

Global Health Research Group
on Dementia Prevention &
Enhanced Care: DePEC


**National Institute for
Health Research**

Dementia screening app development, feasibility and validation: Sept 2018 update

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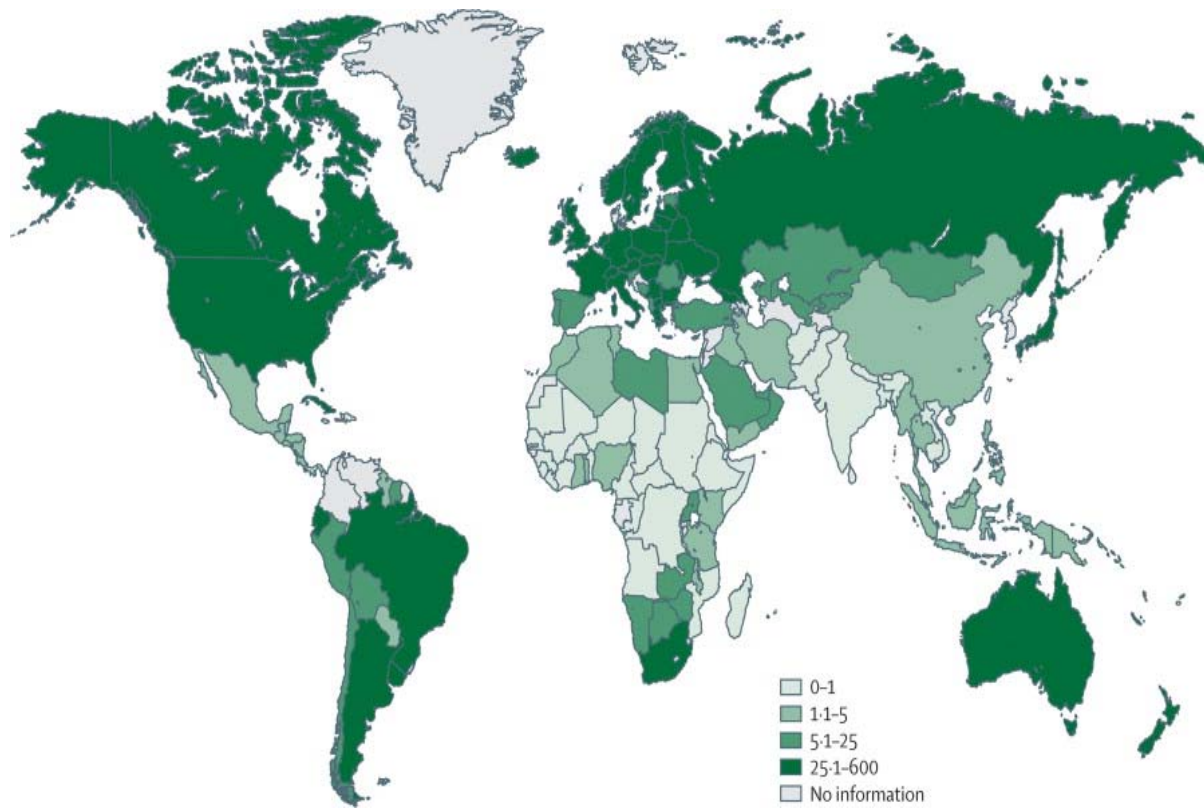


Objective 2: WS2 m1-20

Develop simple tools to identify people at high risk of developing dementia and those with undetected dementia.

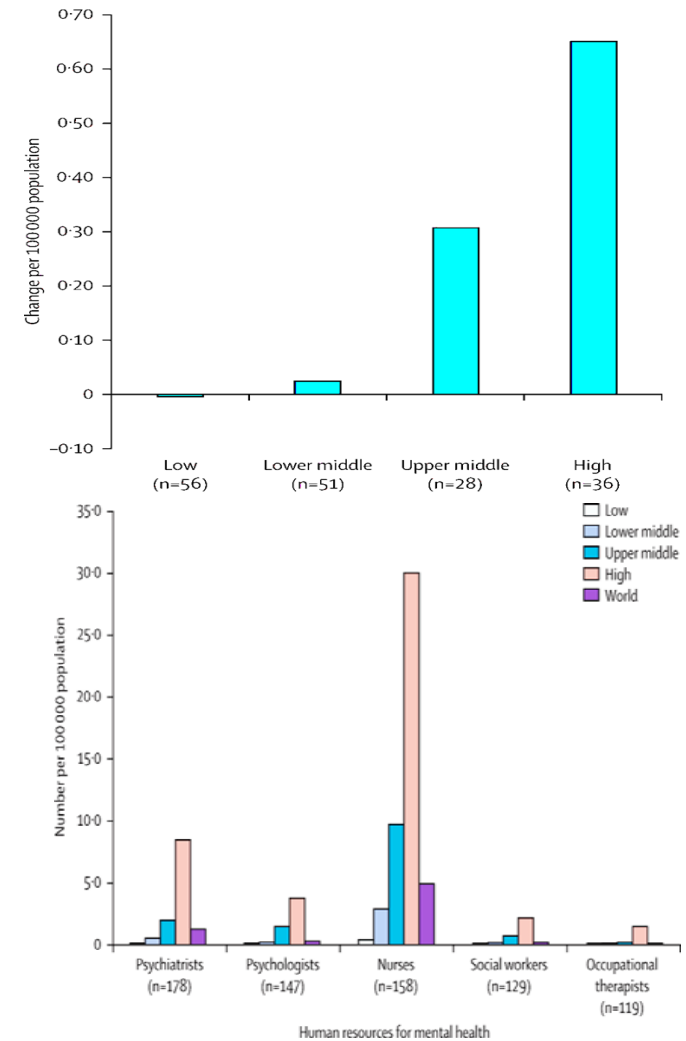


Human resources for mental health (psychiatrists, psychologists, nurses, and social workers) per 100 000 population (15 psychiatrists in Tanzania)



Shekhar Saxena , Graham Thornicroft , Martin Knapp , Harvey Whiteford
Resources for mental health: scarcity, inequity, and inefficiency

[http://dx.doi.org/10.1016/S0140-6736\(07\)61239-2](http://dx.doi.org/10.1016/S0140-6736(07)61239-2)
The Lancet, Volume 370, Issue 9590, 2007, 878 - 889



Challenge of cognitive screening in LMIC countries

- Few specialist clinicians
- Screening tools therefore need to be as accurate and brief as possible (more than HICs)
- If not accurate or too complex – primary care workers won't use them (remember task shifting involves all other health areas)
- How do we arrange safe referral pathways – can't refer everyone/need to avoid treatable false positives

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Will a locally-validated paper and pencil test do? The basis for the App in Tanzania



The IDEA study brief cognitive screen



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- 6 item screening test
- Designed for non specialists and low literacy population
- Designed to cover all lobes of the brain
- Most discriminating questions from CSI-D (used in Hai dementia prevalence study)
- CERAD 10 word learning list
- Baiyewu matchstick test
- Good/excellent diagnostic accuracy in initial validation studies
- AUROC
- IP n=97 (0.917)
- OPD n=59 stat samp 120 (0.919)
- Community screening days n=450 (0.845)
- Not educationally biased (not independently associated with education/literacy on logistic regression)





How to assess function (instrumental activities of daily living) in low/middle income countries.

IDEA-Instrumental Activities of daily living (IADL) Scale – developed for rural Tanzania

1. **Wanatoa Historia**/They give histories of the family, their life, past events.
2. **Wana suluhisha**/They settle conflicts.
3. **Wanasaidia shughuli ndogo ndogo**/They assist in small works in the home.
4. **Wanatoa ushauri**/They give advice.
5. **Wanadumisha na kufundisha mila/unyago**/They teach traditions of society.
6. **Ni walinzi wa nyumbani**/They watch over the house when others are out.
7. **Wanatunza wajukuu**/they look after the grandchildren
8. **Wanatoa ushawishi**/Persuasion, or changing people's ideas for the better.
9. **Wanasaidia katika maswala mazito kama sherehe**/They preside over feasts and ceremonies
10. **Wanapangia watu majukumu**/Delegation of responsibilities to others.
11. **Wanasimamia haki**/They ensure fairness.

Reasons for mHealth approach rather than paper and pencil test

- Increase/widen access to tools – not relying on printed copies
- Allow screening tools to be improved/developed continually
- Allows for different cut-off values depending on background education and setting
- Potential to standardise advice and follow-up via automatic prompts and referral pathways
- 1 billion active mobile phones in SSA (and smartphone access increasing rapidly)

Overall aim

- To design a dementia screening (case-finding) app and decision support aid for non-specialists to use in LMIC settings.
- Initial development in Tanzania, but designed as toolkit adaptable to other LMIC settings following further (efficient and resource conscious) validation.

The prototype App

IDEA cognitive screen – six items 4 taken from
CSI-D, CERAD 10 word list, praxis task

- What is a bridge? (0-2)
- Animals named in 1 minute (0-2)
- Name of village chairman (0-1)
- Day of the week (0-2)
- Number of words recalled (0-5)
- Matchstick test (0-3)



Validated in Tanzania, Nigeria, pilot study Malaysia

The prototype App

IDEA-IADL - 3 qs (most predictive int modelling)

- Engage in small works around the house (0-2)
- Give advice (0-2)
- Preside over feasts and ceremonies (0-2)

Delirium rule out (from IDEA-delirium study)

- Was the person like this last week?
- Fluctuation in hours or days
- Word recall, from 10 word list

The prototype App

- Combines IDEA cognitive screen, IDEA-IADLs questionnaire and delirium screen
- Developed using Open Data Kit (ODK) software
- For use on Android-based tablets
- Currently being trialled in Tanzania
- In Kilimanjaro has been combined with a census in 12 villages. App screening by enumerators (rural health workers).
- Purpose – to understand who does/does not present for community screening (c/o previous screen data)

METHOD

- Blinded validation study by DSM dementia criteria (all screen positives, 50% possible dementia (borderline) 5% no dementia (screen negatives)).
- Diagnoses confirmed by consensus between DEPEC sites

Feasibility/acceptability measures



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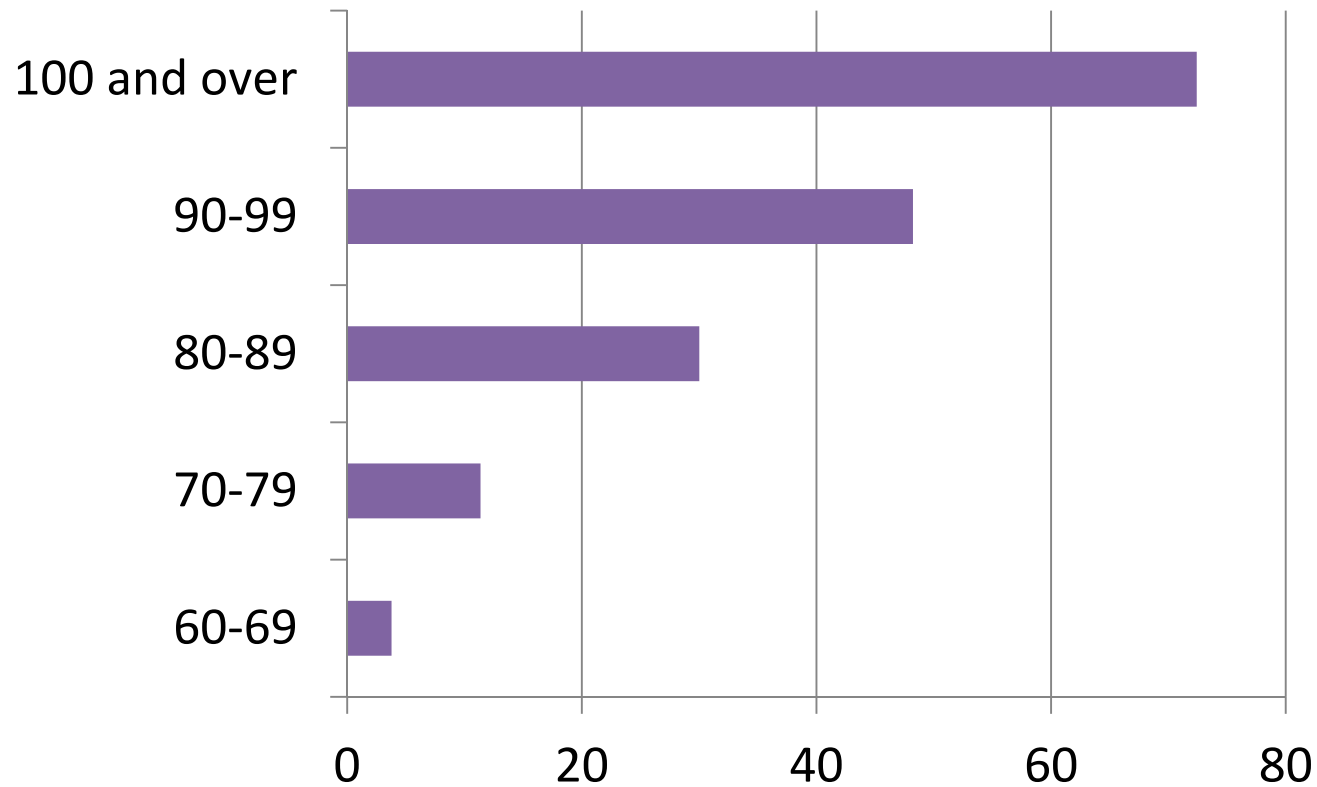
Progress on community-based rural health worker screening



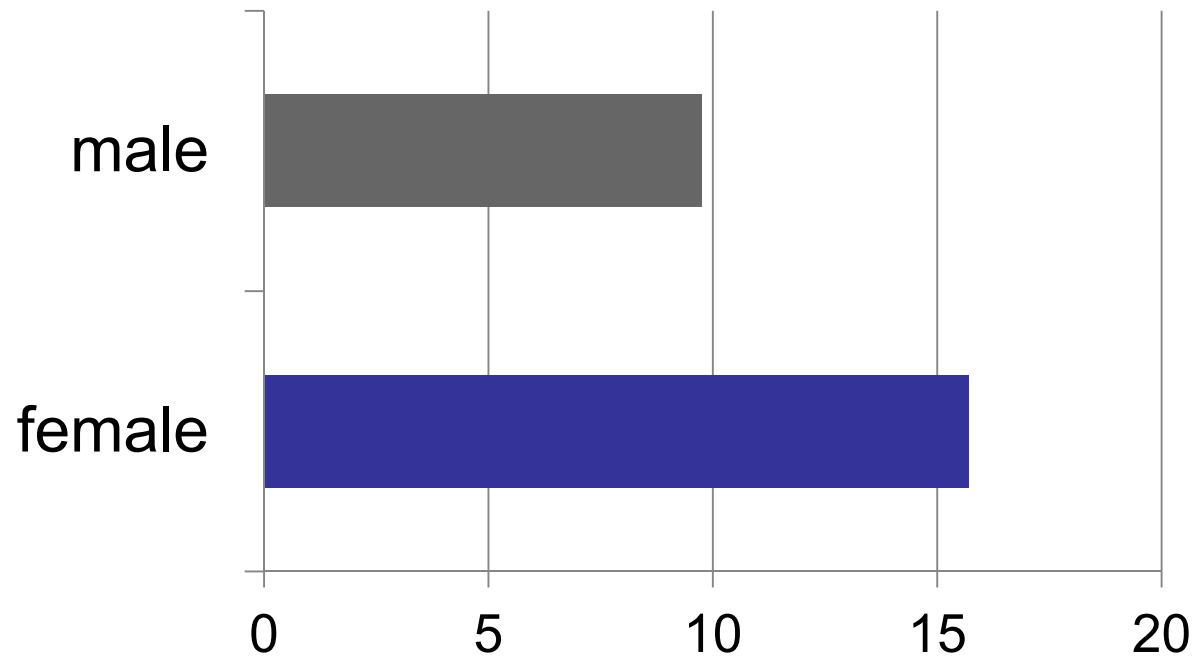
Progress on community – based rural health worker screening

- Screening completed on census population of 28,236 people of whom 3122 (11.1%) aged 60 years and over
- 3011 (96.4%) consented to screening of whom 1337 (44.4%) had an informant
- 410 (13.6%) screened ‘probable dementia’
- 227 (7.5%) screened ‘possible dementia’

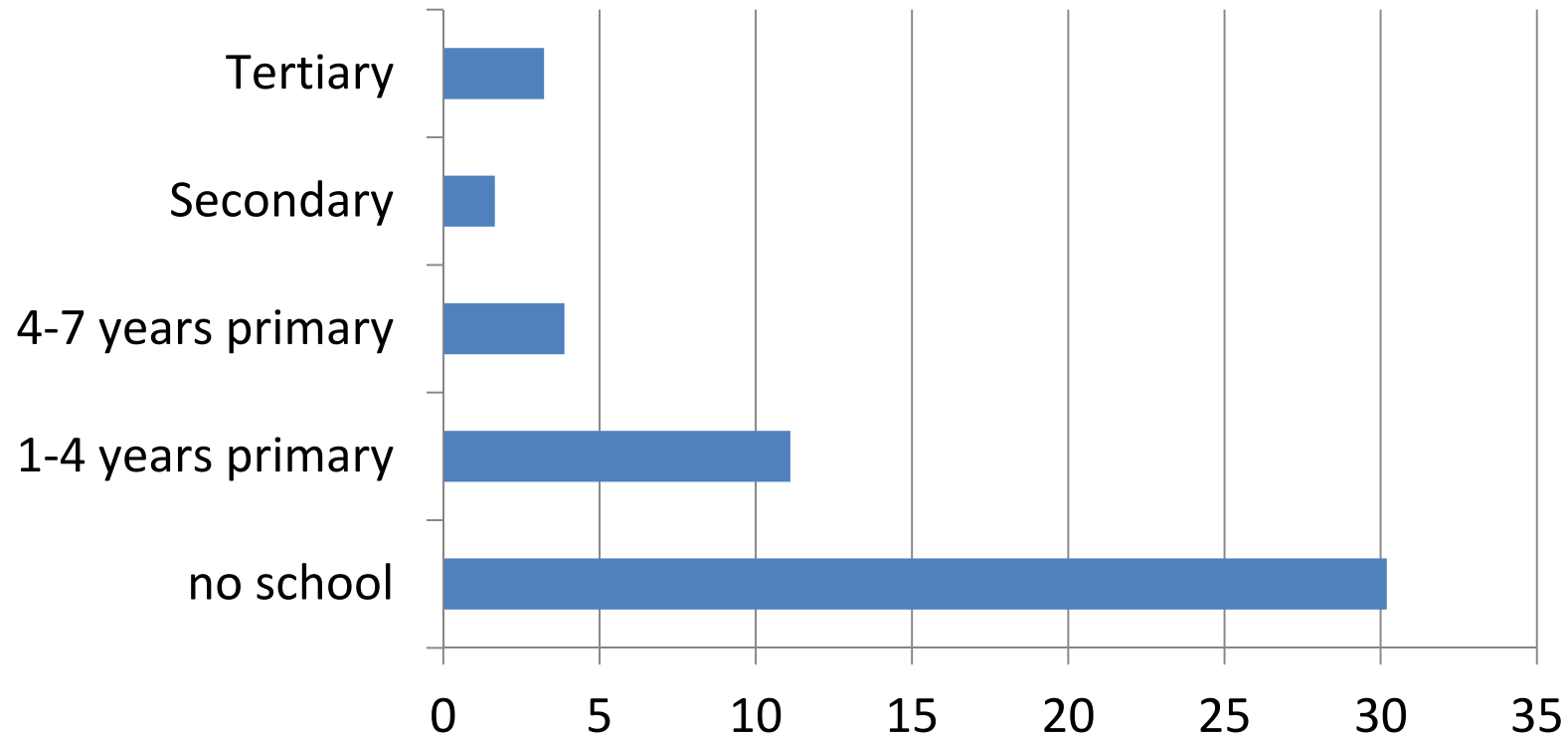
Screen-positives by age



Screen positives by gender



Screen positives by education level



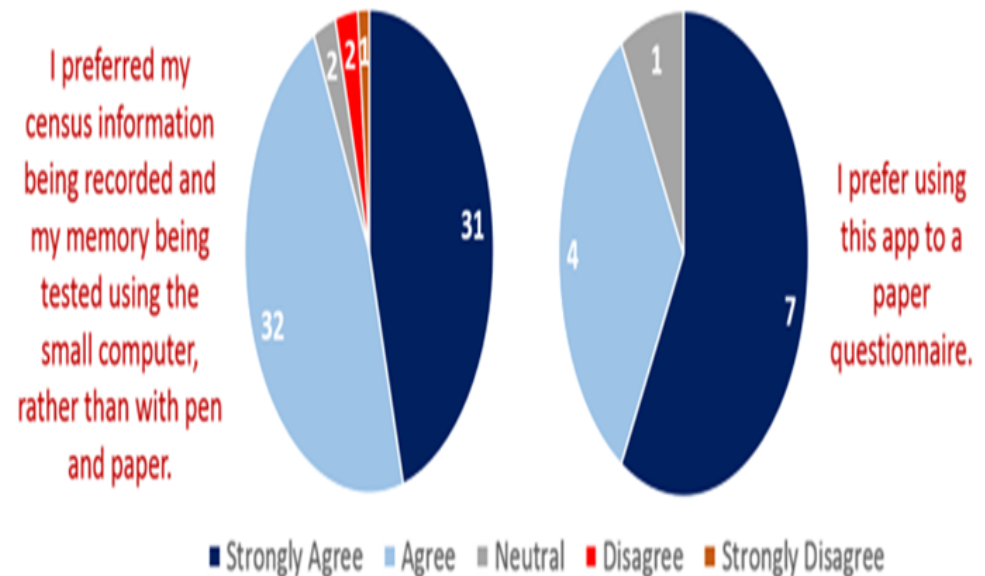
Predictors of positive screen

	Sig.	Odds ratio
60-69 years		1
70-79 years	<0.001	2.371
80-89 years	<0.001	6.992
90-99 years	<0.001	12.466
100 years and over	<0.001	29.475
Male	.323	.877
No education		1
0-4 years primary	<0.001	.384
5-7 years primary	<0.001	.200
Secondary	0.001	.091
Tertiary	0.134	.212

Acceptability of App-based screening

- 11/12 enumerators and 63/68 participants preferred the system to paper assessments
- 11/12 enumerators felt the assessment was too long, compared to 15/68 participants
- NB (incorporated in census, additional pilot questions)

Figure 2 – Participant (left) and health worker (right) preferences on screening methods



Acceptability of app based dementia screening

	S. Agree	Agree	Neutral	Disagree	S. Disagree
<i>The tablet was simple to use</i>	3	5	4	0	0
<i>The app was simple to navigate</i>	2	4	6	0	0
<i>The questions were confusing</i>	0	2	4	5	1
<i>App on screen instructions clear</i>	3	6	3	0	0
<i>Difficult to keep the tablet charged</i>	0	3	3	4	2

Subjective memory complaints – (added to App as pilot)

- Has your memory become worse over last year: 1888 (62.7%)
- Have your memory problems affected ADLs: 1040 (34.5%)

In screen probable dementia:

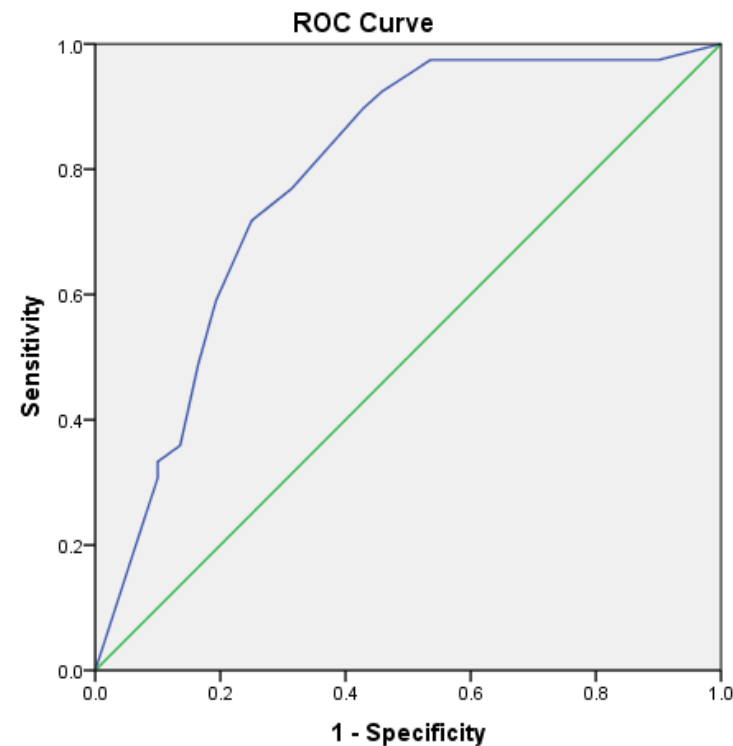
- 88.3% answered yes to question 1
- 75.6% answered yes to question 2

Validation progress

- Aim to see all screen-probable dementia, 50% of screen-possible dementia and 5% of screen no-dementia
- So far, 179 people (from 4/12 villages) seen for formal diagnosis (51.9% screen probable, 19.8% of screen possible and 6.7 screen no dementia).
- Provisional diagnosis only at the moment (aiming for cross-cultural consensus diagnosis by DSM criteria)

Validation of IDEEA screen only

- AUROC 79.0% (95% CI 71.7 to 86.3)
- At cut off ≤ 7
- Sensitivity 89.7%
- Specificity 57.1%



Diagonal segments are produced by ties.

Validation of combined IDEA screen and IADL questions

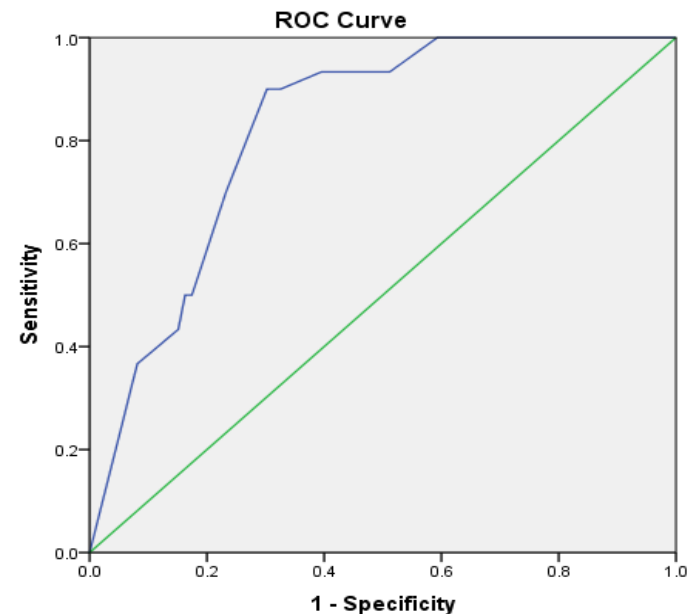
- AUROC 82.4% (95% CI 74.8 to 89.9)

At cut off ≤ 10

- Sensitivity 93.3%
- Specificity 57.0%

At cut off ≤ 7

- Sensitivity 90.0%
- Specificity 69.8%



Diagonal segments are produced by ties.

Prevalence

- Estimated crude prevalence of 8.0% in people aged 60 years and over
- Estimate likely to change as more people followed up and diagnoses finalised.
- Compares to prevalence of 7.5% in people aged 70 years and over in 2010.

Summary (at pilot/provisional stage)

- Diagnostic accuracy of IDEA screen lower (provisionally) than paper and pencil studies (used by rural primary health workers)
- Addition of IADL questions improves on diagnostic accuracy more than in paper and pencil studies (so may be more useful in this setting)

Next steps – diagnostic accuracy

- Develop diagnostic accuracy of App further using other methods (e.g. Bayesian approaches, decision trees)
- Adapt to other settings by adjusting cut-offs for individual items and the whole scale
- Assess performance in case-finding (higher prevalence settings, different health settings) – medical OPD planned early 2019
- Consider how to adapt approach as toolkit for use in other LMIC settings.

Depression – MOSHI-D scale

- 12 item pilot scale
- N=96 older adults (60+) attending medical OPD
- Blind assessment by doctor for DSM-V major depression (supervised by UK/Tanzanian psychiatrist)
- AUROC=.882
- Prospective validation planned early 2019
- Overall all – identify most predictive depression questions for decision-support.

Next Steps – App development

- Bottom-up approach – work with health staff on ground to determine most useful elements of decision-support aid
- Consider most useful questions to reduce length
- Consider user-friendliness and design (currently using ODK prototype)
- Addition of educational resources