Developing A Biometric Based Unique Personal Identifier: the Stone HMIS® Experience

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Overview

- About Afya Research Africa (ARA)
- About Stone HMIS®
- Our Identity need
- The solution and its implementation
- Early results and emerging lessons
- Summary
About Afya Research Africa: Ubuntu Afya Clinics
About Afya Research Africa: Stone HMIS®

We provide affordable, appropriate and integrated electronic health record technology tools that empower health workers assist communities to attain high quality essential healthcare.
Poor Client Health Records

- **Client Record:**
  - Unlinked
  - Untraceable
  - Lost

- **Client Healthcare:**
  - Disjointed
  - Inconsistent

StoneHMIS®:
- Point of care
- Community level
- Links records

Poor Aggregate Health Records

- **Source Data:**
  - Inaccurate
  - Incomplete
  - Untimely

StoneHMIS®:
- Integrates
- Aggregates
- Transmits

Decision Making

- Poor planning
- Stock out
- No co-ordination

Health Outcomes

- **Poor Individual and Overall Health Outcomes:**
  - Low quality
  - Inefficient
  - Poor safety
  - Disparities

StoneHMIS®:
- Track care processes
- Track outcomes
- Quick feedback
Our Identity Need:
A Unique and Universal Identifier for Linkage of Health Records
Why rediscover the wheel?

• Existing identity systems:
  - National identity
  - National Hospital Insurance Fund Identifier
  - Revenue Authority Taxation PIN & other organization level identifiers
  - Proposed National Unique Person Identifier (NUPI)

• Limitation for our use case:
  - Loss, forgetfulness, dubious authenticity & duplication
  - Restricted acquisition by age, citizenship status, tedious and slow, etc
  - Implied legal and administrative consequences
  - Delayed implementation of NUPI
  - Proprietary and restricted organization level identification systems that may not scale
Private Universal Unique Person Identifier (PUUPID)

• Numeric Identifier

• Private
  - No personally identifiable information held
  - Devoid of implied legal and administrative consequences
  - Linkage to identifiable information is left to local use case implementations
  - A single copy of the original raw record held only in one central location

• Universal
  - No restriction to generation, acquisition or use,
  - Can be put into as many use case as need

• Unique
  - Based automatic identification of unique biometric features
  - Currently based on automated fingerprint identification
  - Can be attached to other unique biometric features as they become available
Private Universal Unique Person Identifier (PUUPID) Structure

2008011331321371786

Year of birth

Gender

Global Administrative Unit Layers (GAUL)

Time based variable random fragment
**PUUPID Conceptual Model**

1. **Biometric Image Capture**
2. **Identification**
   - **Generate PUUPID**
     - **Fail**
     - **Pass**
6. **PUUPID Verification**
   - **Pass**
   - **Fail**
7. **Link PUUPID To Person**

**PUUPID- Private Universal Unique Identifier**
Typical PUUPID Infrastructure & Implementation

Local/Wide Area Network

Puupid Desktop Client (pdc)

Puupid Client Server (pcls)

Puupid Central Server (pces)

Cloud Computing
Typical Software Requirements

- **Puupid Desktop Client (pdc)**
  - A platform that supports Unix/Linux shell scripting, typically Ubuntu
  - Web browser

- **Puupid Client Server (pcls)**
  - A platform that supports Unix/Linux shell scripting, typically Ubuntu
  - Database server software, typically mysql
  - Web server software, typically Apache 2
  - National Institute of Science and Technology Biometric Imaging Software (NBIS) Release 5.0.0
  - Internet connectivity

- **Puupid Central Server (pces)**
  - As above for Puupid Client Server
Ubuntu Digital Collaboration: PUUPID Pilot Project
Using PUUPID for Unique Identity In Community Health Work
Using PUUPID for Unique Identification at Health Facilities
Using PUUPID for Unique Identification at Health Facilities
## PUUPID Linked Records

### Registry of Persons - List Person

<table>
<thead>
<tr>
<th>PID</th>
<th>PUUPID</th>
<th>Name</th>
<th>Sex</th>
<th>Date of Birth</th>
<th>Nationality</th>
<th>Registrar</th>
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<tr>
<td>10256</td>
<td>2000011331321371706</td>
<td>Ndirangu Ndritu Biko</td>
<td>Male</td>
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<td>Moses Ndritu</td>
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<td>Moses Ndritu</td>
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<td>14.01.2006</td>
<td>Kenya</td>
<td>Moses Ndritu</td>
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<td>Moses Ndritu</td>
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<td>10246</td>
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<td>Sharon Kanini Mallo</td>
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<td>18.04.1995</td>
<td>Kenya</td>
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</tr>
</tbody>
</table>

Total: 200
Results

- During Feb 2018, nearly 4,000 persons were enrolled for PUUPID identification at community health work level
- In March 2018, health facility level identification commenced
- Linkage of episodes possible:
  - health facilities and community health units
  - Health facilities
  - Community health units
  - Geographically and temporally dispersed locations using puupid
Emerging Lessons

- Thresholds proposed for Automated fingerprint matching and pattern classification may need to be revised appropriately depending on resolution of scanning devices to cater for structurally smaller fingerprints or for closely related persons.
- Because of integration into distributed EMRs, PUUPID is a viable solution for unique identification in front-line health care settings.
- Difficult in acquisition of fingerprint among children below 2 years may preclude use of automated fingerprint identification systems to generate a unique identifier for this group.
Summary

- A unique numeric identity based on a single and/or multiple unique biometric identifiers is possible.

- There is affordable hardware and open source software to construct an Automated fingerprint identification system (AFIS) as the basis for a universal unique identification.

- Initial challenges of cost, software programming skills, and limitation of AFIS in the extreme of ages must be considered when setting up such a system.

- A functional system has minimal maintenance cost, can be used by any computer literate person and is a viable for resource constrained settings.
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