Optical Mark Recognition Technology for Rural Health Data Collection

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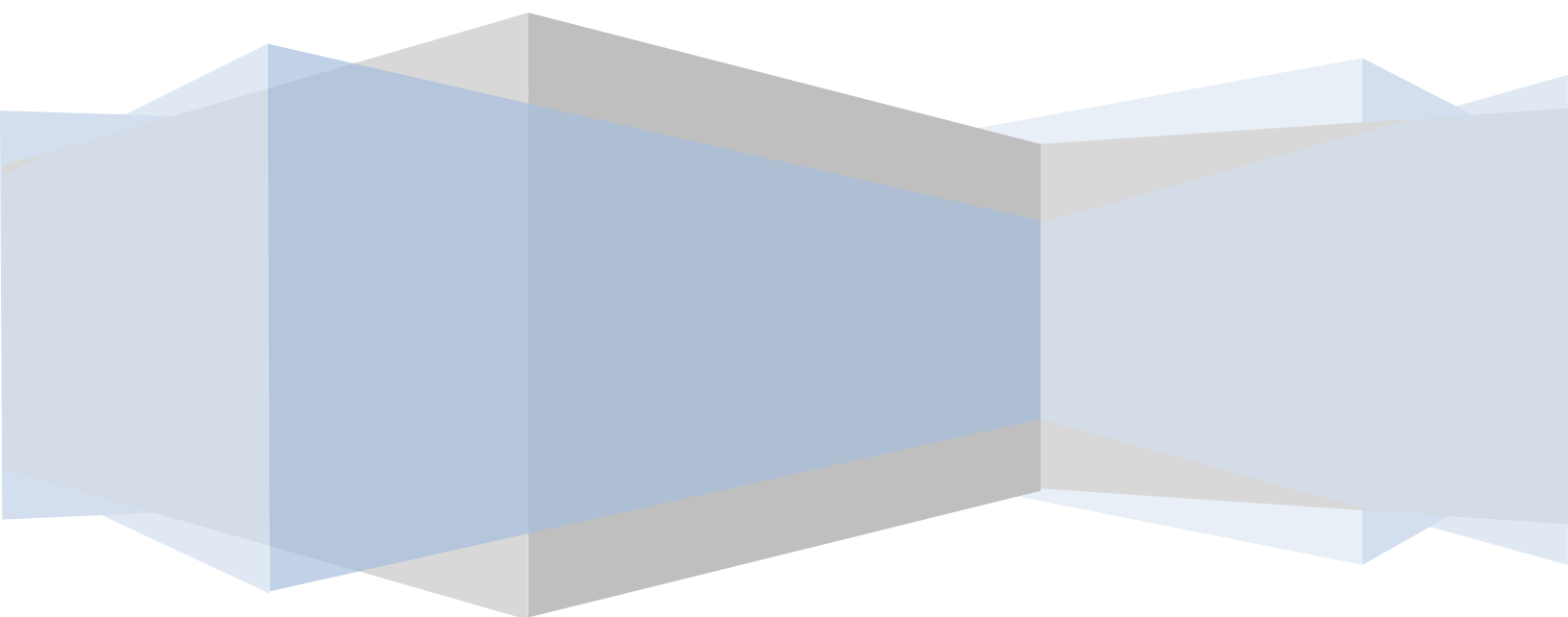
Introduction:

Non-communicable and chronic diseases are the leading causes of death in this part of rural India. The observed pattern of death is unlikely to be unique to these villages and provides new insight into the rapid progression of epidemiological transition in rural India (Rohina Joshi1, July 5, 2006). Health statistics are necessary inputs in planning appropriate health interventions (Badara Samb MD, Badara, & Desai, 2010). Various life-threatening diseases if diagnosed at an early stage can be prevented at a low cost. The collection and use of data for planning and patient follow-up is a challenge for PHC (A.K., 2009). A confirmative diagnosis for an entire population is not always possible in a resource-constrained setting and therefore screening based on basic symptoms like Blood Pressure, Body Mass Index (BMI), Visual acuity, Nicotine and Alcohol consumption etc. (Dr.Christine L Parr PhD, August 2010) (K Srinath Reddy, 2005) can help the health provider to screen risk-prone individuals in the community and to devise strategies for personalized healthcare.

To do a primary level screening, access to household level data becomes extremely crucial. Though there are National surveys that are conducted by different agencies, these data are often not accessible to smaller groups implementing healthcare programs. Therefore there is a demand for household data collection and for making the data accessible to both the community and different intervention groups.

One of the main steps in this endeavour is to identify an appropriate platform for data collection in a rural setting. This paper focuses on different parameters taken into consideration while evaluating technologies and the rationale behind selecting Optical Mark Recognition (OMR) technology (Indonesia, 2001).

OMR technology has been used for various large scale surveys from different Governmental agencies (IT and population census; Paper to be presented in Forum for Asia Pacific Statistics , 3-4 Feb 2005) (Expert Group Meeting on Effective Use of IT in Population Census, 2007) to Microfinance companies like Equitas (EQUITAS Launches Optical Mark Reader based (OMR)solution, 2010) to collect customer enrolment data. Equitas has experienced thrice the normal efficiency by shifting from a conventional process like manual key-stroke entry to an OMR scanning (Innovation In Technology Report, Equitas).

Technology Evaluation for Data Collection:

Among various data collection technologies, viz. Optical Character Recognition (OCR), Optical Mark Recognition (OMR) and Conventional Data Entry methods are evaluated based on different parameters. Though mobile technology seems to be an appropriate solution, it is beyond the scope of this paper as there is no ready to use product available. Implication of mobile technology will be dealt separately in the next paper.

Cost: Though there is no formal documentation on costing, estimates indicate that manual transcribing of printed forms costs around Rs.15-20/- per page (Health Insurance e-Form Document Project, 2009). For a volume of around 20000 pages (Example: Sughavazhvu model-considering each form can be compressed into 2 pages) it will cost around Rs. 3-4 lakhs a year.

1. Turnaround time: Though the turnaround time for digitization is subjective to the volume to be processed, data entry and data cleaning of a batch of 300 pages takes 2-7 days. This makes the total turnaround time 9-14 days assuming the actual data collection of 300 pages takes 7 days (considering the BPO standards).

2. Error rates: Typically in a cycle of manual data collection and digitization there are two points of error. The first during the data collection in the field and the second in the data digitization by a data entry operator. Any optimization should target these two errors.

Technology Comparison:

	Manual Data Entry	Optical Character Recognition (OCR)	Optical Mark Recognition (OMR)
Digitization Cost	Rs.15-20/- per page	Scanning cost of Rs.1/- per sheet	Around Rs.1 to 2/- per OMR sheet depending on volume.
Turnaround time	2-7 days per 300 pages	Around 5 minutes to scan the 300 pages	Around 5 minutes to scan the 300 pages
Usability	The training is often simple and easily comprehensible	The training is often simple and easily comprehensible	Needs minor training on good practices and precautions of filling out an OMR sheet.
Error	Error rates are high-2 levels of error point-As per BLS it's 0.25 %	Recognition of Tamil handwritten text is not reliable.	Error rates are low to medium-1 level of error points.
Versatility	Only stand-alone data collection	Stand-alone data collection	Stand-alone data collection

Table 1: Technology evaluation of different data collection technologies used for various population surveys

The above evaluation is done considering specific context in terms of budget structure, time availability, resource availability and volume of work. Given below is an evaluation of different data collection approach with this specific context.

Manual Data collection: This is a conventional way of collecting data where they are collected manually as hand written text on printed templates. The data are then digitized by a key-stroke entry on a computer either in-house or by a BPO company. This method is ideal for processing of low volume data where an in-house resource can manually analyze the data. Outsourcing the digitization of data is fairly expensive. Manual data collection is ideal for capturing open ended qualitative data.

OCR Technology: While this is an inexpensive and less time-consuming method of data collection, this technology has limitations in reading handwritten regional languages which makes it ineffective in a rural setting where data is collected by lay workers with no knowledge of English.

OMR Technology: This is a cost effective solution for large surveys where closed-ended or objective type data is collected. The price reduces considerably with volume as there is a certain fixed cost involved in the printing and scanning process. OMR technologies could be availed in two different ways.

   a. Building in-house capability: This is preferable for organizations involved in regular data collection and mining as they could recover the setting up cost over time. An in-house capability also reduces unpredictability of the turnaround time.

   b. Outsourcing to an OMR Company: This suits best for organization collecting data in comparatively smaller volumes or during the pilot stage. This saves initial setting up cost and allows per page payment which is preferable as the volume is low. This is also suitable for non-frequent large volume surveys.

Mobile Technologies/PDAs: Mobile technology is suitable for data collection where live data is important. Moreover it opens up a range of possibilities apart from data collection. Example: 1. Collecting immediate health requirement of the patients for acute illnesses for immediate response; 2. Tracking disease outbreak etc. It is also suitable for both close and free text (open ended) data collection which is done in high frequency so that the initial fixed cost could be recovered.

This current paper focuses on the usage of OMR Technologies for piloting Population Level Screening Package (PLSP) (Chockalingam, 2010).

Benefits of OMR over Conventional forms:

   1. Accommodation of more fields: As shown in *Figure 1* and *Figure 3,* the OMR template forms can accommodate many more fields than a conventional survey form (*Example: Figure 1. can accommodate only 19 fields whereas Figure 3. can accommodate 41 fields*

in the same given space). Accommodating more fields in a conventional form leads to higher error rates both during data capture and data scanning because of human error. Accommodating more fields into a small paper area also helps in reducing paper usage and thus the process is more environments friendly.

0560. Malaria Prevention: Use of (bed) nets

Q0560	Do you have a mosquito (bed) net in the house?	1. Yes	5. No	8. DK	If No or DK: Go to Q0570
Q0561	Were the (bed) nets treated with insecticide, a product that kills insects?	1. Yes	5. No	8. DK	If No or DK: Go to Q0563
Q0562	*If Yes:* When was the last time the (bed) nets were (re-) treated with this product?	1. Within the last 6 months	2. 7 months-12 months ago	3. More than 1 year ago 8. DK	
Q0563	Can you please tell me how many children aged under 5 years live in this household? **Interviewer: Enter the number of children in the box. If no child under age 5 in household, enter "0". Correct number of children in household and update roster if necessary.**				If No children under age 5 in household: Go to Q0565
Q0564	How many of these children slept under a mosquito (bed) net last night?		88. DK		
Q0565	Can you please tell me how many women who live in this household are currently pregnant? **Interviewer: If no women are currently pregnant, enter "0".**		88. DK		If No pregnant women in household: Go to Q0567
Q0566	How many of the pregnant women in this household slept under a mosquito (bed) net last night?		88. DK		
Q0567	How many other persons who live in this household slept under a mosquito (bed) net last night? (That is, all the other household members except for young children or pregnant women.)		88. DK		

Figure 1: World Health Survey Conducted by WHO capturing information for Malaria Prevention. The above given is diagram was selected as the format is strikingly similar to ICTPH's old version of a PLSP form

2. <u>Turnaround time for OMR scanning</u>: Theoretically the turnaround time is almost a fraction of a second but in practice the logistics takes longer as all the field data needs to be converged to a centralized location for scanning. The turnaround time is also dependent on volume as the scanning process is not very economical below a threshold.

Process Documentation:

This documentation describes the different components of data collection through OMR which is currently piloted by ICTPH's implementation partner SughaVazhvu. This could be used as a guideline for other organizations who want to emulate this method.

Vendor Selection:
Some of the criteria for vendor selection are listed below:

a. <u>Printing and Scanning Infrastructure</u>: This is an important criterion for vendor selection. During the post-pilot stages, developing a partnership with an established provider is beneficial.

b. <u>Independent Solution Provider</u>: It is advisable to avoid intermediary dealers who outsource the template designing, printing and scanning to other OMR companies. They are often more expensive and chances of miscommunication especially during the template designing can be higher.

c. <u>Location:</u> The company should be ideally located nearest to the field as sending OMR sheet back and forth across geographies increases latency and expenses.

d. <u>Price quotation</u>: Since there are no pricing standards price flexibility is one of the most important parameters during vendor selection.

Some of the OMR solution provider in India who was screened by ICTPH is listed below:

OMR Vendors	URL Link
Mark Reader, Delhi	http://omrindia.com/
Maxso Technologies Pvt. Ltd., Chennai	http://www.maxso.in/
OMR Home, Delhi	http://www.omrhome.com/default.asp
Vikmans, Delhi	http://vikmans.com/index.asp?menuID=14
Multi Graphics, Delhi	http://www.omrsolutionsmulti.com/index.html
Total Reflective Solutions (TRS), Delhi	http://www.trsforms.com/aboutus.php

Table 2: List of OMR solution providers in India

Template Designing:
The first step to design an OMR template is to convert the existing content to an OMR logic. The given below (*Figure 2*) represents an intermediary version with OMR logic designed by ICTPH which was later converted into an actual OMR template (*Figure 3, Also refer* Annexure 1) by Mark India, an OMR company based in Delhi.

Interviewer checkpoint: Only ask Q.501-502 if ADOLESCENT has **ever been married.**		
501	Are you aware about contraception methods?	Yes No (← Skip to Q.503)
502	Do you use any contraceptive methods?	Yes No DK
Interviewer checkpoint: Only ask Q.503-Q.504 if ADOLESCENT is **Female** and **has ever been married.**		
503	Are you currently pregnant?	Yes (←Refer to RMHC) No (←Skip to Q505) Don't' know(←Skip to Q505)
504	How many times have you been pregnant? **Flag:** include current pregnancy, if applicable, and pregnancies that didn't result in a live birth	1 2 3 4 5 6 7 8 9 10 11 12
505	Have you ever smoked tobacco?	Yes No (← Skip to Q.507)
506	Number of times tobacco consumed in past month	0; 1-2; 3-5; 6-9; 10-19; 20-29; 30; DON'T KNOW
507	Have you ever had any alcohol, like beer, wine, or liquor?	Yes No (← Skip to Section 6)
508	How many alcoholic drinks did you have in the last month?	0; 1-2; 3-5; 6-9; 10-19; 20-29; 30; DON'T KNOW
Flag: Family members can now return to the room.		

Figure 2: Intermediary version ICTPH designed from an old questionnaire keeping the actual content of the Adolescent form.

501	Are you aware about contraception methods?		Yes ○		No ○		DK ⊙DK				
502	Do you use any contraception methods?		Yes ○		No ○		DK ⊙DK				
Interviewer checkpoint: Only ask Q.503-Q.504 if ADOLESCENT IS Female and has ever been marred.											
503	Are you currently pregnant ?	Yes refer to RMHC ○		No Skip to Q.505 ○		DON'T KNOW Skip to Q.505 ⊙DK					
504	How many times have you been pregnant? **Flag:** include current pregnancy, if applicable, and pregnancies that didn't result in a live birth	①	② ③	④ ⑤	⑥ ⑦	⑧ ⑨	⑩ ⑪ ⑫				
505	Have you ever smoked tobacco?		Yes ○		No ○						
506	Number of times tobacco consumed in past month	0 ○	1-2 ○	3-5 ○	6-9 ○	10-19 ○	20-29 ○	30 ○	DONT KNOW ⊙DK		
507	Have you ever had any alcohol, like beer, wine, or liquor?		Yes ○		No (Skip to Section 6) ○						
508	How many alcoholic drinks did you have in the last month?	0 ○	1-2 ○	3-5 ○	6-9 ○	10-19 ○	20-29 ○	30 ○	DONT KNOW ⊙DK		

Figure 3: OMR format developed by Mark Reader, a company specialized in OMR technology. The above diagram shows a sample section from the main OMR sheet for Adolescent.

Printing and scanning:
Printing and scanning of OMR is a specialized task and it is advisable to do both these tasks with the same vendor to avoid misalignment leading to error. The OMR templates are printed on a 100 or 105 GSM paper with a red ink. While the recommended paper-thickness prevents the scanner from reading marks on the back of the sheet, the red-ink prevents self recognition of the bubble by the scanner.

The marking could be done either by a pencil or a back ball pen. Ink pens are not recommended because the ink penetrating the opposite side of the OMR sheet could produce a false reading. Once the OMR sheet is filled out with marks it is then scanned by a high speed scanner. Preferably a double sided scanner is used which reduces paper usage and does faster scanning (5000-10000 pages per hour).

Best Practices for using OMR technology:
1. Marking Bubbles: It is advisable to mark the entire bubble with either black pencil or ball pen. Completely filling up of the bubbles increases sensitivity of the scanning. Newer scanners also read partially marked bubbles. Any marks on the main sheet beyond the bubbles should be avoided especially on the alignment marks on the sides. Precautions should be taken to avoid overlapping of marks.

2. Avoid Folds: Any folds or twist in the OMR sheet should be avoided as this hinders the scanning process. Slight curve or minor folds is acceptable, but sharp edge folds or torn sides should be eliminated.

3. Transportation damage: Damage during transportation could be avoided by packing the OMR sheets in a hard cardboard box during transit. A hard card board on either side of

the OMR stack is advisable to avoid folds. During field data collection the community worker should use a hard and a water-proof folder to avoid folding and rain.

4. <u>Mark Editing:</u> OMR sheets allow editing using a rubber eraser. During erasing the paper should not be damaged or made thin which might affect the reading quality by exposing the opposite side of the sheet. Pencil is normally advisable as it can be erased easily with the least damage to the OMR sheet.

Resource for Data collection and monitoring:
ICTPH is implementing these best practices through its field partner SughaVazhvu (Implementation partner of ICTPH, 2010). SughaVazhvu has a nurse-managed-doctor-supervised clinic called a Rural Micro Health Centre (RMHC) with one locally resident full-time graduate nurse (with a B.Sc. Nursing degree). These Nurses are involved in monitoring and evaluation of the OMR process. The nurses are supported by a network of thirteen locally hired and trained extension workers (Johar, 2010). These extension workers go to individual households to capture health data on OMR sheet. Each extension worker serves about 200 households or 1000 individual members.

Geography Allocation:
SughaVazhvu is currently using the GPS-marked map developed by Kshetriya Gramin Finance Services (KGFS), a microfinance company operating in Tanjore. KGFS has mapped all the households in the catchment area consisting of 11000 population including information on the household size and individual members like age, relation with the household head etc (Johar, 2010). Based on this information ICTPH came up with Household Roster forms which contain pre-populated household member name and a code. These forms also allow updating the information by the extension work. Example: New members of the family are added (in case new born or adding newly married) and a member who does not exist anymore in the household (in case of death and marriage) is dropped out from the list.

The entire catchment area was divided into 13 hamlets based on geographical distribution spread across 13 extension workers allowing each worker to serve a population of a 1000 people.
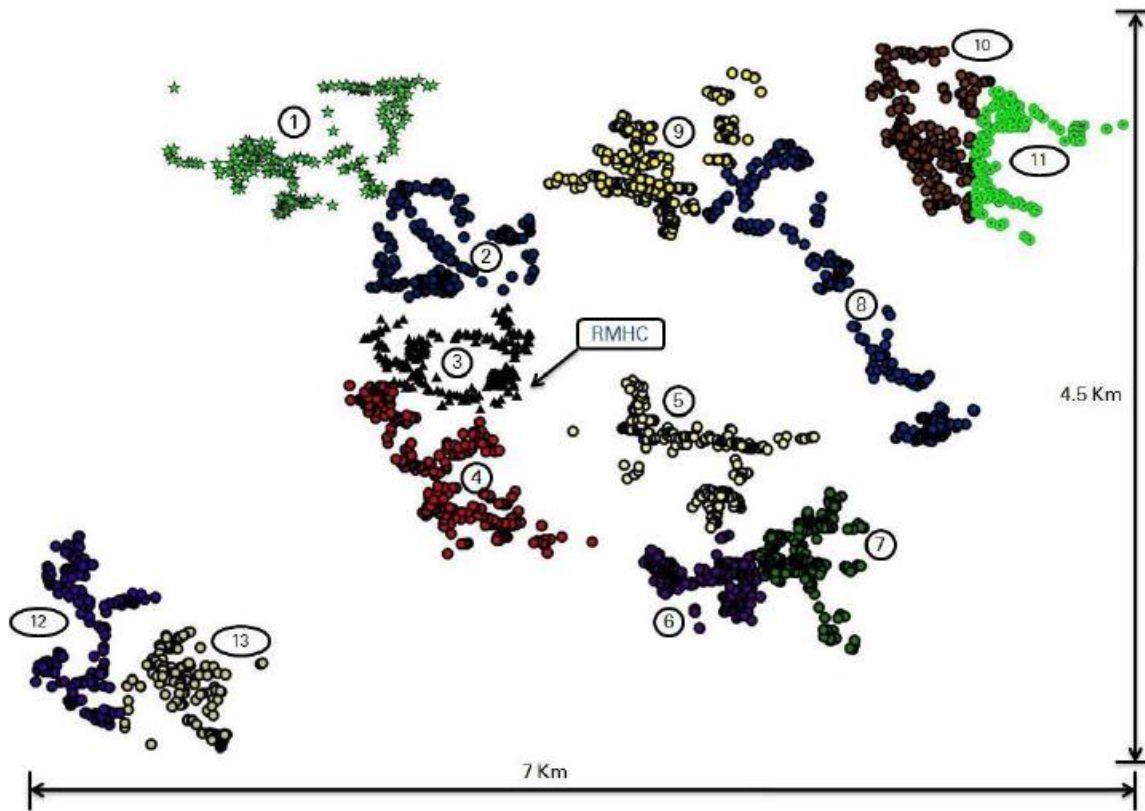
Figure 4: Spatial distribution of the GPS tagged households (2700) defining the catchment area of a Rural Micro Health Centre (RMHC) in Karambayam Village, Thanjavur district, Tamil Nadu, India. The illustrated field represents five villages with a population of 11,000 individuals. Color coded 13 enumerated zones denote the areas allocation for a guide provisioning services to a sub-set population of a 1,000 individuals each. The five village catchment of the RMHC - Karambayam (illustrated area 2-5); Ettuplikadu (6-7); Sembalur (8); Ambalapattu (1 & 9-11); Veppankadu (12-13)

Monitoring and Evaluation:

OMR sheets are dispatched every week to the extension workers as per the allocated Household Roster forms. Records are maintained about the dispatched forms. Once the OMR sheet is filled out by the extension worker they are collected back on a weekly basis. Quick checks on the good practices like folds, overlapping of marks etc. are done and any inconsistencies are eliminated from the batch and feedback is given to the particular extension worker responsible.

Consent form:
Getting consent is the first step to start with data collection by OMR technology. The household consent is taken from the household members after explaining SughaVazhvu's objective. Consent for infant and child is taken from the caregiver. The consent form also captures mobile numbers which could be used later for verification and follow-ups.

OMR training:
A one-day training was organized for all extension workers on the best practices of using OMR sheets. Interestingly, all the extension workers were already accustomed with an OMR sheet during previous Govt. test given by them. This might not be true for other places scoring lower educational status in which case more training would be required.

Accessories for PLSP and OMR sheets:
The extension worker is given a PLSP kit (*Figure 5*) during her visit to household which allows her effective management and usage of different accessories including the OMR sheets. There is a separate section for a hard folder which keeps the OMR sheet in proper condition. It also has a pencil and eraser-holder used for marking and editing OMR marks. There is provision made for essential accessories used in the data collection such as instruments for measuring Blood Pressure, Visual Acuity, Body Mass Index etc.

Figure 5: Community extension worker kit used to carry OMR sheet and other important accessory to fill out OMR forms like pencil, erase for marking and erasing respectively. It also carries other accessories like weighing scale, visual chart, measuring tape etc.

Integration of OMR scanned data with an Electronic Health Record:
Once the OMR sheet is scanned the data is captured into a columnar format that can be viewed and edited in a spreadsheet application such as MS Excel. ICTPH has partnered with Swasth India (Technology partners of ICTPH, 2010) to develop an Electronic Health Record (EHR)

system which acts like a Management Information System. The spreadsheet is picked up by the EHR which allows effective data management and analysis. Example: Any abnormal health symptoms like Blood Pressure, Body Mass Index, Vision acuity etc. raises an alarm which will prompt the healthcare provider to take immediate follow-up.

Report Generation:
A simple report could be also generated by using easily available tools like MS Word. A detailed stepwise process flow is given in (Annexure 2). By this method any column in the excel data dump could be merged with any particular field in the word document.

Process Flow Chart:
At the field the SVG collects health data through OMR which then submitted to the RMHC which acts like a supervising body. These manual data are then sent for scanning and converted into a spreadsheet which is analyzed by the EHR. Risk Assessment Reports are generated by the EHR intelligence system based on which an assessment plan will be designed. A simple assessment report could also be generated by using Java script in Google docs and merging spreadsheet data into a MS Word doc (Annexure 2). This report will be delivered to the household through the assigned SVG which takes around 2-10 days.
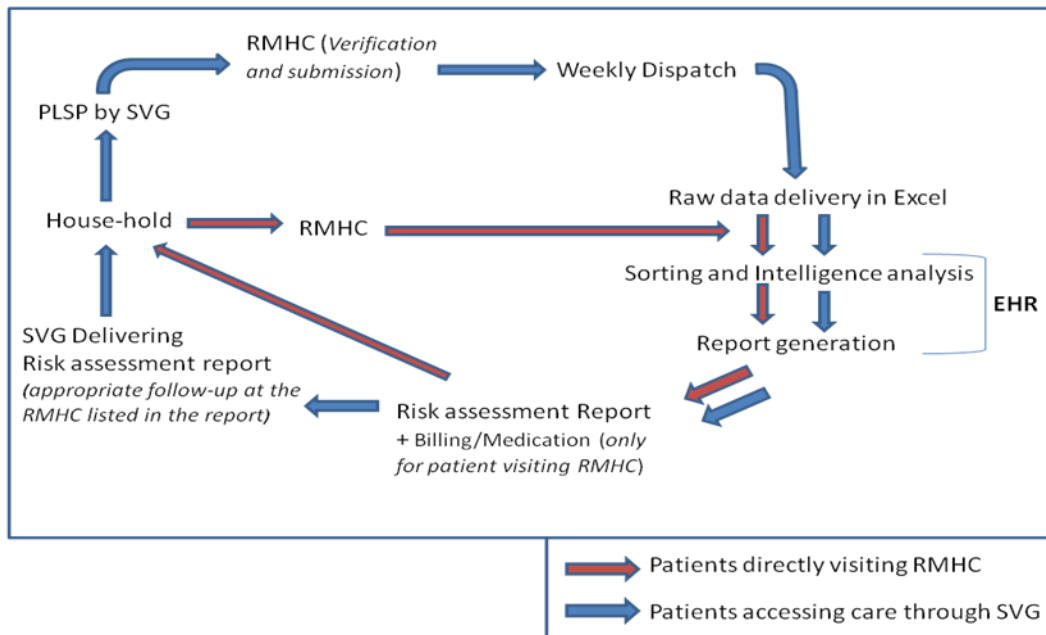
Figure 6: Process flow chart describing OMR data collection and its integration with the EHR. It also describes its relation with the process flow of EHR entry of a patient and report generation.

Limitation of OMR Technology:

Though OMR Technology is an established way of large population level surveys and data collection, it faces some limitations over newer technologies like a Mobile/Handheld device based data collection techniques. Some of the limitations are listed below:

1. <u>Turnaround time:</u> The data collected in the field is not accessible to a large group of people immediately like in case of a mobile based data collection where the data is live. It is accessible only after all the forms are physically converged to a centralized scanning unit.

2. <u>Lack of versatility</u>: OMR can be used only a standalone data collection tool unlike various emerging technologies like GPS, Mobile applications etc.

3. <u>Damaging of OMR sheet</u>: OMR sheets should be carefully handled as any damage on the sheet will lead to errors.

4. <u>Error:</u> OMR logic does not accommodate any error validation logic and any wrong entry cannot be proof-read immediately.

5. <u>Rigidity:</u> Not easy to make changes once the OMR template is already designed.

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Annexure1

ADULT QUESTIONNAIRE OMR SHEET   SIDE - 1

FLAG: THIS QUESTIONNAIRE IS TO BE ADMINISTERED TO A PERSON ABOVE 18 YEARS OF AGE

INFORMATION PANEL

SVG Code | Adult's ID | Date of Interview (DD MM YYYY) | Date of Birth (DD MM YYYY) | Age in completed years

High education completed?
- 0;<5
- 10
- 12
- UG
- PG

Currently in School?
- YES
- NO

Marital status?
- Married
- Widowed
- Divorced
- Separated
- Deserted
- Never married

What has been your main occupation during the past year?
- Daily wage on other people's land
- Cultivation on own land
- Manual labor
- Self-employed, non-farm work
- Government worker
- Non-government worker
- Student
- Homemaker
- Retired
- Unemployed (able to work)
- Unemployed (unable to work)

Blood pressure mmHg

DISEASE SYMPTOMS - Flag : Only ask Q.-302-304 if the answer is YES for Q. 301

Flag: ONLY if YES to Q. 301 ASK:

301. Have you experienced the following conditions in the last month? | 302. Ability affected? | 303. Medical care sought for this condition? Where*? (Medical care location) | 304. Still exists?

Condition:	Yes	No	Yes	No	Medical care location (1–11)	Yes	No
1. Cold symptoms (runny nose,congestion, sneezing)	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
2. Persistent Cough	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
3. Fever	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
4. Diarrhea	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
5. Weakness / Fatique	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
6. Vomiting	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
7. Worms in stool	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
8. Difficulty beathing	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
9. Pain in abdomen	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
10. Genital ulcers	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
11. Painful urination	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
12. swelling ankles	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
13. Difficult hearing	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
14. Skin problems / irritation	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
15. Chest pain	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
16. Paralysis	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
17. Night sweats	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
18. Weight loss	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N
19. Other pain	Y	N	Y	N	1 2 3 4 5 6 7 8 9 10 11	Y	N

IF [ADOLESCENT] IF FEMALE :

Condition:							
20. Menstrual problems (pain irregularity, heavy bleeding)	1	2	1	2	1 2 3 4 5 6 7 8 9 10 11	1	2
21. Abnormal discharge (bad odour, change in colour)	1	2	1	2	1 2 3 4 5 6 7 8 9 10 11	1	2

F [ADOLESCENT] IF MALE :

Condition:							
23. Abnormal penile discharge (bad odour, change in colour)	1	2	1	2	1 2 3 4 5 6 7 8 9 10 11	1	2

*Code for Medical Help: Did not seek care =01,PHC=02,Government hospital=03, Private Hospital = 04, Charitable Hospital =05, Private doctor (MBBS) = 06 Homeopathic or Ayurvedic doctor =07, Unani =08, Unqualified doctor =09, Drug story / Pharmacy =10, Other =11.

305   Interviewer checkpoint : Was the answer Yes to any question under Q.304?   Yes (Refer to RMHC for check-up)   ◯   No   ◯

4. PERSONAL ILLNESSES - Fleg Only ask Q.402 and Q.403 if the answer is YES for Q.401

401-403   Flag:401. Has a health worker ever told you that you have?; 402. Did you have surgery for this?; 403. Any non-surgical treatment received?

Condition :	401. Yes	No	DK	402. Yes	No	403. Yes	No	Condition :	401. Yes	No	DK	402. Yes	No	403. Yes	No
1. Heart disease	Y	N	DK	Y	N	Y	N	7. Tuberculosis	Y	N	DK	Y	N	Y	N
2. High BP	Y	N	DK	Y	N	Y	N	8. Cancer	Y	N	DK	Y	N	Y	N
3. Diabetes/High blood sugar	Y	N	DK	Y	N	Y	N	9. HIV / AIDS	Y	N	DK	Y	N	Y	N
4. High cholesterol	Y	N	DK	Y	N	Y	N	10. STD	Y	N	DK	Y	N	Y	N
5. Liver disease	Y	N	DK	Y	N	Y	N	11. Trauma	Y	N	DK	Y	N	Y	N
6. Respiratory disease	Y	N	DK	Y	N	Y	N	12. Seizure disorder	Y	N	DK	Y	N	Y	N

5. FAMILY HISTORY

501 Has a health professional ever told any of your immediate family members (mother, father, sisters, brothers) that they have:

Condition :	Yes	No	Don't know	Condition :	Yes	No	Don't know
1. Heart disease	Ⓨ	Ⓝ	ⒹⓀ	6. Respiratory disease	Ⓨ	Ⓝ	ⒹⓀ
2. High Blood Pressure	Ⓨ	Ⓝ	ⒹⓀ	7. Tuberculosis	Ⓨ	Ⓝ	ⒹⓀ
3. Diabetes/High blood sugar	Ⓨ	Ⓝ	ⒹⓀ	8. Cancer	Ⓨ	Ⓝ	ⒹⓀ
4. High cholesterol	Ⓨ	Ⓝ	ⒹⓀ	9. HIV / AIDS	Ⓨ	Ⓝ	ⒹⓀ
5. Liver disease	Ⓨ	Ⓝ	ⒹⓀ	10. Seizure disorder	Ⓨ	Ⓝ	ⒹⓀ

6. SEXUAL AND REPRODUCTIVE HEALTH

601 Are you aware about contraception methods? Yes ◯ No ◯	**602**	Do you use any contraception methods? Yes ◯ No ◯ DK ◯

Interviewer Checkpoint: Ask Q.603 - Q.608 only if [ADULT] is **FEMALE** and has **ever been married**

603 Are you currently pregnant?   Yes (Refer to RMHC) ◯   No (Skip to 605) ◯   Don't know (Skip to Q.605) ◯

604 Do you receiving any antenatal care?   Yes ◯   No ◯

605 How many times have you been pregnant? **Flag:** include current pregnancy, if applicable, and pregnancies that didn't result in a live birth   ⓪①②③④⑤⑥⑦⑧⑨⑩⑪⑫

606 How many children have you delivered? **Flag:** include all live births, even if child died afterwards.   ⓪①②③④⑤⑥⑦⑧⑨⑩⑪⑫

607 Have you ever had any miscarriage, abortions, or stillbirths?   Yes ◯   No (Skip to Section 7) ◯   Don't know (Skip to Section 7) ◯

608 How many miscarriages, abortions or stillbirths have you had?   ⓪①②③④⑤⑥⑦⑧⑨⑩⑪⑫

7. SMOKING HABITS

701 Have you ever chewed tabacco? Yes ◯ No (Skip to 703) ◯	**702**	Do you currently chew tabacco? Yes ◯ No ◯
703 Have you ever smoked tabacco? Yes ◯ No (Skip to Section 8) ◯	**704**	Do you currently smoked tabacco? Yes ◯ No (Skip to Section 8) ◯

705 How soon after you wake do you smoke your first cigarette?   After 60 minutes [0] ◯   31-60 minutes [1] ◯   6-30 minutes [2] ◯   Less than 5 minutes [3] ◯

706 Do you find it difficult to refrain from smoking where it is forbidden? No ◯ Yes ◯	**707**	Which cigarette would you most hate giving up? First in the Morning[1] ◯ Any Other [0] ◯

708 How many cigarettes per day do you smoke?   10 or less [0] ◯   11 - 20 [1] ◯   21 - 30 [2] ◯   More than 30 [4] ◯

709 Do you smoke more frequently during the first hours after awakening than during the rest of the day? No ◯ Yes ◯	**710**	Do you smoke even if you are so ill that you are in bed most of the day? Yes ◯ No ◯

711 **Flag:** Calculate total score by summing up all responses for Q.705-Q.710   ⓪①②③④⑤⑥⑦⑧⑨⑩

712 **Flag:** Assign to risk category and inform [ADULT] of result   Very low (0-1) ◯   Low (2-4) ◯   Moderate (5) ◯   High (6-7) ◯   Very High (8-10) ◯

8. ALCOHOL CONSUMPTION

Flag: for drink units definitions refer to the card provided in the Liver and Alcohol guide

801 Have ever consumed alcohal? Yes ◯ No (Skip to Section 9) ◯	**802**	Do you Currently consume alcohal? Yes ◯ No ◯

	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
803 How often do you take more than (6 drink units for women and 8 drink units for men) on one occasion?	◯	◯	◯	◯	◯
804 How often during the last year have you been unable to remember what happened the night before because you had been drinking?	◯	◯	◯	◯	◯
805 How often during the last year have you failed to do what is normally expected of you because you have been drinking?	◯	◯	◯	◯	◯
806 In the last year, has a relative, friend, or health worker been concerned about your drinking or suggested you cut down?	◯	◯	◯	◯	◯

807. Flag: Calculate total score by summing up all responses if Score >3, refer to RHMC   ⓪①②③④⑤⑥⑦⑧⑨ ⓪①②③④⑤⑥⑦⑧⑨

9. BMI - Flag: FOR COMPLETING THIS SECTION, FOLLOW THE BMI AND HEALTH GUIDELINES

	Height in centimeters	Weight in kilograms	Waist circumference in centimeters
901 **902** **903**	⓪⓪⓪ ①①① ②②② ③③③ ④④④ ⑤⑤⑤ ⑥⑥⑥ ⑦⑦⑦ ⑧⑧⑧ ⑨⑨⑨	⓪⓪⓪ ①①① ②②② ③③③ ④④④ ⑤⑤⑤ ⑥⑥⑥ ⑦⑦⑦ ⑧⑧⑧ ⑨⑨⑨	⓪⓪⓪ ①①① ②②② ③③③ ④④④ ⑤⑤⑤ ⑥⑥⑥ ⑦⑦⑦ ⑧⑧⑧ ⑨⑨⑨

10. VISUAL ACUITY - FLAG: FOR COMPLETING THIS SECTION, FOLLOW THE EYE AND VISUAL ACUITY GUIDELINES.

		6/6	5/6	4/6	3/6	2/6	1/6	CF	HM	Blind
1001	Right Eye	6	5	4	3	2	1	10	11	0
1002	Left Eye	6	5	4	3	2	1	10	11	0

If less then 6/6 refer to optician

11. BLOOD PRESSURE (SECOND) - FLAG : FOR COMPLETING THIS SECTION, FOLLOWING THE HEART AND BLOOD PRESSURE GUIDELINES

1101   Blood pressure (Second) mmHg   ___ / ___

⓪⓪⓪ ⓪⓪⓪
①①① ①①①
②②② ②②②
③③③ ③③③
④④④ ④④④
⑤⑤⑤ ⑤⑤⑤
⑥⑥⑥ ⑥⑥⑥
⑦⑦⑦ ⑦⑦⑦
⑧⑧⑧ ⑧⑧⑧
⑨⑨⑨ ⑨⑨⑨

Annexure 2

Step-1

Step-2

Step-3

Step-4

Step-5

Step-6

Step-7

Step-8