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Dried blood spots: An evaluation of utility in the field

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Background: Dried blood spots (DBS) offer several advantages over serum samples when resource and environmental conditions are challenging. Many analytes, including antibodies, are stabilized, once dried on filter paper, despite fluctuating temperatures and extended storage time.

Methods: From November 2011 to May 2015 we interviewed and collected a DBS sample from 3318 people, age 0-49 in Tianjin, China. From each participant, we collected five spots on a single, filter paper card. Each of the five spots were evaluated and rated "good" or "bad." A good spot was one that completely filled the pre-printed circle on the filter paper ($\geq$ 11mm in diameter), and was deemed large enough for analyte testing. Each card was scored based on the number of good spots. We examined the number of good spots per card by participant age and by year of collection.

Findings: DBS quality data were available for 3316 of the 3318 blood spot cards. Among those, 22.8% were had zero good spots, 5.7% had 1 good spot, 8.6% had 2 good spots, 17.6% had 3 good spots, 21.3% had 4 good spots, and 24.1% had 5 good spots.

When compared to those aged 30-39 years, the mean number of good blood spots (3.15) was significantly lower among those aged <12 months (1.68, p < .0001) and aged 1-9 years (2.57, p < .0001). Participants aged 20-29 years had the most good spots (3.52, p < .0001).

The mean number of good spots improved with training. Compared to 2012, the first full year of data collection, which had a mean of 2.52 good spots per card, 2014 was worse (mean = 2.22, p = 0.0002) and 2011 was significantly worse (mean = 1.21, p < .0001), but 2013 (mean = 3.98, p < .0001), and 2015 (mean = 3.62, p < .0001) were better.

Interpretation: While DBS may be easier to collect and transport than serum samples, they may not be as good for young children, especially those under age 1 year. DBS collection requires training and practice to ensure that DBS are large enough for analyte testing. Despite challenges, DBS yielded good results and proved an acceptable alternative to serum samples in a resource limited environment.

Arizona Sonora Border Projects for Inclusion (ARSOBO), a US-Mexico NGO collaboration, develops a sustainable social business to train, employ and assist individuals with disabilities

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Purpose: ARSOBO's binational program opened in 2010 with a construction shop in Nogales, Sonora. Individuals with disabilities are trained and employed to construct medical devices they use. Two wheelchair users construct all-terrain wheelchairs. An amputee fabricates limbs for others. Hearing-impaired assist with hearing aid fitting. The workers contribute to the regional economy by buying materials locally. This serves to promote ARSOBO and increase community positive awareness of disabilities.

Structure: Eleven million Mexicans need a wheelchair. Most commercial wheelchairs are not appropriate for individuals living in rural areas where the terrain is rough. Children with developmental disabilities typically need customized wheelchairs adapted to their physical structure. Approximately 786,100 individuals with an amputation live in northern Mexico, most the result of diabetic complications, some from traumatic limb loss. Access to prosthetics is very limited and cost-prohibitive. Approximately 7% of the population is hearing-impaired; most have no hearing aid. ARSOBO has developed over 17 bi-national public-academic and private partnerships including faculty and students from 5 different colleges/departments from the University of Arizona. Makers and recipients of these devices are recruited locally or referred from Sonoran partner organizations.

Outcome: Since early 2011, 225 all terrain wheelchairs have been constructed, one-third customized. Since April 2013, 179 individuals have received a prosthetic limb. Since January 2015, 292 individuals have received hearing aids. A Sonoran company provides ARSOBO a rent-free 4200 square foot building where construction is done and clinics held. The City of Nogales, Sonora gave ARSOBO land where a building will be constructed to carry on this work. In summer 2015 binational interdisciplinary university students conducted a qualitative survey of 35 device recipients.

Going Forward: ARSOBO is committed to make this program a sustainable 'social business' engaging local businesses to support the work, relying less on assistance from the American side.

The development of a mobile phone based intervention to improve adherence to secondary prevention of coronary heart disease in China

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Program/Project Purpose: Coronary heart disease (CHD) is the second leading cause of cardiovascular deaths among Chinese population. The rapid growth of mobile technology presents unique opportunities for improving secondary prevention, which requires long-term engagement of healthcare providers and patients. Yet few mobile health studies have targeted both patients and providers for CHD secondary prevention.

The study aims to develop a multifaceted mobile health intervention that includes: 1) a provider-facing mobile application (App) to guide medication prescription, and 2) a patient-directed text message/voice call system to promote medication adherence and behavior modification. The development phase lasted from July, 2014 to May, 2015.

Structure/Method/Design: We conducted a physician needs assessment through surveys (n = 50), in-depth interviews (n = 6), and a focus group discussion (4 participants) in three community healthcare centers in Shanghai. We developed patient-directed text-messages based on literatures and invited physicians for evaluation. We synthesized iterative prototyping and stakeholder input to refine the design of the android-based App, and used server with spring Model View Controller, Hibernet framework and MySQL database. We relied on cloud communication technology to set up the voice call system. Encryption and role-based passwords were adopted to ensure data security. We also conducted extensive beta testing internally. IRB approval was obtained from Fudan University and Duke University.

Outcome & Evaluation: We found out that community physicians were interested in a mobile-health solution to improve evidence-based CHD prevention. Based on inputs from physicians, we developed an android-based bilingual App that provided decision support for medication prescription and captured patients' information. In order to support a 12-week pilot testing, we developed a bank of 60 text messages and an automatic text message/voice call system. Extensive beta testing suggested that the provider- and patient-facing interventions were seamlessly integrated and were ready for pilot testing.

Going Forward: Primary technical challenges include: 1) constraints on the number of messages sent simultaneously; 2) missed voice calls cannot be tracked and repeated automatically. Future studies may choose text messages only and set message sending intervals.

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Dengue chat: A novel web and cellphone application promotes community-based mosquito vector control

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Program/Project Purpose: The mosquito-borne diseases dengue, chikungunya and Zika continue to expand dramatically throughout the world in large part due to failed efforts in vector control. The most sustainable approach to curb this expansion is through integrated *Aedes* control strategies that incorporate community-based interventions. *DengueChat* (www.denguechat. org) is an interactive cellphone and web platform that combines mobile technology, entomological data collection, clear information, and game theory concepts to motivate communities to participate in vector control. Residents affected by dengue and chikungunya are the best source of information about active and potential mosquito breeding sites and therefore the best agents for their elimination. *DengueChat* (a) crowd-sources the identification and mapping of vector breeding sites; (b) motivates communities to act; (c) embodies a user-centered and collaborative model of software design; (d) promotes civic engagement ; and (e) involves residents in public health education.

Structure/Method/Design: We developed *DengueChat* through a collaborative strategy of software production involving young user-residents in Brazil, Mexico, and Nicaragua. *DengueChat* crowd-sources the identification of breeding sites through photographic evidence, generating data that appear on the website as graphs and relevant information. Users take a second photograph with their cellphones to document the elimination of the breeding containers. The web interface is interactive, allowing residents to create their own profiles and blogs and to exchange information regarding dengue and chikungunya in their neighborhoods. *DengueChat* features educational components and social networking that also relate to other relevant issues in the community. Using the effective communication strategy "SEPA" (Socializing Evidence for Participatory Action) it engages affected communities in the active management of mosquito foci. *DengueChat* was piloted in five neighborhoods in Managua, Nicaragua for one year in 2015. Baseline entomological surveys were carried out prior to implementation. Teams of volunteer youth brigades deployed *DengueChat* under the supervision of a project facilitator. Users earned badges and points for their documented efforts in identifying and eliminating breeding sites.

Outcome & Evaluation: Results from the pilot studies are informing app refinement and the development of a native smartphone version. The pilot provided direct feedback regarding the impact of *DengueChat* in vector control and its potential for deployment on a wider scale.

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