Thrive thru 5: Mapping for Child Survival in Rural Kenya
Zero to Five Challenge Refinement Q&A

Responses to Questions from the Amplify Team

Question/comment from Guy Viner: Sounds like a fab idea, Katherine. We’d encourage you to try some part of this idea out in order to evolve it effectively and share back your learnings here. Check out our tips on prototyping: http://bit.ly/pr0totype We’re excited about what human centered discoveries you’ll make towards strengthening your idea further!

Comment 2 from Guy: And here’s a friendly tip: update your OpenIDEO profile so folks can dig who they’re collaborating with. Think skills, experience, passions & wit! Looking forward to seeing more of you across conversations on this challenge...

Question/comment from Chioma: Congratulations on your idea moving to Refinement, Katherine! It will be especially helpful for you to fill in some information to introduce yourself to the OpenIDEO community! Cheers!

Question/comment from Wekesa Zablon: Halo Katherine, exciting approach .. Kenya open Data Initiative (kodi) has geolocational data on most of this health facilities.. And maybe some available tools. Kindly check with them to see how u might partner.

Answer from Lwala: Thanks Wekesa, we will take a look at kodi. Using any already mapped health facility or infrastructure data would definitely be beneficial.

Response from Wekesa: Yesterday there was this convo on Data - hosted by http://data2x.org ... http://data2x.org/gender-data-gaps/ ...

Interesting convo on gender data gaps.... All the best ...

Answer from Lwala: Thank you for passing along this link, Wekesa!

Question from Open IDEO: Congratulations on making it to the Zero to Five Challenge Refinement List, Lwala Community Alliance! We really like that your idea contemplates using technology commonly used by businesses to better serve a remote location. We also like the potential this idea has to be widely applied if it proves successful. Something we are interested to know is how you plan to train public health workers to participate in a program like this? What challenges do you anticipate with the adoption of this kind of technology? With the program in general? Are you familiar with examples of programs similar to this being employed elsewhere? If so, what distinguishes your approach? It’s great that you have considered how you could quickly begin to test this idea through brainstorms and engaging the villages you currently work in. It would be great if you could begin to prototype some part of this idea (even if only with a handful
of villages) during the Refinement phase and share what you learn with the OpenIDEO community. Check out tips for Refinement [http://ideo.pn/0to5-tips-refine](http://ideo.pn/0to5-tips-refine) for some tools to assist you. Also, have you turned your mind to any partners might collaborate with on this initiative? Is there something you would like help with from the OpenIDEO community?

**Answer from Lwala:** Thanks! We look forward to refining our idea and are excited about demonstrating its effectiveness as part of the refinement phase.

We've worked hard over the last few years to develop a robust reporting process with our community health workers (we aren't the only ones, communities all over the world have done the same). We agree it will take some time to understand how best to train health workers to use the data; for example, what do the maps look like, how can the information they contain best be visualized, in what ways should the maps be presented. Successfully implementing new technologies is best done by identifying champions from among the end users who understand the value and can learn and then teach others. We'd like to apply that same approach here, and have our champion community health workers guide the implementation.

Perhaps the biggest challenge will be translating the mapped data into meaningful information. The communities we serve are a maze of hilly footpaths and winding roads through fields of sugar cane and maize. Rarely do villagers use maps or cardinal directions to communicate geography, instead relying on familiar landmarks and natural features. It will be important to ensure that the maps we develop are effective in communicating what we learn to health workers, and enable them to pass those lessons on to the rest of the community.

Lack of familiarity with traditional geographic information poses a challenge to implementation. We also think it is one reason why this approach might actually be so successful- rarely do community members in Lwala get a bird's eye view of what is happening. We believe the ability to provide that perspective, while incorporating features that we know to influence public health (like where are the improved water sources versus unimproved water sources) will yield meaningful results. We also hope that the findings of the initial maps serve as a useful tool to demonstrate to community members that there are strong links between health-related behaviors and health-related outcomes.

Mapping (more specifically geographic information, or the use of software to store location data and create computer-based maps) has become commonplace in the last decade. A number of organizations have successfully used community-led mapping to improve the effectiveness of programs in health and development. Most often it has been employed in an urban setting (for example slums in Nairobi or Mumbai), or in resource-rich countries. So while the idea is certainly not new, implementing it effectively in a rural setting and targeting commonplace diseases that effect children is
less typical. We are excited to demonstrate that it can be done, and that the results can meaningfully impact lives.

We would definitely be interested in partnerships, and are actively reaching out to peer organizations who could contribute and also benefit. We are especially interested in the technology options (like how can the many low-cost data collection tools and mapping applications that exist be most effectively combined- we have some ideas but welcome others) and how could their use be standardized to benefit other organizations around the world. This is also something the OpenIDEO community can definitely contribute to, and we welcome anybody with thoughts to share them.

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**Question from Meena Kadri:** Great replies. Be sure to follow the instructions on our Tips for Refinement post and add these responses to the Word form over on our challenge brief.

**Answer from Lwala:** Thanks Meena. We will definitely do that.

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**Question from Chioma:** Hello! Great to see some excellent questions being posed about your idea - I'm going to add a few more! From the video, it looks like your CHWs are using Skyscape - is this the case? Are there plans to integrate the information collected with that app into the mapping project that you are proposing? What challenges did you face with the implementation of that process? Similarly, are there things you have learned from your talks/collaboration with groups like Map Kibera that you plan to apply to this project? Also, you might find the work of Kathmandu Living Labs interesting - they are using mobile phones and existing community groups to create various maps (albeit of an urban environment) - with a lot of success!

http://www.kathmandulivinglabs.org/

**Question/comment from Wakesa Zablon:** A lot of resourced too available on UN global pulse research section and a list of available big data related projects in Africa... U might be lucky to get some open source codes on github and.. There is a spread sheet on listed data funded projects ... Will share once I figure it out .. Be sure to open up your data too for other organizations for reuse..

- http://www.nation.co.ke/news/UK-spend-Sh2-7billion-spur-economic-growth-Kenya/-/1056/2566286/-/15og0emz/-/index.html .... In the dailies on DFID's Kenyan interests ...

**Response from Chioma:** Thanks Wakesa! Also, Lwala – great to see you sharing with other ideas that have a mapping component (e.g. Group Pediatric Care!)

**Answer from Lwala:** Thanks Chioma!
We do use Skyscape (actually Omnio, which replaced Skyscape last year but with the same/improved features, and released by the same organization). Our clinical staff, public health staff, and CHWs use several types of devices (android tablets, ipads, ipods) to help with diagnosis, treatment, and health education both in our hospital and out in the community. We love it, and find it especially valuable in our resource-limited setting. We also use a couple of other related applications developed by Real Medicine Foundation and Health eVillages to be more effective in our public health outreach, mostly tools to educate mothers about maternal and child health. We are actively thinking about how to integrate mobile applications into all of the work we're doing (including our mapping idea), focusing especially on more efficient and effective data collection by our CHWs. We've been engaged in conversations with our friends at Medic Mobile and Dimagi to advance that work. A lot of the challenges we face around use of mobile applications have been logistical, and we think we've learned a lot that is informing this mapping idea. For example, just managing a large number of devices, keeping them updated and charged (there is limited electricity in Lwala) has been a challenge. It's doable, but we've had to be very intentional in how we manage that process. That is one reason why we're keen on using volunteers outside of Lwala to do the actual mapping via Open Street Map- it lets us avoid having to deploying numerous teams in the field with GPS or mobile devices. It's also why we think it's important to make this idea about sharing data on a map, but not necessarily in a fancy, web-based map on a smartphone (though that day will likely come)- the emphasis of the idea is on the content we intend to share with CHWs, and doing that in a way that is effective and sustainable. Another obvious challenge has been introducing more advanced technologies in an area where literacy (especially in English) can be relatively low, but we're hoping our work with Omnio will pave the way for the introduction of mobile tools to support this.

We talk regularly with partners working in Kibera and around the region, and try and "borrow" as much as possible. Much of our emphasis on data and understanding our beneficiaries has been inspired by talks with and visits to Shining Hope for Communities (SHOFCO) in Kibera, who use a robust information management system to understand how the people of Kibera are using their services. And we plan to continue these conversations as we advance our idea- we've had a number of conversations with technology partners about assembling a sustainable and low-cost technology stack (combination of software applications) to successfully map our mothers and under fives.

Thanks for pointing us to the work of Kathmandu Living Labs! It looks like they're using Open Street Map to build a base map of infrastructure in Kathmandu, and are then using it to inform focused projects (like we're proposing, but with maternal and child health). Their work on agriculture is especially relevant to us as a follow on project, and we'll explore more and reach out to understand what they've learned. We think this really highlights why Open Street Map is such an incredible tool - you can engage community members and volunteers all over the world to build out a free and publicly
accessible map of any community, and then use that information as the starting point for doing so much more. In our case, we'd love to learn how it can be used to improve outcomes around maternal and child health, and create a process that can be readily transferred to any other community that has been mapped in Open Street Map (of which there are many).

On that note, we're actively planning a mapathon in early January of the Lwala community, with the support of our friends at Vanderbilt University. We'd like demonstrate the viability of mapping our community and want to share some examples of maps as soon as possible with CHWs to get their feedback. We'll include more about planning the mapathon in our idea submittal above, and are looking for ways to involve the broader Open IDEO community in the mapathon, so check back in the next few days. We're excited to get this process started!

Thanks and happy holidays!

Question from David Citron (not from Amplify, but the Amplify Team made comments in response to his question): LCA team, reading through this super impressive and thorough project! I'm eager to follow this project. Where we work in Nepal (Group Pediatric Care, https://openideo.com/challenge/zero-to-five/refinement/we-need-to-deliver-group-pediatric-care), we are also using mobile phones and SurveyCTO to collect and ultimately display program and population health indicators over time and space on geo-topographical maps. Our goal is to use GPS mapping from handheld devices to continuously enumerate our catchment population, creating an electronic census list that is adaptive and updated by the community health worker, and which incorporates census-updating into the daily health functions of the community health worker. The maps will be interactive and multi-layered, and ideally printable with so they become actionable reference maps (ie patient or household lists and indicators of interest distributed by village cluster units).

A few questions for your team:

(1) Are the CHWs you recruit part of the Kenya government healthcare system, or are they recruited and trained by your team? Are they compensated?

(2) What are some of the key implementation challenges you've encountered? I'm always amazed at the real-world scenarios/issues that our CHWs bring back for troubleshooting; not necessarily related to using the android phone or the SurveyCTO app itself, but rather - as you point out - with the implementation issues that arise from the heterogenous, mobile and agro-pastoral "households" we try to map. A real testament to innovation borne from human centered design, as our CHWs are continuously teaching us how to refine our instruments and design for simplicity, scale, and impact.
Using openstreetmaps, what is your estimated time of enumeration/mapping?

Another option for mapping partners is http://broadstreetmaps.org, based in Seattle.

Would love to be in touch about mapping/data visualization moving forward, and look forward to following this as it evolves. Thanks again!

**Question from Chioma:** Awesome update, Lwala. Interested to hear how you might involve the OpenIDEO community in your upcoming mappathon – keep us posted! Thanks for giving us more insight into how this idea has come to being and the groups that have inspired you. Just as David mentioned – it will be really interesting to hear the insights that come from CHWs to see how they shape how these maps will be used!

**Question/comment from Wakesa Zablon:** http://upande.com/

I got a chance less last month to interact with people from upande and they expressed their interest in mapping projects. am also excited bout the Mappathon certainly open street maps gives more control and use of data vs Google maps. Reach out to them too and seek to see how you might benefit from there expertise.

**Answer from Lwala:** David,

Thanks for the comments and the insight into how you all are integrating census and mapping activities into the work of CHWs. The data collection is really the challenging part, and as you all have probably realized, there are limitless opportunities to use geo-located data in all sorts of ways once it's collected. We'd love to hear about the pros and cons of any platforms you're using to create interactive and multi-layered maps, and whether you are making any of those web accessible? With the right considerations for privacy, we think making some of our maps web accessible would be a really cool way to engage the global community and donors, and raise awareness and interest in child health issues for communities like Lwala. For our work on the ground though, we really think printable maps will be key, especially if they can be made on-the-fly by our public health team using simple tools that require little maintenance (besides the work updating health data in our existing database). In answer to your questions:

1) We have a relationship with the Kenya Ministry of Health to incorporate their CHWs into our system, but we also recruit our own CHWs. Our CHWs participate in a monthly meeting with our public health team which sometimes include specialized training. We've integrated a position we call Mentor Community Health Worker (MCHW) into our network, so a number of CHWs are overseen by a more experienced MCHW who is primarily responsible for direct reporting to our public health team and will be a key player in helping us roll out the mapping tools to their CHWs. We are fortunate to be able to provide our CHWs with a monthly stipend.

2) One of our biggest initial challenges in implementing such a data-intensive program
was ensuring that all of our CHWs understood each indicator correctly. While we provided thorough training at the start, it was only through experience that we learned how CHWs might interpret a certain indicator while they are actually talking to mothers at a household. With the help of our MCHWs and public health team, who noticed discrepancies early on, we were able to identify and target these issues right away to ensure a high quality of data. Our staff meet with MCHWs individually every month, so issues like this, and others that could arise with the use of mapping tools, can be identified as we go by the individuals using the system. For rolling out this idea, we anticipate there will be a learning curve for CHWs to actually draw conclusions from maps, so we'll be working closely with our monitoring and evaluation staff, public health staff, and MCHWs to make sure that happens.

3) We think we'll be able to map our catchment area in one or two "mapathons" if we can get enough volunteer participants. We’re planning to host a mapathon in January (see our idea post above for more info) at Vanderbilt University and will update the community here with the results of that effort. There are also some cool tools to engage a broader community in getting an area mapped - check out the OSM Tasking Manager (http://tasks.hotosm.org/) which lets you divide an area into gridded segments which online volunteers can select and map. It creates an effective way to farm out the process of mapping to a network of interested participants (like donors), without having to get them all organized in one location.

Thanks! Let’s do stay connected and continue to exchange ideas about mapping and data visualization. We’ve got a few other initiatives we’re working on to better analyze and visualize our data outside of maps, and are excited to draw on ideas from others.

**Responses to Questions from the OpenIDEO community**

**Question/comment from Jessie Cronan:** Hi Lwala team,

Congratulations, this is a fascinating idea with the potential to save thousands of lives!

I’m especially excited about the potential that this data has, as you noted, to inform broader public health efforts to reduce under 5 mortality. Have you thought about how you will share this data, and with whom?

I also love the idea you shared, above, about creating some type of regional "best practices" manual -- where do you see the biggest areas of overlap between your work and other NGOs with similar missions and/or geographic focus?

Do you see this project as building a roadmap (pun intended) for NGOs who are interested in undertaking similar projects down the line?
Good luck, and congratulations again on such an well thought out and impactful proposal!

**Answer from Lwala:** Thanks Jessie. We've incorporated the "best practices guide" into our revised submission, let us know what you think. We think this idea has broad applicability. As for serving as a roadmap for other NGOs, we think that's possible too. Much of this idea relies on organizing data effectively, which is something that many organizations are starting to do with more ubiquitous internet and "cloud-based" products like Salesforce. It's only in the last few years that an organization didn't need high-cost hardware and IT staff to manage lots of data they collect. Now that organizations can do that, developing basic maps of that data is a natural extension. We'd love to demonstrate and share that process.

Sharing the data is also something we're interested in. We have connections with a couple different U.S. universities, and sometimes host medical and public health fellows or even whole classes. Sharing the data sets we produce (with consideration for confidentially) could allow for research projects that benefit not only us but the field of public health as well.

Thanks for the great comments- it sounds like you have lots of ideas about how to have the widest impact with whatever work we succeed at, and we'd love to hear more.

**Response from Jessie:** Thanks for your thoughtful answer! It has been inspiring to watch this great idea continue to develop. I've thought of some additional questions for your team. First, which specific mapping tools do you hope to use with Open Street Map? Would you be supplying your team with electronic devices with which to plot the data points? Are you planning to lead trainings for your volunteers on how to use the devices and plot data points? I would be very interested to learn more about your training methods!

**Answer from Lwala:** Thanks for all the feedback Jessie, and for checking in as our idea evolves. We're still thinking through some of execution, but here are our current thoughts. As we mention in our post, we're looking to partner with an organization whose primary mission is developing technology systems for NGOs similar to ours. We think that we have the capacity in-house to support that partnership, then take over and successfully maintain the system.

Once data has been added by volunteer mappers in Open Street Map, you are able to export a subset as a standard file type that can be read by any mapping software. The data will stay on Open Street Map for others to see and add to, but we'll have a baseline version that we'll begin working with. Using free software (check out [http://qgis.org](http://qgis.org)) we can print a series of maps to go out in the field with. We don't think that CHWs or volunteers on the ground will need any GPS devices to get our idea up and running. They'll have a detailed paper map showing all of the buildings, roads, footpaths, rivers,
etc., in a particular area. In the field, CHWs will work with youth volunteers to match houses on the maps with unique household codes that we're already using to track under 5 children and their mothers. That's the key to linking the mapped households to all of the health data our CHWs are currently collecting. A GPS device could be used by our public health staff to verify when there are uncertainties. In the future, when a CHW reports that a particular household has two children with severe diarrhea (for example), we'll only need to know the household code to put those two cases on a map. The real benefit of mapping the households with Open Street Map is that they can be accurately put on a map without having to train a cadre of volunteers to trudge through the field with GPS devices to mark every house. If you look at the sample maps we've posted, you can see that households will even be outlined as rectangles, not just marked as single points. That will make it even easier for a CHW on the ground to recognize the households he or she is already familiar with.

As for training, we think that will be crucial for successful implementation. As we mention in an earlier comment, most community members aren't familiar with seeing Lwala from above (on a map). We think it will take some time to get our CHWs accustomed to recognizing a map's features, and interpreting maps that show health data (also as we mention above, we think that giving that new perspective will really prove useful in better understanding health issues the community faces).

We currently hold a monthly CHW meeting with our public health staff to exchange data and share thoughts, so we'll use those meeting as an opportunity for training. One early thought is to translate from the map back into descriptive narrative. For example, if we realize that most typhoid cases are clustered together on a map, that could be translated into narrative that means something to our CHWs, like "90% of the typhoid cases occurred in the households between Lwala school and the river." Over time, we think our CHWs would require less interpretation, and could draw their own conclusions from maps.

In developing a guidebook or best practices manual, one of the key focuses would be documenting our own challenges in translating the data we map into meaningful information the CHWs can understand and apply. In fact, that is really the core of this idea, not just mapping a bunch of data to look at (that's not so unique an idea), but providing it back to traditional networks of public health workers as useful information.

We hope this all makes sense, and would love to continue the conversation. We're excited to continue thinking about and demonstrating the efficacy of the idea as the refinement phase progresses!

Question/comment from Thalia Aponso-Ramirez: I feel like this idea could definitely help the public health system over there, the only problem is, is there enough funding for the vaccinations/immunisations etc?
**Answer from Lwala:** Thank you for your question, Thalia! We receive in-kind support from the Kenyan Ministry of Health, reimbursement from the National Hospital Insurance Fund, and some local revenue from patient fees to help cover the costs of treatment and medications. In addition, we have a diverse funding portfolio of international partners including Ronald McDonald House Charities, Izumi Foundation, Health eVillages, Real Medicine Foundation, Segal Family Foundation, and Blood:Water Mission, which helps to cover the cost of providing clinical care to our rural population.

**Question/comment from Alisa Ahmadian:** This sounds like an amazing initiative! I worked for some time with the United Methodist Committee on Relief in their network of hospitals in Sierra Leone, which uses a CHW-model. I can see incredible benefits that might come from building out a community-mapping tool, including data-driven decision-making and more targeted, responsive spending.

Some questions:

1) What is the plan for how often these maps will be updated?

2) Do you intend to document the steps you take to realize your journey, potentially turning it into an open-source guidebook/how-to book? I think that this idea is very scaleable and adaptable for CHW-based systems in other regions and areas!

**Answer from Lwala:** Thanks for the comments Alisa!

We agree there would be numerous benefits- helping us spend our dollars more effectively, and also empowering the community health workers that are at the core of our outreach with more useful information. Community-led mapping (where the community members map their own region, including health and safety hazards) has proven very effective in other areas- we think this could be similarly effective, with an emphasis on child health and the diseases that affect them. We would love to see the mapping effort grow from being focused on under 5s to improving all of the work we do. In answer to your questions:

1) Our CHW network collects data from most households monthly. We would like to streamline our approach to mapping the data so that each month when our lead CHWs get together to share data from their region, we are able to provide them with maps from the previous month's data.

2) We totally agree- we regularly share information on our programs (as well as learn from) other similar organizations in our region. Creating a best practices book or guidebook to this process is a great idea. We really think this idea is about demonstrating the effectiveness of basic mapping techniques for rural public health,
including that it can be done with limited resources and leveraging existing public health networks.

We hope you'll continue to check in with this idea and contribute your thoughts.

**Answer 2 from Lwala:** Alisa,

We've incorporated your idea to document the steps and best practices in the "who will benefit section" above.

We really think this is an idea that can be broadly applicable to a lot of organizations. Others are doing related work, but we really believe we can prove its effectiveness in a rural setting, using a network of community health workers, and in a way that is inexpensive and sustainable.

Take a look and let us know what you think!

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**Question/comment from Charlotte Buehler:** You are absolutely right--where you live should not determine whether you live. I think your organization's idea to use mapping technology in order to better track and target interventions could yield measurable results.

Having partners/staff with experience coordinating and carrying out mapping activities or outreach will help this project immensely. Has your organization done any kind of mapping before? Some things to consider for the project might be: identifying who will help orchestrate the data collection in the field (will he/she/they have mapping experience?), staff training, data collection plans/timelines, and what tools will be necessary (handheld GPS, cell phone, computers, etc.) for the project.

**Answer from Lwala:** Charlotte,

Thanks for the feedback and the great questions- you are thinking about the important implementation details that we'll have to address in the refinement phase. You are also right- since technology is at the core of our idea, we should make sure that we can support and sustain our approach long-term.

We currently have public health staff that do GPS data collection as part of their water, sanitation, and hygiene outreaches, so we are comfortable that our staff can manage the field data collection. Our CHWs are very effective at data collection, but they would require training for any additional data collection, especially if it involves mobile devices or GPS. We have IT staff in Kenya with experience collecting and using geographic information, and we have several technology partners that develop complex technology solutions specifically for development organizations. In the past, we've also partnered
with universities from the U.S. to do focused mapping exercises (for example, mapping the locations and conditions of all water sources within our catchment).

Part of the inspiration for this idea is to better apply the location data and projects we've done in the past, and turn it into useful information our CHWs can use. We also want to demonstrate that other organizations can do the same, since many NGOs working in both rural and urban settings are increasingly using technology, and specifically map-based applications like GPS and GIS software (like Google maps), to do their work. For us, this is part of a bigger push to use technologies like Google Docs, Dropbox, Salesforce, and mobile applications to do our work more effectively. We also continue to host interns and researchers who work in a number of focus areas within public health and technology, and we think we can use their talents to really innovate and expand on our idea once implemented.

Thanks again- and please check back with us during the refinement phase as we post more information on our idea's project planning and implementation details.

Response from Charlotte: Thank you for such a thoughtful reply! Yes, sharing what works and what doesn't your with respect to your tools and procedures would benefit other NGOs working in rural areas-- no sense in others recreating the wheel, so speak.

I really appreciate your initiative in getting people together for a Mapathon. It sounds like a great way to get started!

Many thanks!

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Question/comment from Anne Gildea: Hi Lwala Team,

This looks like a fantastic idea that will have amazing benefits for your community! We've often thought about mapping our schools in a similar manner, so as you move forward I would love to hear more about your experiences and challenges with mapping.

A few questions for you,
1) What tools do the CHWs need in order to do the mapping. Are they going to be equipped with phones, tablets, or physical maps when they go for their monthly visits?
2) Do you have any significant population movement? We've found that sometimes children move between parent's and grandparents' homes quite frequently, do you have any movement like that, and will that affect your mapping?
3) Do you have plans on the way forward once you've identified gap areas? Is there the potential to hire more CHWs to target those areas?
4) Are you going to be able to use the geographic data from your existing programs to inform or contribute to this new initiative?
I'm looking forward to your responses, and would love to continue to share ideas on this and many more programs and/or experiences working in rural Kenya!

Anne

**Answer from Lwala:** Anne,

Thanks for the thoughtful feedback, these are great questions. Here are some initial thoughts, they may change as we further refine our idea.

1) The physical mapping of household locations would be crowd-sourced to volunteers using a platform called Open Street Map- anybody, anywhere can map. Check out [http://mapkibera.org](http://mapkibera.org) for an example. The next step is to integrate the results of that activity with all of the data our CHWs collect on paper about individual households ("this data belongs with this mapped house"). The real value of the idea is that we would then generate monthly maps that display the mapped data back to the CHWs. We would give them paper maps, but we think it will also be valuable to talk through our findings as a group. Suppose we see that a majority of under 5 deaths from diarrhea are occurring in households within several km of the river that runs through our region. As they do their monthly visits, CHWs would be able to target all of those households near the river with education about safe drinking water practices. With paper maps in hand, they could also make a convincing case to members of those households that treating drinking water is important.

2) Another great question. We have seen some evidence of that in our current data collection. We don’t think it will be a major issue, but it is hard to know until we get started. If an under 5 gets sick because of conditions in one family member’s household but is associated with another household in our CHW data, it might skew our findings. On the whole though, we think (hope) that those cases will be outliers that won’t impact the broader trends. One thing going for us might be that most families live within compounds, so if children move from individual household to household, they hopefully aren’t moving too far.

3) Yes, we'll have some flexibility to adjust our CHW program. Hopefully by applying our findings we can also just work to make CHWs more efficient, so they can concentrate in the right areas with the right information. Other activities will also benefit, for example, how often and where our public health team does outreaches. It's possible that those activities could help "fill the gaps."

4) YES! We will definitely try to take advantage of any data we've already captured. For example, our WASH team has collected the locations of many latrines in the community, so adding that to a map with other data on health outcomes for under 5's might tell us something.
We hope these help clarify the idea, and look forward to incorporating your thoughts as we refine our idea write-up.

We would love to share our own ideas on your work. Mapping schools sounds great—you should consider putting some of your facilities on Open Street Map if they aren’t already there. Have you thought about other "map-related" elements of your work? Do children that live closer to their school have better attendance? Do children that live closer to their families water source perform better in school?

The Lwala Team

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**Question from Laura Schwecherl**: This idea is fascinating, Lwala team! I’m curious about the CHW network and training: are they already equipped with the education and tools to collect mapping data? Are there ongoing sessions? Since CHW programs are traditionally volunteer, we find it's sometimes hard to incentive women to put in their full hours when they also have a family and household to run.

Also, how long will you be collecting mapping data, and then - what are the next steps? Have you come up with quantifiable metrics that define which communities have a malnutrition problem, for instance? (aka it is based on # of people/population, etc).

**Answer from Lwala**: Hi Laura, thanks for taking the time to comment.

Our CHWs currently collect A LOT of tabular (not mapped) data, but we don't do a great job of using it to make smarter decisions. Our idea involves having volunteers (in the U.S. for example) do the actual mapping of households- we'll have to work with community members to apply context. After that process is complete though, the goal is to then show CHWs maps of that tabular health data they collect each month, without them having to learn the intricacies of GPS.

We are fortunate to be able to pay our CHWs with a small stipend, and we've found that they are very amenable to changes in the data collection process. Even still, we think mapping the data they collect will make their job easier, since they'll be able to target households more effectively, so we hope that CHWs working in a volunteer system could also appreciate our approach.

Great question on defining the quantifiable metrics that drive decisions. In the beginning it will probably just be "look at all children being treated for malnourishment in this area", but over time we'd like to build into the system the triggers (i.e. specific metrics) that help us better identify issues as they happen. For example, our catchment is divided into 24 sub-villages, so if we know the number of households in each sub-
village we could take action when the percentage of households with a malnourished child is over a certain percent.

_Response from Laura:_ Thanks - very helpful and thoughtful. Looking forward to watching this unfold even more.

_Question Diini Omar:_ The Idea providing community health workers with basic maps about household health behaviours and child illness and death, they will be empowered to provide more effective outreach to community is very good. "Very good idea"

_Answer from Lwala:_ Thanks Diini- we think there's a lot of value in giving poor, rural communities the bird's-eye view that they don't often get. Engaging them to participate in the mapping can be a very informative process.

_Question/comment from Masheyat Chowdhury:_ Fantastic introduction, very catchy! The idea is well thought of, have you any ideas on who the staff could be? This is a very important aspect of your idea as they will need to know exactly what they are doing and be fully trained. Well done!

_Answer from Lwala:_ Great question, Masheyat! Based on your comment, we added in sections describing a little more about our community health worker team as well as our organization's capacity to enact this type of work on the ground. We appreciate your feedback!

_Question/comment from Daniele Reisbig:_ I think one of the best parts of your program idea is that you will have nearly continuous feedback about your program outcomes. The ability to change your services will make you more efficient so you can put resources where they’re needed. Maybe I missed this in your description, but do you have long term plans to evaluate outcomes using this tool? I can see this being extremely valuable for collecting a wide variety of data and measuring individual improvements while you provide interventions. If it were me, I would use the academic relationships you mentioned to evaluate these same children later in their lives. It would be interesting to see if your interventions had lasting impact or if other supports were needed. I love the idea of having useful short term data that can also be used for long term evaluation.

_Answer from Lwala:_ Hi Daniele - your question about evaluating outcomes is a great one. We currently collect data on about one-hundred public health indicators in our catchment, and as part of Thrive thru 5 we’re collecting basic health data and behaviors about individual under fives and their mothers. We’re working with our monitoring and evaluation team to ensure that those indicators we’re collecting are really useful for
evaluating outcomes of all of our public health programs. Your question is a good reminder that we need to periodically review the data we collect to make sure it is suitable for assessing both short-term and long-term outcomes of our programs. Leveraging our partnerships with academic institutions - both in the U.S. and Kenya - to evaluate families and children years from now is something we'd love to do. As a separate effort from our Thrive Thru 5 program, we are considering carrying out annual household surveys across our catchment to better understand long-term outcomes for all of our programs.

But, we think the idea of using this tool (mapping data) to actually evaluate outcomes is a slightly different question, and one that is really interesting. One example we've thought up is using the capabilities afforded by capturing the location of activities to see how that affects outcomes. Here's an example- a large percentage of the community outreaches we do happen at schools, because they are known locations among community members that have lots of field and classroom space. With the mapping system we'd implement through executing our idea, we'd have the ability to assess whether families living closer to schools (and therefore closer to our outreaches) are practicing more health-seeking behaviors than those that are farther away. If that were the case, we could do a better job of distributing our outreaches throughout the community where other families are more likely to participate or provide additional individualized outreach to families that live farthest from any public space. What do you think?

Response from Daniele: I think that's great. I'm excited to see how this helps you improve services.

Answer from Lwala: Thanks Daniele- we're planning to prototype our idea before the end of the refinement phase, so check back in next week.

Question/comment from Jonathan Andereck: I love the idea and the vision you all have for serving this community. You clearly are thinking about all the ways you can deploy your existing resources most efficiently and really make the most of an already-thriving CHW network. Hopefully this initiative helps you all get the resources and funds you need to launch this mapping project.

You outlined really well the ways Open Street Map has been used in the past and how you see it contributing effectively to your goal of cutting child mortality in half by 2016. What other unintended benefits do you envision might result from having such a detailed map of the area that is constantly being updated by CHWs on the ground?

Answer from Lwala: Jonathan, thanks for the positive feedback! We are exciting to work with our CHWs to make them more effective in their outreach. They are the real champions for public health who interact with the community on a daily basis, so whatever we can do to better empower them is worth the effort.
We think there are a number of unintended benefits of this effort. Maybe the first is putting Lwala on the public map. The work volunteers do in Open Street Map will remain online for all to see, update, and use. We'd love to get youth in and around Lwala excited about owning and adding to that map - we could even set up a computer at our facility where youth can explore and contribute to the map. We think that map could be used by decision makers in the community and government for planning, for example, where to locate new schools or which roads to prioritize for improvement. In addition to the hospital we run, there are two other government dispensaries (health clinics offering basic services) in our catchment that we coordinate with regularly, and we think a better understanding of health-seeking behaviors and outcomes would improve the overall quality of service being provided to residents of the area. It would prove especially useful if a public health emergency or disaster were to occur that affected Lwala.

Aside from the work we do in public health, Lwala Community Alliance also runs programs in education and economic development, including a substantial focus on diversified and improved farming techniques (almost all of the community members are farmers). The addition of data from these other programs could have similar benefits to those we envision for public health, helping us better focus the work of our volunteers and staff where it matters. Here's a really simple example - we help facilitate farmer savings and loans groups to encourage crop diversification, tracking of revenue and profit, and growth of personal savings. These groups meet once a week, and can involve a walk of several hours each week for participants. Having an accurate map of the area with households could help us better coordinate the locations of groups to limit walking time, so members have more time working in their farm or selling in the market. That's a really basic example, and something that can be done without complex data collection or analysis, it's just using the map to make more informed decisions. And we think there are many more examples like that. We'll continue to think about and share these additional benefits, since they really add to the value proposition of the idea.

Response from Jon Andereck: I love the vision you all have for how this can continue to help transform the community in which you work. I think about how having real time access to accurate maps has helped make me more informed and more efficient in my everyday life in ways I never could have imagined a few years ago, and realize that the possibilities for how this project can positively influence the Lwala community are truly endless. Great work and thanks for sharing your vision and passion!

Question/comment from Apiyo Mercy: I love the idea and I know this will go a long way in helping Lwala target its community health interventions for more impact
**Answer from Lwala:** Thanks Mercy! We think there will be a lot of intended (and unintended) benefits of getting new perspectives on health and health-seeking behaviors in Lwala.

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**Question/comment from Elizabeth Carr:** What interesting work you’re doing! Cheers to you for all you're doing to help the community you're serving. Looking forward to seeing how your work unfolds in 2015!

**Answer from Lwala:** Thank you Elizabeth! We are planning to do a prototype of our idea in January and will be posting updates, so please check back.

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**Question/comment from Craig Parker:** This is a great idea. I especially like how you are working with local community health workers and how you have established lots of trust over the past 7 years.

**Answer from Lwala:** Thank you, Craig! One of our core values is community participation in the planning and implementation of our programs - it is one of the primary reasons our community health outreach has been so effective!

**Response from Craig:** Recruiting, training and mobilizing your local assets has proven over and over to be the best public health intervention. You have demonstrated your commitment to this as a best practice. I also like that by having a "mapathon" in Nashville you are involving US partners in a simple and useful way. This increases US awareness and promotes your organization, but doesn't take the front line of involvement away from your local practitioners. This is really smart.

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**Question from Isha Nirola:** Very interesting idea! I have a soft spot in my heart for East Africa, as I lived there for over 3 years and it’s encouraging to hear about the wonderful work you are doing out there. I really appreciate your intent to empower the CHWs and encourage them to take ownership over this project.

I am the Community Health Director at Possible in Nepal now and our CHWs also are the frontline implementers for all of the activities within our catchment area, including data collection and mapping. As I build out the components of our own community health program, I’m interested in learning how other orgs are leveraging their CHW network and managing their workload. I might have missed this in your description but are your CHWs engaged in other activities for your organization? If so, how will you balance their other responsibilities with data collection? Once this data is collected do you intend to continue the data collection beyond your catchment area or will the CHWs resume their normal activities?
These are all questions and challenges we've had to work through during the implementation process of our data collection and mapping tool and would love to get ideas on how others are tackling these challenges while doing the same.

**Answer from Lwala:** Isha, Thanks for the kind words! We're glad to have accomplished a lot in Lwala, but have plenty more to do. Our CHWs have a number of responsibilities - the primary one is to maintain a relationship with a set number of families (about 30 per CHW) and educate and encourage health seeking behaviors, and encourage visits to a health facility as needed. A secondary responsibility is to collect data on health-related behaviors and disease within those households. To get the data, our CHWs complete a standard data collection sheet each month, and report it within our CHW structure up to their assigned mentor community health worker (MCHW). MCHWs then report aggregated data from their CHWs to our public health department (as a side note- we also have two "community health nurses" on our staff who support CHWs in the field and follow-up with challenging cases. We've found this to be very effective).

One thing we're very aware of us making sure we don't increase the workload for our CHWs. Our proposed approach, therefore, is to outsource the mapping of the Lwala community to volunteers around the globe (using Open Street Map). CHWs will then be able to link the data they collect with households on the map, but without them having to do additional work to support the map creation process. This differs from a typical approach to field mapping in which somebody like a CHW in the field is responsible for collecting location with a GPS each time another piece of data is collected (i.e. an instance of a child sick with malaria). CHWs will go on collecting the health and behavior data using our current process. We'll create maps based on that data as needed, and will refine them over time as we learn what's most effective (provide the most information back to the CHWs with the fewest number of maps). We anticipate that introducing mapping will actually lead to a reduction in the amount of data our CHWs need to collect, as we hone in on what data is most useful for decision making.

Take a look at the example case we've just added in the "What does our idea look like in practice?" section- hopefully this will give you a better idea of how a CHW interacts with the system, and what they are responsible for.

It sounds like you all are doing interesting work with data and mapping in Nepal. We'd love to hear more about it, and exchange ideas for making the most of CHW networks, including contributions that improve this idea for mapping under 5 health data in Lwala.

**Question/comment from Lindsey Toomey:** This is a powerful idea. By providing community health workers with a tool that maps the morbidity and mortality of under 5's in the community, intervention is targeted, timely and more effective. Excellent approach.
Answer from Lwala: Thanks Lindsey- we agree, and as a lot of commenters have pointed out, we think there will be a lot of unanticipated benefits of mapping the community beyond improving under 5 morbidity and mortality.

Response from Lindsey: Just want to endorse an earlier recommendation made on-line, that the CHW’s be engaged in the planning and implementation of this initiative. They have the intimate knowledge on the ground of the needs and can identify specific uses and strategies for this GPS tool. Excellent work Lwala; keep it up!

Answer from James Nardella: Thanks Lindsey. We really appreciate your feedback and encouragement. The CHWs in particular are uniquely suited to the task of knowing and caring for their neighbors. The CHWs are parents themselves so they understand the parents and families they are visiting daily. They serve in their own neighborhoods and are reaching friends and family, so the strength of trust relationships is really the key here. The GPS mapping is a technology, a tool. What we are really after is an increase in the strength of relationships- of neighborliness. Because when a real friend comes to you and suggests a behavior change that peer influence is powerful.

Question/comment from Susan Douglas: I love your idea to use mapping as a way to make health data work hard for the local community instead of just sitting in some underutilized bin somewhere! Your overall concept seems a fantastic way to create useable information that empowers community health workers to target their outreach services more effectively. I particularly thought the extension of the concept to best understanding how to present the data to community members was laudable. Information, especially when understandable and actionable, can be a powerful tool for everyone. One question sprang to mind as I was reading about your project - what are your thoughts on how to best engage CHWs and community members in considering how to balance the benefits of sharing data with privacy needs?

Question/comment from Chris Hobday: Great idea, Lwala Community Alliance! Similar to Susan Douglas, I wondered about the perception of your data collection efforts by families within your catchment area. Do you think folks have a clear sense for what you do with this data and how it impacts them? Will the families see the mapping component as any more invasive than previous efforts?

Answer from Lwala: Thanks Susan, we totally agree. So many organizations (including ours) collect a lot of data, but fail to take advantage of that data to make outreach and program implementation smarter.

The questions on privacy raised by you and Chris are very valid, and must be an important consideration in any effort that puts individuals on a map, in Lwala or elsewhere. The first step we’ll take is to share our process with the Lwala Village Development Council (LVDC). The LVDC is a governing board that we helped establish.
when our organization started working on the ground in Lwala. It is comprised of local community members (most of them leaders in schools and churches in our area) who represent the Lwala community in important matters related to our work. Aside from administrative activities like reviewing our monthly budget, the LVDC understands and provides feedback on the programmatic activities that we’re doing. We’ll certainly raise the issue of individual privacy with that group, to understand specific concerns that they or community members have. Over time, we can continue to engage them or add other community members to a larger panel as our work evolves. We have dealt with similar issues related to ongoing data collection and our activities around HIV counseling and testing and HIV defaulter tracing, so are confident we’ll be able to ensure the community of our commitment to privacy. Many of our CHWs and public health staff have been involved in conversations around privacy related to this work, so will be generally aware of the issues.

Regardless of the stance that the LVDC and community members express (because of our close relationship with the community, we generally haven’t found opposition to data collection efforts), we’ll have an obligation to the ethical use of data that affords community members sufficient privacy, especially related to sensitive issues like HIV/AIDS. We see this obligation as something that extends beyond mapping, and includes any data collection that happens as a result of implementing our idea. To address the issue we’ll take a couple approaches:

- The first will be a continued institutional commitment to privacy that is outlined in specific policies we develop. For example, mandating that consent is required for the collection of personally identifiable information including location, training staff and CHWs around the ethical considerations of data, and clearly outlining what is permissible and not permissible in sharing data we collect or maps we generate. Some of this structure is already in place since we currently deal with sensitive health data.

- The second approach will be to build the data collection and mapping system in a way that provides some protections against violation of privacy. For example, data about our program participants is already stored in a password-protected database. In developing a system to map that data, we’ll need to load that data into mapping software, but can exclude names and other personally identifiable information from the data that’s available for inclusion in maps. In actually generating maps about sensitive health topics, we can aggregate data up from individual data points. For example, instead of showing the location of each community member, we could show the total counts by sub-village. Though less effective for understanding the data, that approach would afford privacy to the community members included in the data. These are just a couple of examples, and we’ll need to continue thinking about the best approach that balances individual privacy with useful data collection and maps.

Lastly, there are some great resources that address the ethical issues of mapping health data like these that we’ll continue to explore. One example is a 2007 study by the U.S.
Response from Susan: Lwala Community Alliance - I appreciate your thorough and multifaceted response to our questions about data privacy. You clearly have the requisite experience that is necessary to build a strong foundation for ethical use of data, both in terms of your infrastructure and your community involvement. Thank you!

Answer from Lwala: Thanks Susan! We'd like to document our process as a resource on privacy considerations for others looking to implement similar ideas.

Question from Bettina Fliegel: Hi Lwala Community Alliance. Fantastic project! I love that it is using technology to identify and find practical solutions to problems faced in your community. The examples you present above, and in the comments below, are great and makes your work so relevant really to any community!
1- Identifying the source of a diarrheal outbreak and using it to educate families on prevention.
2- Finding the most convenient location for a weekly meeting for the majority of a farming/business group so that members do not waste hours walking to and from rather than having that time to work on their farm.
3 - Looking at health outcomes for children that live closer to, or further from, the source of care, in this case local schools.

Expanding on this have you looked at or considered looking at this work as a way to identify positive deviants in your community? Which families have children that are thriving in terms of growth and development parameters as one example? Locating these families, assessing their lifestyle and utilizing this local information to inform others?

You mention that your health workers screen families continuously asking for example "Has your child been treated for malaria in the past month?", "Is your child malnourished?" Do the workers use data to get this information as well - such as growth parameters of the child either presented to them or taken themselves?
I also wonder if mapping will help to capture clusters of disease, acute or chronic, that may be attributed to environmental toxins - in the same way that burning may contribute to clusters of respiratory illnesses. Toxins that may be in the local environment or brought into the home on the clothing of parents who are out working. (not sure if there are toxic substances used in farming, as there might be in factory work as an example - lead etc.)

You mention that utilizing the CHW system you have been able to increase the percent of women delivering in a health facility from 26% to 96%. How was this change elicited? Education alone? Was it mobilization of a transport network? Financing transport?
Would be great to learn from your experience with this. I would think that mapping passable roads, access to transport to health facilities for all care - taxis, motorcycles, neighbors with vehicles that would participate in a transport network - would be a great use of your mapping project as well.

I am also curious in general about the members of your community health worker team. As you mention that it is a part time paid position - what are these workers employed at during the other time? What are their motivations to participate? Are any of them educated formally in the health field?

Exciting work! Looking forward to watching as it develops. Will check out the link to participate in the mapping! Thank you for sharing this with the community here!

**Answer from Lwala:** Hi Bettina, thanks for all the comments and info, your link on the Positive Deviance approach is especially fascinating. We plan to incorporate some aspects of this into our idea and will post an update after we do. There are a lot of challenges in our community, but also a lot of successes (including Lwala Community Alliance’s founders) and to understand the factors of success and highlight those through mapping would be great.

We think an unintended consequence of mapping community features and disease data will be a realization of previously unknown factors that are contributing to under 5 health. We mention a few as examples, like unimproved water sources. But there is certainly the possibility that we'll identify other factors, like environmental toxins. There are a few "industries" in our catchment, like gold mining and fishing from a polluted river that may be a factor in public health, but we haven't yet had the time to investigate these. Mapping would be a really effective way to identify abnormal clusters of short-term or longer-term disease related to these activities (or even identify the economic benefits for those who participate).

Our success in achieving safe deliveries in health facilities was a mix of the factors you mention: our CHWs educate mothers, we run a hospital so can provide an alternative to home delivery, we have an ambulance so are able to provide transport, and, maybe most importantly, we worked with traditional birth attendants to educate them and incentivize them to refer pregnant women to a facility. As part of our Thrive Thru 5 program, we are using those same methods to encourage pregnant women to attend antenatal care visits, and then bring their child for check-ups and immunizations after birth. As you point out, using maps to understand how transport and logistics factor into effectiveness of maternal and child health services will prove extremely valuable. We've heard from the community that distance from our or other health care facilities is a factor in their taking advantage of the services offered, but without being able to quantify that, we've had a hard time effectively addressing that issue.

Our community health workers tend to be women and men who work at home, usually
as farmers, or who might run a small business, like tailoring or selling vegetables at the market. Typically they are not employed by any other organization, so working with us is a substantial addition to their income. These individuals are very motivated by the desire to help their community members. They are specifically selected based on their existing involvement in their communities (in fact, some of the CHWs used to be traditional birth attendants) and their familiarity with mothers and children there. A few of our CHWs studied at a college, possibly in healthcare, but much more frequently, they have little formal education beyond secondary or even primary school. We provide them with numerous trainings and ongoing education during monthly meetings. Individuals who show greater ability might be selected to become mentor community health workers (MCHWs) and take on additional responsibilities. We'd like to make a few of these MCHWs champions for mapping data, to work with their CHWs to improve and innovate our idea.

Thanks again for all the great insight, and please provide any additional information you have on how others have applied the Positive Deviant approach. We'll also learn more about it and post our own thoughts.

Response from Bettina: Hi!

Positive deviance is a fascinating topic/approach to problem solving. I agree! My first exposure/learning about positive deviance was while reading about a well known case study done in Vietnam by a team asked to look into causes of severe malnutrition in children there. You can learn about it here. 
http://opinionator.blogs.nytimes.com/2013/02/27/when-deviants-do-good/?_r=0

The article also references a variety of problems worldwide in which the positive deviance approach has been used to tackle them. Interesting list!

In a previous OpenIDEO challenge, The Women's Safety Challenge, I posted in the research phase and Meena linked an article that references positive deviance in a comment there. Great read discussing positive deviance and design thinking. 
http://www.ssireview.org/articles/entry/design_thinking_for_social_innovation

You might be interested in this research post from the same challenge which talks about this approach and how it might be applied in the context of that challenge -(sponsored also by Amplify.) https://openideo.com/challenge/womens-safety/research/positive-deviants

(there are great resources on the OpenIDEO site.... always worth looking around here..)

While researching for a nutrition project on this site I discovered the following resource guide on nutrition in children. It is on the PD website. Might be useful in your work?

Nutrition project in Kenya -
http://www.positivedeviance.org/projects/no%20contact%20info%20Kenya%20PD%20hearth%20PDI%20in%20KILIFI.pdf

Hope this helps!
Excited to watch your team innovate going forward!
Thank you for the information you have shared in your comment above!

Response from Lwala: Bettina,

Thanks for all the additional references- these are great. We've incorporated a little more about the Positive Deviance approach into our idea. It's just a mention of the possibilities, but we'd love to expand on this idea as we look to implement. And it's applicable to all of our Thrive Thru 5 program, not just a mapping element. We do think that in the same way our idea is intended to identify clusters of illness and poor health-related behaviors, the mapping process could be used to highlight areas of success and further explore some of the root causes for that success.

Also, your links on design thinking were really useful. We've incorporated that information in subtle ways throughout our idea description, and the more we evolve this idea the more we realize the key to success will be developing processes that put CHWs and other community members in the center of the design process. They will be the ones that can identify risks to implementation, but also identify opportunities where minor changes to our approach could really yield huge benefit. And in many ways, the process of mapping the data and discussing the maps among our CHWs and public health team on a monthly basis will be more important than each month's final maps being perfect.

Thanks again for all of the valuable insight!

Question/comment from Angie Henderson: This is a very compelling and well planned project. It is fascinating to see mapping and mobile technology coming together with education and mentorship to improve health outcomes. I think the mapathon is a great idea for engaging volunteers and supporters and getting more people interested in the good work you do. Wishing you much success!

Answer from Lwala: Thanks Angie! We agree. In addition to eliminating a lot of the labor intensive field work, using online volunteers to develop much of the Lwala map will be a great tool for building awareness about child health in rural communities. And hopefully those same volunteers will continue to contribute to Open Street Map far beyond the borders of Lwala.

Question/comment from Scott Halliday: Hi Lwala! I've been reading about your work- your projects look to be quite comprehensive, community-driven, and impactful. I think your model is inspiring for communities worldwide (including ours in rural Nepal). Keep it up!

I'm curious to learn more about the relationship between the Mapathon and the
ongoing/continuous surveillance efforts by CHWs. I understand that the Mapathon volunteers, through crowdsourcing, will create the base map (based on Google Earth?) and that CHWs will add specific data points of community/public health/population medicine interest when/where relevant. Openstreetmaps will be your platform for creating the base map.

I'm not sure how often Google Earth is updated and how precise it will be for your community. Does Google Earth have the temporal or spatial precision for the mapping needs of your community? Do you have any plans for further iterations of your Mapathons so that the base map can be updated (6 months, yearly)? I'm also not sure what the patterns of migration are in your community. If your community in Google Earth was mapped over 3 years ago, would that be sufficiently accurate for your needs (or would recent patterns of migration reveal a different reality on the ground)?

This is a delicate balance that our team faces in rural Nepal with our efforts to enumerate our entire catchment area population. On the one hand, you want a comprehensive picture and that is accurate, yet this requires much time and effort. Defining that interval for repetition is difficult.

However, your idea is very well built out as evident from the level of description above and the comment threads below. Wishing your team nothing but success.

Answer from Lwala: Thanks Scott for all the great questions! As you know, these are some of the important details that can really influence a mapping project’s outcome.

Your characterization of our approach is spot on- we’re using volunteers to build the "base map" and will be supplementing that with work on the ground by staff and CHWs who really know Lwala. It's likely that volunteers on Open Street Map will be able to tackle about 80% of the work, but the remainder will require somebody with a little more knowledge about the area (we have great internet, so will end up doing some of the final clean-up work on the base map with staff or volunteers here in Lwala). But compared to sending teams of volunteers out into the field with GPS units to map everything, this is a vast improvement.

Open Street Map is based on satellite images, and looks much like Google Earth when editing. The Open Street Map online editing software has high quality images already loaded and rectified (oriented to align with the appropriate spots on the Earth), so accuracy is not a concern. Coverage for much of the globe, including Lwala, is more than sufficient to map almost all of the main features. We've looked at the satellite images available online for our catchment, and we'll even be able to map a lot of the heavily trafficked footpaths if we want. (for those interested, anybody can create an account on http://openstreetmap.org and start contributing/editing immediately to the map anywhere in the world, from anywhere in the world).
As for temporal resolution (how recent the image is), the images available in Open Street Map of Lwala are from 2014, so are more than suitable for what we need. Users can also upload their own images for use in editing Open Street Map (organizations might find satellite image providers willing to donate recent, high quality images for free), but for most populated places the quality and recency of images already available is very good. You're right that over time we'll need to edit our Lwala "base map" to account for new households- that can be done in periodic mapathons or just by staff on the ground (we think once per year is sufficient). Since our catchment is a manageable size, we'll even be able to add new households immediately if they aren't yet captured in satellite images.

It sounds like one major difference between your team's work in Nepal and what we're looking to do is that you all are essentially maintaining a census of community members? We'd definitely like to map all of the major instances of child death or disease and as many households and behaviors as possible, but we're less concerned about getting exact counts right. We are really more interested in identifying broad trends in health-seeking behaviors, disease, and health (positive deviators, so to speak) in our community. We see mapping as an additional, critical perspective on health outcomes to support our work, but since there is currently no "bird's-eye-view" of Lwala at all we'll be happy producing maps that are 90 or 95 percent accurate. It's really the process of actively thinking about location and environmental factors and their effect on health with our CHWs and community members that we think will have the greatest impact on outcomes for under fives.

Hope this is all clear- we'd love to hear more about other specific challenges and successes you all have encountered in your work in Nepal. Thanks for taking the time to comment.

Response from Scott: Hi Lwala! Thanks for your detailed response. Its clearly evident the level of thought you've put into developing your idea. I'm glad to hear that the OpenStreetMap platform will be responsive and appropriate to your needs from precision/accuracy standpoints.

Yes, we are conducting a census of our catchment area population. The goal is twofold:

1) to create a map that has the temporal/spatial precision to inform community health and other programmatic interventions
2) to gather rigorous population-level health outcome-driven data about our catchment area population

There is a second component of our program to follow our census which is continuous disease surveillance coupled with vital birth/death registration. Continuous disease surveillance will be conducted by our CHWs and our community health program staff; the geolocalized census will be connected with all follow-up patient encounters via
SimPrints thumbprint technology. For the death registration, we will be implementing a verbal autopsy program. Additionally, we will be implementing a maternal near-miss program to capture critical perinatal complications that could have resulted in the death of the mother but did not. Our challenges implementing this program will be numerous and the key to our success. Working out robust quality assurance measures, developing a responsive user interface for data collection, and implementing the program in such a way that meets our program needs yet is respectful of staff time and needs. We feel that rigorous qualitative metrics drawing from implementation research will be crucial to understanding and learning from this organic process of implementation.

With all that being said though, I do want to strongly echo the words of my team members- Isha, Laura, and David- I'm excited to see your project take off and reach new heights. Please do reach out and continue to push us to improve our own idea.

**Answer from Lwala:** Thanks Scott for the encouragement. Sounds like your team has a lot of interesting work going on. We agree there is real need for balance between implementing technical tools and being respectful of staff time and needs in the field. It’s often unanticipated practical challenges that complicate implementation on the ground and add risk, especially when incorporating technology-centric solutions. This forum has been a great opportunity to make sure human centered design is at the core of the work we’re doing.

We’d love to continue to exchange thoughts on both our ideas, and best of luck in all your work.

**Question/comment from Joel Stanton:** Hi Lwala. Thanks for this great idea. I think it sounds like a fascinating combination of technology, innovation, and on-the-ground, real-world application. Sounds like it has the potential to really keep moving the needle in the direction of health improvement for the local communities. I did have one question that I was curious about: Have there already been discussions with many of the CHWs regarding the possibilities here, and if so, what feedback did they provide to the process? (And if not, is it worth considering bringing them on board with this sooner rather than later?) Thanks so much -- wishing you all the best!

**Answer from Lwala:** Good question Joel. One of our primary strengths as an organization is community engagement. Since we are a Kenyan founded, Kenyan staffed organization that has focused our work in this region with acute needs since 2007, we have developed strong trust relationships and participation from the local stakeholders. Through their monthly feedback meetings with the Community Health staff, the CHWs themselves actively participate in the planning of programs, trouble shooting during implementation, and ongoing monitoring of program data.

In 2013, the Community Health team in Lwala began testing GPS tools on a small scale to try to map water sources that households in the region utilize. Each water source was
tagged with an estimated number of users, a short descriptor, and an assessment on whether it met World Health Organization standards for drinking water. 10 CHWs were trained on the usage of the GPS devices and the maps of the water sources were shared with the whole team. After this testing, the CHWs expressed excitement and willingness to utilize mapping for more, but resource, technical, and staffing constraints have kept us from taking the idea any further. Thrive thru 5 is the perfect program to match tools like Open Street Map with our primary maternal and child health population in Kenya.

**Question/comment from Laura Schwecherl:** I love the latest user map, guys!

The mapathon sounds really interesting too. Myself and the Possible team would love to help support. Please let us know when you have more information.

**Answer from James Nardella:** Thanks Laura. We would love to get the Possible team in on the Mapathon if there is a good way to do so. I bet we could both learn from it.

**Question/comment from Katie Silberman:** I'm so impressed by these ideas. Thank you for doing true community health work that is led by and for the community. You have so much to be proud of.

**Answer from Lwala:** Thank you Katie. Our history in this region is one of our greatest assets. The local staff and local community health workers bring a lifetime of trust relationships to the Thrive thru 5 project. They know the families with children under 5 who will be the focus of the mapping. The CHWs and families have children who share the same schools and churches. That neighborliness is a powerful influence because health seeking habits are made at the family level.

**Question/comment from Betsy Warren:** Great job! I always come away impressed by the work you do in Kenya.

**Answer from Lwala:** Thank you Betsy. We appreciate the encouraging words.

**Question/comment from Lindsey Toomey:** Well done Team! This is a utilization of technology that will further improve the quality of Lwala's clinical care; from strength to greater strength.

**Answer from Lwala:** Thank you Lindsey.

**Question/comment from Ruth Donlon Bowles:** This is so exciting. I am so honored to know about this community and see how people really do make a difference. This is what I want to teach my children...have goals, dreams, ideas, help others...go into the world and make a difference!! This idea is a brilliant, positive use of technology and
resources! As a nurse I see HUGE benefit to this idea!! We take for granted here in the states all the little things that happen every day for us to make health care possible. In places like rural Kenya, so many things have to happen to make the actual healing begin...things we would never think of in the states because we don't have to. This idea really outlines principals that are key to ensuring a healthy, thriving community. Prevention, planning, having solutions and measurable goals to ensure that treatable illnesses are identified and cared for timely and appropriately
I love this idea! I love this community!! Kids are the future...let's help them THRIVE!!!!!!

**Answer from Lwala:** Thank you for the supportive words, Ruth! We certainly hope and expect that this idea will lead to a healthier, thriving community.

**Question/comment from David Citrin:** Lwala team, great stuff! The user maps are a great addition. As Laura mentioned, please do let us know at the Possible team how we can help with the mapathon.

Your updates also continue to reveal how the user experience (CHW engagement with communities) is the engine driving innovation and shaping how you approach the process of data collection, and what you map. And as our team begins to think about further building out our own mobile data collection and mapping program to include vital events registration, verbal autopsy and near misses, I wonder what other trends will emerge and how best to engage the broader domains of the community – from government officials, to mothers groups, to CHWs – in the process of linking together and addressing these aspects of health and wellbeing. Among some of the more prevalent that affect MCH outcomes, as well challenging to map and address, may be gender-based violence, hunger, and mental health. I read the comment that discuss the links and strategies have the Lwala team have developed to deal with potentially challenging these issues, which are clearly at the center of CHW-driven public health programs, but also elude discrete interventions (eg, hunger so multifaceted, structural/political-economic) or challenge the notion of public mapping (eg, GBV and mental health for reasons of privacy and dignity)? As you mention, the ability to drill down to the individual, as well as aggregate de-identified data for privacy is key there. And the strong historical connections in the region and the advisory committee I imagine also assist in this systems design process.

Again, great post and updates, and I’m excited to follow the development of an implementation and user guide for best data collection and mapping procedures. Something like this is so clearly needed.

**Answer from Lwala:** David, you are really insightful here. We certainly know how hard it is for parents or children to report gender-based violence and mental health issues, though both are important. In our region 1 in 5 pregnant women (and adults in general) is HIV positive. HIV stigma is a major factor affecting health seeking decisions of these parents. Mapping sensitive health conditions will require great trust relationships and
privacy controls. In some cases mapping may not even be appropriate, so protocols will have to be developed. Although maps would be a helpful tool to show our team where gender based violence is most reported or where most pediatric HIV cases exist, patient privacy and confidentiality are the higher priority. Aggregating this data before any public reporting happens will be critical to ensure households are not being singled out.

**Question/comment from Wycliffe Omwanda:** Fantastic. I believe that every life counts, whether young or old. and every person has an equal right to quality and affordable healthcare irrespective of their geographical region.

This is the major challenge faced by most under fives. The work done by Lwala is marvelous in ensuring that morbidity and mortality in the under fives are reduced to below the national requirement.

Meaningful community involvement is very helpful in this. This is a very wonderful innovation.

**Answer from Lwala:** Wycliffe, as Head Clinician in Lwala, it is great to have your buy-in and belief in the work we do together. Thanks for taking the time to help form this plan for mapping our Thrive thru 5 clients.

**Question/comment from David Cox:** This project will make it so much easier to understand the conditions in the communities. As a follow on effort consider incorporating a "big data" analytics application to evaluate the GIS based data. It can quickly process all the data that you can feed it and provide insightful indicators based on applying simple analytics to all the incoming data.

**Answer from Lwala:** Thanks David. Great point on taking maximum potential of the data we’re already organizing for maps to run analytics that better support decision-making. The structure of the data we collect on households and under 5 health will be suited to do both.

Do you have any recommendations on low-cost analytics applications that are especially user-friendly? We don't think we'd need anything too complex, just something that lets us do basic analysis on the ground in Lwala.

**Question/comment from Lynne McFarland:** Lwala Community Alliance,

Love it. It's really terrific to read the comments from other experienced workers in similar endeavors all over the globe, and to see how your thoughtful responses incorporate those good ideas as they flow in! What a beautiful world. As a follower in Nashville, at Vanderbilt, and someone who hopes to be a volunteer mapathoner, I am moved by the possibility that I can get to know the community of Lwala in a more personal way-- to walk those roads (virtually) and to imagine the children living in the houses we map. LCA Exec Director James Nardella spoke to us at a Nashville meeting about "neighborliness" as a core feature of LCA. We have seen photographs of a
newborn ("a good baby!" my friend a NICU nurse proclaimed when she saw the pic) and heard stories about how young girls can stay in school after they start their menstrual cycles thanks to reusable sanitary pads (sponsored by Johnson & Johnson and sewn by the Lwala women's sewing cooperative)...the more I know, the more the people of Lwala FEEL like my neighbors. Perhaps a consequence of enlisting us far-away supporters will be to put US in the neighborhoods and villages as well!

**Question/comment from Erick Mak’oracha:** WoW! This one of the best approach for the well being of Lwala community at large. I congratulate the brains behind this wonderful ideas coz health and life comes before any other thing in human life. I applaud.

**Question/comment from Milton Ochieng’:** These are some lovely ideas and excellent questions/comments from the Openideo community! A quick question: What do you think would be the Kenyan government's reaction to your work specifically when it comes to this kind of mapping? Do you envision getting support from the Kenyan Ministry of Health and the local Migori County health ministry or Rongo Medical Officer of Health? If not, how do you anticipate "winning them over?"

**Question/comment from David Pyke:** What I really like about this project is that it is innovative and uses technology creatively, but also recognizes that "boots on the ground" are critical. Having been involved with the Lwala Community Alliance for many years, I know that this team will effectively carry this out.

**Question/comment from Japhet Aloyce Kalegeya:** I impressed with your idea!

**Question/comment from Kelly Baird:** This sounds like a great opportunity to bring real-time information to community health workers to allow them to encourage behavior change based on real information. I know that often people hold to outdated or unsubstantiated beliefs around why people are getting sick when they don’t have new, concrete data to dispute it. I think that being able to show graphically that houses around certain water sources have more cases of diarrheal disease or that houses that don't use bed nets have more instances of malaria, people will be convinced enough to change their behavior. Will this information be shared with the county government as well?

**Answer from Lwala:** Thanks Kelly. Really appreciate the encouragement. Our community health team works directly with the county ministry of health, so this mapping project would be a demonstration to our local county officials as well as many peer organizations who come to visit our work site in Kenya. We would love to utilize the Ideo Challenge to model this innovation to others - including the Kenyan Ministry of Health and organizations working in similar rural settings.
**Question/comment from Damanius Nyakinye:** In so many ways this a one project that will bring technology, community and healthcare givers as a family. It will enable the healthcare giver to interact with the community health needs and even the challenges the community face. This technology will give the healthcare worker a clear and a direct way of knowing the type approach to take and how to deliver it to the community. Also it will give so much knowledge involving the social and health related needs of a community at a click. This is how technology can positively change or save life of people living in remote villages like Lwala. This piece of technological artwork will forever change the way LCA delivers its multidimensional services to people of north kamagambo.

**Answer from Lwala:** Thanks Damianus for the supportive words. As you point out, a major benefit of mapping communities is that it provides a clear link between cause and effect for the community members, and empowers our community health works to more clearly demonstrate to the people of Lwala how health outcomes are a function of health-seeking behaviors.

We think this idea will succeed because we’re applying technology, but in a way that is flexible, adaptive, sustainable, and puts the human users with the most on-the-ground knowledge (our community health workers) at its center.

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**Question/comment from Noah Derman:** Love the idea and your organization. I know part of thrive thru five is also looking at malnutrition. Is there a way to incorporate mapping of community gardens and agriculture?

**Answer from Lwala:** Thanks for the comment Noah. In October we started incorporating targeted nutrition training for high-risk mothers in our Thrive Thru 5 program. That especially includes young mothers and HIV positive mothers/children.

At some point we'd look to map elements of health-seeking behaviors that influence nutrition for these households. This is data we already collect to some extent- for example, we know which households maintain an active kitchen garden, but mapping these households would be really useful in determining where and why some households are successful and some aren't.

Long term there are lots of possibilities too. Open Street Map allows for mapping of agricultural areas, including crop type. We could partner with a university or researcher to facilitate crowd-source mapping of the cultivated areas in Lwala, volunteers on the ground could assign a crop type where it can’t be determined by in Open Street Map. Then we could explore relationships between crop areas, crop type, household health, income, etc. This is obviously just one example, but gets at some of the options. We'd love to hear other ideas from the IDEO community as well on how to integrate data collection and mapping to advance rural agriculture programs.
**Question/comment from Jenny Dyer:** This is an exciting project for Lwala Community Alliance and for the Lwala community. I haven’t seen any discussion about how to involve the various faith communities in the area and/or faith leaders. How might their leadership and possibly their willingness to involve volunteer congregants help with this project? I look forward to seeing the possibilities here for this research and how it might result in saving the lives of young ones across the community.

**Question/comment from Ash Rogers:** I love the use of the volunteer mappers. You’ll get community members interested in the data even before you collect it.

Are there other ways to share this data beyond thru your CHWs? SMS directly to community members? Planning meetings w/ local health officials? Hardcopy maps at the your hospital?

**Answer from Lwala:** Thanks Ash. We think this is a great awareness and outreach tool for our own work, but also for raising awareness of issues (i.e. malnutrition, malaria, water/sanitation/hygiene) related to child health in lots of other areas and for other organizations.

**Response from Kevin Chamberlain:** Ash, your question about sharing data beyond CHWs is a great one. This is something we’ve discussed as a team and alluded to in some comment responses below. We’re required to share much of the data we collect with the county ministry of health office and so are often exchanging information and ideas with them about how to combat diseases that affect children. We think mapping our data could really help advance the understanding of child health for all of our county, so would plan to make any information, analysis, and maps available to them. We’d also like to share our findings to the whole Lwala staff and broader community as much as possible - we have a few avenues for this, like weekly staff trainings, brown bag lunches, local board meetings, and quarterly community outreach events. Posting hardcopy maps in our hospital would be a great way to communicate especially poignant links between environmental factors and health in the community.

**Question/comment from Matthew Grimes:** Good stuff. Interesting to see the use of innovative new technologies and crowdsourced data to solve social problems like infant mortality. I do wonder if there’s an opportunity to think from the outset about how this effort would scale beyond Lwala. You reference other rural mapping projects that do similar things, but I have to wonder why there aren’t efforts to systematize these otherwise "one-off" projects. While it’s entirely clear how your local data could be used to identify particular problems in the region you serve (e.g., contaminated water source), it seems that a larger opportunity might lie in figuring out 1) how to incorporate similar data from all over the world and 2) develop analytic tools (or open-sourced
approaches) for identifying generalizable patterns. This would provide the possibility for collective intelligence that might help you realize the full potential of the technologies and approaches you are pursuing. Best of luck as you take this forward! Keep up the great work!

**Answer from Lwala:** Thanks Matthew - you raise some really great points on doing this analysis at a large scale. From our perspective, there are currently a number of challenges in scaling this type of work. For example, the complications of dealing with large data sets, and the level of effort required to collect the detailed context information on the ground. But these are changing:

1) The idea of crowd-sourced mapping has been effectively overcome through Open Street Map's platform (others exist, but this has been widely contribute to). So the platform exists and a lot of urban areas have been mapped, but most rural areas in developing countries still need a lot of work. This is where people like those in the IDEO community come in- anybody, anywhere can contribute. Over time, the availability of internet will allow members of these rural communities to do the mapping most effectively (we're short-cutting that process by combining remote mappers with volunteers on the ground who can add context).

2) The ability to deal with big data is something that is talked about a lot in the business world now. Many vendors now offer "big data" solutions that can analyze millions of data points, and some of this software is available for free (i.e. open source).

The two items above are both necessary for analysis of map data on a large scale. These two elements are falling into place, and it's only a matter of time before a project like we're proposing can be done on a larger scale. Here's a great example of a tool that combines large-scale mapping and large-scale analysis:

http://earthenginepartners.appspot.com/science-2013-global-forest

But it's likely that will never replace the critical role of people on the ground, like community health workers, who can interpret the data and work closely with community members to overcome locality-specific challenges. Thanks for taking the time to read and comment!

**Question/comment from Dedo Baranshamaje:** Lwala, this is a brilliant idea to involve more CHW in collecting data. I admire the fact that you involve more and give more responsibilities to CHW. It's excellent to collect data and it's even more to actually using the data to inform communities themselves and also to come up with creative and informed solutions.
**Question/comment from Mike Nyambilo Ondiek:** This is technology at door step, brilliant idea indeed add more devices for this community health care workers and enlighten them on other communicable causative agents, importance of having latrines and consequences of early parenthood in relation to health nutrition, anaemia and so on.

**Answer from Lwala:** Thanks Mike! You are right, there are a lot of known and some potentially unknown factors that influence whether an under 5 child thrives. We think combining technology with traditional networks of community health workers will help identify and address these factors. And over time, as populations grow increasingly technology literate, organizations will be able to further leverage this approach with bigger impact.

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**Question/comment from Elizabeth Rose:** What an interesting and fantastic idea. I'd love to be a part of the initial mapping. How will you keep the maps up to date? Will CHW be trained to update household information on a monthly or yearly basis?

**Answer from Lwala:** Thanks Elizabeth! CHWs already collect data on a monthly basis, from most if not all of the households we're serving as part of our Thrive Thru 5 program. For this idea, we'd intend to map this data, and refine what data gets collected based on the findings of our mapping exercise so that the data yields more useful information.

There are a couple ways to contribute to the mapping:

1) We've updated the information above on participating in the mapathon in person, but we realize most people don't live in Nashville so....

2) We'd like to open it up to the IDEO community online. For updates on how to do this after the refinement phase closes, you can check our facebook page at: [https://www.facebook.com/pages/Lwala-Community-Alliance/20198062213](https://www.facebook.com/pages/Lwala-Community-Alliance/20198062213). We plan to update this page later in the week with instructions on how to contribute.

3) Anybody can contribute to Open Street Map at anytime. The reason to have a focused mapathon is to map a large/dense area, and to make sure participants understand what to map (in our case, it's making sure mappers know what a typical household looks like). If you can't participate in the mapathon, we still encourage you to use Open Street Map to map your own area, or to map other rural regions. Your contributions will be used by many in the future.

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**Question/comment from Faith Adongo:** Thumbs up Lwala for the innovative idea. Integrating ICT into health programming is the way to go. As the famous Hausa proverb says “if the drumbeat changes, the dance must also change. About 93% of Kenyans own cell phones and if the same system can be used to generate feedback, health and
behavior change communication text messages to the community members then this will indeed have a great impact as the entire community will be reached. Just late last year I was in a workshop and was impressed by how people were integrating ICT and agriculture using simple mobile phones to reach the small holder farmers in Africa with extension messaging and market information. Am sure the Kenyan government and other development agencies will want to borrow a leaf from this innovation so please document your experiences and share as widely as possible.

**Answer from Lwala:** Thanks Faith, we're glad to see others on the ground experiencing and taking advantage of all the recent advances in technology.

Lots of other organizations have leveraged the tools we're proposing to use, but we're excited to combine them in what we see as a unique approach that utilizes technology but puts it in the hands of front-line community health workers in a way that is sustainable, low-cost, and straightforward, and that meaningfully improves child health. And we think it's important to document that experience so that others can draw on the lessons we learn.

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**Question/comment from Kim Bailey:** This is a wonderful idea and seems very doable. I love that there is a way for Nashville supporters of Lwala, who may never be able to travel to Kenya, to participate in a community health project there. Using technology to advance community health is an idea whose time has come!

**Answer from Lwala:** Thanks Kim for your supportive words. We certainly hope and expect that this idea will lead to a healthier, thriving community. And we're excited to give those outside of Lwala who support our work a tangible way to contribute.

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**Question/comment from Matt Clark:** As a follower of Lwala's work for a few years now, I can say that I believe they are doing some of the best work out there as far as community development goes. The way they are taking a broad approach to tackling health issues in the area and have done so with and through the local community is remarkable. They are transforming a high-risk community with their approach of health education which is permeating into other aspects of the community. Highly capable team to implement this tech.

**Answer from Lwala:** Thanks Matt! We still have a long way to go on improving health outcomes for under 5 children, and hope mapping our health data can contribute. For this idea, we have really benefited from the input of the IDEO community, and are definitely continuing to rely on partners and peer organizations to improve all of our programs. For our past successes, we really think our participatory approach with community members was key, which is why this idea has evolved to focus squarely on our community health workers as its driver.
Question/comment from Caitlin Glover: This is a fantastic and exciting idea that is perfectly suited for an organization so well integrated into the community it serves. Data is empowering and enlightening, and the ability to see data visually can spark new ideas about interpreting it and addressing health challenges. Have you thought about how you will prioritize what data to map? I can imagine the temptation to map as much data as possible simply because it is so interesting and so doable! But this then can result in a lot of data that is not used or wasted time/resources in collecting data that is not the most useful. It would be really interesting to see how your team prioritizes which data to collect and map based on what will be most useful to see visually, as well as have the greatest impact on mortality.

Answer from Lwala: Thanks Caitlin, you’ve got some great insight on the challenges that come along with "big data". We plan to rely heavily on the input and feedback from our community health workers on what data is most important-they’ll understand the links between environment, behavior, and child health. It’s definitely a continuous process to refine how data is visualized and presented so you get the most value from it. We think making sure that feedback loop is in place, and being disciplined about only presenting the most important data will be two keys to success for this idea. And as we mention in our idea description, we’d like to capture our lessons learned on this process to help others doing similar work.

Question/comment from Paul Turner: Neat idea and approach. With volunteers, I think this really sings. I can see how this is an easy "win" in your community. It looks like you are primed and ready. Perhaps if it is indeed successful, you can seek other organizations to partner with and scale this approach? You also might want to consider a cascading training system - even if after the first stage or two it only serves to inform the public, that might prove useful. This approach can provide a methodology for other work you may wish to do in the future. I look forward to hearing about your progress!

Question/comment from Sasha Fisher: Lwala has always stood out to have great community engagement models, but this one takes it a step further. The simplicity of how community members will be able to both collect and use the information is fantastic. I hope that after this is launched the learnings will be shared and increased community mapping will take place in other regions to ensure communities are able to make their own decisions for their development. It is also nice to see the impact on children's health and lives is done in systematic way to addresses those in need throughout the region. I’d love to know how you’ll keep the data updated? Thanks for developing this project and your great work in Kenya!

Answer from Lwala: Thanks Sasha for the kind words about Lwala.

During the course of idea refinement we’ve really concentrated on what you’re referring
to- this idea is about simple technology (think big, clear paper maps) in the hands of community members and CHWs, and not a complicated technology solution that is unintuitive to people on the ground.

Non-mapped data (like monthly cases of malaria) are collected by our community health workers in the field. We envision a couple ways to keep the mapped data (which houses, schools, etc. are where) up to date. One is through periodic contributions by volunteer mappers, who will be able to compare what is already mapped to what is in an updated satellite image of our region- this is facilitated automatically by Open Street Map. The other is that we can manually add individual households online on Open Street Map from Lwala, if there are specific updates required. We'll have to continue to work out the exact process required to keep our data up-to-date.

**Question/comment from Maja Castillo:** I think it is a very interesting idea- often times not everyone has all the information and this type of system will put it together in a manageable way. I agree that it will be important to consider the larger context of how this information could be connected to other agencies that would, for example, clean up the water source or provide some other missing service. Although it is not a concept yet in most of Africa, I do think patient confidentially and privacy will ultimately be something to consider when using this technology as well.

**Answer from Lwala:** Thanks Maja. You’re right, this idea is about connecting the dots between where families live (i.e. environmental factors), what health-seeking behaviors they practice, and the health outcomes for children under 5. We don’t think the analysis or data collection has to be perfect, but sufficient enough to understand the trends that can influence health and how we implement our public health outreach. The real value is in the process of bringing community health workers and community members into the discussion, and leveraging their understanding of all the factors that influence health.

See our comment response to Susan on Dec 24 to see how we’re taking privacy into consideration. It’s definitely something that needs to always factor in to implementation of a program like this.

**Question/comment from Sydney Nehrig Kochmanski:** Lwala team-- I am so impressed by the level of thought and detail put into this approach. As someone who has been on the ground in North Kamagambo, I know that detailed mapping will make a huge impact on child survival. I would love to hear more about how you’re planning to add context to the maps on the ground; more specifically, how you’re involving the larger community in adding context. I can't wait to learn more as this unfolds!

**Question/comment from Sarah Eckhardt:** I think this is a fantastic idea and one that will undoubtedly benefit the Lwala community. Having worked in Lwala twice now, I have come to appreciate the difficulty in patient follow-up and tracking in a community that
is quite spread out and there are no set addresses. For example, in attempting to locate the homes of HIV patients who are lost to follow-up for ARV care, we often have to ask numerous people in the surrounding sub-community to simply locate their home. Mapping and tracking health of these homes will not only be invaluable for thrive through five but also for future health endeavors. Lwala Community Alliance is consistently at the forefront of implementing new and creative measures to improve health in the developing world and they absolutely deserve the funding and support to continue with their innovative efforts in this rural region.

Answer from Lwala: Thanks for the comment Sarah. It's hard to appreciate the challenges in understanding "location" in rural villages like Lwala unless you've been here or somewhere similar. That's why we think the concepts behind this idea are so important, because they provide a very new perspective on how health is playing out in the community.

Question/comment from Susan Douglas: I love love love your January 2nd update - the pictures and words help so much to see a concrete example of this concept at work. Thank you!

Answer from Lwala: Thanks Susan! The concept is a bit hard to grasp (people in Nashville, Tennessee mapping rural Kenya), but we hope the role of the community health workers as end users is clearer thanks to the pictures; especially including the benefits to them in seeing the bigger picture.

Question/comment from Ann Green: Congrats on pulling together such a well-organized project while maintaining flexibility for continuous input and improvement! Program monitoring and evaluation are such crucial elements of success, and community involvement consistently proves an integral component for sustainability and behavior change. Your idea reminds me of Emily & Sidney Kark’s work in Pholela back in the 1940’s – creating the genesis of community-oriented primary care (COPC); there’s a lot to learn from the past. So exciting to hear that LCA is taking this on – seems a perfect fit!

Just a few questions:
• Is the current LCA CHW data collected manually or via smartphones? I ask b/c our project in Mozambique has utilized local surveyors for a 4K household survey via smartphones, and the user-friendly interface (from Dimagi) proved to have a quick learning curve. The women with which we worked loved using the phones, and it eliminated a lot of tedious data entry. You may already be doing this, but I thought it worth mentioning. We have also worked with VU's LAPOP, who does similar work as Dimagi in terms of programming/ data collection.
• Will the household data exist as longitudinal datasets, whereby the trends in an individual HH’s progress can be tracked, or will the data be retained and analyzed at a
more aggregate level? While the former may mean more controls and consideration ethically, it could provide some great insight.

- For creation of the analysis maps, will there be an LCA team lead involved in creating the analysis maps with Vera solutions? Having a local lead that can generate and manipulate the maps onsite seem important for sustainability and ownership of the data. Our team lead in Mozambique loves working with QuantumGIS – good idea!
- There have been some fantastic comments on here related to community involvement. A related area that can often be a challenge is sharing results with community members and not just the project team. You've mentioned incorporation of local youth for updating maps, which sounds great. I love the idea of finding creative forums for sharing this information throughout, be it through outdoor movie screenings, health fairs, meetings, etc.

Best of luck to the team – I sincerely look forward to following your progress! *Also, here are links to some COPC and Pholela related articles, in case they're of interest: [http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3221479/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3221479/) [http://www.kznhealth.gov.za/pholela/history.htm](http://www.kznhealth.gov.za/pholela/history.htm)

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**Question/comment from Bonnie Herald:** This sounds like a great plan although I do have to wonder about the likelihood of people being able to read maps. While staying in Costa Rica, we consulted our host about how to get into the town. We showed him a map, and he had absolutely no idea how to read it. I'm sure you'll make the maps as clear as possible (designating water near a certain grove of trees, for example). One very minor error is in the spelling of "their" (found in the paragraph starting with "This concept is not new.") Good luck on this very worthwhile endeavor!

**Answer from Lwala:** Thanks Bonnie! That's a great question - many of these maps will be large scale to display trends (more cases of child diarrhea occur closer to the river), and won't be necessarily used to get around. But, your recommendation to include recognized landmarks is important, since that's how many in rural communities navigate. We've also noted that we think the unfamiliarity with maps might suggest a greater potential impact from this approach - a bird's eye view of health outcomes on a map will be a more unique (and hopefully informative) perspective, since people are less likely to have previously though about the community in this way.

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**Question/comment from Julie Mancuso:** This is a really smart, innovative, yet pretty straightforward and simple way to get accurate and local data (something Kenya struggles to capture and share) and make a difference for the community with access to information. Mapping out and finding trends, linkages, outliers and other unique associations amongst the information could have some really helpful outputs. I think (or would like to at least hope) that the local Kenya government representatives would be on board once problems are pinpointed to try and provide help or improvements to infrastructure. Great initiative!
**Answer from Lwala:** Thanks for the comments Julie.

We agree that the key to success for this idea is simplicity, and leveraging technology without it needing to be overly complicated or heavily relied on in the field by non-traditional technology users (our community health workers). In the future we think there will be opportunities to roll out integration with web-based mapping and mobile devices to increase the overall impact of our data-centric approach. And we hope to have the continued support of local ministry of health officials, as we already partner with and exchange ideas with them frequently.

**Question/comment from Richard Klopp:** Team Lwala, So good to see this submission. I applaud these efforts at essentially crowd-mapping household health behaviors. It seems like such a natural next step to the Lwala holistic community-wide model, and I can think of a bunch of uses for this type of application. I couldn't help but wonder if you've networked with the iHub in Nairobi on the technology side? They might have some interesting connections, especially for scaling what you guys are building.

**Answer from Lwala:** Richard,

Thanks for your comment, and your recommendation to check in with iHub. We have not yet, but will certainly reach out to see how we can improve on the technology side as we look to implement. We are actively talking with a couple technology partners, including Vera Solutions (who we’re working with in other areas) to make this idea scalable and repeatable.

**Question/comment from Meena Kadri:** Woohoo – bring on the map-a-thon!

**Question/comment from James Nardella:** On behalf of the 3,000 families who will be served by this project, our 86 full-time staff in Kenya, and 115 Community Health Workers, I want to say thank you to all of you who have made suggestions and comments. Truly this has helped make our idea more human centered. We are inspired to take this forward.

**Question/comment from Colby Passaro:** Wow! This is a very exciting idea. It seems that one of the major benefits of this project will be the knowledge imparted to CHW’s of how to effectively construct and use these maps. Do you foresee certain elements of this map, e.g., where safe water sources are located, being shared with the greater community in some paper form? Or are there ways for the CHW’s to share this skill at making and understanding maps with other people in the community (obviously in ways that do not violate confidential information that is collected)?

**Question/comment from Elizabeth Spiegel:** Congratulations on such an incredibly proposal! Apologies if the question has already been asked (clearly there is overwhelming support from the community!) - could you talk a bit about how the
mapping will be paired with interventions? How will interventions be chosen and implemented? Thank you for sharing!

Response from Katie: I agree with Elizabeth. This is such a cool way to use technology to help children in the community. I might have missed this in all the commentary or comments, but will there be a plan to train any of the local staff on the same mapping software? I saw that you will be using local volunteers in Nashville and the online community. I would also love to help out with the mapping if possible.

Question/comment from Scott Revey: After increasing the percentage of hospital births of pregnant women from 26% to 96% I am very excited to see what comes of this latest LCA initiative! In addition to tracking children's health I would be very interested to know what information is being gathered on the mothers. For example, some studies suggest that women’s self-reported agency (their belief that they can achieve their goals and strive for the future they desire) has tremendous impact on their reproductive health, which, in turn, could have a significant effect on child mortality. By creating these data points and coupling it with the recurrent household surveys, LCA is really blazing a trail and paving the road for some amazing policy work. Hats off!

Question/comment from Anna Spickard: Wow, wonderful idea Lwala team! Truly fascinating. Have you heard of/ collaborated with Broad StreetMaps (http://www.broadstreetmaps.org)? I think you would both appreciate one another's work and greatly benefit from collaboration. Can't wait to see this concept take flight!

Question/comment from Kirstin Hobday: Great idea Lwala! Excited to see how you will continue to serve this community.

Question/comment from Johanna Riesel: Great Idea LCA. How very John Snow of you all! I would strongly encourage an outcomes assessment of this work to document the impact of mapping under 5 year olds and their proximity to the clinic, clean water, latrines etc. As a mentor once said to me, if you don't publish or present it, it never happened. Also, this may be in your proposal and perhaps i missed it, but I would also hope that including treatment and a means to access that treatment would be included in the project once your CHW identifies a sick child. Keep up the great work!

Question/comment from Amy Brake: So excited to learn about your mapping concept. This is an excellent method for clearly sharing information and, more importantly, helping communities draw their own conclusions about issues and then work toward solutions.