

Biomonitoring & Disparities: Update and Targets

Summary of a Biomonitoring Update and July 28th 2008 Working Meeting

Final August 2008

I. Overview

Biomonitoring advances can reduce health disparities. There are important emerging advances in biomonitoring and proven applications of biomonitoring, particularly in chronic diseases management for low income and minority populations. A scan of recent biomonitoring activities supports the promise, particularly in saliva and blood testing, including early detection of cancer. Furthermore, significant opportunities already exist if the slow diffusion of proven remote monitoring systems can be accelerated. This will require leadership, providing incentives to overcome barriers (e.g. the CMS decision to not pay for hospital readmissions within 30 days of discharge), developing toolkits for adoption in Community Health Centers (CHCs), and tools for providing community-wide analysis of costs and benefits. In addition, a focus on the evolving cell phone infrastructure and use with biomonitoring remains an area of opportunity. The DRA Project, with meeting participants and other DRA Project Partners will pursue these over the coming year.

II. Introduction/description of meeting

In 2006, the DRA Project, with support from the Robert Wood Johnson Foundation, produced a series of reports focusing on the promise of biomonitoring and how advances in that area can be leveraged to reduce disparities. Many promising trends in home monitoring, electronic medical and personal health records, saliva, blood, or other diagnostic tests and other aspects of biomonitoring were chronicled, and forecasts and recommendations were issued (see www.altfutures.com/bfp). Now, two years later, advances in biomonitoring technology and practice have continued. Biomonitoring is advancing rapidly, with a range of promising technologies in development and, if linked to health coaching, behavioral change tools, and more effective health care, these technologies could improve health and potentially reduce health disparities. With the purpose of updating current activities and forecasts for biomonitoring advances and applications, along with recommendations in this area, and of considering Federal Government applications, the DRA Project hosted a meeting on biomonitoring and reducing disparities. The meeting was held on July 28, 2008 in Washington, DC and included attendees from a dozen government, nonprofit and business organizations focused on the use of health information technology and biomonitoring.

The objectives of this meeting were- a) to consider recent developments in biomonitoring and their potential for reducing health disparities, specifically considering the insights of Molly Coye of The Health Technology Center; b) to review Federal Agency activity in biomonitoring and; c) to discuss and consider next steps in promoting appropriate biomonitoring and its contributions to reducing disparities.

III. Updating the Biomonitoring forecasts and DRA project recommendations

During his presentation, IAF Chairman and Director of the DRA Project, Clem Bezold stressed the point that “biomonitoring advances will enhance health outcomes, *but* they will reduce disparities only with concerted action.” As such, the organizations from which the meeting attendees were drawn- government, business, and non-profit organizations with a stake in biomonitoring- need “a strategy for making biomonitoring reduce disparities – focusing on the right technologies & applications, integration in care and self care, health care provider capacity to use, and shorter diffusion times.” The presentation went on to outline the state of biomonitoring technology and the potential for biomonitoring to reduce disparities. The 2006 Biomonitoring Futures Report had identified early cancer detection, continuous passive biomonitoring, and cell phone use with biomonitoring as particularly promising opportunities for biomonitoring advances to reduce disparities. A Biomonitoring Update Scan was done in 2008 for the DRA Project. Considering the update and related monitoring by the DRA Project, the areas identified in 2006 still hold promise, and there continue to be successes both with new technologies and with pilot projects. Clem Bezold and IAF Senior Futurist William Rowley, MD, in reviewing the 2008 forecast and 2008 update, pointed out that:

- The advances forecast in 2006 are generally on track, but the field remains very complex and the creation of highly sensitive, specific, reliable and easy to use systems will take time.
 - Saliva testing has moved forward, with the identification of most of the unique proteins in salivary glands;
 - A potentially low-cost bio/nano chip for testing saliva proteins is being tested in ambulances this summer.
 - Blood tests for Alzheimer’s and bipolar disorder are moving forward and options for monitoring medication compliance are also growing.
 - A high level of activity and excitement remains in the search for biomarkers and biomonitoring for cancer screening, earlier detection, and assisting in treatment.
- A specific advance that has not moved as rapidly as expected is non-invasive glucose testing using passive body monitoring
- There are some caveats to the promise of biomonitoring, though, and some questions that the use of biomonitoring raises. For biomonitoring to be effective, it has to be paired with access to effective healthcare. Payment models for preventive health care do not support the use of biomonitoring. Physicians are concerned about the liability implications of biomonitoring systems and patients are concerned about privacy and security. Much of health is also affected by the environment and social determinants, and in order to improve health, biomonitoring must change behavior. This points to the “bathroom scale problem,” where we already have a cheap, easy-to-use biomonitoring device that provides information on a pre-disease indicator for cancer, heart disease and diabetes and a progress monitoring indicator for heart disease and diabetes in the bathroom scale, but this does not necessarily lead to change. A related question is: what is the role of biomonitoring if environmental conditions or lack of access to healthcare prevent the patient from making the necessary changes or getting treatment? Additionally, in

the area of cell phones in particular, the infrastructure is uncertain, and spectrum allocation may be an area where it is relevant to try to influence outcomes to reduce disparities.

Recommendations from the DRA project and the Commission to End Health Care Disparities were also presented which included: encouragement of healthcare payers to provide reimbursement for proven biomonitoring strategies, especially for prevention, among low-wealth and marginalized communities; HRSA and CMS encouragement for testing in community health centers (CHCs); the creation of a research funding strategy for disparity focused biomonitoring among the DoD, NIH, and VA; FDA encouragement of testing of biomonitoring platforms in low-wealth communities; consideration of disparity reducing opportunities by commercial developers for interoperability standards; understanding, anticipating, and influencing advances in wireless communications technology, services, and infrastructure; and encouragement for health providers for low-wealth communities to forecast developments and best innovations in biomonitoring and to test, evaluate and deploy these.

IV. Remote Health Management Technologies and Disparity Reduction Strategies

Molly Coye, founder and CEO of the Health Technology Center, summarized the Center's biomonitoring research and forecasts. HealthTech is a 501c3 pooled research organization that strives to provide a trusted source of objective, expert and actionable information on the future of healthcare technologies. In order to do this, HealthTech has taken no money from the companies that develop the technologies, although they do involve companies in their research on technology deployment. The Health Technology Center's vision is that: "Innovations and technologies are adopted rapidly across the industry to make healthcare better and reduce the cost of care." Coye noted an important distinction between technologies and innovation: while technologies are just the physical systems and platforms that make up biomonitoring, innovation is the change in the work process or business model, and may or may not require technology. In fact, technology is just a tactic and, generally, it is not the technology that is the barrier, it is the need for innovation. Thus, HealthTech is focused on innovation: changes in business models, culture, and education.

One of HealthTech's activities is to boil their research down into trends so that there is something bigger to hook the specific technologies into. For example, one of the trends that HealthTech forecasts is that biomonitoring will shift care upstream to earlier diagnosis and treatment. There will also be a shift to minimally invasive therapies, and to minimally invasive care overall, as in-home biomonitoring is less invasive than leaving the home to go to the doctor's office. Biomonitoring advances will offer potential for increased workforce productivity as it shifts the direction of the needed workforce. These advances could lead to significant change in how we deploy health care personnel. Such biomonitoring and related advances may cause a shift toward community health workers deployed by nurses and physicians, rather than relying solely on doctors and nurses. Simultaneously, new models of care that use existing technologies will emerge, for example shifting to chronic care management from episodic care.

The shift to in-home biomonitoring and minimally invasive care has corresponded with continuing development of remote device management and devices that support independent living. Molly Coye highlighted systems that monitor and encourage medication compliance, such as devices that detect the opening of medications bottles, remind patients to take medications, or transmit medication compliance information to caregivers or family members. She also emphasized systems that detect motion and even learn normal behavior in order to detect changes. These include motion sensors, floor sensors, bed sensors, and smart toilets. There are also new devices that can remotely monitor the health of a device, for example a cardiac implant or artificial joint.

Many of the home monitoring systems have shown very impressive results. A study on home-based telemedicine for a mostly Latina population of uninsured high-risk diabetics, found that the use of telemedicine reduced inpatient admissions by 32%, emergency room encounters by 34%, and outpatient visits by 49%. A study on care-coordination for VA patients with hypertension, heart failure, COPD or diabetes found that emergency room visits were reduced by 40% with the technology, hospital admissions were reduced by 63%, hospital bed days by 60%, nursing home admissions by 64% and nursing home days of care by 88%. These technologies have also been shown to be highly cost-effective. In a study on remote management of congestive heart failure, the technology was shown to reduce hospitalizations by 32% and provide a 25% cost savings, of approximately \$1,800 per patient. This study indicated that if only 50% of the relevant population adopted remote management of their condition, the total savings could be up to \$1 billion.

However, despite being very cost effective and efficient, there are many barriers to deployment of those technologies and also to ongoing research and development. In her presentation, Molly Coye noted the obstacles caused by reimbursement issues, the legal and regulatory framework, the lack of infrastructure in rural areas, the need for technical and operational talent, and concern by physicians about the loss of traditional care patterns. She focused on the fact that the barriers are not technical, they are related to finances, business models, culture, or training. She suggested that one of the strategies for deployment is to link challenges that a provider faces to concrete technologies that may alleviate those challenges.

Coye noted that chronic disease management using remote monitoring has shown impressive results, particularly in integrated delivery systems such as the VA. However, to date, despite these impressive results, adoption continues to be very slow, and the current rate is slower than the typical diffusion time of 17 years identified by IOM.

Part of this slowness in adoption is the lack of incentives for these innovations – hospitals may lose money if admissions are reduced. But for hospitals, Coye identified a major change in federal policy that represents a tipping point: the CMS decision not to pay for thirty-day readmissions to the hospital. Hospitals now have an incentive to ensure that patients do the right things when discharged. Hospitals have turned to home care agencies that are beginning to use monitoring technologies in the home. This is causing organizations and healthcare companies to put more money into home care technologies.

V. Key issues in Biomonitoring for Reducing Disparities

Through the discussion, the participants addressed several key issues in biomonitoring for reducing disparities, including ownership and leadership, incentives, deployment, CHCs, and biomonitoring platforms. There was generally consensus that the main goal at this point is wider adoption of current biomonitoring technologies. There was a lot of discussion of ownership and leadership, and several attendees saw it as one of the main determinants of the success of biomonitoring programs. It was argued that until someone was responsible for advancing biomonitoring, current slow trends will continue. There was discussion of the public as owners and drivers of this movement, and there was some discussion of a top-down approach, because current incentives structures work against the adoption of biomonitoring, as doctors and hospitals are concerned about their own interests.

From this, it was also suggested that incentives are key to encouraging the adoption of biomonitoring systems. Generally, the primary care providers who spend money on biomonitoring technologies will not be the ones to see the savings. Instead, the savings accrue to the system, which leaves primary care providers with little incentive to switch. There is an additional disconnect in incentives for hospitals, as some of the major advantages of biomonitoring systems have proven to be reductions in readmissions and length of hospital stay, which can actually lose money for hospital systems. This led to a call for gain-sharing and systems-level approaches, whereby the gains achieved through the use of biomonitoring are shared fairly and strategically across the system and across types of healthcare providers.

Deployment problems for proven monitoring advances, particularly with older doctors, are significant. Strategies that consider these and make doctors partners can be more successful. There was also much discussion of the role of biomonitoring technologies in community health centers (CHCs) and the role of CHCs in testing biomonitoring technologies. In terms of testing biomonitoring technologies in CHCs, it must be carried out in partnership with the CHC, rather than be imposed on it. Some participants felt that introducing monitoring advances in CHCs later, after the approach is proven, may be a more appropriate time than using CHCs to test unproven technologies. Others felt it was important for CHCs to be involved in testing so that diffusion time could be minimized. However, for any biomonitoring study in a CHC or rural hospital there are important questions about whether or not the test area will be allowed to keep the systems and whether they can afford to continue or expand the use of biomonitoring technologies after a successful study.

One issue of concern for the DRA Project is whether it makes a difference if the biomonitoring uses blood, breath, saliva, body monitoring or something else. Will a difference in the platform make a difference in the potential to reduce disparities? There was general agreement that what matters is not which of these would “win out” but that the systems in which they are used be inexpensive and presented in relevant languages in culturally acceptable ways. Any such biomonitoring system that is ready to be deployed soon and can be linked to information therapy and other supporting systems will reduce disparities.

VI. Conclusions/Next Steps

Based on these key issues in biomonitoring for reducing disparities, there was discussion of the leadership steps necessary to effectively promote and support the adoption of biomonitoring-related innovations. There was interest in leadership discussions for federal agencies dealing with health information technology and biomonitoring. Details as to the level of leadership and objectives of this discussion are still being considered, but the DRA Project hopes to facilitate such discussions in 2009.

Cell phones remain a target of opportunity. The 2006 Biomonitoring Futures Project Report identified cell phones as being relevant to disparity reduction. Developments since then in the use of cell phones to communicate biomonitoring results and to provide information and reinforcement to the patient have been significant. The infrastructure for cell phones and wireless communication is in flux and there are also opportunities for disparity reduction in the use of cell phones that have not been pursued. Clem Bezold, Molly Coye, Wilbur Malloy of TATRC, and Dena Puskin of HRSA indicated interest in working on a team to explore how cell phones could be used to reduce healthcare disparities and what opportunities exist for the DRA project to promote decisions and policies that support that end.

The attendees also discussed at length the opportunity and possibility for creating a toolkit or a set of toolkits to assist CHCs with adoption and deployment of biomonitoring systems. These toolkits could help inform CHCs of what systems are available, what the cost is, how to frame the deployment, and some criteria in choosing and deploying systems. It would not suggest any particular biomonitoring system, but instead would present the choices in an easy-to-use format. This would have to be combined with some availability of funding, but HRSA has an HIT grant available and could encourage applications in that area.

It was agreed that one important aspect of this toolkit would be to include descriptions of areas where biomonitoring technology has worked. There was some discussion of two toolkits, an adoption toolkit focusing on the technicalities of choosing and adopting a biomonitoring system and an implementation toolkit dealing with startup and funding aspects. Generally, it was agreed that the adoption toolkit would be the first task. Although there is some concern about whether or not CHCs are ready for really getting into biomonitoring, there was general interest in the creation of a toolkit to combine existing knowledge in a way that will usefully assist CHCs in their own adoption process. This will be further pursued.

An option considered in the development of toolkits was a community or systems approach, working with all stakeholders to demonstrate the effects that introducing biomonitoring technologies can have on community health and the finances of the healthcare system. In this way, the overall advantages and savings will be more apparent and may help convince others to support biomonitoring. This would involve working with public hospitals and county and city health officials to track the overall savings and the public health effects of widespread deployment. By essentially creating a closed model within the community, healthcare providers may be more willing to be involved. If biomonitoring technology could be proven in a community this way, particularly in a community with a high minority and low-income

populations, a toolkit could be created that not only shows biomonitoring options, but also shows the impact and how these technologies can plug in with other aspects of healthcare provision. The DRA Project will further pursue the adoption and implementation toolkits and a community systems analysis tool. Clem Bezold, Molly Coye, Ronald Carlson, Cheryl Austein-Casnoff and David Ellis indicated interest in working on developing this toolkit. It was also suggested that Michael Lord (?) should be recruited to participate.

In summary, there are important emerging advances in biomonitoring, as well as proven applications of biomonitoring, particularly for chronic diseases management for low income and minority populations. Slow diffusion of these proven technologies results from the incentives of many of the players, e.g. hospitals or primary care providers, lack of leadership or ownership within organizations, and costs of the systems. Opportunities for accelerating development and deployment include leadership discussions among federal agencies, development of toolkits for community health centers to use for adoption and implementation of biomonitoring approaches, a tool for community systems analysis of the costs and benefits of deploying biomonitoring advances, discussions of the evolving cell phone infrastructure and their implications. The DRA Project, with meeting participants, and other DRA Project Partners will pursue these over the next year.

The attendees of this meeting were: Clement Bezold, chairman and co-founder of the Institute for Alternative Futures (IAF) and director of the DRA project, Cheryl Austein-Casnoff, Director of the Office of Health Information Technology at HRSA, Ahmed Calvo, Acting Deputy Director of the Center for Quality at HRSA, Ronald H. Carlson, Director of the Policy Analysis Center, Molly Coye, CEO of the Health Technology Center, David Ellis, Corporate Director for Planning and Future Studies at Detroit Medical Center, Miryam Granthon, Public Health Analyst at the Office of Minority Health, DHHS, Wilbur Malloy, Program Manager for U.S. Army Medical Research & Materiel Command's (USAMRMC) Telemedicine & Advanced Technology Research Center (TATRC), Dena Puskin, Director of the Office for the Advancement of Telehealth, HRSA, Rochelle Rollins, Acting Director of the Division of Policy and Data at the Office of Minority Health, DHHS, Joshua Seidman, President of the Center for Information Therapy, and Jerome Yates, National Vice President of Research at the American Cancer Society.

Appendix

Checking the Biomonitoring Forecasts – Interpretation

by William Rowley and Clem Bezold, July 2008

In 2006 the DRA Project's biomonitoring component was completed, with support from the Robert Wood Johnson Foundation. Forecasts were developed for diabetes and cancer, and trends and emerging developments were considered in biomonitoring using blood, breath, saliva and other media or platforms. These were reviewed by an advisory committee and recommendations were developed to make advances disparity reducing rather than disparity increasing. The forecast reports and the final report are available at www.alfutures.com/bfp. Also in 2006, priorities were set and additional reports were developed focusing on [early detection of cancer using blood testing](#), [continuous passive body monitoring](#), [cell phones](#). Networking and advocacy on the recommendations continued. In 2008 this update was done and its pieces included here. A scan was done of developments related to our 2006 forecasts. This 2008 scan and the 2006 forecasts were reviewed by William Rowley and Clem Bezold. Their interpretation of the promise and challenge of biomonitoring in light of the recent developments identified in the scan can be summarized as

- Biomonitoring will yield significant advances over the next decade.
- The advances forecast in 2006 are generally on track.
- The promise of “Big Wins” remains:
 - Managing chronic diseases esp. CHF, asthma, and diabetes;
 - Enhanced cancer screening & earlier detection.
- Yet the field remains very complex!
- No platforms have dropped out of the running. However, to create highly sensitive and specific, reliable, and easy to use tests will take time.
- Promising developments include:
 - Saliva testing has moved forward, including identifying most of the unique proteins in salivary glands .
 - A potentially lower cost nano/bio chip for identifying saliva proteins is being tested in ambulances this summer.
 - Simple blood test to identify Alzheimer's is in testing.

- The blood test for bipolar disorder could be useful in getting better treatment where many doctors are biased against mental disease.
 - Options for using monitoring to check compliance is also growing (pill box, tagging pills, saliva tests).
 - Cancer -- Activity and excitement remain high in the search for biomarkers and biomonitoring for cancer screening, earlier detection, and assisting in treatment. This appears to remain the area with the greatest level of effort. Biomarkers for cancers that are difficult to diagnose early, e.g. ovarian and pancreatic cancers, appear to be making progress.
- An area that showed promise but does not appear to have had successful movement is non-invasive monitoring of blood glucose.
 - Biomonitoring, to make a difference, needs to lead to changes – in treatment, in the individual’s behaviors, and/or in the environment.

Conclusion

- Biomonitoring advances will enhance health outcomes – they will reduce disparities only with concerted action.