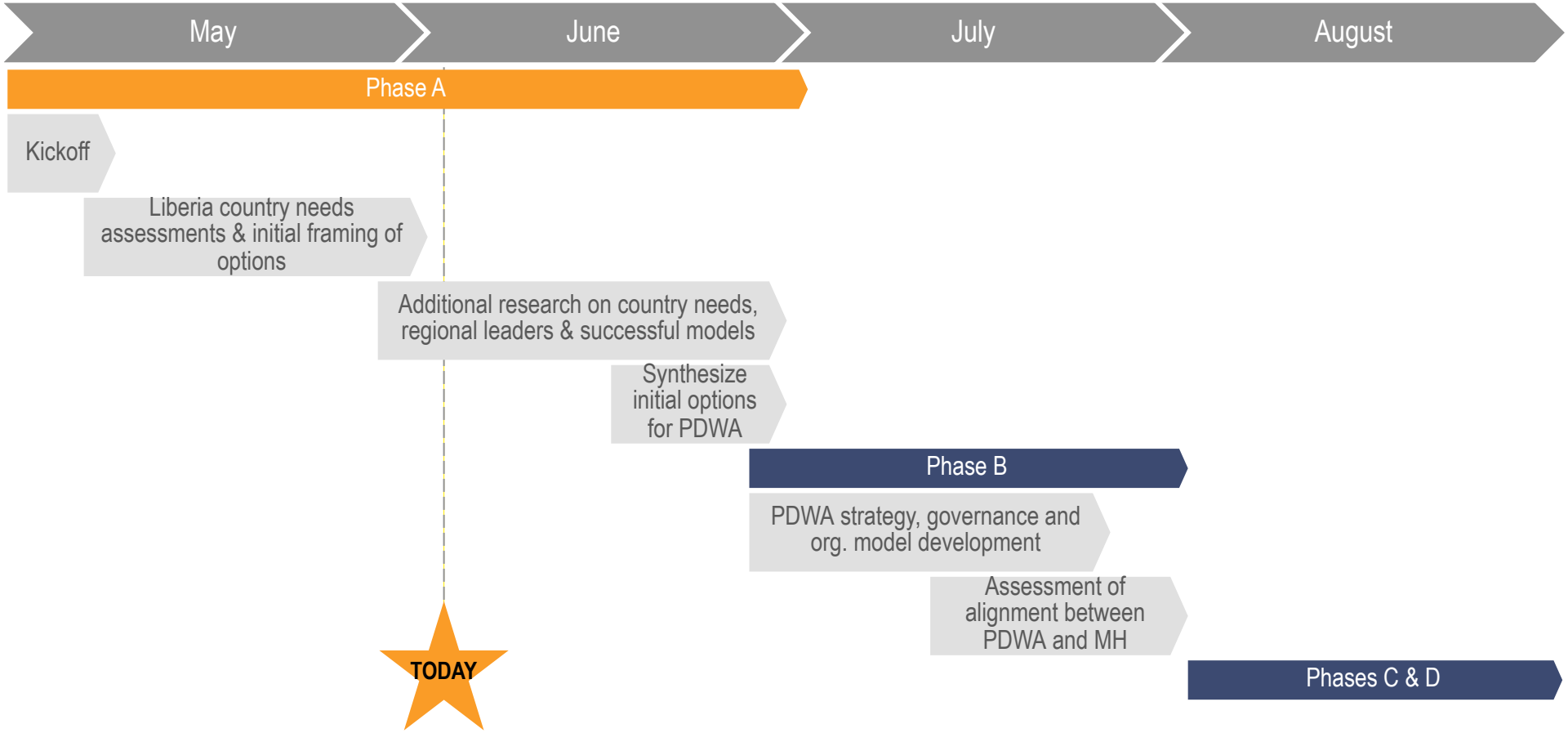
We are approximately four weeks into our work on PDWA



Today's discussion will share our initial findings from the Liberia country assessment and a preliminary menu of options for PDWA, which will then be refined and further elaborated upon in the coming

Meetings

Objectives for today's discussion

Objectives	• Share update on work to date • Discuss Liberia country assessment findings • Discuss preliminary menu of options • Review next steps
For discussion today	• Framing and scope of focus areas for PDWA • Findings from the Liberia country assessment • Scope of preliminary 'menu of options' for PDWA, including opportunities to further narrow and specify menu and any possible additions to the menu
Not focus of today's discussion	• Selection of next country deep-dive • Ongoing discussions on potential PDWA partners

Executive summary (1/3)

Context

The Partnership for Digital West Africa (PDWA) will seek to catalyze the sustainable development of digital infrastructure in West Africa, beginning with Ebola-affected countries and focused on vulnerable populations in order to enable more effective *responses* to future outbreaks and to accelerate *economic recovery and resilience* after the outbreak. Given its objective, PDWA will begin by supporting connectivity, mobile payments and real-time health information systems (HIS) all of which are considered enablers for response, recovery and resilience and recognized as areas where catalytic financing and policy support could help attract further investments to the region. This will allow PDWA to draw upon USAID's unique ability to support policy changes in parallel to providing catalytic financing that draws in additional private sector partners.

To date, Dalberg has conducted a deep-dive needs assessment in Liberia as well as an initial scan of successful models in the region by conducting desk research and interviews with over 40 experts. This document shares our initial findings around current state and gaps to support connectivity, mobile payments and real-time health information systems in Liberia, the financial, policy and capacity needs to fill these gaps, and a preliminary set of potential options that PDWA could pursue to meet the identified needs. The current menu of options was identified in order to fill priority gaps while meeting PDWA principles: namely, combining financial and non-financial support; reaching vulnerable, rural populations; permitting long-term sustainability beyond donor funding; and, complementing existing initiatives. The list of options is preliminary and will be further refined and developed in the coming weeks based on further expert discussions and country deep-dives. While we are discussing a set of individual options today, it will be important going forward to consider how these options could lead to a single vision and strategy for PDWA, if aggregated.

Connectivity

***Importance**:* Connectivity can enable more efficient response to future outbreaks by providing reliable means to communicate from rural areas, often where outbreaks begin, to central facilities and accelerate recovery and resilience by improving the country's ability to do national and international business, including but not limited to increased financial transactions.

***Gaps**:* An in-depth needs assessment of connectivity in Liberia, in coordination with Nethope, revealed four main gaps in connectivity: (i) the lack of fair access to the existing international backhaul (ACE landing station), which is currently being controlled by Libtelco; (ii) the lack of a fiber backbone, which has resulted in higher cost and lower quality of connectivity outside of Monrovia, limiting the reach of affordable connectivity in to rural areas, including those most affected by Ebola; (iii) limited infrastructure sharing by MNOs, especially in medium density areas, which increases expansion and operational costs for towers and limits the reach of affordable connectivity in to rural areas; and, (iv) absence of innovative business models to serve the rural last mile in order to further increase reach of affordable connectivity to rural populations affected by Ebola.

Executive summary (2/3)

Connectivity (continued)

Options for PDWA: Given these gaps we have identified three potential options for PDWA:

- Support the formation of a PPP to build out the fiber backbone and providing catalytic financing, which requires a significant amount of capital (i.e. $60-150M), but is likely necessary in order to achieve the baseline affordable connectivity necessary to support the other proposed options.
- Facilitate the development of innovative business models to reach the rural last mile, which would imply the Partnership incentivizing either MNOs or smaller enterprises to serve remote populations with new models (e.g., micro-GSMs in Mexico) or new technology (e.g., Whitespace in Ghana). These models have been successful elsewhere, but may not be feasible and economically sustainable without the fiber backbone.
- Provide grant funding to fund broadband costs for health facilities and schools, which could help build out connectivity and demand in parallel. This likely also requires the fiber backbone and relies on sufficient demand generation in the medium-term to be economically sustainable.

Mobile payments

Importance*:* Mobile payments tangentially support response to future outbreaks by allowing users to receive money real-time during crises and accelerate recovery and resilience by bringing the unbanked into the formal financial system.

Gaps*:* An assessment of the mobile payments space in Liberia revealed four main gaps: (i) a limited agent network, with only Lonestar agents in existence today; (ii) lack of platform interoperability that will allow multiple offerings, once available, to easily co-exist and seamlessly integrate in the market; (iii) no national identification registry, despite indications of one in 2006, which limits the ability for consumers to transact using mobile money; and, (iv) no critical mass of institutions and merchants acting as anchor customers to drive uptake and demand.

Options for PDWA*:* Given these gaps we have identified three potential options for PDWA:

- Enable the entry of an aggregator to address agent network, cash-out points, and interoperability, which would require fairly low investment and potentially transform the competitiveness and reach of mobile money. This model has seen success in other markets (e.g. Sierra Leone).
- Support the roll-out of a National I.D. registry in conjunction with other donors, which is a necessary baseline for a well-functioning mobile payment system. There may already have sufficient support for this from the World Bank, but will need to be confirmed.
- Drive uptake of mobile payments by institutions, such as government ministries through short-term financial support during switch-over (e.g. voucher for mobile money fees). This option is intended to spark demand by demonstrating the value of mobile payments to institutions and their beneficiaries (e.g. digitizing Government salary payments), assuming that institutions and/or individual will be willing to pay after switching.

Executive summary (3/3)

Health information systems

***Importance**:* Health information systems can enable more efficient responses to future outbreaks by collecting and disseminating information on outbreaks in real-time and support recovery and resilience of health systems by increasing the availability the information required for planning and decision-making.

***Gaps**:* Gaps currently exists across the health information value chain from collection of information to dissemination of information. However, the most prominent gaps are around: (i) collection of information, given that the majority of HIS data collected at the moment is still paper based; (ii) sharing of information, given low interoperability across existing platforms and the limited privacy and information sharing agreements; and (iii) dissemination of information, with only one existing 'push' system and few agreements in place to allow for real-time dissemination in an emergency.

***Options for PDWA**:* Given these gaps, we have identified two potential options for PDWA:

- Provide devices, training and incentives to enable efficient, real-time information collection, which would help improve collection in the near term. This may not be sustainable without long-term inclusion in MoH or donor budgets.
- Launch a region-wide data analytics center, with framework agreements to use MNO data and other information in order to improve sharing, analytics and dissemination by having a single point of aggregation and analysis. The center would provide ongoing services but would also own the agreements necessary for real-time services during future outbreaks.

Next steps

In the coming weeks, Dalberg will further vet and refine the menu of options through expert interviews and further understanding of successful financing models that have worked to fill these identified gaps in other low-resource countries. For each option, Dalberg will also build out more concrete details around the required activities and their costs, impact and risks. In addition, Dalberg plans to conduct at least one additional country assessment in the coming weeks to further vet and refine this menu of options, as well as calls with regional experts to understand the applicability of these options in Guinea and Sierra Leone, specifically.

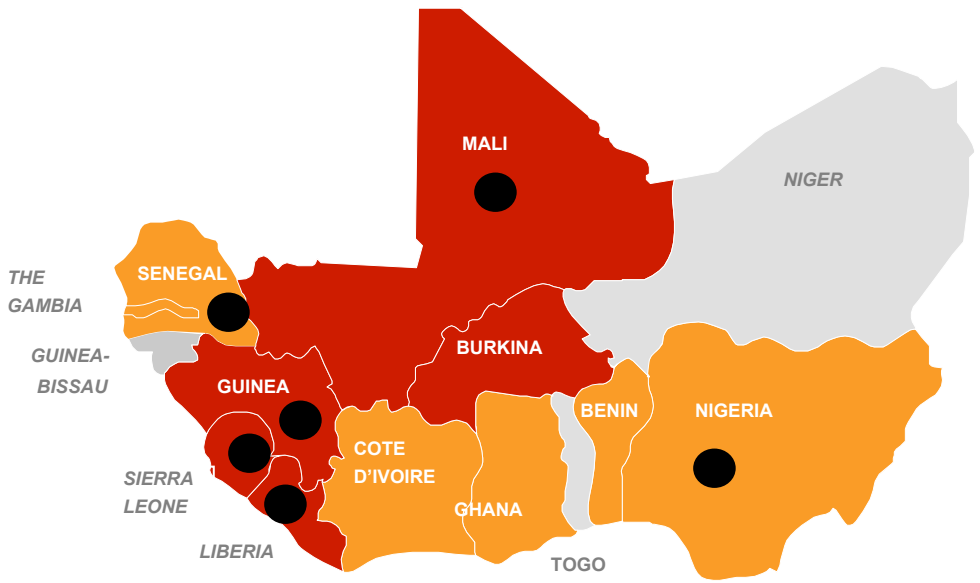
Agenda

- **Overview of the importance of digital infrastructure in West Africa [10 mins]**
- Summary of Liberia country findings and associated menu of options [30 mins]
- Discussion on menu of options [20 mins]
- Alignment on next steps [10 mins]

The West African Ebola crisis exposed severe gaps in the digital infrastructure of countries already under strain

Low digital infrastructure starting point pre-Ebola

*Infrastructure & data services (ranked 1-7) in World Economic Forum's Networked Readiness Index 2014**



Key:

- Low
- Very low
- No data available
- Ebola-affected

Digital infrastructure stretched beyond limits during crisis

Quotes from interviews to date

*"**Paper-based surveillance reports were transported by taxi over poor roads** from the counties to Monrovia and laboratory test results were burdened by a 3-day lag."*

Research Institution
Liberia

*"**Health workers in Sierra Leone went on strike because they weren't paid on time**. Mobile money could have been more effectively used, but people don't trust it – sometimes the transaction doesn't go through, sometimes there's a delay and when it does work the agents don't have enough money to cash out"*

ICT expert
Sierra Leone

iNGO
Liberia

*"Our field officers could only send their daily reports late at night because of internet traffic – even then, sometimes they'd need to **climb up in a tree to get a strong enough signal**" – iNGO, Liberia*

Source: World Economic Forum (2014); Images Freepick (head)
Notes: *Aggregated ranking based on the following metrics: Electricity production (2011), Mobile Network coverage rate (2012), International Internet bandwidth (2012), Secure Internet servers (2012), Accessibility of digital content (2012/3). There is no ranking available for Niger, Togo or Guinea Bissau

Across West Africa, the development of digital infrastructure is hindered by a number of constraints

Overview of cross-cutting regional constraints:

Inadequate policy and regulatory environment

*"**Regulation does not enable competition**, and most countries are dominated by a handful of incumbents"* Senegal

*"**The right conditions for investment are lacking**; a PPP framework does not yet exist"* Liberia

*"**Infrastructure sharing** elsewhere is not incentivized and largely remains unregulated"* Guinea

Lack of financing

*"**Access to finance is a challenge**. I want to move into other markets but need equity finance which is hard to come by"* Sierra Leone

*"**There are existing funds** but these **remain uncoordinated** and are often slow to move"* Mali

Lack of capacity/interest to implement

"*While the policy is well formulated, LTA **lacks the teeth to implement it***" Liberia

*"**Coordination capacity is low** and Government ministries do not agree about the role of LibTelco"* Liberia

*"**Last mile models do not exist or are only being piloted**; appropriate technologies and commercial viability are still being explored"* Ghana

Source: Expert interviews; Dalberg analysis; Images: Pixshark (Policy); EOCP (Financing); Avantibi (Implementation)

The Partnership for Digital West Africa (PDWA) will catalyze improvements in digital infrastructure across West Africa

PRELIMINARY

PDWA Objective: Support the development of digital infrastructure in West Africa, beginning with Ebola-affected countries and focused on vulnerable populations in order to aid the response to future outbreaks and accelerate economic recovery & resilience

Given this objective, PDWA will initially focus on:

CONNECTIVITY	MOBILE PAYMENTS	REAL-TIME HEALTH INFORMATION SYSTEMS (HIS)
Importance to PDWA objectives		
Response: In a crisis, reliable and instant internet and mobile access promotes real-time communication and feedback loops. *E.g., It took 3 weeks to set up emergency internet in Haiti after the 2010 earthquake.*	**Response:** Mobile payments allow users to send and receive money if financial institutions are inaccessible. *E.g., In Kenya, mobile payments helped mitigate the impact of 2008 post-electoral violence.*	**Response:** In real time, HIS collect and disseminate information, such as test results, notifications, and reports. *E.g., Mass mobile-based notifications supported Nigeria's Ebola containment strategy.*
Recovery & resilience: Connectivity is increasingly recognized as a key component of thriving economies.	**Recovery & resilience:** Mobile payments bring unbanked into the formal financial system. *E.g., 43% of Kenyan GDP passes via M-PESA.*	**Recovery & resilience:** HIS are essential on a day-to-day basis, as this information can help the health officials budget, allocate, and survey trends across the health sector.
Interplay with other components		
Connectivity underpins mobile payments and real-time health information systems	Mobile payments rely on connectivity to build out payment infrastructure to people unreached by traditional financial services	Real-time health information systems rely on connectivity in order to operate effectively at scale

These areas represent the initial focus for PDWA but will be refined based on fit with PDWA purpose; the unique assets and capabilities of USAID and other partners; and feasibility of success, given the total budget of the Partnership

PDWA will be designed according to 5 core principles

1. PDWA will also seek to provide the necessary **financing and non-financial support** to ensure catalytic investments that achieve their intended impact

2. PDWA will ensure **reach to vulnerable populations**, especially those that are **vulnerable to public health threats**

3. PDWA will seek to invest in areas that **maximize impact on digital infrastructure** rather than maximizing return

4. PDWA will **be additive and complementary** to existing efforts for digital infrastructure

5. PDWA will target investment that deliver **sustained impact** after the end of donor financing

Today we are sharing the initial findings from our Liberia needs assessment and a preliminary 'menu of options' for PDWA

CONNECTIVITY | **MOBILE PAYMENTS** | **REAL-TIME HEALTH INFORMATON SYSTEMS (HIS)**

1 What is the **current state**?

Diagnose the current state of connectivity, mobile payments and real time health information systems in the country, and highlight the gaps that prevent the country from achieving its 'target state'[1]

2 What are the biggest **needs**?

Determine the needs, both financial and non-financial, that prevent existing and new players from addressing key gaps and realizing the 'target state' within each area (connectivity, mobile payments, real time health information systems)

3 What **options** can PDWA pursue to help address these needs?

Identify options that fill priority gaps and meet key PDWA principles:

- *Combination of financial and non-financial support that catalyzes additional funding*
- *Reach to vulnerable populations*
- *Long-term sustainability (beyond donor funding)*
- *Complementarity to existing initiatives*

4 What options should be **prioritized** for PDWA?

Prioritize options based on alignment with principles as well as partner interest

Focus of today's discussion

Preliminary list shared, to be vetted and fleshed out in coming weeks

1. Target state is defined as appropriate digital infrastructure that enables access that is fast, affordable, and available in all regions.

Findings to date are based on interviews with 40+ stakeholders across the Government, private sector and international community

Liberian experts:*

3 Mobile Network Operators (MNOs)

2 Internet Service Providers (ISPs)

3 IT entrepreneurs

4 financiers

7 Implementing partners

Plus, a 60+ public-private stakeholder roundtable, participation in 2 government meetings, and multiple formal and informal consultations with NetHope

Regional experts:*

2 Government officials

1 Financiers

12 Technology providers

1 coordinating bodies

We have additional interviews planned in the coming weeks to continue to test and validate our findings as well as to further develop our option set

*See annex for full list of stakeholders consulted
Image Freepick (heads); Dalberg (photos)

It is important to note that the current option set is highly preliminary

- The options we are sharing today, including any costs mentioned, are highly preliminary.

- We will further develop the costs, associated activities, impact and feasibility of options with additional analyses.

- In the coming weeks, we will also continue to build out the options through further research and interviews with experts and stakeholders. This will include proposals for how to link policy and capacity building to financial investments in an effective way.

- In the creation of our options, we have taken in to account the roles of other funders and partners in Liberia (including the Government of Liberia) as well as the political landscape in Liberia. In future versions, as we build out options, we will explicitly highlight these dynamics.

Agenda

- Overview of the importance of digital infrastructure in West Africa [10 mins]
- **Summary of Liberia country findings and associated menu of options [30 mins]**
  - **Connectivity**
  - Mobile payments
  - Real-time health information systems
- Discussion on menu of options [20 mins]
- Alignment on next steps [10 mins]

Current state: Poor coverage outside Monrovia is primarily driven by lack of a fiber national backhaul




	International backhaul	National backhaul	Middle mile	Last mile		
	WIRED *No wired*	WIRELESS *No wired*	WIRED *No wireless*	WIRED	WIRELESS: CELLULAR	WIRELESS: OTHER
High density (Monrovia)	A **High-speed fiber connection** but fair access is limited by Libtelco	*N/A*	**Incomplete high-speed wired fiber ring** drives poor connectivity in Monrovia	**Some high-speed wired broadband** for very high-value customers (i.e., large businesses)	**High-speed mobile broadband** (up to "3.5g") available at relatively low costs	**High-speed wireless broadband** for high-value clients
Medium density (Cities/Towns)	*N/A*	B **Microwave: lack of fiber backbone** is key barrier to building out connectivity	*N/A*	C **No high-speed wired broadband** outside of Monrovia	**Low speeds of mobile internet** (2g/3g) available at relatively low cost in most urban centers	**No wireless broadband providers** (except VSAT) outside of Monrovia
Low density (Rural)	*N/A*	*N/A*	*N/A*	D *N/A*	**Very low speeds of mobile internet** (up to 2g) available in some rural areas	**No wireless broadband providers** (except VSAT) in rural areas

Source: NetHope/USAID "Liberia Broadband Technical Assessment; Desk research; Interviews

Severe gap | Medium gap | Small gap

Needs: The greatest connectivity needs in Liberia are a fiber backbone, tower sharing and innovation in the rural last mile

Gap	Need	Financing needs	Policy needs	Capacity needs
International backhaul A	**Fair access to ACE cable**	*Assumption is that USAID and other partners (i.e., World Bank) will work on this gap prior to the formulation of the Partnership as this may not be the best role for the Partnership given it is highly political and requires very little associated direct financing.*		
National backhaul B	**Fiber backbone** to ensure reliable, fast, cheap wholesale connectivity outside of Monrovia	• Estimated cost of providing a fiber backbone is **60M – 150M USD,** which could be invested by either the private or the public sector (or both) • While private players (i.e. MNOs) are likely to have access to finances to fund or co-fund the fiber backbone, it is unclear whether the Government of Liberia (GoL) has sufficient finance to fund or co-fund	• **PPP policy** is necessary to allow government and MNOs to come together and build out a fiber backbone that will allow for equal access over the long-term • **Fiber access policy** is necessary to ensure equal access to existing and future fiber networks (lowering costs for MNOs and preventing Libtelco monopoly)	• **Coordination and brokering** of deals (e.g. a PPP) between different players (particularly, Libtelco)
Last mile (med. density) C	**Tower sharing** to encourage MNO expansion	*Assumption is that, given MNOs and third-party tower operators have significant access to capital, this is primarily not a financing need and is therefore not within PDWA's scope. Prior to the formulation of the Partnership, USAID and/or others could work with the Liberian government to create an enabling environment for the entry of a tower provide; this would largely be a political/brokering play given that infrastructure sharing policy already exists.*		
Last mile (low density) D	**Rural last mile innovation** to reach populations or specific infrastructure (e.g. schools & health centers)	• Individual investments at last mile are likely low (e.g. micro-GSM towers cost approximately **10K USD**), but there will be a need for multiple pilot and scale investments • Players in this field tend to be SMEs, which have **very poor access to capital and high interest rates** (i.e., 10-20% for 1 year loans even with guarantees and limited access to long-term debt or equity financing). MNOs have greater access to capital but likely lack the incentives (given their business models) to provide innovative solutions	• **Telecommunication taxation and licensing review** to ensure that taxes and licensing fees do not prohibit small- and medium-size entrants (i.e., spectrum management policies)	• **Technical assistance** to support SMEs

B Options (1/3): Support the formation of a public-private partnership (PPP) to build out the fiber backbone and provide catalytic financing

PRELIMINARY

The lack of a fiber backbone in Liberia increases costs and decreases quality of connectivity for populations outside of Monrovia, limiting the reach of affordable internet in to rural areas. PDWA could work with private and public sectors to develop a PPP agreement and entity for building out and operating the fiber backbone, as well as providing financing to the GoL.

What would PDWA do?	Financing support	✓	• **Type**: Grant or debt financing for Government of Liberia to participate in a PPP* • **Amount**: $15-75M (i.e. 25-50% of total costs: $60-150M)
	Policy support	✗	*N/A in Liberia (assumption: work on PPP policy and Fiber Access Policy, i.e. Libtelco monopoly on laying of fiber, will be under-way before start of Partnership (see prerequisites below))*
	Capacity support	✓	• **Type:** Convening and coordination support to define the agreement for the PPP entity and broker private investment • **Amount:** 150-200K USD** (policy advisor/convener, potentially a secondment from similar country)
How does this model fulfill PDWA's objectives?	Additive and catalytic	M	Investment only additive if traditional infrastructure funders (e.g. World Bank) are not going to provide financing to the GoL. The funding is intended to catalyze investment by MNOs in the PPP entity.
	Impacts vulnerable populations	H	Investment extends the reach of affordable, fast connectivity beyond the capital, provided that the correct PPP framework and agreements are reached. Without the backbone it will be difficult to reach rural areas.
	Path to sustainability	H	The PPP should be designed to incentivize good and efficient management of infrastructure over time, while preventing private or public sector monopolies or rent-seeking, leading to a sustainable network.
Why is this model feasible?	Successful applications elsewhere		Local examples for building out *international* backhaul using grants and debt to buy govt. equity in a PPP entity include Guinea and Liberia. Elsewhere, PPPs have been used to build out national backhaul, e.g. Burundi
	Risks		There is a risk that the terms of a PPP are influenced by political or commercial interests, leading to rent-seeking on essential infrastructure
	Prerequisites and Interdependencies		Review and implementation of the national PPP policy; resolution of conflict between Libtelco, the LTA and MNOs on the right to access international and national backhaul at a fair price (i.e. Fiber Access Policy)

Notes: *A number of forms of PPP exist and have been successful for building out infrastructure. At this stage we are not proposing a particular model, except insofar as the model will need to be structure in a way that ensures equal access *Initial estimate based on 1 FTE at a rate of 150-200K, contracted for 1 year. Initial estimate based on 1 FTE at a rate of 150-200K, contracted for 1-2 years.

D Options (2/3): Facilitate the development of innovative business models to reach the rural last mile

PRELIMINARY

None of the current players in Liberia are testing more innovative approaches to reaching the rural last mile, where geographic remoteness and low ATP imply unattractive prospects for MNO expansion. PDWA could either i) provide seed capital to SMEs; ii) co-finance expansion by MNOs using new business models; or iii) co-fund pilots of promising last mile technology in Liberia.

What would PDWA do?	Financing support	✓	• **Type**: Financing for capital expenditure in the rural last mile (i.e. equity or loan guarantees to SMEs; subsidies for MNO or grants for private players piloting new technology) • **Amount**: *To be determined*
	Policy support	✘	*N/A (assumption: spectrum licensing policy review is already under way and work on broad SME policies are out of scope for PDWA)*
	Capacity support	✓	• **Type:** Technical support to grantees, likely in the form of an externally contracted technical expert • **Amount:** 150-400K USD* (technical expert)
How does this model fulfill PDWA's objectives?	Additive and catalytic	H	Currently there is little funding in Liberia 'ear-marked' for the rural last mile. Few SMEs operating in Monrovia have access to any form of capital (private or public); MNOs rarely receive any incentives from public players to expand their services**; there are also few pilots for new technology in smaller markets.
	Impacts vulnerable populations	H	The purpose of the investment would be to extend connectivity to vulnerable populations who, in Liberia, largely live in the geographically remote, low-resource areas.
	Path to sustainability	M	Investment would need to target business models that generate enough revenue to cover capital costs for expansion in the medium-term in order to justify financing for initial capital expenditure.
Why is this model feasible?	Successful applications elsewhere		Successful examples of incentivizing new players exist (e.g. micro-GSMs in Mexico), however the concept is relatively new. MNOs subsidies are being piloted (e.g. in Mali by NORAD). Co-funding of pilots for new technology has had some success (e.g. WhiteSpace in Indonesia).
	Risks		Business models are insufficient to ensure sustainability for SMEs or, in the case of MNOs, revenues are insufficient to make expansion a priority. In the case of pilots, key risks are around models to reach scale.
	Prerequisites and Interdependencies		Existence of fiber backbone; existence of interested partners and investees; policies that support SME entry and favorable spectrum licensing in Liberia

Notes: *Initial estimate based on 1 FTE at a rate of 150-200K, contracted for 1-2 years **With the exception of ECSI during the crisis

D Options (3/3): Provide grant funding to fund broadband costs for health facilities and schools

PRELIMINARY

Many health facilities in Liberia are not connected to the internet, limiting the impact of health information systems; universities and schools are also unlikely to have internet, undermining the development of ICT literacy in Liberia. PDWA could provide could provide grants to guarantee revenue for an ISP willing to serve health facilities and schools.

What would PDWA do?	Financing support	✓	• **Type**: Grant/subsidy to health centers/universities to guarantee revenue for their tendered provider* • **Amount**: *To be determined*
	Policy support	✗	*N/A*
	Capacity support	✗	*N/A*
How does this model fulfill PDWA's objectives?	Additive and catalytic	**M**	Investment will be additive and catalytic provided that i) the barrier to uptake of internet subscriptions by health centers and/or schools is willingness-to-pay and ii) ISPs cannot offer their own incentives for uptake
	Impacts vulnerable populations	**H**	Extends connectivity to vulnerable populations and the institutions that serve them (i.e. health centers, schools etc.).
	Path to sustainability	**M**	The purpose would be to transfer payment for broadband to "customers" (either governments or wifi users) at the end of the grant term, ensuring sustained access to broadband over the longer term.
Why is this model feasible?	Successful applications elsewhere	This approach was successful for schools in Moldova. In West Africa, The Ebola Response Connectivity Initiative are piloting a similar approach in Sierra Leone and Liberia but sustainability of the approach is not yet known.	
	Risks	Health centers, in particular, may be too small scale to sustain their own access to internet following the donor subsidy phase	
	Prerequisites and Interdependencies	Existence of fiber backbone; continued access to unlicensed spectrum for wISPs in Liberia	

Notes: *Advantage of this approach is the grant can be used as a revenue guarantee for the ISP to access debt from a traditional financial institution (e.g. bank)

Agenda

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  - Real-time health information systems
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Current state: In Liberia, the limited reach of the agent network and low uptake by anchor clients have discouraged competitors to enter the market

PROVIDERS

The institutional partners necessary to initiate and complete transactions

Mobile money providers
- Single-player system – Lonestar/MTN launched in 2011; new players needed to foster competition
- Cellcom to launch Q3 of 2015
- Lacuna, a credit union, may potentially launch

Stores of value
- Ecobank, GT Bank, UBA, and IBLI have all partnered with Lonestar
- Planned banking switch at Central Bank of Liberia (CBL) may expand ATM network

A

Agent network
- Lonestar has ~400 agents via a third-party recruiter, BrandWorx; mainly in Monrovia
- Cellcom unlikely to invest heavily in network
- No aggregator to build shared agent network

INFRASTRUCTURE

The IT software and systems that support digital payment capabilities

Back-end system
- Lonestar uses an old version of Fundamo; plans exist to update

B

Platform interoperability
- No existing players for mobile wallet interfacing; Splash and HAK exploring
- Digital switch not applicable in the short to medium term (recommend 3+ providers)

C

National Identification registry
- Not all citizens hold a unique identification number
- National Identification Registry announced in 2006, feasibility studies undertaken but not yet underway given lack of capital

USERS

A critical mass of merchant and consumer uptake

D

Individuals
- 30-40% of Lonestar subscribers (about 350,000) have accounts, but actual usage is very low; mobile payments are 1% of Lonestar revenue
- Low mobile penetration (42%)

Institutions
- Government of Liberia (GoL) interested in mobile payments (e.g. teachers, health worker salaries)
- Also some GoL interest in accepting fees (e.g. taxes, driver's licence processing)

Merchants
- DSTV; Electricity bills available via MM in certain IBLI accounts
- Few target mass-market merchants exist across Liberia

While PDWA can begin to address mobile payments gaps today, impact will ultimately be limited without a solution to low-cost connectivity at the rural last mile

Source: Expert interviews (USAID mSTAR; Cellcom; Lonestar MTN; Splash Mobile Money; HAK Technologies); Dalberg analysis.; Images: Brennan Novak (Code); Chris Kerr (Mobile phone); Martha Ormiston (Network)

Severe gap | Medium gap | Small gap

Needs: Liberia's key needs – a strong agent network and consumer uptake – are drivers of one another, and will need to be addressed in parallel

Gap	Need	Financial needs	Policy needs	Other needs
Agent network; platform interoperability A B	**Account opening and management** is limited by the lack of an extensive agent network to find and register customers, a shortage of cash-out points across the country (e.g. banks)	**Seed equity** is needed to build out an agent network and outlets to facilitate cash-in and cash-out; while returns will be generated over time, the nature of mobile payments often necessitates this up-front capital to build the necessary human and capital infrastructure before an anchor client can be secured	**No clear policy need**; Liberia's Mobile Money policy, released in 2014, is considered best-in-class	**Technical assistance** might potentially be needed to adapt aggregation product/services to the Liberian market
National identity registry C	**Fraud management** is limited by the lack of a national identity registry, constraining scale up of mobile money transactions	**Pooled donor funding** to set up the structure of the registry, and support with data collection and I.D. issuance.	**Tiered Know Your Customer (KYC) guidelines** already exist as a temporary work-around	**Technical assistance** might be needed to support the sustainable management of a National Database Registry, mandated by Government to ensure every Liberian has an I.D.
Users D	**Account usage -** Lack of an anchor client or institution is a driver of low consumer uptake of mobile money in Liberia	**A modest amount of up-front capital** is needed to transition payrolls to mobile money. In addition, **transaction fees** are a yet-unsolved challenge in mobile money; in other contexts.	Potentially, a **presidential order** to transition ministry payrolls to mobile money could be an incentive to secure anchor clients	• **Potential anchor customers may need technical assistance** to integrate mobile money into payroll systems, register and train employees, and launch programs • **Digital literacy** among potential payees is a broader challenge

Source: Expert interviews (USAID mSTAR; Cellcom; Lonestar MTN; Splash Mobile Money; HAK Technologies); Dalberg analysis

A Options (1/3): Enable the entry of an aggregator to address agent B network, cash-out points, and interoperability

PRELIMINARY

The presence of a mobile payments aggregator could address gaps in Liberia's agent network, availability of cash-out points, and interoperability. It is especially relevant in the near-term as a second provider (Cellcom) attempts to enter the market. PDWA could help a mobile payments aggregator enter the market by providing startup capital and technical assistance to expand to Liberia.

What would PDWA do?	Financing support	✓	**Type**: Seed equity to expand to 1 country, preferably structured to include other investment partners **Amount**: $0.6-1M (PDWA to invest 1:1 with partners, investing 50% of the total need of $1.2-2M)*
	Policy support	✗	*N/A in Liberia*
	Capacity support	✗	*N/A in Liberia (assumption: PDWA will invest in an existing player)*
How does this model fulfill PDWA's objectives?	Additive and catalytic	M	Aggregators find equity financing challenging to access, and this model could de-risk the investment for potential partners. However, aggregator expansion will be limited by mobile access and connectivity.
	Impacts vulnerable populations	H	An aggregator will incentivize the agent network to extend beyond Monrovia, address rural liquidity constraints, attract competition to the mobile payments market, and facilitate interoperability
	Path to sustainability	H	An equity investment would catalyze the development of an aggregator market and require no additional investment; additionally, would generate an ROI for PDWA, to be reinvested elsewhere
Why is this model feasible?	Successful applications elsewhere		In West Africa, Splash (Sierra Leone) used seed capital from Manocap to expand to reach more than 50,000 customers and 150 outlets in its first six months. Outside West Africa, Selcom (Tanzania) has had success.
	Risks		As with any equity investment, there is a risk associated with 'picking a winner;' PDWA would need to have the capacities necessary to undertake the necessary due diligence to support the right actor
	Prerequisites and Interdependencies		As with other digital services, an aggregator model will be limited by connectivity and infrastructure across the country

*Figure based on Splash Mobile Money equity estimate in expert interview; assumes a PDWA 1:1 investment ratio based on GDA's leverage requirements
Source: Expert interviews; Dalberg analysis.

C Options (2/3): Support the roll-out of a digitized National Identification registry in conjunction with other interested donors

PRELIMINARY

A National Identification Registry is especially relevant in the mid to long-term as mobile transactions increase and broader non-financial inclusion develops (i.e. card-based transactions). The Liberian Government passed legislation in 2006 but funding constraints have led to a decade-long delay in implementation.

What would PDWA do?	Financing support	✓	**Type**: Pooled grant funding to support the establishment and operationalization of the registry **Amount**: $5m - $10m, of which PDWA could provide a portion
	Policy support	✘	*N/A in Liberia*
	Capacity support	✓	Technical assistance will be needed to support registry design including interoperability and standardization as well as provisions for sustainable management
How does this model fulfill PDWA's objectives?	Additive and catalytic	**M**	The World Bank is considering how to support the roll out of a National E-I.D, and PDWA could pool its funding to encourage faster movement on this element
	Impacts vulnerable populations	**H**	A unique identifier is particularly important for populations to access Government social payments electronically
	Path to sustainability	**M**	Work with Government on establishing a sustainable resource allocation model to ensure citizens are continually registered once the initial database has been set up
Why is this model feasible?	Successful applications elsewhere	Recent developments in the Global South indicate trends towards National e-ID Systems, many of them funded by donors.	
	Risks	Setting up and implementing the registry is a long-term endeavor that may take years to yield results. Irregular technology procurement and '' trying to do too many things at once can lead to delays.	
	Prerequisites and Interdependencies	Connectivity and skills to input and issue cards; strong Government ministry driving the initiative forward	

**Highly initial estimate Based on World Bank funding to build out a biometric national I.D. database in Ghana with $21 million for a population of c.25 million
Source: GGI (2013); Expert interviews; Dalberg analysis.

D Options (3/3): Drive uptake of mobile payments by government ministries

PRELIMINARY

An "anchor client" or event is often a catalyst for the uptake of mobile payments, and adoptees find that they save money by paying their staff via a mobile-based system. However, institutions are often reluctant to try because of the up-front investment in both resources and training. PDWA could jumpstart the market by incentivizing and supporting institutions to transition to mobile payments.

What would PDWA do?	Financing support	✓	**Type**: Provide a temporary transaction fee voucher to an institution to transition to mobile payments **Amount**: $9-18,000 for supporting transaction fees for salaries of Liberia's public teachers for 3-6 months
	Policy support	✘	*N/A in Liberia*
	Capacity support	✓	**Type:** TA will be needed in most cases to transition IT systems and payroll, and train employees **Amount**: $37,500-$50,000 for 1 technical consultant for 12 weeks
How does this model fulfill PDWA's objectives?	Additive and catalytic	**M**	There does not appear to be much funding in this space; additional funders might not need to be crowded in if the model is sufficiently catalytic; however, it's possible another player would fund if PDWA did not
	Impacts vulnerable populations	**H**	Much of the inertia in Liberia has been around using mobile payments to pay rural and hard-to-reach populations; this will also reduce corruption and payment delays associated with a cash system
	Path to sustainability	**M**	This model is voucher-based, but with the goal of jumpstarting. Employees who begin receiving pay via mobile may become users, and other institutions may uptake as the value proposition is proven out.
Why is this model feasible?	Successful applications elsewhere	A pilot to pay Afghan policemen through M-Paisa catalyzed nationwide uptake	
	Risks	Institutions pass the transaction fee to the user when the voucher period concludes (studies show that midway introduction of fees often causes individuals to drop out of mobile services)	
	Prerequisites and Interdependencies	Should be done alongside developing an aggregator model: paying a group of people who have different mobile carriers necessitates a mobile wallet	

* [13,092 public school teachers in Liberia (MOE 2011)] * [$140 to $500 monthly salary – use $320 benchmark (Benedict Wreh, President of the MCSS Teachers' Association, via AllAfrica)] * [6-12 months] * [MTN Mobile Money benchmark for $320 to registered user of $0.71 per transaction (MTN Mobile Money Uganda – Liberia information unavailable]

** Based on $150,000 to $200,000 annual salary for a technical expert

Agenda

- Overview of the importance of digital infrastructure in West Africa [10 mins]
- **Summary of Liberia country findings and associated menu of options [30 mins]**
  - Connectivity
  - Mobile payments
  - **Real-time health information systems**
- Discussion on menu of options [20 mins]
- Alignment on next steps [10 mins]

Current state: Gaps in the collection and sharing of information drive weak information dissemination in Liberia

	Collection	Storage	Sharing	Analysis	Dissemination
	A		B		C
Hardware	**Few staff have access to devices** (feature phones and/or PC)	**Storage housed at MoH** (currently being expanded) **and at GoL data center** (largely unused)	*N/A*	*N/A*	**Few staff have access to devices** (feature phones and/ or PC)
Software	**Front-end of current platforms** is broadly suitable for staff	*N/A*	**Limited inter-operability** between health platforms at MoH and between gov't and NGOs	**Software exists to perform analyses;** use is limited by collection issues	**1 main "push" messaging platform** (RapidPro); front-end suitable
Human	**Few staff have training** to operate devices and/or collect statistically significant data	*N/A*	*N/A*	**Few actors have expertise** to analyze information collected	*N/A*
Policy	**Limited agreements** and coordination on standardizing metrics to be collected	*N/A*	**Privacy and data sharing agreements are largely lacking**	*N/A*	**Dissemination policy and agreements are largely lacking** (e.g., for push notifications)

Health information systems need functionality in both normal and crisis times – in an emergency, the best information system is one that is already in place and used regularly

Source: Desk research; Interviews (MercyCorps, IntraHealth, MOHSW)

Severe gap Medium gap Small gap

Needs: The greatest needs in Liberia are for strong information collection and sharing platforms that can also enable dissemination

Gap	Need	Financing needs	Policy needs	Capacity needs
Information collection A	**Internet-enabled devices for health workers** to increase information collection at last mile	• Health centers are suffering budget constraints in Liberia and are unlikely to be able to fund the devices and bulk SMS, voice and data required for information collection in health information systems • Health workers are likely to have low ATP for devices and airtime, although the extent of this is difficult to predict, particularly in areas which do not yet have connectivity.	*N/A*	• **Technical expertise** to operate devices and collect statistically sound data • **Connectivity** (at least at health centers) will be a fundamental prerequisite to the collection of information
Information sharing B	**Information-sharing between health players** to improve coordination and knowledge-sharing	*N/A*	• **Data privacy and sharing policy** to ensure safety and privacy of health workers and patients while allowing the sharing of information with appropriate decision-makers	• **Coordination and brokering** of deals between health actors to enable sharing agreements and common data-standards in collection
Information dissemination C	**Internet-enabled devices for health workers** to increase information dissemination at last mile (including "push" notifications/SMS)	• As above for devices and airtime • Additionally, the costs of procuring bulk SMS "push" notifications for health workers and/or the public are unlikely to be funded through the MoH	• **Dissemination policy** to ensure that (particularly in cases of emergency) Govt. can send out information to HWs and/or the public. This would likely imply a framework agreement between MNOs and the regulator (LTA) • **Data privacy and sharing policy** as above	• **Coordination and brokering** of deals between different players (e.g. for push SMS systems) • **Connectivity** as above

Source: Expert interviews

A Options (1/2): Provide devices, training and incentives to enable efficient, real-time information collection

PRELIMINARY

PDWA could jumpstart the digitization of health information systems by providing basic phones, information collection usage training, and incentives in the form of airtime paid via mobile money. Currently, HIS in Liberia are mainly paper-based below the county level. Approximately 90% of critical health facilities are within reach of mobile coverage, but only 42% of the population owns a mobile phone.

What would PDWA do?	Financing support	✓	**Type**: Grant funding to distribute basic phones to Liberia's health workers and provide training on usage **Amount**: $160,000- $320,000* for phones, $240,000 - $370,000 for training** and $35,000 -$ 55,000 for continuous follow-up***; airtime incentives TBD
	Policy support	✘	*N/A in Liberia*
	Capacity support	✓	**Type:** Coordination between the Ministry of Health, software provider and MNOs will be needed in most cases to set standards around interoperability, privacy and sharing
How does this model fulfill PDWA's objectives?	Additive and catalytic	**M**	Paper-based HIS exist, and Rapid Pro has launched a program to report new cases of Ebola. Providing devices to health workers will catalyze the ability of this program or equivalent to be scaled.
	Impacts vulnerable populations	**H**	Creating a human capacity base able to efficiently collect data in real time during periods of stability is an important pre-requisite for the activation of effective information collection systems during periods of crisis.
	Path to sustainability	**L**	The models for sustainable financing of mHealth Information Systems are uncertain, but it is expected that phone penetration will become more prevalent as the economy takes off.
Why is this model feasible?	Successful applications elsewhere		Pilots of mHealth information systems have been successful in increasing effectiveness of existing systems including Rwanda, South Africa and Tanzania
	Risks		The sustainability of the project relies on adequate funding for continued use of the system i.e. Government funding for collecting health information and donor support
	Prerequisites and Interdependencies		Should be closely coordinated with Ministry of Health and software provider to ensure information collected is fit for purpose, and standards for interoperability, privacy and sharing are in place at a policy level

*A basic feature phone costs c.$20 each and a basic android phone costs c.$40 each. There are 8000 health workers in Liberia.
** Based on similar trainings in Senegal for a 1 day basic training for all health workers + 5 days training for 2 champions in each of the 30 counties to prepare for follow up over a 1 year period
Source: Packet Clearing House (2014); Expert interviews; Dalberg analysis.

B C Options (2/2): Launch a region-wide data analytics center, which could house and harness framework agreements to use CDR and other info

PRELIMINARY

--- VERY EARLY THINKING ---

PDWA could seed fund and launch a regional, third-party data analytics business. Governments and NGOs tend to lack the agreements, privacy protection capacity, and skills required to drive usable insights from development data – this business would specialize in all three, maintaining sharing agreements with key data collectors (e.g. MNOs), and contracting out analytics to NGOs and governments.

What would PDWA do?	Financing support	✓	**Type**: Seed equity to help an existing data analytics business to open a West Africa development data line **Amount**: TBD
	Policy support	✗	*N/A for Liberia*
	Capacity support	✓	Some TA around supporting the business to develop framework sharing agreements in the target countries may be required, depending on the networks and capacities of the business.
How does this model fulfill PDWA's objectives?	Additive and catalytic	**M**	There has been a great deal of talk about integrating MNO and other information in a practical and real-time way, but little action – with the right model, it is very possible that other funders would crowd in.
	Impacts vulnerable populations	**H**	A data analytics center designed to have the capacity to respond to emergency situations would, by definition, have the potential to be highly impactful to humanitarian responders.
	Path to sustainability	**L**	Assuming that a business model (e.g. via a strong client base of NGOs and governments) can be found, this could be sustainable in the long run, but there is a chance that this would require sustained funding.
Why is this model feasible?	Successful applications elsewhere	None in the development sector	
	Risks	**This model is untested in the development sector**, and therefore this option is by nature a risky, albeit potentially game-changing, venture.	
	Prerequisites and Interdependencies	This model assumes that there is a business that has the capacities, relationships, and appetite to expand to West Africa; it is likely out of scope for PDWA to incubate a business from scratch.	

Source: Expert interviews

Agenda

- Overview of the importance of digital infrastructure in West Africa [10 mins]
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- **Discussion on menu of options [20 mins]**
- Alignment on next steps [10 mins]

For discussion: Are there specific options that are most aligned with PDWA's objectives or additional options to consider?

Preliminary PDWA Menu of Options

Connectivity

1. Support development of fiber backbone
2. Facilitate development of innovative business models for the rural list mile
3. Increase connectivity of health facilities and schools

Mobile payments

1. Enable entry of a mobile payments aggregator
2. Support roll-out of national I.D. registry
3. Dive uptake of mobile payments by institutions

Real-time health information systems

1. Provide devices, training and incentives for collection
2. Launch region-wide analytics center

Questions for discussion

- **Are there options that we should consider that are not included in this initial list, but that we should further consider going forward?**
- **Do any of these existing options seem misaligned with PDWA's overall objectives and vision and warrant removal?**
- **As we discuss trade-offs on cost, impact and feasibility, are there reflections on the core decision factors going forward?**

Agenda

- Overview of the importance of digital infrastructure in West Africa [10 mins]
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Next steps

Activity	Completion Date
Dalberg to develop country visit plan for additional 'high need' country	10 June 2015
Dalberg to map partner initiatives in core countries to ensure options are complimentary and additive	17 June 2015
Dalberg to conduct additional research and interviews to further narrow and specify 'menu of options'	17 June 2015

Annex

- **Full list of stakeholders consulted**
- Definitions of the three pillars of a digital ecosystem
- Regional examples

To date, we have completed approximately 22 interviews in Liberia, including all of the major MNOs and ISPs…

Perspective	Organization	Name
Connectivity	PowerNet	Nasser Matar
	Novafone	Bechir Khoury
	NAS Global	Philip Parker
	Inveneo	Eric Zan
	WARCIP	Kolubahzizi Howard
Connectivity; Mobile payments	Cellcom	Avishai Marciano, Avi Zaidenberg
	Lonestar/MTN	Babatunde Osho
Mobile payments	mSTAR	Oliver Dziggel
Information systems	IntraHealth	Leah McManus
Cross-cutting	BRAC	Sadhan Chandra Dey, Abdus Salam
	Incyte Consulting	David Rogerson
	RoviaGate	Oliver Klark
	University of Liberia	Sunny Nyemah
	Power Africa	Anita Nzeriba
	HAK Technologies	Edmund Kloh
	MercyCorps	Jeff Wishnie; Penny Anderson
	Tamma Corporation	Abdullah Kamara
Financing	International Bank of Liberia	Harris Quaqua
	International Bank of Liberia	Henry Saamoi
	Ministry of Finance	Chris Sopkor
	Pan African Capital Partners	Stephen Murray

…and also participated in a series of broader stakeholder meetings with both public and private partners

USAID/A4AI Connectivity Roundtable

- **Half-day public-private stakeholder meeting**, with 60+ attendees from GoL, donors, and private sector (MNOs, ISPs)
- **Targeted breakout sessions**, including:
  - Infrastructure
  - Last mile
  - eGov/Shared services
  - Policy

Donor coordination meetings

- **Government of Liberia** – Presidential Decision-Making Unit
- **African Development Bank** – Margaret Kilo
- **Ministry of Health and Social Welfare** - Health Information Systems Donor Coordination

Other

- **Various informal meetings** with the NetHope mission team:
  - Jonathan Metzger
  - Steve Song
  - Etc.
- Worked closely with Andrew Karlyn
- Dimagi

We are currently testing the frameworks and recommendations that have come out of the Liberia deep-dive assessment with many of the experts we consulted on the ground

Additionally, we have had 16 interviews with regional experts, with 8 more planned for the coming weeks

Perspective		Organization	Name
Geography	*Vertical*		
West Africa	Connectivity	Google	Seydina Diop
West Africa	Mobile payments	CGAP	Corinne Riquet
West Africa	Mobile payments	Gates Foundation	James Dailey
West Africa	Mobile payments	AfricXpress	Felix Ofungwe, Nvalaye Kourouma
West Africa	Mobile payments	MFS Africa	Rachel Balsam
West Africa	Cross-cutting	ICT Specialist	Bouba Dieme
The Gambia	Connectivity	QCell	Faye
Ghana	Connectivity	MTN	Abdul-Latif Issahaku
Mali	Connectivity`	AMRTP	Moussa Ouattara
Mali	Connectivity	Afribone	Dr. Boubacar Kanté
Nigeria	Connectivity	Main One	Jumoke Akande and Funke Opeke
Senegal	Information Systems	Orange	Coumba Sangaré
Senegal	Cross-cutting	Cisco	Cheikh Fall
Senegal	Cross-cutting	ARTP	Seyni Faty
Sierra Leone	Financing	ManoCap	Tom Cairnes
Sierra Leone	Mobile Payments	Splash Cash	Daniel Osei-Antwi

Annex

- Full list of stakeholders consulted
- **Definitions of the three pillars of a digital ecosystem**

Connectivity definition: There are four steps in the connectivity value chain

International backhaul*

The pipeline that runs between countries and continents, linking them to global networks

Infrastructure

Wired: Fiber (undersea or land)

Wireless: Microwave (P2P) or Satellite

National backhaul*

The main "pipe" that serves as the backbone of a country's infrastructure, linking international backhaul to major telecom centers

Wired: Fiber or copper

Wireless: Microwave (P2P)

Middle-mile*

Intra-city networks ensuring connectivity between and among users within a metropolitan area

Wired: Fiber or copper

Wireless: Microwave (P2P)

Last mile*

Segment of the infrastructure that reaches end user devices

Wired: Fiber or copper

Wireless: Cellular or Other (e.g. balloon, wifi, whitespace, micro-GSM etc.)

ENABLING ENVIRONMENT

Policy **Technical Expertise** **Other infrastructure**

Source: Mobile Hub. *Definitions taken from MH documents. Value chain maps to World Bank framework: International Connectivity > Domestic backbone > Metropolitan connectivity > Local connectivity

Mobile money definition: A mobile payments ecosystem connects consumers and merchants using digital platforms and infrastructure

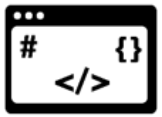
PROVIDERS

The institutional partners necessary to initiate and complete transactions

Mobile payment providers
- Often MNOs; can also be banks or credit unions that work via a telco or mobile wallet
- Preferable to have multiple players competing in the market to drive price and quality

Stores of value
- Legislation typically prohibits MNOs from maintaining stores of value
- Therefore, if provider is an MNO, partner banks hold the assets, facilitate transactions

Agent networks
- Point-of-service agents who often double up as agents in a shop, gas station, airtime, etc.
- Facilitate account opening and management, and serve as access points to cash in and out



INFRASTRUCTURE

The IT software and systems that support digital payment capabilities

Back-end system
- Connects transactions to payout destination system for real-time delivery
- International MNOs (e.g., MTN) often apply proprietary systems used in other countries

Platform interoperability
- Allows interoperability between platforms
- Aggregators act as a "mini-switch" between multiple MM providers, and often build out shared agent and cash-out infrastructure

National identification registry
- Allows citizens to have an ID in order to open a financial account

USERS

A critical mass of merchant and consumer uptake

Individuals
- Must have access to compatible devices, appropriate ID, and level of digital literacy
- Often need behavioral nudges (e.g. vouchers) to be persuaded to give MM a try

Institutions
- Includes government agencies, NGOs
- Can use mobile money to pay salaries, CCTs, and/or to accept fees (e.g. taxes)
- An anchor client can jumpstart a MM market

Merchants
- Agreements with MM providers to enable consumers to pay for goods/services with MM
- Ideally, early adopter merchants will have many branches, e.g. gas station, chain store

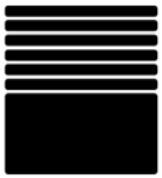
ENABLING ENVIRONMENT

Connectivity | Policy | Liquidity

Real-time HIS value chain definition: There are five elements in a well functioning health information system (HIS)

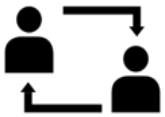
Collection

The creation and reporting of information



Storage

The "housing" of information which has been collected



Sharing

The movement of stored information between parties

Analysis

The processing and "making sense" of information

Dissemination

The sharing of information in a format appropriate to its users

	Collection	Storage	Sharing	Analysis	Dissemination
Hardware	**Device** e.g. mobile phones, satellites etc.	**"House"** e.g. Data center	*NA*	*NA*	**Device** e.g. mobile phones, satellites etc.
Software	**Collection** e.g. data collection app	*NA*	**Inter-operable platforms and data-entry standards**	**Platforms for data analysis**	**Dissemination** e.g. push messaging platform
Human	**Staff** e.g. health workers	*NA*	*NA*	**Analysts** e.g. data scientists	*NA*

ENABLING ENVIRONMENT

Connectivity **Technical Expertise** **Policy**

Source: Mobile Hub. Interviews, Desk research.