Spring 2018

Utilizing mobile health clinics to improve health literacy

Teresa Prinster
John Carroll University, tprinster18@jcu.edu

Recommended Citation

Utilizing mobile health clinics to improve health literacy

Teresa Prinster

John Carroll University

Author Note

Teresa B. Prinster, Department of Psychological Sciences, John Carroll University

Correspondence concerning this article should be addressed to Teresa Prinster,

Department of Psychological Sciences, 1 John Carroll Blvd., Cleveland, OH 44118. Contact:

tprinster18@jcu.edu

Abstract

Mobile Health Clinics (MHCs) are an effective method of delivering healthcare by increasing access to populations experiencing healthcare disparities (Yu, Hill, Ricks, Bennet, Oriol, 2017; Edgerly, El-Sayed, Druzin, Kiernan, Daniels, 2007; Guruge, Hunter, Barker, McNally, Magalhaes, 2010; Song, Hill, Bennet, Vavasos, Oriol, 2013; Hill et al., 2012). MCHs primarily serve socio-vulnerable populations, who have similar demographics of individuals with low health literacy, an alterable factor to reduce health disparities and improve health outcomes (Yu et al., 2017; Brown-Connolly, Concha & English, 2014; U.S. Department of Human Services, 2000; Nielsen-Bohlman, Panzer, Kindig, 2004; National Institute of Health, 2006; Sanders, Shaw, Guez, Baur, & Rudd, 2009; Institute of Medicine, 2002; Howard, Sentell, & Gazmararian, 2006; Curtis, Wolf, Weiss, & Grammer, 2012). Thus, MHCs present opportunities improve health and health disparities beyond a direct clinical manner by increasing health literacy to patients who are receiving care from them.

Keywords: mobile health clinics, health literacy, health disparity

Prologue

I have been interested in medicine since I went to doctor camp at the museum when I was four. I then proceeded to cover myself, or anything that would let me, with Band-Aids throughout my childhood. My allure to the medical field grew stronger with my fascination of my shoulder surgeries in middle school, and was further fostered by a summer pre-college program in high school. This interest was solidified during my academic college experience. I learned about the basis of medicine and healthcare in college with my life sciences courses, as well as the psychological and behavioral side with a health psychology class. My classroom experiences provided a foundation that I could further expand my knowledge through many experiences, including a Wilderness EMT certification, a medical immersion trip, as well as independently volunteering at a rural mobile health clinic. Both facets of traditional classroom and experiential learning have profoundly impacted my view of healthcare and medicine, and have urged me to further explore the field of healthcare disparities through research.

I have never experienced disparities or lack of healthcare as a patient. When I was sick, I would go see a doctor and get medicine. When I injured my shoulder in 8th grade, I got the surgeries and went to physical therapy. I had not been exposed to or knew someone not getting help they needed if they were sick; I thought that everyone just went to the doctor. If I did not need to see a doctor, my parents usually knew what was going on, what I needed to feel better, and had the knowledge to discern if I needed to seek professional treatment. In addition, they had the educational and community influences of their health knowledge, knew how to navigate the healthcare system, and was able to teach these things to me.

This perception quickly dissipated as I was exposed to some of the healthcare disparities that many people encounter. The first poignant experience was in Northern California, where I

was completing a Wilderness EMT course the summer following my freshman year. Part of the

course requirements were clinical observation rounds at emergency departments (EDs) in the

area. The region I was in (Siskiyou County, CA) is rural, and the small Fairchild Medical Center

was the main healthcare center for the area; patients would have to travel over an hour if they

needed additional care that Fairchild could not provide. I observed many patients come in with a

primary complaint, for example his back was hurting. Then, when he was seen by the doctor in

the ED, he would mention other ailments, such as a sore wrist, a cough, and a rash. The doctor

would usually listen to the requests, try to treat the primary illness or complaint, but then tell the

patient he would have to follow up for the others with a primary care doctor. To this, many

patients would look defeated, and some would argue with the doctor, pleading to help him. I was

confused. Why couldn't the patients just schedule and appointment and follow up with their

doctor? I asked a nurse, who explained to me that many of these patients are not able to afford,

or do not have the insurance, to see a primary care doctor, and therefore use the EDs to receive

their primary care. This was the first time I realized that healthcare is not as simple as being sick

and going to the doctor. I learned how there are people who do not have the resources or money

to receive care, and from this, their health and quality of everyday life is comprised.

My clinical experiences in California opened me to a viewpoint showing the complexities

and disparities of healthcare. This was further developed during a Health Psychology course I

took as a sophomore, where I was introduced to aspects of healthcare that extend beyond the life

sciences and pathological basis. I learned positive and negative impacts of patient and provider

relationships, about health behaviors and health literacy, and had an introduction to some public

health issues. This course taught me that healthcare encompasses more than just a doctor

prescribing medicine or direct patient care. From this, I was most intrigued by health literacy and

the attainment of health knowledge. I have personally always been interested in medicine, but I had hardly considered how the average individual gains expertise about his or her health. Reflecting on health literacy, I am able to attribute my general good health to not only to my fortunate access to healthcare, but a significant part to my familial, educational, and community systems that consequently developed my health literacy.

My expanding understanding of healthcare continued with the convergence of my developing focus on healthcare disparities and my allure to rural areas, leading me to mobile health clinics. Following my John Carroll immersion experience in Honduras, where we delivered healthcare to rural areas via medical brigades, I was interested in what mobile health options were available in the United States. After a quick search, I found Remote Area Medical (RAM), an organization that sets up weekends of mobile health clinics across the country. I signed up to volunteer at a one during a weekend in Wise County, VA, which was close to where I was spending part of my summer in Kentucky. Little did I know, the the RAM Wise clinic is their oldest and most heavily attended clinics, so I was fully immersed into the mobile healthcare experience.

The RAM Wise clinic was held at the county fairgrounds, where tents were set up as makeshift doctor and dentist "offices," vision labs, and pharmacies. Patients of all ages flooded the area, many who had been waiting the entire day before in line to receive care. I worked at the patient intake table, where I checked in patients and recorded information. Interestingly, I asked essentially the same questions to the RAM patients that I had asked the patients at intake in Honduras. Honduras and Wise seem to be worlds apart, but still, we are both still struggling with the similar difficulties of delivering proper healthcare.

An impactful experience from RAM was a conversation I had with a woman named Ann. She was from the surrounding area, and had not seen a primary care doctor for over five years. I learned how she felt like she was basically healthy, but she wished she could see a doctor regularly, not just when a mobile clinic was in town. Ann explained to me how "her people" sometimes just did not know much about health and lifestyle habits that make them unhealthy. I learned how her brother with diabetes had symptoms aggravated because he did not have the regular direction of a physician. Though brief, my conversation with Ann exposed to me how integral the role of a physician *and* health literacy are for a patient.

As a psychology student, I have stretched to look at myself and others through different lenses. Blending with my interest in medicine, I wanted to do research incorporating a wider area of health and addressing healthcare disparities that many Americans encounter. My personal experiences witnessing and interacting with disparities in healthcare and health literacy has had a significant impact on me, greater than if I had just read an article about it or learned it in a class. Sparked by my experience in Virginia, I was interested in delving more into learning about mobile health clinics. Throughout my literature review, I discovered how mobile health clinics have supporting evidence that they are effective in delivering healthcare, and how some patients actually prefer mobile health clinics to the traditional system (Edgerly, El-Sayed, Druzin, Kiernan, Daniels, 2007; Guruge, Hunter, Barker, McNally, Magalhaes, 2010; Yu, Hill, Ricks, Bennet, Oriol, 2017). Of course, it would be ideal that there is a healthcare system that eliminates the need of mobile health clinics, but since that is unattainable in the near future, I began to consider if there were ways that the mobile health clinics could do more than just deliver direct clinical care? I returned to my interest in health literacy, and noticed a cross-over between patient demographics between patients of low health literacy and patients who receive care from mobile

health clinics (Kindig, 2004, Nielsen-Bohlman, Panzer). Improving health literacy has significant

impacts on a patients' health, and may be a way for mobile health clinics to further improve it.

Utilizing mobile health clinics to improve health literacy

Socio-vulnerable populations experiencing healthcare disparities are able to receive

healthcare from Mobile Health Clinics (MHCs) instead of traditional healthcare systems

(Edgerly, El-Sayed, Druzin, Kiernan, Daniels, 2007; Guruge, Hunter, Barker, McNally,

Magalhaes, 2010; Hill et al., 2012; Song, Hill, Bennet, Vavasos, Oriol, 2013; Yu, Hill, Ricks,

Bennet, Oriol, 2017). These patients who seek clinical treatment and utilize healthcare services

from MHCs have demographics similar to individuals with low health literacy (Benjamin, 2010;

National Institute of Health, 2006; Nielsen-Bohlman, Panzer, Kindig, 2004; U.S. Department of

Human Services, 2000). Although there are many issues involving healthcare disparities rooted

within healthcare policies and systems, health literacy is an alterable factor that may reduce

health disparities and improve health outcomes (Curtis, Wolf, Weiss, & Grammer, 2012;

Howard, Sentell, & Gazmararian, 2006; Institute of Medicine, 2002; Sanders, Shaw, Guez, Baur,

& Rudd, 2009). MHCs present opportunities improve health and reduce health disparities beyond

a direct clinical manner by increasing health literacy. The purpose of this paper is to highlight the

strengths of MHCs, and then discuss health literacy and implications to improve it based on the

unique characteristics of MHCs.

The centralized clinical database of MobileHealthMap.org estimates that there are

approximately 2000 MHCs throughout America, with around 6.5 million patient visits each year.

MHCs is a loose term to describe "popup" clinics varying from a bus converted to a clinic, to

medical resources brought to a fairgrounds or an abandoned mall. Some mobile health clinics are

set up for weekends, while others serve areas for just a day. For example, MCH Remote Area

Medical clinics typically run all day Friday to Sunday in a specific locale, whereas the Family

Van in Boston has a set schedule of where the van will be in the city each day of the week

(Family Van, 2018; Remote Area Medical, 2018). The majority of patients receiving care from MHCs are uninsured (60%), but 31% have public insurance and 9% are privately insured. Of these patients, 57% are female and 43% are male. The racial and ethnic demographics of MHCs vary with each clinic, but Mobile Health Map estimates that around 30% of MHC patients identify as African American/Black and 40% of patients identify as Latinx/Hispanic. MHCs span all areas of the United States, with 14% serving only rural locales, 39% in only cities, and 47% seeing patients in both urban and rural settings (Mobile Health Map, 2018).

As mentioned, there is strong evidence supporting MHCs' ability to offer healthcare services at the caliber of the traditional healthcare system (Edgerly et al., 2007; Guruge et al., 2010). MHCs offer a variety of services including primary care, prevention screening, dental services, and specialty care (Yu et al., 2017). Additionally, at MHCs, patients can also receive guidance on preventive medicine, as well as chronic disease management such as adherence to medication and lifestyle changes to improve their overall health (Song, Hill, Bennet, Vavasos, Oriol, 2013; Brown-Connolly, Concha, & English, 2014).

Not only are MCHs offer comprehensive d services, they are an effective method of delivering healthcare to vulnerable populations (Edgerly et al., 2007; Guruge et al., 2010; Yu et al., 2017). MCHs primarily serve socio-vulnerable populations: patients who have low socioeconomic status, are underinsured, are homeless or displaced, and are frequently fragmented from the traditional healthcare system (Brown-Connolly et al., 2014; Yu et al., 2017). Often, the majority of MHCs' patients are of racial or ethnic minorities, have education attainment levels at or below the 12th grade, and many do not speak English as a primary language (Song et al., 2013). Additionally, it is important to note that patients who seek care at MHCs are not exclusively uninsured. Some insured patients may be using MHCs to receive

services that are not covered by their insurance, to avoid expensive co-pays, not having transportation to their appointment, and also by feeling disconnected and taken advantage of by the traditional healthcare system (Yu et al., 2017). MHCs are able to alleviate some healthcare disparities for these socio-vulnerable populations and assist patients navigate the healthcare system.

MHCs are typically set up within the community, and frequently include staff diversity and cultural competency training (Yu et al., 2017). This community centered model of MHCs encourages community engagement, as MHCs allow for the familiar presence in the community, seeing patients in a variety of settings such as "Sunday morning at the grocery store, after church at community center, special events, and the workplace" (Brown-Connolly et al., 2014, p. 19). Patients recognize that MHCs are taking the effort serve *their* community, contributing to positive patient and provider relationships. Along with this, patients feel welcomed, appreciate the more informal nature of the interactions with the MCHs' providers, and are less intimidated by healthcare and the healthcare system as a whole (Caramack, Bouchelle, Rawlins, Bennet, Hill, Oriol, 2017; Guruge et al., 2010). MHCs are also recognized to promote a patient to gain or regain trust in their health, as well as the healthcare system (Song et al., 2013; Yu et al., 2017).

Another strength of MHCs is flexibility of location. MHCs and their services can be easily adapted specific to the community, addressing a unique needs relevant to that geographic and cultural area (Brown-Connolly et al., 2014; Song et al., 2013; Yu et al., 2017). Diaz-Perez, Farley, and Cabanis (2004), highlighted how a MHC in northern Colorado was able to adapt to Mexican immigrants, offering health services tailored to the population's needs of hypertension and psychosocial problems. The mobile nature of MHCs permits access to rural areas, where there is often a scarcity of healthcare options, and transportation logistics impede individuals

from receiving care (Guruge, et al., 2010; Song, et al., 2013, Yu et al., 2017). MCHs' flexibility in location and type of care also allows for bringing care to crisis situations. For instance, MCHs were able to provide healthcare to alleviate emergency lead poising of individuals in Flint, Michigan (Hanna-Attisha, LaChance, Sadler, Schnepp, 2016; Johnson, 2016).

Beyond offering free and affordable care to patients, MHCs offer economic benefits to the healthcare system (Hill et al., 2012; Song et al., 2013; Yu et al., 2017). Patients who use emergency departments as their source of primary treatment can access MHCs to provide treatments and resources designed more specifically to the patients' needs. In addition, emergency department resources are opened up for the community for patients requiring actual emergency treatments (Hill et al., 2012). MHCs show promise to lowering overall healthcare spending, measured by the costs of hospitalizations and emergency room visits saved from "symptom-free days" (Yu et al., 2017). Song et al. (2013) estimated an average cost of $474 for each preventable visit to an emergency department that could be saved by the investment of MHCs. In addition, MHCs are also moving towards highlighting screening and preventable medicine, which provides the public and healthcare system "a high return over time on such an investment…by delaying or preventing the development of chronic diseases" (Brown-Connolly et al., 2014, p. 22).

Furthermore, MHCs can additionally decrease healthcare costs by providing opportunities for patients to increase their health literacy. Limited health literacy can lead to higher healthcare expenditure both on the patient and systematic level (Eichler, Weiser, Brugger, 2009; Rasu, Bawa, Suminski, Snella, Warady, 2015). Health literacy is formally defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Ratzan & Parker, 2000,

p. 6). Health literacy encompasses three major domains of information including clinical,

prevention, and navigation of the healthcare system. To actively use one's health literacy, he or

she must be well versed in health-related communication (both verbal words and written

material), as well as have abilities and knowledge for navigation of the healthcare system

(National Institutes of Health, 2006). Health literacy is also a determinant of the development

and maintenance of health, and health literacy relies on the contribution of education systems,

health systems, and culture and society. (Nielsen-Bohlman et al., 2004). Health literacy and

communication are also related, as indicated by individuals with higher health literacy having

more productive communication with their healthcare providers (National Institutes of Health,

2006).

Patients with higher health literacy have better management of self-care, easier

understanding of medical technology and terminology, and increased ability of preventative care

(Goldman & Smith, 2002; Howard et al., 2006). Conversely, patients with limited or low health

literacy have higher rates of hospitalization or emergency department use and self-report poor

health over double than individuals with adequate health literacy (Baker 2002; Baker, Parker,

Williams, Clark, and Nurss, 1997; Curtis et al., 2012). Regarding health outcomes, Saramgarm et

al. (2017) found that almost half of English-speaking and over 90% of Spanish-speaking patients

had limited health literacy in their respective languages. Of these patients, age and insurance

level was a predictor of limited health literacy for both English-speaking and Spanish-speaking

patients, and education was a predictor of limited health literacy for English-speaking patients.

Patients of low socioeconomic status or of a racial or ethnic minority are more likely to have

limited health literacy, which may be a contributing factor to poorer health outcomes (Rikard,

Thompson, McKinney, & Beauchamp, 2016; Ayotte, Allaire, Bosworth, 2009; Sudore et al., 2006; Howard et al.,2006; Goldman & Smith, 2002; Curtis et al., 2012; Benjamin, 2010).

Improving health literacy is successful when the focus is aimed on cultivating the patient's self-efficacy (confidence and belief in self to succeed), rather than presenting causal informational models of disease and prevention for health literacy and education (National Institutes of Health, 2006). The patient centered model of MHCs presents individualized and intimate environments where patients report feeling more confident, and would be able to likely foster an environment to promote health literacy (Hill et al., 2012). Furthermore, individuals with lower health literacy are also more likely to rely on and seek information from other people on medical decisions and information, opposed to written medical information or the internet (Christy, et al., 2017; Koo, Krass, & Aslani, 2006). The evident positive patient-provider relationships at MHCs have the ability to contribute to a patient learning more about that patient's health, developing his or her health literacy.

Additionally, to improve health literacy, the linkage between health literacy and access to healthcare must be addressed at the community level, aligning with the community-based model of MHCs (National Institutes of Health, 2006). Culture has an established influence of health literacy by molding perceptions of health or illness, access or barriers of the system, definitions of health information or messages. Therefore, health literacy can be improved by focusing on specific communities' aspects and allowing for integration of cultural contexts and incorporating it into health information (Institute of Medicine (U.S.); National Institutes of Health, 2006; Nielsen-Bohlman et al., 2004). Culture and religion also provide context and a familiar method of communication for health, which can be utilized as a means to increase health literacy (Christy, et al., 2017, Institute of Medicine (U.S.), Nielsen-Bohlman et al., 2004). Differences

between the patient population and healthcare providers regarding culture and language are a significant contributing factor that aggravates barriers for patients with limited health literacy (Nielsen-Bohlman et al., 2004). Consequently, for the improvement of health literacy, communication must not increase in amount, but be adapted to the target receivers of the information, which can be achieved with the flexibility MHCs have with community and cultural context (National Institutes of Health, 2006).

Along with the adaptability to culture to improve health communication to patients, MCHs also have the ability to reach different demographics regarding age. Early development of health behaviors is important; there is more likely an impact of increased health literacy throughout an individual's life if it is introduced during childhood or adolescence (Winkelman, Caldwell, Bertram, Davis, 2016). Furthermore, access to primary and preventive care and children of families with low health literacy have a bidirectional correlation (Sanders, Shaw, Guez, Baur, & Rudd, 2009). MHCs assist with access of healthcare for these children, while simultaneously presenting the opportunity to establish and develop health literacy. Children are able to understand cause-and-effect relationships and apply them to broader contexts, such as health and health information, which can also be encouraged by the emphasized patient-provider relationships of MHCs (Sigelman, Rinehart, Sorongon, Bridges, & Wirtz, 2004). Likewise, health literacy is an important factor for older-aged populations. Baker et al. (2002) determined that limited health literacy is an independent risk factor of hospitalization for elderly. The pairing of potential of cognitive and memory declines, as well as new issues of an individual's health, highlights a two-fold importance of health literacy (Brown and Park, 2003). MHCs can adapt to these specific needs of an elder patient population to target the development of health literacy and communication.

Beyond clinical care, MHCs can also stand as a platform to address broader community issues, such as overall literacy. Relations between general literacy and health literacy are prominent; individuals who possess stronger overall literacy are more likely to have better health literacy as well (National Institutes of Health, 2006; Nielsen-Bohlman et al., 2004). Bennet, Chen, Soroui, and White (2009) postulate that education-level and health literacy may actually have a closer connection over race and health literacy. For instance, individuals who have a high school degree report higher levels of mental and physical health than those without a high school education (Howard et al., 2009). Outside of health literacy, limited overall literacy is associated with lower self-rated health, higher rates of chronic illness, and higher rates of health complications. (Schillinger, et al., 2002; Sudore, et al., 2006). Continuity between community and family with educational domains have a positive impact on improving literacy (Friedlander et al., 2016; Zygouris-Coe, 2007). Thus, due to their community centric methods, MHCs present the opportunity for fostering with general literacy within the healthcare domain. Additionally, literacy resources and tools can be brought individuals at the convenience of while they are receiving their healthcare. For example, there is a clear association between the number of books a child grows up with, regardless of the education attainment of the parents (Evans, Kelley, Sikora, Treiman, 2010). One way MHCs can address to improve the broader literacy issue could be to provide books to children and families, as well as other literary resources.

As discussed, there are clear benefits that MHCs bring to patients, especially regarding clinical care and cost. Additionally, there is a similarity between the demographics of patients receiving care from MHCs and patients with limited health literacy. MHCs strengths of flexibility of location, culture, and patient and community centered care present opportunities to

improve patients' health literacy. By improving health literacy, MCHs offer an additional and

sustainable mean to improve health and health outcomes.

Epilogue

Previous to my research, I had not recognized the role that culture plays in someone's

health and in healthcare experience. I perceived medicine as more objective, understanding that

there are cultural differences, but discounting the role that culture plays with health as a whole.

Now, I am able to notice the differences in the sub-cultures I have spent time in: differences

between my hometown, health-crazed Boulder, CO, to Cleveland, to rural Kentucky, where I

have spent two summers. The perceptions and definitions of health among these communities

differ and the health of the community members is widely shaped by the culture. From my

research, I have learned how community and culture are underutilized and powerful tools to

promote health.

I had also underestimated the role of community with mobile health clinics. Reflecting on

my experience in Wise, I now can retrospectively recognize how wholly the community was

involved in the event. Although the towns in the county are small, the fairgrounds (where the

clinic was held) serve as a central and known location. As I drove through the town after the

clinic, I saw posters hung up all over. I explored a thrift shop and was chatting with the owners,

two women from the area. They immediately knew I was from out of town by my non-

Appalachian accent, asked if I was here for the clinic before I had the chance to tell them. They

told me how excited the community gets each year for the RAM clinic and how helpful it is to

have the clinic in town.

Although my research did not involve any clinical contact or care, I have learned about

patient and healthcare provider interactions and relationships I hope weave into my career as a

healthcare provider. At first glance, I thought mobile health clinics seemed to be impersonal;

there is a lack of privacy compared to traditional healthcare, and the patients are seeing doctors

they are unfamiliar with, compared to a family doctor a patient has known for years. I was surprised to discover that many patients receiving care from mobile clinics actually *prefer* mobile clinics to the traditional healthcare setting, mostly because the patients feel that the providers actually care about them and want to help them as a person. I want to be a doctor to guide people to understand how they can be in charge of their health, and understand more that I must embrace each patients' reluctances, challenges, vulnerabilities with health that they face in their daily life. I have learned that I cannot achieve this without being able to communicate with patients, regarding both clinical care and helping patients develop health literacy. I have always wanted to become fluent in Spanish, and after learning the necessity of patient and provider communication, it is a priority goal so I am able to have effective and meaningful interactions with my patients.

Through my research and the process of completing my Senior Honors Project, I enjoyed the opportunity to explore in depth a facet of healthcare, public heath, and health disparities. I was surprised at the amount of existing research that was available on mobile health clinics. In addition to a few literature reviews, most of the research was of specific mobile clinics in a certain area, each one focusing on the success of a MHC in the community. It was interesting to note the differences in healthcare services the mobile clinics were targeting to that community: for example, some focused on hypertension, others on diabetes or asthma. The literature had a common theme of pride of the success and impact they had on the community. This was encouraging to read and supported the statistical claims about how mobile health clinics are effective. I believe that it is easy to get caught up with how our healthcare system is frustrating and fragmented. In a developed country, we should not need mobile health clinics. But I have learned through my research that many small actions and intentions can add up to improve

healthcare. I hope that with my research, I have added to the literature base supporting the value

and positive aspects of mobile health clinics.

References

Ayotte, B. J., Allaire, J. C., & Bosworth, H. (2009). The associations of patient demographic

charateristics and health information recall: the mediating role of health literacy.

Neuropsychology, Development, and Cognition, 16(4), 419-432.

http://doi.org/10.1080/13825580902741336.

Baker, D. W., Gazmararian, J. A., Williams, M. V., Scott, T., Parker, R. M., Green, D…Peel, J.

(2002). Functional health literacy and the risk of hospital admission among Medicare

managed enrollees. *American Journal of Public Health, 92*(8), 1278-1283.

http://doi.org/10.2105/AJPH.92.8.1278.

Baker, D. W., Parker, R. M., Williams, M. V., Clark, W. S., & Nurss, J. (1997). The relationship

of patient reading ability to self-reported health and use of health services. *American

Journal of Public Health, 87*(6), 1027-1030. http://doi.org/10.2105/AJPH.87.6.1027.

Benjamin, R. M. (2010). Improving health by improving health literacy. *Public Health Reports,

125*(6), 784-785. http://doi.org/10.1177/003335491012500602.

Bennett, I. M., Chen, J, C., Soroui, J. S., & White, S. (2009). The contribution of health literacy

to disparities in self-related health status and preventative health behaviors in older

adults. *Analysis of Family Medicine, 7*(3), 204-211. http://doi.org/10.1380/afm.940.

Brown-Connolly, N. E., Concha, J. B., & English, J. (2014). Mobile health is worth it! Economic

benefit and impact on health of a population-based mobile screening program in New

Mexico. *Telemedicine and e-Health, 20*(1), 18-23. http://doi.org/0.1089/tmj.2013.0080\

Brown, S. C. & Park, D. C. (2003). Theoretical models of cognitive aging and implications for

translational research in medicine. *Gerontologist, 43*(1), 57-67.

http://doi.org/10.1093/geront/43.suppl_1.57.

Caramack, H. J., Bouchelle, Z., Rawlins, Y., Bennet, J., Hill, C., & Oriol, N. E. (2017).

Mobilizing a narrative of generosity: Patient experiences on a urban mobile health clinic.

Communication Quarterly, 65(4), 1-17. https://doi.org/10.1080/01463373.2017.1279677.

Christy, S. M., Clement, K., Gwede, S. S., Enmanuel, C., Davis, S. D., Abdulla, R., Ravindra, C.,

Schultz, I., Roetzheim, R., Meade, C. D. (2017). Health literacy among medically

underserved: The role of demographic factors, social influence, and religious beliefs.

Journal of Health Communication, 22(11), 923-931.

https://doi.org/10.1080/10810730.2017.137732.

Curtis, L. M., Wolf, M. S., Weiss, K. B., & Grammer, L. C. (2012). The impact of health literacy

and socioeconomic status on asthma disparities. *Journal of Asthma, 49*(2), 178-183.

http://doi.org/10.3109/02770903.2011.648297.

Diaz-Perez, M. J., Farley, T., & Cabanis, C. M. (2004). A program to improve access to health

care among Mexican immigrants in rural Colorado. *Journal of Rural Health, 20*(3), 258-

264. http://doi.org/10.1111/j.1748-0361.2004.tb00037.x.

Edgerly, L. P., El-Sayed, Y. Y., Druzin, M. L., Kiernan, M., & Daniels, K. L. (2007). Use of a

community mobile health van to increase early access to prenatal care. *Maternal and

Child Health Journal, 11*(3), 235-239. http://doi.org/ 10.1007/s10995-006-0174-z.

Eichler, K., Wieser, S., & Brugger, U. (2009). The costs of limited health literacy: A systematic

review. *International Journal of Public Health, 54*, 313-324.

http://doi.org/10.1007/s00038-009-0058-2.

Evans, M. D. R., Kelley, J., Sikora, J., & Treiman, D. J. (2010). Family scholarly culture and

educational success: Books and schooling in 27 nations. *Research in Social Stratification

and Mobility, 28*(2), 171-197. https://doi.org. https://doi.org/10.1016/j.rssm.2010.01.002.

Family van: Van schedule. (2018). Retrieved from http://www.familyvan.org/van-schedule/.

Goldman D. P. & Smith, J. P. (2002). Can patient self-management help explain the SES health

gradient? *Proceedings of the National Academy of Science, 99*(16),10929–10934.

https://doi.org/10.1073/pnas.162086599.

Guruge, S., Hunter, J., Barker, K., McNally, & M. J., Magalhaes, L. (2010). Immigrant women's

experiences of receiving care in a mobile health clinic. *Journal of Advanced Nursing,*

66(2), 350-359. http://doi.org/10.1111/j.1365-2648.2009.05182.x.

Hannah-Attisha, M., LaChance, J., Sadler, R. C., & Schnepp, A. C. (2016). Elevated blood lead

levels in children associated with Flint drinking water crisis: A spatial analysis of risk and

public health response. *American Journal of Public Health, 106*(2), 283-290.

https://doi.org/10.2105/AJPH.2015.303003.

Hill, C., Zurakowski, D., Bennet, J., Walker-White, R., Osman, J. L., Quarles, A., & Oriol, N.

(2012). Knowledgeable neighbors: A mobile clinic model for disease prevention and

screening in underserved communities. *American Journal of Public Health, 102*(3), 406-

409. http://doi/org/10.2105/AJPH.2011.300472.

Howard, D. H., Sentell, T., & Gazmararian, J. A. (2006). Impact of health literacy on

socioeconomic and racial differences in health in an elderly population. *Journal of*

General and Internal Medicine, 21(8), 857-861. http://doi.org/10.1111/j.1525-

1497.2006.00530.x.

Institute of Medicine. Unequal Treatment: Confronting Racial and Ethnic Disparities in Health

Care. (2002). Washington, DC: National Academies Press. Retrieved from

https://www.nap.edu/read/12875/chapter/1.

Johnson, J. (2016, February 12). Medical mobile unit will help aid Flint children exposed to lead

    in water. *MLive.com.* Retrieved from

    http://www.mlive.com/news/flint/index.ssf/2016/02/medical_mobile_unit_will_help.html

Koo, M., Krass, I., & Aslani, P. (2006). Enhancing patient education about medicines: Factors

    influencing reading and seeking of written medicine information. *Health Expectations,*

    *9(*2), 174–187. http://doi.org/10.1111/ hex.2006.9.issue-2.

Mobile Health Map: Impact report. (2018). Retrieved from

    https://www.mobilehealthmap.org/impact-report.

Nielsen-Bohlman, L., Panzer, A. M., & Kindig, D. A. (2004). Health literacy: A prescription to

    end confusion. Washington, D. C.: National Academies Press.

National Institutes of Health. (2006). Surgeon General's workshop on improving health literacy.

    Besthesda, MD. Retrieved from

    https://www.ncbi.nlm.nih.gov/books/NBK44257/pdf/Bookshelf_NBK44257.pdf.

Rasu, R. S., Bawa, W. A., Suminski, R., Snella, K, & Warady, B. (2015). Health literacy impact

    on national healthcare utilization and expenditure. *International Journal of Health Policy*

    and Management, 4(11), 747-755. http://doi.org/10.15171/ijhpm.2015.151.

Ratzan, S. C. & Parker, R. (2000). Introduction: National library of medicine current

    bibliographies in medicine: Health literacy. Bethesda, MD: National Institutes of Health,

    U.S. Department of Health and Human Services.

Remote Area Medical: Clinic schedule. (2018). Retrieved from https://www.ramusa.org/clinic-

    schedule.

Rikard, R. V., Thompson, M. S., McKinney, J., & Beauchamp, A. (2016). Examining health

    literacy disparities in the United States: A third look at the National Assessment of Adult

Literacy (NAAL). *BMC Public Health, 16*(1), 975.

http://doi.org/10.1080/13825580902741336.

Sanders, L. M., Shaw, J. S., Guez, G., Baur, C., & Rudd, R. (2009). Health literacy and child

health promotion: Implication for research, clinical care, and public policy. *Pediatrics,*

124(3), 306-314. http://doi.org/10.1542/peds.2009-1162G.

Saramgarm, D., Ernst, A., Horner, R., Crum, A., Weiss, S. J., Zemkova, Y., King, K. (2017).

Cross-sectional study of the relation of health literacy to primary language and

emergency department length of stay. *Southern Medical Journal, 110*(12), 796-801.

http://doi.org/10.14423/SMJ.0000000000000743.

Schillinger, D., Grumbach, K., Piette, J., Wang, F., Osmond, D., Daher, C…Bindman, A. B.

(2002). Association of health literacy with diabetes outcome. *Journal of the American*

Medical Association, 288(4), 4745-482. http://doi.org/10.1001/jama/288.4.475.

Sigelman, C. K., Rinehart, C. S., Sorongon, A. G., Bridges, L. J., & Wirtz, P. W. (2004).

Teaching a coherent theory of a druc action to elementary school children. *Health*

Education Resources, 19(5), 501-513. http://doi.org/10.1093/her/cyg058.

Song, Z., Hill, C., Bennet, J., Vavasos, A., & Oriol, N. E. (2013). Mobile clinic in Massachusetts

associated with cost savings from lowering blood pressure and emergency department

use. *Health Affairs (Millwood), 32*(1), 36-44. http://doi.org/10.1377/hlthaff.2011.1392.

Sudore, R. L., Yaffe, K., Satterfield, S., Harris, T. B., Mehta, K. M., Simonsick, E.

M...Schillinger, D. (2006). Limited literacy and mortality in the elderly: The health,

aging, and body composition study. *Journal of General Internal Medicine, 21*(8), 806-

812. http://doi.org/10.1111/j.1525-1497.2006.00539.x.

U.S. Department of Health and Human Services. (2000). Healthy people 2010. Washington D.

     C.: US Government Printing Office. Retrieved from

     https://www.cdc.gov/nchs/data/hpdata2010/hp2010_final_review.pdf.

Winkleman, T. N. A., Caldwell, M. T., Bertram, B., & Davis, M. M. (2016). Promoting health

     literacy for children and adolescents. *Pediatrics, 138*(6), 1-3.

     http://doi.org/10.1542/peds.2016-1937.

Yu, S. W. Y., Hill, C., Ricks, M. L., Bennet, J. & Oriol, N. E. (2017). The scope and impact of

     mobile health clinics in the United States: A literature review. *International Journal for*

     Equity in Health, 16(178),1-12. http://doi.org/10.1186/s12939-017-0671-2.