisting mothers of at-risk girls can reduce their chances of HIV infection. Scientists supported by the National Institute of Nursing Research adapted the approach to see if the same is true in Jamaica.

“We can’t just assume that U.S. findings translate into other countries,” said Dr. Katherine Hutchinson, of Boston College Connell School of Nursing, who led the Jamaica research. “We need to develop interventions that can be effective in the contexts in which people live.” About 1.8 percent of Jamaicans aged 15-49 are HIV-positive, or about 30,000 people, according to UNAIDS.

Several factors contribute to the lack of awareness and empowerment in Jamaican adolescent girls for avoiding HIV risk, Hutchinson said. Sex education is limited in schools. Churches and parents typically promote abstinence, especially for girls, so do not inform them about safe sex. Hutchinson also noted that gender norms fuel the risk, since young men are encouraged to gain sexual experience and often choose girls who can be more easily seduced.

In the study, U.S. and Jamaican scientists enrolled 330 mother-daughter pairs to test their strategy for reducing HIV. A control group received general health information while the study group participated in a two-day session focused on teaching them about HIV risk, the importance of condom use, strategies girls could use to refuse sex or insist on a condom, and how to recognize and avoid situations where coercion could arise. The participants watched videos with Jamaican music and dance moves, role-played and discussed topics such as how to open conversations about sex and communicate well. In one sketch, a mother took her daughter to buy condoms, which in Jamaica involves asking a pharmacist who might balk at supplying a teen girl.

“We found evidence that the whole mother-daughter approach could be effective at changing some of the known mediators of risk,” Hutchinson said. Mother-daughter communication and the mothers’ monitoring increased during the trial and remained higher three and six months later.

Photo by Kathy Straus, courtesy of PhotoShare



Mothers can play a critical role in protecting their daughters from HIV, according to a study supported by the National Institute of Nursing Research.

Helping the mothers develop tools to take action was key, Hutchinson noted. “A lot of mothers haven’t had ideal role models in their own lives and don’t have the knowledge and skills to speak with their daughters about sex. But if you can help people with opening lines for discussion, with strategies on how to talk to their daughters and how to monitor their behavior, that is powerful.”

The study also revealed that the mothers’ own sexual role-modeling can be a critical influence on their daughters’ actions, she added. “How do their mothers behave around men? Do they let themselves get pushed around? Do they bring lots of different men home? The mothers’ own behaviors may be influential, even if they are telling their daughters to abstain,” Hutchinson said.

Aside from testing the intervention, another key aim of the study was to build research capacity in Jamaica. The team included more than eight nursing and medical faculty members at the University of the West Indies, who gained research skills and contributed to scientific papers. Nursing students and practicing nurses were also trained during the study, for instance in data collection and working with enrollees.

At the end of the trial, the team sent the materials to community-based family organizations so they could continue using the videos, handouts, games and materials to educate adolescent girls and mothers about HIV prevention. Hutchinson hopes government policymaker interest in the intervention—in Jamaica and other similar settings—will grow and lead to adoption of the program.