Population based –
Individual Screening Protocol for Rural Indian Populations

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Introduction

1. Response to Chronicity

The WHO Health Systems framework (WHO, 2007) defines six components of a Health System – service delivery; health workforce; information; medical products, vaccines & technologies; financing; leadership and governance. Within this framework, the evolving '*chronicity*' (long duration and slow progression) of the global disease burden requires a highly integrated response to provide continuum of healthcare, within a population, that does not have tertiary care as its focal point (Allotey, 2010) but community based care. In 2000, the World Health Assembly endorsed a three component global strategy (WHO, 2005) for the prevention and control of non-communicable diseases comprising of (i) surveillance to track and monitor major risk factors, (ii) promotion of health to reduce these risk factors and (iii) improved management to promote access to healthcare (Alwan, 2010). Tobacco use and excess weight (body mass index ≥25) were reported as key risk factors for non-communicable diseases (Alwan, 2010) (Prospective Studies Collaboration, 2009) that needed to be urgently dealt with by the "new" health system.

It is indeed the case that prevention, treatment and management of chronic diseases entails a core set of interventions – primary prevention, proactive high-risk case identification (through routine screening and assessment of risk factors), education, efficient referrals, pharmacological and psychosocial interventions, long term surveillance, and monitoring and assessment of quality of care (Samb, 2010). In a health system designed to address the double burden of infectious and chronic disease and implement this set of interventions, Health Extension Workers (HEWs) are needed to bring care close to the community and play a critical part in early detection and support for long-term self-management and home-based care (Samb, 2010). The behavioural risk factors for chronic diseases closely linked with obesity are diet and physical inactivity. Improving diet and increasing physical activity are cost-effective interventions when dealt with at a policy level e.g. pricing interventions, regulation of food advertising (Cecchini, 2010) (Geneau, 2010). However, strategies targeting individuals e.g. tobacco control, salt reduction, and a multi-drug strategy to treat individuals with high-risk cardiovascular diseases have strong support in terms of cost-effectiveness for scale-up in low and middle income countries (Gaziano, 2007) (Asaria, 2007).

2. Definition of Screening

It is clear from the above discussion that treatment of chronic diseases needs a number of steps to be taken at the community level of which the very first one is screening. The World Health Organization (WHO) defines screening as the "presumptive identification of unrecognized disease or defects by means of tests, examinations or other procedures that can be applied rapidly". The Australians state

that the aim of screening for a disease or a risk factor is to reduce the burden of the disease in a community including incidence of disease, morbidity from the disease or mortality (Population Based Screening Framework, Screening Subcommittee, Australian Population Health Development Principal Committee, 2008).

The USPSTF (U.S. Preventive Services Task Force Grade Definitions, 2008) graded recommendations allow standard evidence based format for preventive/screening protocol development within a nation specific context. As listed by the USPSTF the Grade A&B recommendation across various risk groups are:

1. Adults (USPSTF A and B Recommendations, 2010): Blood pressure screening (aged 18 years and older); cholesterol abnormalities screening (men - 35 years and older; women - 45 years and older); cervical cancer screening in women who have been sexually active and have a cervix; tobacco use counselling and tobacco cessation interventions for those using tobacco products; colorectal cancer screening (adults beginning at the age of 50 years until age 75 years); HIV and syphilis screening for persons at increased risk; Chlamydia infection screening for women (sexually active, aged 24 years and younger, for older women at increased risk)

2. Pregnant Woman (USPSTF A and B Recommendations, 2010): Bacteriuria screening, Hepatitis-B screening at first prenatal visit, Rh (D) blood typing and antibody testing, syphilis screening, tobacco use and counselling (providing augmented pregnancy tailored counselling to those who smoke) Chlamydia infection screening for women (aged 24 years and younger, for older women at increased risk)

3. New Born Infants (USPSTF A and B Recommendations, 2010): Hemoglobinopathies (sickle cell disease) screening; congenital hypothyroidism and Phenylketonuria (PKU) screening

The WHO STEPS surveillance protocol also details the risk factors to be assessed periodically for chronic disease management (WHO, 2005). The WHO STEPS instrument for chronic disease risk-factor surveillance (WHO, 2005) allows for a careful design through screening of non-invasive parameters e.g. demographic information, physical activity assessment, personal medical history, physical non-invasive parameter measurement e.g. height, weight, waist circumference, hip circumference, blood pressure and heart rate by a non-medical provider in a non-clinical setting. Biochemical measurements e.g. blood glucose, blood lipids, triglycerides and HDL Cholesterol as recommended in the STEPS instrument can be performed in a clinical setting.

Despite evidence of their effectiveness, the delivery of preventive services continues to remain relatively low. In a US based study it was estimated that 7.4 hours per working day of physician's time was required to provision USPSTF Grade A&B recommended services to a population of 2,500 individuals defining a typical practice (Yarnall, 2003). Whereas, for only Grade-A recommended services the time

implication is estimated at approximately 2 hours per working day (Yarnall, 2003). This study further substantiates the case for task-shifting routine screening activities towards HEWs and establishing effective referral pathways for '*high-risk*' individuals.

3. ICTPH Health Systems Approach

This paper details the age-specific evidence based protocol as assembled by the authors – all of whom are senior researchers at the IKP Centre for Technologies in Public Health (ICTPH). ICTPH is a not-for-profit research organization with its mission to innovate health-systems designs for remote rural populations (ICTPH, 2010) (ICTPH Epidemiology Data Set, 2010) – particularly those that are facing the dual burden of disease mentioned earlier. The Health Systems approach at ICTPH aims to redefine primary healthcare towards an inclusive continuum, accommodating evolving chronicity (Johar, ICTPH Health Systems Approach, 2010). The four elements defining the ICTPH Health Systems approach are human resource, infrastructure, technology, and financing.

Provisioning enhanced diagnostic capability through the village-based Rural Micro Health Centre (RMHC) allows for optimum condition management. Basic haematology, biochemistry, ophthalmology, curative care, intervention management are provisioned through a RMHC for a population of 10,000 people through a village-based nurse and a network of health extension workers (Johar, Financing Health Systems, 2010) (Johar, Provisioning Ophthalmic Care for Remote Rural Indian Populations, 2010) (Mor, 2010). The village-based RMHCs anchor multiple functions, wherein establishing a relationship focused on '*Wellness*' with the household is of utmost importance. Wellness as defined within the ICTPH Health Systems context, not only provisions curative services for management of acute conditions but also *risk-profiles populations* targeting secondary prevention at a population level. Identified *high-risk groups* are then exclusively targeted for provisioning specific interventions e.g. iron/folic acid supplementation through sprinkles for 6 month – 24 month old infants.

4. Plan of the Paper

This paper aims to detail the *individual risk-profiling protocol* as developed and implemented at the population level through a network of health extension workers within the ICTPH Health Systems context as implemented in close collaboration with its Thanjavur, Tamil Nadu based partner SughaVazhvu Healthcare (SughaVazhvu Healthcare, 2010).

Population based Individual Screening Protocol (PISP)

The Population based Individual Screening Protocol (PISP) as assembled by ICTPH aims to screen all individuals of a household using a special tool which is implemented by hamlet-based HEWs (referred to as the ICTPH Guide (Chockalingam, 2010). In concordance with several international screening guidelines which are primarily age-specific the PISP approach also targets four age groups within the intervened population – Adult (all individuals above 18 years of age); Adolescent (all individuals between 10 years – 18 years of age); Child (all individuals between 2 years to 10 years of age); and Infant (all individuals below 24 months of age).

Effective implementation of a high quality screening programme requires the development of a household roster and obtaining consent from the individuals that are sought to be screened.

1. Household Roster: Within the Karambayam, Thanjavur, Tamil Nadu context wherein PISP was implemented in close collaboration with SughaVazhvu (SughaVazhvu Healthcare, 2010), basic demographic details of a household entailing the name, age, gender, relationship to a pre-defined family head, address including GPS coordinates were obtained from Kshetriya Gramin Financial Services (KGFS) a local financial institution (IFMR Trust, 2008), which they shared with us after obtaining the consent of the households served by them – no financial or economic information about the household was obtained from KGFS. Using the geo-tagged data and GIS technology, each one of the twelve HEWs were allocated a set of households that they would serve (ICTPH Guide; Lakshmanan, 2010) within the overall catchment population of 10,000 people for the RMHC, allowing proximate household allocation of approximately 200 households for each Guide. Pre-populated household specific rosters accompanied the age-specific PISP Optical Mark Recognition (OMR) sheets, along with the ICTPH Guide Kit (Das, Optical Mark Recognition Technology for Rural Health Data Collection, 2011), providing her with relevant demographic details and equipment for acquiring PISP related information.

2. Consent Form: Consent using a Standardised Form was obtained from all the PISP assessed members of a household, though either a signature or a thumb impression. For all PISP assessed infants, children and adolescents consent was obtained from their respective caregivers.

The following sections briefly describe the Tool used for each age group mentioned earlier. The Appendices have more detailed descriptions.

1. Population based Individual Screening Protocol (PISP) – ADULT (Appendix 1)

a. *Additional Demographic:* The code for the health extension worker, and individual ID as indicated in the household roster, date of birth, age completed in years, education status (illiterate, matriculate,

higher secondary, graduate, post graduate), currently enrolled in school, marital status, occupation in the last one year (daily wages on other people's land, cultivation on own land, manual labor, self-employed non-farm work, government employee, non-government employee, student, homemaker, retired, unemployed (able to work), unemployed (unable to work) are cited as independent fields on the PISP OMR sheet.

b. _Anthropometric Measurement:_ Height and weight for all individuals computing the Body Mass Index (BMI) (only exception for BMI computation – pregnant female) along with waist circumference (Dobbelsteyn, 2001) (Prospective Studies Collaboration, 2009) were measured using a measuring tape, weighing scale, cardboard slab and a marking pencil. The normal cut-off for waist circumference was < 80 cm for women and < 90 cm for men (WHO, 2000). The normal BMI range for adults was defined as 18.5 – 25 (with an additional cut-off at 23 for Asian populations). BMI of < 18.5 was categorized as underweight, BMI range of 26 – 29 as overweight, and BMI of ≥ 30 as obese (WHO, 2000).

Figure 1: A snapshot of the PISP Adult tool in Tamil. This PISP tool has been implemented in Thanjavur, Tamil Nadu by one of the health extension workers in her routine PISP beat in her catchment area.

c. _Blood Pressure:_ Two blood pressure measurements for all individuals using a mercury sphygmomanometer separated by a minimum of 30 minutes were obtained (USPSTF Screening for High Blood Pressure, Topic Page, 2007).

d. _Acute Conditions_: Through a home-based assessment of common acute conditions, the PISP protocol aims to identify individuals requiring immediate medical attention. Other than an extensive listing of common acute conditions, their onset in the last month, debilitating effect, treatment sought were also recorded. If the individual reports current existence of the reported symptoms immediate referral to a healthcare provider by the health extension worker is recommended. A listing of acute conditions - persistent cough, fever, diarrhoea, weakness, fatigue, vomiting, worms

in stool, difficulty breathing, pain in abdomen, genital ulcers, painful urination, swelling ankles, difficulty hearing, skin problems/irritation, chest pain, paralysis, night sweats, weight loss, other. *Additional female*: menstrual problem (pain, irregularity, heavy bleeding), abnormal discharge (bad odour, change in colour). *Additional male*: Abnormal penile discharge (bad odour, change in colour) (Banerjee, 2010).

e. *Personal Illness*: A recall based approach to record personal illness allows appropriate risk profiling of an individual for chronic conditions. Related surgical/non-surgical intervention, along with current treatment sought is also recorded. A listing of conditions assessed - heart disease, high blood pressure, diabetes/high blood sugar, high cholesterol, liver disease, respiratory disease, tuberculosis, cancer, HIV/AIDS, STD, trauma, seizure disorder.

f. *Family History*: A recall based approach to record family (mother, father and/or siblings) illness allows close assessment of acquired risk. A listing of conditions assessed - heart disease, high blood pressure, diabetes/high blood sugar, high cholesterol, liver disease, respiratory disease, tuberculosis, cancer, HIV/AIDS, STD, trauma, seizure disorder.

g. *Sexual and Reproductive Health*: Other than a query assessing the awareness and usage of contraceptive methods, this section entails to assess the reproductive health of a female. If the female reports a pregnancy an immediate referral to a healthcare facility for ante-natal care (ANC) is recommended. Other queries aim to assess if ANC is being currently sought, previous birth history of the female, including miscarriage, abortions and still-births.

h. *Smoking Habits*: The PISP nicotine dependence assessment is an adaptation of the Fagerstrom Tolerance Questionnaire (Heatherton, 1991) incorporating tobacco consumption through chewing. The nicotine dependence through smoking, as assessed through a score follows the standard Fagerstrom protocol (Heatherton, 1991).

i. *Alcohol Consumption*: The PISP alcohol consumption assessment is an adaption of the FAST Alcohol Screening Test (Hodgson, 2002). A clear scoring mechanism as illustrated in the FAST tool allows careful assessment of hazardous alcohol consumption within the population (Hodgson, 2002).

j. *Visual Acuity*: The PISP protocol aims to assess myopia related refractive error leading to vision impairment using a Snellen Chart, and a 6mt long string, with markings at 1mt each, so as to move the patient closer to the Snellen chart in units of a meter each on reporting compromised reading capability beginning at 6mt. Upon reporting a compromised visual acuity of $< 6/6$ a referral to a healthcare provider is recommended by the health extension worker i.e. ICTPH Guide.

2. Population based Individual Screening Protocol (PISP) – ADOLESCENT (Appendix 2)

The Adolescent PISP Tool (for individuals of 10 years – 18 years of age) is primarily an adaption of the Adult PISP Tool. Within the demographic details an additional field to capture the Caregiver's ID was incorporated to ensure the consent of an adult/caregiver was obtained while the Adolescent PISP tool is implemented by the Health Extension Worker. The Sexual and Reproductive Health section is a slight adaptation of the Adult Tool.

Following the USPSTF recommendations for screening blood pressure (BP) at the population level (USPSTF Screening for High Blood Pressure, Topic Page, 2007) BP was excluded from the PISP Adolescent Tool. The Fagerstrom Tolerance Questionnaire (Heatherton, 1991) and FAST Alcohol Screening Test (Hodgson, 2002) are both recommended for adult populations (18 years and above of age) hence, a simplified adaption without any scoring capability was incorporated in the PISP Adolescent Tool.

For the adolescent population z-scores for BMI for age as defined by WHO were used to define standard PISP cut-off range (WHO, 2011). Waist Circumference was not measured for adolescents, in accordance for recommended guidelines. All the other sections of the Adolescent PISP Tool follow the Adult PISP Guidelines.

3. Population based Individual Screening Protocol (PISP) – CHILD (Appendix 3)

The PISP Child Tool is a further adaptation of the PISP Adolescent Tool accommodating an additional section detailing episodic occurrence of common childhood illness i.e. measles, chicken pox, mumps and polio. The sexual & reproductive health section, the smoking and alcohol history section as detailed in the PISP Adolescent Tool were deleted from the PISP Child Tool. The acute conditions section was also simplified further excluding menstrual and penile discharge sections as explained previously.

For child population ranging from 2 years – 10 years of age the z-scores for weight for age, and height for age, as defined for boys and girls by WHO were used to define standard PISP cut-off range (WHO, 2011).

4. Population based Individual Screening Protocol (PISP) – INFANT (Appendix 4)

The PISP Infant Tool was assembled to primarily focus on birth history, feeding practices, immunization, along with other parameters listed in the PISP Child Tool.

Detailed birth history is sought including:
a. Place of delivery - at home, government hospital, government health centre, private hospital/clinic

b. Antenatal Care (ANC): *provider*: health professional/doctor, nurse/midwife, traditional birth attendant, no care sought; *Health-check-up*: at home, government hospital, government health centre, private hospital clinic

c. Birth weight – if possible from a standard infant delivery card, or else recall

d. Immunization history as per the WHO India guidelines for - Polio, DPT, BCG, Measles, MMR (WHO India, 2011)

The acute conditions and the childhood illness section remain the same as detailed in the PISP Child Tool. For infant population < 2 years of age the z-scores for weight for age and height for age, as defined for boys and girls by WHO were used to define standard PISP cut-off range (WHO, 2011).

The breast feeding practice, exclusivity, and frequency; complementary feeding – initiation, pattern, and feeding practice is assessed using the *WHO tool for assessing infant and young child feeding practice* (WHO, 2008). The WHO tool is recommended as an indicator for population level assessment of infant and young child feeding practices (WHO, 2008). A clear recommendation towards usage of the WHO tool for large-scale surveys and national programs, and against indicator definition translation into caregiver messaging is noted (WHO, 2008). This limits PISP towards making individual caregiver specific diet recommendation upon assessment.

Human Resource facilitation for PISP

Within the ICTPH Health Systems context primarily two levels of human-resource are necessary at the village level. Each village-based RMHC is managed by a nurse, servicing a population of 10,000 people and for every 1,000 people (primarily a hamlet within the village context) a local health extension worker is required (Lakshmanan, 2010). The RMHC is supervised by an assigned medical practitioner overseeing all provisioned curative care, along with anchoring other activities. The health extension worker referred to as *Guide* within the ICTPH Health Systems context is the primary anchor point of the population to the Health System.

The tasks of a *Guide* primarily entail individual screening at the population level, intervention implementation, clinical rotation at the RMHC and follow-up care. Amongst all of these, individual screening establishes her status within the community, through methodically approaching households within her service area. This allows her an opportunity to carefully assess the profile of all screened individuals and categorize them within assigned risk-groups.

The integrated data-collection platform allows a smooth flow of accumulated information to the RMHC based individual electronic health record (hosting personal, demographic (geo-tag), family history and health information) allowing automated analysis and risk-profiling of all individuals within a household.

The analyzed individual health assessment reports are then delivered back to the household with a turn-around time of a week, with automated individual risk-factor specific recommendations. The recommendations are further detailed by the *Guide* to various members of the household reiterating the message to prioritized '*high*' risk individuals. The individualized recommendations allows an opportunity to the *Guide* to establish a trusting rapport across all age groups within the household allowing her to stress the urgency to follow-up based on individualized risk exposures.

Within the ICTPH Health Systems approach, a through community understanding is attained through methodically interacting and assessing *all* members of the community. This not only allows a deeper understanding of the serviced population to the healthcare provider but also empowers resident individuals with pertinent health information.

Technology facilitation for PISP

Among various data collection technologies, Optical Character Recognition (OCR), Optical Mark Recognition (OMR) and conventional manual data entry methods were evaluated. For PISP implementation considering the cost, turnaround time, error rates and responses from other user group, OMR emerged as the preferred choice in the short-run (Das, Optical Mark Recognition Technology for Rural Health Data Collection, 2011) (Das, Data collection and technology, 2010). Going forward the intent is to switch to mobile phone based data entry technologies which will enable the reduction in the error rates and the level of latency (delay between data entry and printing of final analysis).

Figure 2 shows the process-flow protocol for completing a PISP cycle, i.e., assessing an individual in a household to risk-assessed report delivery as a multi-step process with a current turn-around time of two weeks. The PISP-OMR forms are collected weekly by the Guide supervisor and are sent for scanning, and error checking to the technology team. The scanned results of the PISP-OMR are obtained in a tabular, excel sheet format as shown in *Table-1*. The excel sheets are then integrated with the Electronic Health Record (EHR) portal, wherein household specific individual information is mapped to the demographic information as obtained from KGFS, and detailed in the Household Roster section of this paper.
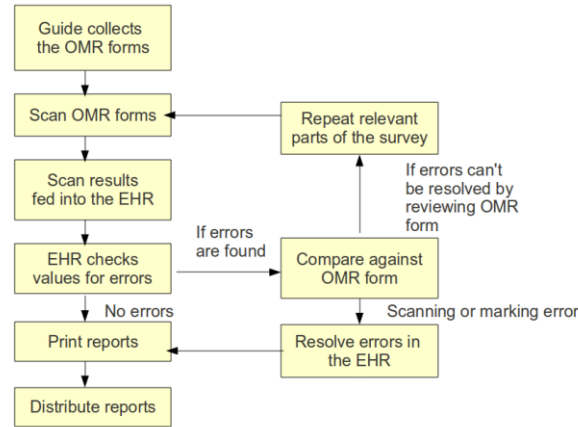
Figure 2: The process flow protocol for PISP. OMR sheets collected weekly, by the Health Extension Worker (ICTPH – Guide) supervisor, forwarded for scanning and error checking to the technology vertical, back-checks conducted if deemed necessary, validated PISP-OMR processed for automated reporting as generated through the ICTPH Electronic Health Record (EHR) portal and delivered to the relevant household through the Guide network.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	Form_No	F101	F102	F103	F201D	F201M	F201Y	F301D	F301M	F301Y	F401	F501	F601	F701	F801	F90
2	0000001122	03	3748203	3748202	13	12	2010	16	12	1995	14	6	3	Y	N	Y
3	0000001123	03	3748204	3748202	13	12	2010	02	03	2000	10	6	1	Y	Y	Y
4	0000001124	07	205905	205901	06	11	2010	02	03	1996	14	6	3	N	N	N
5	0000001125	07	183004	183001	09	11	2010	24	04	1993	17	6	3			
6	0000001126	07	183005	183001	09	11	2010	11	06	1997	13	6	2	Y	Y	Y
7	0000001127	07	203903	203901	09	11	2010	01	05	1998	12	6	2	N	N	N
8	0000001128	07	176405	176401	07	11	2010	06	12	1994	16	6	3	N	N	N
9	0000001129	07	2920*	29201	30	10	2010	21	19	1998	12	6	2	Y	Y	Y
10	0000001130	01	790307	790301	12	11	2010	23	03	2001	08	6	1	N	N	N
11	0000001131	01	796603	796601	26	11	2010	09	01	1998	11	6	2	N	N	N
12	0000001132	08	191804	191801	27	11	2010	12	02	1993		6	3	N	N	N
13	0000001133	08	184103	184102	01	12	2010	23	01	1996	15	6	3	N	N	N

Table 1: A snapshot of the excel data dump of the scanned PISP – OMR sheets. The excel sheets are then merged with the back-end household specific individual database in the Electronic Health Record (EHR) portal for further analysis and processing.

Post the OMR-PISP and demographic data mapping within the EHR, the hamlet specific Guide information is also mapped to the data. Automated error checking of the data within cut-off limits as defined in _Table-2_ for BMI, blood pressure, waist circumference, nicotine and alcohol dependence are applied. For most other fields within PISP e.g. acute conditions, family history etc. are primarily recall

based binary fields with a yes/no reporting. These are checked for skip-logics, empty fields and gender consistency e.g. female reporting penile discharge, male pregnancies are flagged as errors.

The error checking stage is followed by automated risk analysis through the EHR. Based on the cut-offs defined in *Table-2* pre-determined messaging for various levels of identified risk along with specific recommendations are tagged to the individual report. For example, relating to blood pressure three levels are defined, normal, high and very high. Individuals with very-high blood pressure are prioritized for follow-up and are strongly recommended to seek medical attention given the associated probability of hypertension. Similarly for pregnant women, a strong ANC recommendation is made through the PISP report. Existing acute-conditions are also recommended for attention from a medical practitioner.

BMI		Blood Pressure	
Range	**Assessment**	**Range**	**Assessment**
< 10 or > 40	ERROR	<60/30 or >300/150	ERROR
10 - 14.9	Very Low	120/80	Normal
15 - 18.4	Low	>120/80 and <140/90	High
18.5 - 22.9	Normal	>140/90	Very High
23 - 24.9	Above Normal	**Nicotine Dependence**	
25 - 29.9	High	**Score**	**Assessment**
30 - 40	Very High	≤ 3	Low Risk
Waist Circumference		3 - 7	High Risk
Range	**Assessment**	7 - 10	Very High Risk
> 80 cm (Female)	High	**Alcohol Dependence**	
> 90 cm (Male)	High	**Score**	**Assessment**
		> 3	High Risk

Table 2: Risk definition for five conditions as protocolized in the Electronic Health Record (EHR) portal for automated risk analysis for PISP assessed individuals. Height & weight (computing the BMI), waist circumference, blood pressure, nicotine dependence as implemented through the Fagerstrom Score (Heatherton, 1991), and alcohol dependence as implemented through the FAST Score (Hodgson, 2002)

As shown in *Fig. 3*, the mapped OMR-PISP and demographic information in the EHR post error checking and risk-profiling are assembled together as individual reports. The household specific individual reports are consolidated together in the household folder which is delivered back to the respective household through their hamlet specific guide.
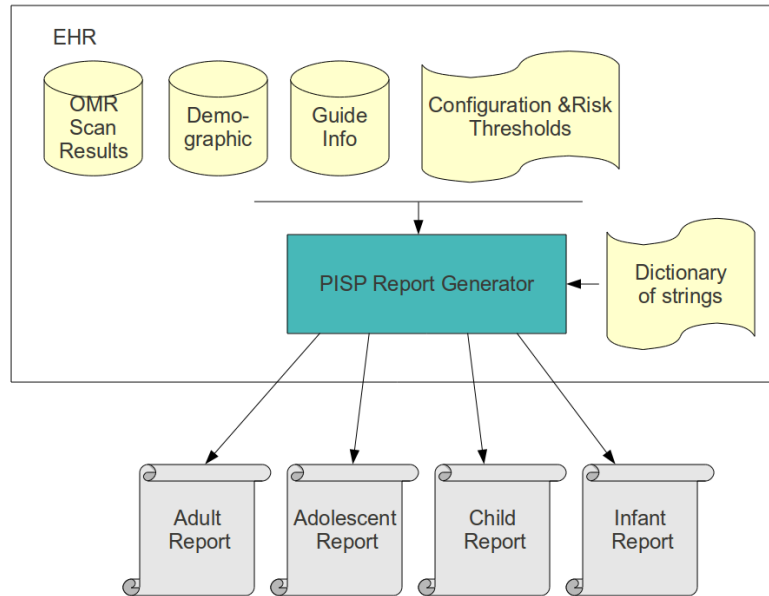
Figure 3: Automated report processing protocol for PISP screened individuals. The scanned PISP-OMR sheets are mapped to respective demographic and Guide details, as obtained from the household specific individual database in the Electronic Health Record (EHR) portal. Pre-configured risk analysis of all PISP assessed individuals yielding age-specific PISP risk assessment report generation.

PISP – An Early Snapshot from Karambayam, Tamil Nadu

The PISP tools, as developed by ICTPH for four different age groups, were implemented in close collaboration with SughaVazhvu Healthcare, Thanjavur, Tamil Nadu (SughaVazhvu Healthcare, 2010). The Karambayam Rural Micro Health Centre, servicing a population of 10,000 people along with a network of 12 Health Extension Workers implemented the PISP tool, following a pre-specified beat in October 2010.

Fig. 4 illustrates the CVD risk-profiles of 547 adults based on their PISP assessment, as collected through the first-batch of PISP-OMR in the first two weeks of PISP implementation in Karambayam through Health Extension Workers. The three risk parameters indicated are BMI, blood pressure and waist circumference. 16% of adult population was assessed with high blood pressure, with an additional 5% of the adult population with very high blood pressure indicating the need of an immediate therapeutic intervention (risk classification categories for high and very-high blood pressure as listed in _Table-2_),

27% with high BMI (joint representation of high and very-high BMI categories as listed in *Table-2*), 30% with low BMI (joint representation of low and very-low BMI categories as listed in *Table-2*), and 24% with high waist circumference (joint representation of male and female WC categories as listed in *Table-2*). Other PISP assessment risk indicators that also contribute towards an individual's CVD risk score are family history, personal history, age and sex.
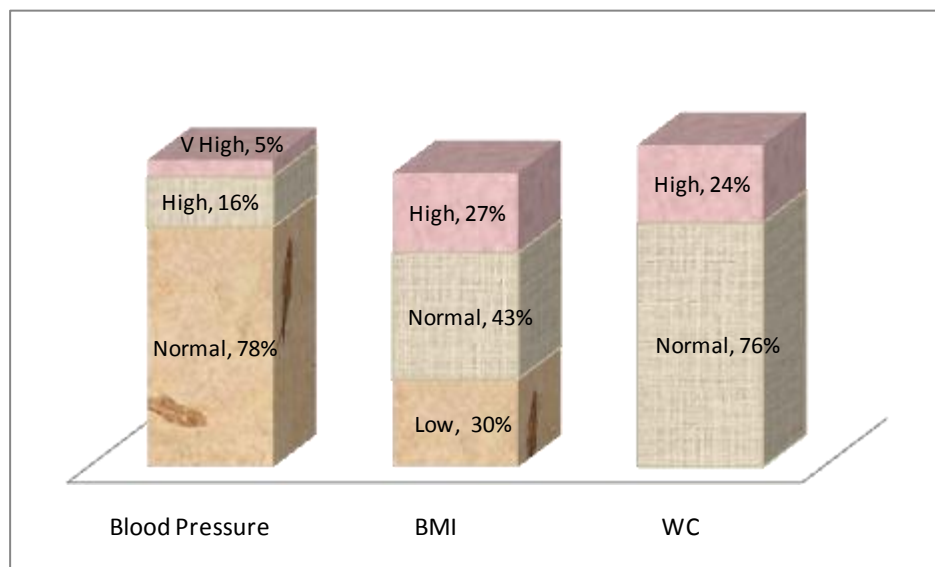
Figure 4: CVD risk profiling of 547 Adults based on three risk factors as obtained through the PISP Adult Tool. The three reported *CVD Risk Factors* are *Body Mass Index (BMI) for 473 adults* as computed from height and weight, *blood pressure for 494 adults*, and *waist circumference for 518 adults*. All adult individuals screened through the PISP Adult Tool in the year 2010, were residents of Karambayam Village, Thanjavur District in Tamil Nadu, being serviced by the ICTPH/SughaVazhvu Karambayam Rural Micro Health Centre.

All the other parameters relating to acute illness, visual acuity, immunization for infants, ANC for pregnant mothers are also individually assessed and consolidated as household specific individual reports.

A multi-factorial individual risk-factor analysis for all the variables gathered through the PISP tool along with village-level 'Wellness Index' computation will be presented in a separate working paper.

Conclusion

This paper demonstrates the feasibility of population-based individual screening for age-specific risk factors.
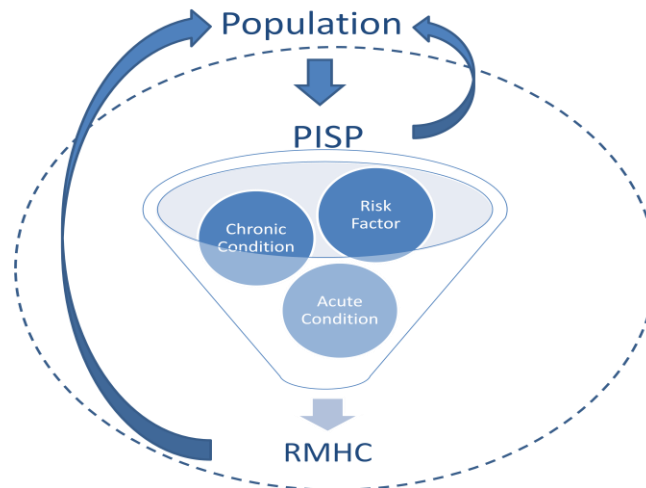
Figure 5: The Annual PISP cycle as implemented in rural Indian geographies utilizing Optical Mark Recognition (OMR) technology through trained Health Extension Workers (ICTPH Guide). Healthy populations are tracked annually for risk factor development. Individuals with elevated risk factors, chronic disease condition and/or acutely-illness are referred to the RMHC and/or other healthcare provider for a follow-up.

As shown in *Fig. 5,* population screening for risk profiling, and detection of existing acute and chronic conditions allow appropriate individual prioritization and long-term condition management. The effectiveness of the PISP intervention as monitored by population outcome through risk factor indicators and enhanced disease-condition management is yet to be established.

The PISP individualized assessment provides an opportunity for customized risk profiling and focused recommendations. The population level interpretation of the *WHO tool for assessing infant and young child feeding practice* (WHO, 2008) integrated in the PISP Infant tool limits making individual caregiver specific diet recommendations.

Appropriate technology intervention through OMR, facilitated the turn-round time but the latency and error rate can be further reduced through the use of mobile-based technological solutions. PISP implementation by Health Extension Workers (ICTPH Guide) was proven feasible through the training and implementation phase.

The enormity of the data fields associated with the age-specific PISP tools, allowed minimum interaction time between the ICTPH Guide and the household individual. One of the targets of using specific tools like PISP was to establish a dialogue on '*Wellness*' within the household. Mechanical and elaborate data fields minimize free interaction, limiting the outcome of the PISP exercise. As a recommendation, a more methodological approach, wherein the PISP interaction is accomplished through multiple-visits to a household, not only allows an opportunity to carefully assess an individual but also simultaneously act-on already acquired information yielding specific recommendations of either a follow-up, or an intervention e.g. iron-supplementation for a 6 month old infant.

Within the current PISP protocol, a strong emphasis has been laid on accumulating risk factors relating to cardiovascular diseases and diabetes. As a recommendation, other chronic conditions, most importantly mental illness (Alexander, 2008), cataract, and presbyopia may also be included within the PISP Adult Tool framework.

Individual prioritization based on risk-factor profiling is only a one-dimensional analysis. Ensuring accessible and equitable healthcare provisioning to serviced populations, poverty identifying markers other than the usual BPL (Below Poverty Line) card need to be integrated in the PISP framework. Given the simplicity of Grameen Foundation's *Progress out of Poverty Index* (Schreiner, 2008) to assess the poverty index of a household may be evaluated for integration within the PISP framework. These poverty indicators coupled with PISP risk-factor profile will then classify the populations on a multi-dimensional high-risk matrix including both individual's health and ability to afford/seek healthcare.

The PISP protocol as illustrated in this paper has been implemented in a population based setting through Health Extension Workers. Given the protocolized nature of PISP, this can also be integrated into the SOAP (Subjective Objective Assessment Plan) methodology as implemented in a primary-care clinic based setting, facilitating opportunistic screening.

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ADULT QUESTIONNAIRE OMR SHEET

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

SIDE - 1

INFORMATION PANEL

NAME : ....

SVG Code	Adult's ID	Date of Interview	Date of Birth	Age in completed years
		D D M M Y Y Y Y	D D M M Y Y Y Y	

(Bubble grids 0–9 for SVG Code, Adult's ID, Date of Interview, Date of Birth, and Age in completed years)

Highest 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

(Bubble grid / 0–9)

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

301. Have you experienced the following conditions in the last month?			302. Ability affected?		303. Medical care sought for this condition? Where*?											304. Still exists/ persist?	
Condition:	Yes	No	Yes	No	Medical care location											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 / Fatigue	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 in breathing	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 of ankles	Y	N	Y	N	1	2	3	4	5	6	7	8	9	10	11	Y	N
13. Difficult in 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 [ADULT] IS FEMALE :

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

IF [ADULT] IS MALE :

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 store / 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 - Flag Only ask Q.402 and Q.403 if the answer is YES for Q.401

401-403 Flag:401. Has a healthcare provider 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 healthcare provider 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	Y	N	DK	6. Respiratory disease	Y	N	DK
2. High Blood Pressure	Y	N	DK	7. Tuberculosis	Y	N	DK
3. Diabetes/High blood sugar	Y	N	DK	8. Cancer	Y	N	DK
4. High cholesterol	Y	N	DK	9. HIV / AIDS	Y	N	DK
5. Liver disease	Y	N	DK	10. Seizure disorder	Y	N	DK

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 pregant? **Yes (Refer to RMHC)** ○ **No (Skip to 605)** ○ **Don't know (Skip to Q.605)** ○

604 | Are 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 | 0 1 2 3 4 5 6 7 8 9 10 11 12

606 | How many children have you delivered? **Flag:** include all live births, even if child died afterwards. | 0 1 2 3 4 5 6 7 8 9 10 11 12

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? | 0 1 2 3 4 5 6 7 8 9 10 11 12

7. SMOKING HABITS

701 | Have you ever chewed tobacco? **Yes** ○ **No (Skip to 703)** ○ | **702** | Do you currently chew tobacco? **Yes** ○ **No** ○

703 | Have you ever smoked tobacco? **Yes** ○ **No (Skip to Section 8)** ○ | **704** | Do you currently smoked tobacco? **Yes** ○ **No (Skip to Section 8)** ○

705 | How soon after you wake up 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 | 0 1 2 3 4 5 6 7 8 9 10

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 alcohol? **Yes** ○ **No (Skip to Section 9)** ○ | **802** | Do you currently consume alcohol? **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 RMHC

[ ] [ ]
0 0
1 1
2 2
3 3
4 4
5 5
6 6
7 7
8 8
9 9

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	0 0 0 / 1 1 1 / 2 2 2 / 3 3 3 / 4 4 4 / 5 5 5 / 6 6 6 / 7 7 7 / 8 8 8 / 9 9 9	0 0 0 / 1 1 1 / 2 2 2 / 3 3 3 / 4 4 4 / 5 5 5 / 6 6 6 / 7 7 7 / 8 8 8 / 9 9 9	0 0 0 / 1 1 1 / 2 2 2 / 3 3 3 / 4 4 4 / 5 5 5 / 6 6 6 / 7 7 7 / 8 8 8 / 9 9 9
903			

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**

[ ][ ][ ] / [ ][ ][ ]
0 0 0 / 0 0 0
1 1 1 / 1 1 1
2 2 2 / 2 2 2
3 3 3 / 3 3 3
4 4 4 / 4 4 4
5 5 5 / 5 5 5
6 6 6 / 6 6 6
7 7 7 / 7 7 7
8 8 8 / 8 8 8
9 9 9 / 9 9 9

ADOLESCENT QUESTIONNAIRE OMR SHEET

FLAG: ONLY ADMINISTER THE QUESTIONNAIRE IF THE ADOLESCENT IS PRESENT; ADOLESCENT SHOULD BE BETWEEN THE AGES OF 10 AND 18; ONLY ASK THESE QUESTIONS AFTER THE CONSENT HAS BEEN SIGNED. ADOLESCENT SHOULD ANSWER QUESTIONS WITHOUT THE INFLUENCE OF A CAREGIVER IF ABLE TO DO SO.

SIDE - 1

INFORMATION PANEL

NAME : ....

SVG Code	Adolescent ID	Caregiver ID	Date of Interview
KAR			D D M M Y Y Y Y

Date of Birth: D D M M Y Y Y Y

Age in completed years

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

Highest education completed
- 0;<5 ○
- 5<10 ○
- 10<=10+2 ○
- UG ○
- PG ○

Currently in School?
- YES ○
- NO ○

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

301. Have you experienced the following conditions in the last month? Condition:	302. Ability affected?		303. Medical care sought for this condition? Where*? (Medical care location)											304. Still exists/Persists?	
	Yes	No	Yes	No												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 / Fatigue	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 in breathing	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 of ankles	Y	N	Y	N	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪										Y	N
13. Difficult in 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] IS **FEMALE** :																	
20. Menstrual problems (pain / irregularity / heavy bleeding)	Y	N	Y	N	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪										Y	N
21. Abnormal discharge (bad odour / change in colour)	Y	N	Y	N	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪										Y	N
IF [ADOLESCENT] IS **MALE** :																	
22. Abnormal penile discharge (bad odour / change in colour)	Y	N	Y	N	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪										Y	N

Flag: ONLY if YES to Q. 301 ASK:

*Codes for Medical Care: 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 store/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 - Flag Only ask Q.402 and Q.403 if the answer is YES for Q.401

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

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

5. SEXUAL AND REPRODUCTIVE HEALTH and ALCOHOL AND SMOKING HISTORY

Read: I would now like to ask [ADOLESCENT] questions that are very important for his/her health. It is important that [ADOLESCENT] answer these questions directly and in private. For this reason, I would like to ask anyone present here to step out of the room for a moment.
Flag: Remind [ADOLESCENT] that their answers will be kept strictly confidential.

| 501 | Are you aware about contraception methods? | Yes ◯ | No ◯ | DK ⒹⓀ |
| 502 | Do you use any contraception 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 Q.505 ◯ | DON'T KNOW Skip to Q.505 ⒹⓀ |

| 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 ◯ 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 ⒹⓀ

6. BMI

601 602 603

Height in centimeters

⓪	⓪	⓪		⓪
①	①	①		①
②	②	②		②
③	③	③		③
④	④	④		④
⑤	⑤	⑤		⑤
⑥	⑥	⑥		⑥
⑦	⑦	⑦		⑦
⑧	⑧	⑧		⑧
⑨	⑨	⑨		⑨

Weight in kilograms

⓪	⓪	⓪		⓪
①	①	①		①
②	②	②		②
③	③	③		③
④	④	④		④
⑤	⑤	⑤		⑤
⑥	⑥	⑥		⑥
⑦	⑦	⑦		⑦
⑧	⑧	⑧		⑧
⑨	⑨	⑨		⑨

7. VISUAL ACUITY

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

If less then 6/6 refer to optician

CHILD QUESTIONNAIRE OMR SHEET

SIDE - 1

FLAG: THIS QUESTIONNAIRE SHOULD BE ADMINISTERED TO THE CAREGIVER (USUALLY THE MOTHER) OF A CHILD BETWEEN 2 AND 10 YEAR OF AGE AFTER OBTAINING CONSENT.

INFORMATION PANEL

NAME : ....

SVG Code — KAR

Caregivers ID

Childs ID

Date of Interview (D D / M M / Y Y Y Y)

Date of Birth (D D / M M / Y Y Y Y)

Age in completed years

Highest education completed
- 0; ◯
- <5; ◯
- 5-10 ◯

Currently in school
- YES ◯
- NO ◯

Height in centimeters — Unable to record

Weight in kilograms — Unable to record

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

301. Has [CHILD] experienced the following conditions in the last 30 days? 304 Condition:	301 Yes	301 No	302. Was it serious? Yes	302 No	303. Medical care sought for this condition? Where*? Medical care location											304. Still exists/ persists? Yes	304 No
1. Cold symptoms - runny nose, congestion, sneezing	Ⓨ	Ⓝ	Ⓨ	Ⓝ	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	Ⓨ	Ⓝ
2. Persistent Cough	Ⓨ	Ⓝ	Ⓨ	Ⓝ	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	Ⓨ	Ⓝ
3. Fever	Ⓨ	Ⓝ	Ⓨ	Ⓝ	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	Ⓨ	Ⓝ
4. Diarrhea	Ⓨ	Ⓝ	Ⓨ	Ⓝ	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	Ⓨ	Ⓝ
5. Weakness/Fatigue	Ⓨ	Ⓝ	Ⓨ	Ⓝ	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	Ⓨ	Ⓝ
6. Vomiting	Ⓨ	Ⓝ	Ⓨ	Ⓝ	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	Ⓨ	Ⓝ
7. Worms in stool	Ⓨ	Ⓝ	Ⓨ	Ⓝ	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	Ⓨ	Ⓝ
8. Difficulty in breathing	Ⓨ	Ⓝ	Ⓨ	Ⓝ	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	Ⓨ	Ⓝ
9. Pain in abdomen	Ⓨ	Ⓝ	Ⓨ	Ⓝ	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	Ⓨ	Ⓝ
10. Skin problems/irritation	Ⓨ	Ⓝ	Ⓨ	Ⓝ	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	Ⓨ	Ⓝ
11. Weight loss	Ⓨ	Ⓝ	Ⓨ	Ⓝ	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	Ⓨ	Ⓝ
12. Other pain	Ⓨ	Ⓝ	Ⓨ	Ⓝ	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	Ⓨ	Ⓝ

*Codes for Medical Care: 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 store/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. CHILDHOOD ILLNESSES

401	**401. Has a healthcare provider ever told you that [CHILD] has:**	Yes	No	DK
	1. Measles	Ⓨ	Ⓝ	ⒹⓀ
	2. Chicken pox	Ⓨ	Ⓝ	ⒹⓀ
	3. Mumps	Ⓨ	Ⓝ	ⒹⓀ
	4. Polio	Ⓨ	Ⓝ	ⒹⓀ

5. PERSONAL ILLNESSES - Flag: Only ask Q.502 and Q.503 if the answer is YES for Q.501

Flag:501. Has a healthcare provider ever told you that you have?; 502. Did you have surgery for this?; 503. Any non-surgical treatment received?

501 503	501				502		503		501				502		503	
Condition :	Yes	No	DK	Yes	No	Yes	No	Condition :	Yes	No	DK	Yes	No	Yes	No
1. Heart disease	Ⓨ	Ⓝ	ⒹⓀ	Ⓨ	Ⓝ	Ⓨ	Ⓝ	**7. Tuberculosis**	Ⓨ	Ⓝ	ⒹⓀ	Ⓨ	Ⓝ	Ⓨ	Ⓝ
2. High Blood Pressure	Ⓨ	Ⓝ	ⒹⓀ	Ⓨ	Ⓝ	Ⓨ	Ⓝ	**8. Cancer**	Ⓨ	Ⓝ	ⒹⓀ	Ⓨ	Ⓝ	Ⓨ	Ⓝ
3. High blood sugar	Ⓨ	Ⓝ	ⒹⓀ	Ⓨ	Ⓝ	Ⓨ	Ⓝ	**9. HIV / AIDS**	Ⓨ	Ⓝ	ⒹⓀ	Ⓨ	Ⓝ	Ⓨ	Ⓝ
4. High cholesterol	Ⓨ	Ⓝ	ⒹⓀ	Ⓨ	Ⓝ	Ⓨ	Ⓝ	**10. Trauma**	Ⓨ	Ⓝ	ⒹⓀ	Ⓨ	Ⓝ	Ⓨ	Ⓝ
5. Liver disease	Ⓨ	Ⓝ	ⒹⓀ	Ⓨ	Ⓝ	Ⓨ	Ⓝ	**11. Seizure disorder**	Ⓨ	Ⓝ	ⒹⓀ	Ⓨ	Ⓝ	Ⓨ	Ⓝ
6. Respiratory Disease	Ⓨ	Ⓝ	ⒹⓀ	Ⓨ	Ⓝ	Ⓨ	Ⓝ								

6. VISUAL ACUITY

		6/6	5/6	4/6	3/6	2/6	1/6	CF	HM	Blind	
601	**Right Eye**	⑥	⑤	④	③	②	①	⑩	⑪	⓪	**If less then 6/6 refer to optician**
602	**Left Eye**	⑥	⑤	④	③	②	①	⑩	⑪	⓪	

INFANT QUESTIONNAIRE OMR SHEET

FLAG: INFANTS SHOULD BE LESS THAN 24 MONTHS (2 YEARS) IN AGE; THIS QUESTIONNAIRE SHOULD BE ADMINISTERED TO THE INFANT'S PRIMARY CAREGIVER (USUALLY THE MOTHER) AFTER OBTAINING CONSENT

SIDE - 1

INFORMATION PANEL

NAME : ....

SVG's Code	Caregiver's ID	Infant's ID	Date of Interview

Date of Interview columns: D D M M Y Y Y Y

(Numeric bubble grids 0–9 for each field)

---

1. INFANT DELIVERY

101 / **102** / **103** / **104**

Date of Birth: D D M M Y Y Y Y (bubbles 0–9)

Age in completed years: Y Y (bubbles 0–9)

Where was [INFANT] delivered?
- At home ○
- Government Hospital ○
- Government health centre ○
- Private hospital/clinic ○
- Other ○
- Don't know ○

Did you/[INFANT]'s mother see anyone for antenatal care for this pregnancy?
- Health professional/doctor ○
- Nurse/midwife ○
- Traditional birth attendant ○
- Other ○
- Don't know ○
- No care sought=6 ○

If Yes, where* did this health check take place?
- At home ○
- Government Hospital ○
- Government Health centre ○
- Private hospital/clinic ○
- Other ○
- Don't know=6 ○

---

2. IMMUNIZATIONS

201 Do you have an immunization card for [INFANT]? May I see it?
YES (Use card to cross-verify the information given by the interviewee) ○   **NO Card** ○   **No,** you may not see it ○

Read: Has [INFANT] received any of the following vaccinations:

202 Full polio vaccine, that is drops in the mouth given thrice, usually at the age of 1 ½ months, 2 ½ months, and 3 ½ months?
Yes, all 3 doses ○ Yes, < 3 doses ○ NO ○ DK ○

203 Full DPT vaccination, that is, an injection given thrice in the thigh or buttocks, sometimes at the same time as polio drops. This is usually given at the age of 1 ½ months, 2 ½ months, and 3 ½ months.
Yes, all 3 doses ○ Yes, < 3 doses ○ NO ○ DK ○

204 A BCG vaccination against tuberculosis, an injection in the arm that often causes a scar, usually given shortly after birth?
YES ○ NO ○ DK ○

205 An injection to prevent measles, usually given once around the age of 9 - 12 months?
YES ○ NO ○ DK ○

206 An MMR vaccination against measles, mumps and rubella, usually given around age 15 -18 months?
YES ○ NO ○ DK ○

---

3. BREAST FEEDING AND COMPLEMENTARY FEEDING

301 Was [INFANT] ever breastfed?
YES ○   NO (Skip to Q310) ○   Don't Know (Skip to Q310) ○

302 / **303** / **304** / **305**

If Yes, when was [INFANT] first breastfed? Flag: If not immediately, mark the number of hours/days
HOURS HOURS (bubbles 0–9) DAY DAY (bubbles 0–9) DON'T KNOW ○

In the first three days after delivery, was [INFANT] given anything to drink other than breast milk?
- YES ○
- NO ○
- DK ○

Is [INFANT] still being breastfed?
- YES (Skip to Q.306) ○
- NO ○

If No: How old was [CHILD] when you stopped breastfeeding him/her? (Skip to Q.309)
MONTHS MONTHS (bubbles 0–9) DAY DAY (bubbles 0–9) DON'T KNOW ○

306 / **307** / **308**

How many times was [INFANT] breastfed last night between sunset and sunrise?
(bubbles 0–9) DON'T KNOW ○

How many times was [INFANT] breastfed yesterday during the daylight hours?
(bubbles 0–9) DON'T KNOW ○

Does [INFANT] take any other liquid or food in addition to being breast-fed? Probe if the child has been given water.
- Yes, only liquids ○
- Yes, both liquid and food ○
- NO (Skip to Section 4) ○

309 — If Yes, how old was [INFANT] when he/she was first given other liquid or food?

0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

DON'T KNOW ◯

310 — Please take a moment to think about what liquids [INFANT] had yesterday. Did [INFANT] drink:

	YES	NO	DK
1. Plain water?	Ⓨ	Ⓝ	ⒹⓀ
2. Commercially produced infant formula fed as a liquid (for example Lactogen, ProteinX)?	Ⓨ	Ⓝ	ⒹⓀ
3. Any other milk such as tinned, powdered, or fresh animal milk?	Ⓨ	Ⓝ	ⒹⓀ
4. Fruit juice?	Ⓨ	Ⓝ	ⒹⓀ
5. Tea or coffee?	Ⓨ	Ⓝ	ⒹⓀ
6. Any other liquids?	Ⓨ	Ⓝ	ⒹⓀ

311 — Please take a moment to think about what food [INFANT] ate yesterday, either separately or combined with other foods from the time of waking up until going to sleep at night. Did INFANT eat the following? Flag: Probe and check all food items below that caregiver recalls.

FOOD ITEM	YES	NO	FOOD ITEM	YES	NO
1. Any porridge or gruel?	①	②	10. Any chicken, duck or other birds?	①	②
2. Any commercially fortified baby food such as Cerelac or Farex?	①	②	11. Any other meat?	①	②
3. Any bread, roti, chapati, rice, noodles, biscuits, idli, or any other foods made from grains?	①	②	12. Any eggs?	①	②
4. Any pumpkin, carrots, or sweet potatoes that are yellow or orange inside?	①	②	13. Any fresh or dried fish or shellfish?	①	②
5. Any white potatoes, white yams, cassava, or any other foods made from roots?	①	②	14. Any foods made from beans, peas, or lentils?	①	②
6. Any dark green, leafy vegetables?	①	②	15. Any nuts?	①	②
7. Any ripe mangoes, papayas, cantaloupe, or jackfruit?	①	②	16. Any cheese or yoghurt?	①	②
8. Any other fruit or vegetables?	①	②	17. Any food made with oil, fat, ghee or butter?	①	②
9. Any liver, kidney, heart or other organ meats?	①	②	18. Any other solid or semi-solid food?	①	②

412 — How many servings of solid, semi-solid, or soft foods (no liquids) did [INFANT] have yesterday during the day or at night?

0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

DON'T KNOW ◯

4. ANTHROPOMETRIC MEASURES

4.A. BIRTH WEIGHT

401 — Do you have a card with [INFANT]'s birth weight written down? May I see it?

402 — YES ◯

403 — NO (Skip to Q.403) ◯

Copy the birth weight of [INFANT] in kilograms (Skip to Q.403)

What is [INFANT]'s birth weight to the best of your memory? Flag: If birth weight is unknown, fill all the blanks with 0.

4.B. HEIGHT AND WEIGHT

404 / **405**

Height in centimeters — Unable to record ◯

Weight in kilograms — Unable to record ◯

5. DISEASE SYMPTOMS - Flag: Only ask Q.-502-504 if the answer is YES for Q.501

501. Has [INFANT] experienced the following conditions in the last 30 days?

504

Flag: ONLY if YES to Q. 501 ASK:

502. Was it serious?
503. Medical care sought for this condition? Where*?
504. Still exists?

Condition:	501 Yes	501 No	502 Yes	502 No	\multicolumn{11}{c}{503 Medical care location}	504 Yes	504 No
1. Cold symptoms - runny nose, congestion, sneezing	Ⓨ	Ⓝ	Ⓨ	Ⓝ	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪											Ⓨ	Ⓝ
2. Persistent Cough	Ⓨ	Ⓝ	Ⓨ	Ⓝ	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪											Ⓨ	Ⓝ
3. Fever	Ⓨ	Ⓝ	Ⓨ	Ⓝ	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪											Ⓨ	Ⓝ
4. Diarrhea	Ⓨ	Ⓝ	Ⓨ	Ⓝ	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪											Ⓨ	Ⓝ
5. Weakness/Fatigue	Ⓨ	Ⓝ	Ⓨ	Ⓝ	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪											Ⓨ	Ⓝ
6. Vomiting	Ⓨ	Ⓝ	Ⓨ	Ⓝ	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪											Ⓨ	Ⓝ
7. Worms in stool	Ⓨ	Ⓝ	Ⓨ	Ⓝ	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪											Ⓨ	Ⓝ
8. Difficulty in breathing	Ⓨ	Ⓝ	Ⓨ	Ⓝ	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪											Ⓨ	Ⓝ
9. Pain in abdomen	Ⓨ	Ⓝ	Ⓨ	Ⓝ	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪											Ⓨ	Ⓝ
10. Skin problems/irritation	Ⓨ	Ⓝ	Ⓨ	Ⓝ	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪											Ⓨ	Ⓝ
11. Weight loss	Ⓨ	Ⓝ	Ⓨ	Ⓝ	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪											Ⓨ	Ⓝ
12. Other pain	Ⓨ	Ⓝ	Ⓨ	Ⓝ	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪											Ⓨ	Ⓝ

***Codes for Medical Care:** 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 store/Pharmacy=10, Other=11

505 — Interviewer checkpoint: Was the answer Yes to any question under Q604? **Yes** (Refer to RMHC for check-up) ◯ **No** ◯

6. CHILDHOOD ILLNESSES

601 — **601. Has a healthcare provider ever told you that [INFANT] has:**

	YES	NO	DON'T KNOW
1. Measles	Ⓨ	Ⓝ	Ⓝ
2. Chicken pox	Ⓨ	Ⓝ	Ⓝ
3. Mumps	Ⓨ	Ⓝ	Ⓝ
4. Polio	Ⓨ	Ⓝ	Ⓝ