

1 **Validation of a culturally sensitive, Swahili-translated instrument to assess**  
2 **suicide risk among adults living with HIV in Tanzania**

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### Abstract

49 In Tanzania, there are high rates of suicidal thoughts and behavior among people  
50 living with HIV (PLWH), yet few instruments exist for effective screening and referral.  
51 To address this gap, we developed and validated Swahili translations of the  
52 Columbia Suicide Severity Rating Scale (C-SSRS) Screen Version and two  
53 accompanying scales assessing self-efficacy to avoid suicidal action and reasons for  
54 living. We administered a structured survey to 80 PLWH attending two HIV clinics in  
55 Moshi, Tanzania. Factor analysis of the items revealed four subscales: suicide  
56 intensity, self-efficacy to avoid suicide, fear and social concern about suicide, and  
57 family and spirituality deterrents to suicide. The area under the receiver operating  
58 curve showed only suicide intensity and fear and social concern met the prespecified  
59 cut-off of  $\geq 0.7$  in accurately identifying patients with a plan and intent to act on

60 suicidal thoughts. This study provides early evidence that brief screening of intensity  
61 of suicidality in the past month, assessed by the C-SSRS Screen Version, is a  
62 strong, resource-efficient strategy for identifying suicide risk in the Tanzanian setting.  
63 Patients who report little fear of dying and low concern about social perceptions of  
64 suicide may also be at increased risk.

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66 *Keywords:* HIV, suicide screening, Tanzania

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### **Impact Statement**

69 Suicide is a major cause of loss of life worldwide, claiming about 700,000 lives every  
70 year. Many African nations have high suicide rates and few mental health resources,  
71 leading to low levels of suicide screening and poor linkage to care. In Tanzania,  
72 there is fewer than one psychiatrist or psychologist per one million people. Given  
73 these human resource constraints, the 'gold standard' of a full clinical assessment by  
74 a mental health professional is rarely feasible. Further, there is a lack of locally  
75 validated tools to screen for suicidal thinking and behaviour.

76 In this study, we explored whether adapted brief measures of suicidal intensity, self-  
77 efficacy to avoid suicide, and reasons for living could be used to effectively assess  
78 for suicide risk in Tanzanian HIV clinics. Brief assessment tools can be administered  
79 by non-specialists in a variety of settings, which can greatly enhance the recognition  
80 of people at-risk for suicide and facilitate linkage to care.

81 We collected data from 80 people living with HIV, a group that has a remarkably high  
82 prevalence of suicide compared to the general population. Participants were  
83 screened for suicidal ideation during routine HIV care appointments and those who  
84 reported suicidal ideation in the past month were enrolled and completed a  
85 structured survey.

86 As expected, higher intensity of suicidality was strongly associated with suicide risk  
87 (i.e., active plan or intent to attempt suicide). Items from the reasons for living  
88 measure that assessed fear of death and concerns about social reactions to suicide  
89 also were associated with risk.

90 These brief suicide measures are highly feasible for administration by non-specialists  
91 and show promise for identifying risk of suicide. Implementing routine suicide risk  
92 screening in HIV care and other high-risk settings is a low-impact strategy to rapidly  
93 improve the assessment of suicide, enhance linkage to mental health care, and save  
94 lives.

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### **Background**

99 Suicide is a major cause of premature death, as more than 700,000 people die by  
100 suicide each year worldwide (World Health Organization, 2021). More than three-  
101 fourths of these deaths occur in low- and middle-income countries (LMICs) (Bachani  
102 et al., 2020). Rates of suicide in sub-Saharan Africa (SSA) are among the highest in  
103 the world (Naghavi, 2019; United Nations, 2022), and the topic of suicide has been  
104 increasingly prominent in news reports and public discourse in SSA in the past decade  
105 (Makoye, 2021; Muiruri, 2021). However, little attention has been paid to improving  
106 assessment and evidence-based intervention for suicide prevention in the region, and  
107 the evidence obtained from countries outside of Africa may not be culturally-  
108 appropriate (Knettel, Knippler, et al., 2023; Mars et al., 2014).

109 Public accounts of suicide in SSA often focus on the events leading up to the death,  
110 such as stress due to relationship conflicts, financial challenges, physical illness,  
111 substance use, and unattended mental health issues (Kaggwa, 2022; Li et al., 2021;  
112 Mars et al., 2014). Chronic illness is another major contributor to suicide risk globally,  
113 particularly in low-resource settings where preventable deaths are all too common  
114 (Bachmann, 2018). SSA is the region of the world with the greatest burden of HIV,  
115 and death by suicide is shockingly common among people living with HIV (PLWH),  
116 representing a true public health emergency (Ndosi et al., 2004; Pelton et al., 2021).

117 Suicidal behavior, including attempting suicide, is illegal in nine African countries,  
118 including Tanzania (Mishara & Weisstub, 2015). The risk of legal consequences  
119 surrounding suicide contributes to widespread societal stigma around this issue and

120 may lead to considerable underreporting of suicidal thoughts, behaviors, and deaths  
121 (Naghavi, 2019; Uddin et al., 2019). This also means that many people experiencing  
122 suicidal thoughts do not access mental health services due to credible fear of  
123 prosecution (Moradinazar et al., 2019).

124 In Tanzania, only 55 psychiatrists and psychologists attempt to provide care for a  
125 population of more than 60 million people (World Health Organization, 2020).  
126 Extremely high rates of suicidal thinking have been identified in HIV care in Tanzania  
127 (Knettel et al., 2020), yet very few resources are available for PLWH who are  
128 experiencing a mental health crisis (Madundo et al., 2023; Oshosen et al., 2020). The  
129 few mental providers in the country are mostly based at large, urban tertiary facilities,  
130 which are costly and often difficult to access (Binyaruka & Borghi, 2022). Further, few  
131 models exist for effective suicide intervention in SSA, and even fewer address the  
132 unique experiences of PLWH (Govender et al., 2014; Knettel, Knippler, et al., 2023).

133 In the context of these multiple barriers to appropriate care for people experiencing  
134 suicidality, there is an urgent need for improved, culturally sensitive assessment of  
135 suicide risk and linkage to treatment. There is also a notable lack of locally-validated  
136 assessment tools for suicide risk in SSA. Several studies have relied on a single item  
137 related to suicidal thoughts, such as the final question of the Patient Health  
138 Questionnaire-9 (Doukani et al., 2021; Hammett et al., 2022), or measures which do  
139 not measure suicidal intent, such as Module C of the Mini International  
140 Neuropsychiatric Interview (Ertl et al., 2011). Others have used longer measures such  
141 as the Beck Scale for Suicide Ideation or the Suicide Risk Screening Scale (Govender  
142 et al., 2014; Mutiso et al., 2019) that take more time and effort to administer, which  
143 can present challenges in a busy clinical setting. Further, few studies in Africa have  
144 utilized strengths-focused suicide assessments such as measures of self-efficacy to  
145 avoid suicide or reasons for living, which include culturally salient constructs in African  
146 settings such as the influence of religious beliefs and collectivistic social values on  
147 suicide risk (Lawrence et al., 2016; Pompili, 2022).

148 The objective of this study was to validate a brief, culturally informed, Swahili-  
149 translated measure of suicide risk, the Columbia Suicide Severity Rating Scale (C-  
150 SSRS) Screen Version (Andreotti et al., 2020; Posner et al., 2011) among adults living

151 with HIV in Tanzania. To capture a broader view of suicide risk, we also examined the  
152 value of adding items assessing reasons for living and self-efficacy to avoid suicide.  
153 We hypothesized that the combined measure would provide a valid and reliable brief  
154 screen for suicide risk among PLWH that could be administered by healthcare workers  
155 in Tanzania.

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## Methods

158 We conducted a cross-sectional survey study with 80 adults who were living with HIV  
159 and experiencing suicidal ideation at two urban HIV clinics in Moshi, Tanzania from  
160 January to October of 2022. These data were collected as part of a larger study aiming  
161 to develop a task-shifted counseling intervention focused on preventing suicide and  
162 improving HIV care engagement in Tanzania (BLINDED FOR REVIEW, 2023).

163 The two study clinics provide routine HIV care for approximately 6,000 PLWH within  
164 the region according to national protocols, whereby all PLWH receive HIV care and  
165 medication free of charge. For patients experiencing emotional distress, brief  
166 counseling is provided by professional nurses during HIV care, and people with severe  
167 distress are referred for psychiatric care. However, prior to the commencement of this  
168 study, no routine suicide risk assessment was occurring in these clinics.

## 169 Procedures

170 At the start of the study, we provided training to the HIV clinic staff at these two sites  
171 to implement suicide screening during all routine HIV clinic appointments. Professional  
172 nurses administered a single yes/no screening item derived from the C-SSRS Screen  
173 Version (Posner et al., 2011): "In the last month, have you had any actual thoughts of  
174 killing yourself?" Patients who responded yes to the screening item were informed of  
175 the research and, if interested, were referred to meet with a study Research Assistant  
176 (RA). Participants were eligible for inclusion if they were 18 years of age or older, fluent  
177 in Swahili or English, and deemed medically and cognitively capable of completing the  
178 study procedures according to the HIV clinic nurses and study RA.

179 Upon referral from the clinic nurses, the RA read the consent form aloud and  
180 interested, eligible patients provided written informed consent prior to enrollment.

181 Patients who responded yes to the screening item but were not interested in  
182 participating or were ineligible for participation were referred for psychiatric treatment  
183 according to the standard of care.

184 Upon enrollment, the RA verbally administered a structured, tablet-based survey to  
185 the participant. Participant responses were entered in real time to a secure cloud-  
186 based data repository. The C-SSRS component of the survey was audio recorded and  
187 select recordings were reviewed for quality assurance.

188 Upon completion of the study procedures, the RA provided an approximately 20-  
189 minute Safety Planning session using a structured worksheet according to evidence-  
190 based procedures developed by Stanley and Brown (2012). All participants then  
191 received referral information for standard of care psychiatry services. The research  
192 team had procedures in place for further support of any individuals with an active plan  
193 or intent to attempt suicide at the conclusion of their participation; however, this was  
194 not needed for any of our study participants.

195 Study procedures were approved by the Tanzanian National Institute for Medical  
196 Research and the ethical review boards of BLINDED FOR REVIEW.

### 197 **Research Assistant Characteristics and Training**

198 The study RAs included two individuals with Bachelor's level training in psychology  
199 and prior training and experience in psychology, and one study nurse. RAs received  
200 two weeks of study-specific training from the principal investigator, who is a licensed  
201 psychologist, and a consultant psychiatrist prior to any patient contact. Training  
202 included didactic training in mental health and HIV, suicidality, the Safety Planning  
203 intervention, counseling skills, suicide assessment, and steps to mitigate and respond  
204 to suicide risk in research. RAs completed several mock assessments during training  
205 and were required to demonstrate competency in these mock sessions prior to  
206 enrolling actual study participants.

207 The RAs also attended a weekly supervision session with a psychologist and two  
208 psychiatrists (study supervisors) for quality assurance and skill building. Each week,  
209 1 to 2 audio recordings of C-SSRS assessments were reviewed by the three study

210 supervisors using an adapted Therapy Quality Scale (Patel et al., 2017) to evaluate  
211 the quality of the assessments and provide structured feedback.

## 212 **Measures**

213 All measures were translated from English to Swahili by a bilingual research team  
214 member and then back translated by second team member. The full study team then  
215 cross-checked the versions and made edits for clarity and cultural appropriateness  
216 until team consensus was reached.

### 217 *Sociodemographic Variables*

218 We first collected a variety of sociodemographic variables, including the participant's  
219 age, gender, religion, education, relationship status, employment status, and monthly  
220 income.

### 221 *Intensity of Suicidality*

222 The intensity of recent suicidality was assessed using the Columbia Suicide Severity  
223 Rating Scale (C-SSRS) Screen Version and Full Version (Posner et al., 2011). The  
224 Screen Version has six yes/no items that use plain language to assess for suicidal  
225 thinking, intent, and preparatory behavior (e.g., writing a suicide note or gathering  
226 materials needed to attempt suicide) in the past one month. Items include, "Have you  
227 had suicidal thoughts and had some intention of acting on them?" and "Have you  
228 started to work out or worked out the details of how to kill yourself? Do you intend to carry  
229 out this plan?" Cronbach's alpha for the C-SSRS Screen Version items in this study  
230 was 0.84.

231 The C-SSRS Full Version is a semi-structured guide for a longer, more narrative  
232 clinical interview, intended to support the gathering of details about the intensity of  
233 suicidal thinking, suicide risk, any past suicide attempts or self-injurious behaviors, and  
234 lethality of those attempts. The last item in the Full Version is a rating by the interviewer  
235 of the patient's highest severity of suicidality in the past month, which serves as a  
236 summary risk assessment. Rating on this item (C-SSRS\_M) ranges from 1-Wish to be  
237 dead to 9-Actual attempt. Information obtained from the Full Version, particularly the  
238 determination from the clinical interview of whether a participant had an active plan or  
239 intent to attempt suicide, was used as a gold standard for suicide risk assessment in  
240 this study.



241 *Self-Efficacy to Avoid Suicide*

242 Participant belief in his/her ability to avoid acting upon suicidal thoughts was assessed  
243 by the Self-Efficacy to Avoid Suicidal Action (SEASA) scale. This scale consists of six  
244 questions (e.g., “How certain are you that you could control future thoughts of suicide if  
245 you were experiencing physical or emotional pain?”) that are rated from 0 (Very  
246 uncertain) to 10 (Very certain), with higher scores indicating higher self-efficacy  
247 Cronbach’s alpha for the SEASA items in this study was 0.91.

248  
249 *Reasons for Living*

250 Motivations to stay alive and not to attempt suicide were measured by the Brief  
251 Reasons for Living (BRFL) inventory which consists of twelve questions (e.g., “My  
252 family depends upon me and needs me”), with response options starting from 1 (Not at  
253 all important) to 6 (Very important) and higher scores indicating higher endorsement  
254 of each reason for living. Cronbach’s alpha for the BRFL items in this study was 0.79.

255 **Statistical Analysis**

256 We summarized socio-demographic characteristics using means and standard  
257 deviations or frequencies and percentages as appropriate. We conducted an  
258 exploratory factor analysis (EFA) to assess validity related to internal structure of the  
259 combined items from the C-SSRS Screener, SEASA, and BRFL. Our sample size was  
260 fairly small. However, common standards for acceptable sample size in EFA are a  
261 minimum of 50 participants or 3 participants per item (de Winter et al., 2009), both of  
262 which were met with our sample of 80 participants for 22 items.

263 Because the scales had different response options, we created a polychoric  
264 correlation matrix among the scales for data input. Polychoric correlations are  
265 preferred over Pearson correlations when dealing with ordinal variables or a  
266 combination of ordinal, binary and continuous ones (Garcia-Santillan et al., 2021;  
267 Holgado–Tello et al., 2010). In our case, as we had both ordinal and binary variables,  
268 we chose to utilize a polychoric correlation matrix. Items one and two from the C-SSRS  
269 screening version (related to recent thoughts of suicide) were part of the enrollment  
270 criteria and relevant to all participants, so these were not included in the analysis. The  
271 resulting polychoric correlation matrix was non-positive definite and therefore  
272 smoothing was done (see supplementary materials).

273 Parallel analysis and scree plot were used to suggest the number of factors to extract  
274 and factor analysis was then conducted using oblique (oblimin) rotation, assuming the  
275 sub-scales are correlated. Items were retained if they had a loading of  $> 0.35$ , a  
276 communality of  $\geq 0.25$ , and no cross-loading. Cross-loading was defined as loading  $>$   
277  $0.35$  in more than one factor and a ratio of the square of the loadings (variance) below  
278  $2.0$  (Hair & Babin, 2018).

279 To examine criterion validity, adjusted  $R^2$  was obtained from a regression model with  
280 the extracted factors as predictors and the final summary item of risk (C-SSRS\_M) as  
281 the dependent variable. We hypothesized there would be significant associations of  
282 factors derived from all three included scales (C-SSRS Screen Version, SEASA, and  
283 BRFL) with the C-SSRS\_M summary item of suicide risk. Additionally, to evaluate the  
284 scale's capability to identify patients who are at high risk, we calculated the area under  
285 receiver operating characteristic (AUROC) curves (see supplementary materials). An  
286  $AUROC \geq .70$  indicates that the scale will produce acceptable discrimination as a  
287 diagnostic test (Hosmer et al., 2013).

## 288 **Results**

289 Eighty PLWH were enrolled in this study. The majority were women ( $n=62$ , 77.5%)  
290 and the median age of this sample was 42 years. Most participants had a primary  
291 school education or less ( $n=61$ , 76.3%) and were not in a relationship (i.e., were single,  
292 divorced, or widowed) ( $n=46$ , 57.5%). The median monthly income was 60,000  
293 Tanzanian shillings (Tsh), equivalent to roughly \$26 USD per month. Disclosure of  
294 one's HIV status was common in this sample, as 83.8% ( $n=67$ ) of participants had told  
295 at least one other person that they were living with HIV.

296

297 The scree plot suggested the best fit would occur with 4 factors and parallel analysis  
298 suggested the best fit would occur with 3 to 5 factors; all three solutions were examined  
299 (See Supplementary Materials). Variance explained by the solutions was 62%, 62%,  
300 and 67%, for the 3-factor, 4-factor, and 5-factor solutions, respectively. The 4-factor  
301 solution was determined most adequate, as all of the original scale items were retained  
302 in this solution, whereas theoretically important items had low loadings in the 3- and  
303 5-factor solutions.

304 In the final 4-factor solution, we retained one item with a communality below 0.25, “If  
305 you have thoughts of killing yourself in the future, how confident are you that you will  
306 tell someone?,” as this item measures a very important aspect of self-efficacy to avoid  
307 suicidal action. It was determined that the low communality for this item was likely  
308 related to the difficulty of disclosing suicidality, particularly in a culture where social  
309 ties are critically important to emotional health and suicidal thinking is both highly  
310 stigmatized and illegal.

311 In the final 4-factor solution, items from the Self-Efficacy to Avoid Suicidal Action scale  
312 formed Factor 1, “Self-Efficacy” ( $\alpha = 0.98$ ), and items from the C-SSRS screening  
313 version formed Factor 2, “Intensity of Suicidality” ( $\alpha = 0.99$ ). Items from the Brief  
314 Reasons for Living inventory were split, with items related to one’s family, children,  
315 and spirituality making up Factor 3, “Family and Spirituality” ( $\alpha = 0.94$ ), and items  
316 related to fear, morality, and social perception making up Factor 4, “Fear and Social  
317 Concern” ( $\alpha = 0.92$ ). Cronbach’s alpha for the combined 4-factor scale was 0.91 and  
318 the corrected item-total correlation for all items was above 0.3, indicating an adequate  
319 correlation between items and the overall scale, despite the items deriving from three  
320 different instruments.

321 Inter-factor correlations between “Intensity of Suicidality”, subscale and other  
322 subscales was -0.42 for “Self-Efficacy”, -0.17 for “Family and Spirituality” and -0.25 for  
323 “Fear and Social Concern”. All inter-factor correlations were in theoretically expected  
324 directions (Table 3)

325 As expected, regression analysis showed that higher Intensity of Suicidality (derived  
326 from the C-SSRS Screen Version) was strongly associated with suicide risk (i.e.,  
327 active plan or intent to attempt suicide, derived from the C-SSRS Full Version) ( $\beta=0.91$ ;  
328 95% CI= 0.69, 1.13). The Fear and Social Concern subscale ( $\beta=-0.07$ ; 95% CI= -0.13,  
329 -0.01) was significantly negatively correlated with suicide risk. However, Self-Efficacy  
330 ( $\beta=0.003$ ; 95%CI= -2.89, 3.92) and Family and Spirituality ( $\beta=0.04$ ; 95% CI= -0.06,  
331 1.14) were not significantly associated with suicide risk. The total variance in suicide  
332 risk explained by the four factors was 55.9% and was 54.5% when Intensity of  
333 Suicidality was the only predictor. Both Akaike Information Criterion (AIC) and

334 Bayesian Information Criterion (BIC) indicated that Intensity of Suicidality alone is the  
335 best model for identifying suicide risk.

336 Similarly, ROC analysis showed that Intensity of Suicidality was most useful in  
337 correctly identifying patients with high suicide risk [AUC = 0.89], followed by Fear and  
338 Social Concern [AUC = 0.78], Self-Efficacy [AUC = 0.69] and lastly Family and  
339 Spirituality [AUC = 0.64].

340 To utilize the individual subscales as a screening test, optimal cut-off points of the  
341 significant predictors can be referenced to identify individuals at high risk of suicide  
342 and the need for intervention. For Intensity of Suicidality, our findings support the  
343 commonly accepted cut point used for the C-SSRS Screen Version, which is a “Yes”  
344 response on any of items 3, 4, 5, or 6, indicating active plan, intent, or preparation for  
345 a suicide attempt. For the Fear and Social Concern subscale, a score  $\leq 34$  may  
346 indicate a higher risk of attempting suicide.

## 347 **Discussion**

348 Constraints in healthcare worker capacity and a lack of specialist mental health  
349 providers are major barriers to suicide risk assessment in many low- and middle-  
350 income countries. In Tanzania, we have identified high rates of suicidality among  
351 PLWH, but mental health providers are extremely rare, HIV clinic staff have little  
352 mental health training, and healthcare workers report feeling overburdened in their  
353 current roles (BLINDED FOR REVIEW, 2018; Oshosen et al., 2020). In light of these  
354 challenges, the ‘gold standard’ of an extended clinical interview by a mental health  
355 professional to assess suicide risk is rarely feasible (BLINDED FOR REVIEW, 2023).  
356 In this analysis, we identified that the brief screening of Intensity of Suicidality in the  
357 past month, measured by the C-SSRS Screen Version, is a valid and reliable  
358 strategy for identifying suicide risk (plan or intent to attempt suicide) among PLWH in  
359 Tanzania.

360 In addition to measures of recent suicidal intensity, strengths-focused instruments  
361 such as the BRFL can be beneficial in assessing suicide risk (Bakhiyi et al., 2016;  
362 Malone et al., 2000), as these are more likely to capture culturally salient protective  
363 factors (Lawrence et al., 2016; Pompili, 2022). In our analysis, participants with low  
364 endorsement of fear of death and low social concern on the BRFL were more likely

365 to have an active plan or intent to act on suicidal thoughts. Prior studies have shown  
366 that reduced fear of death differentiates between having suicide ideation and  
367 attempting suicide (Dhingra et al., 2015; Klonsky et al., 2017; Smith et al., 2016).  
368 This highlights the potential of these questions in identifying patients who need  
369 immediate help and referral for a higher level of care. The Family and Spirituality  
370 subscale of the BRFL was not associated with reduced suicide risk in the current  
371 study. However, understanding how the patient views family and spirituality can  
372 inform the clinician about resources available for support (CDC, 2022; Osafo et al.,  
373 2021).

374 Another strengths-focused instrument, was also not associated with suicide risk in  
375 the current study. However, this measure may still aid in assessing the broader  
376 clinical picture and can guide planning treatment. Evaluating patient's self-  
377 assessment of their ability to cope with suicidal thoughts in the future can provide  
378 valuable information to the clinician (Czyz et al., 2014, 2016).

379 Our study points to the value and validity of suicide screening in healthcare settings;  
380 however, assessment alone is not sufficient. Identification of high-risk patients must  
381 be paired with effective linkage to high-quality, evidence-based treatment. There  
382 have been slow but steady efforts to build the mental health system in Tanzania,  
383 which allows for the referral of people experiencing suicidal thinking to standard  
384 care. However, there is an immediate need to develop suicide prevention  
385 interventions that can utilize currently available resources efficiently while rapidly  
386 developing new services. This may also include enhanced mental health education  
387 in nursing and allied health professions, task-sharing of treatment with non-  
388 specialists, and utilizing technological advancements such as telehealth to increase  
389 treatment capacity (Knettel, Amiri, et al., 2023). It is important, however, to ensure  
390 that new services are developed while considering patients' safety, the evidence  
391 base of the treatments provided, and culturally informed development or adaptation  
392 of treatment approaches (Perera et al., 2020; Spanhel et al., 2021).

393 The study findings should be interpreted in light of the following limitations.  
394 Participants of this study were adults recruited from two HIV clinics in an urban  
395 setting with a relatively small sample size, and therefore results may not be

396 generalizable to other settings, populations, or to youth under the age of 18. Future  
397 studies may seek to identify whether the patterns of suicide risk we observed among  
398 PLWH are similar for people with other health conditions. The intention of this work  
399 was to assess the value of brief screening by healthcare workers other than  
400 psychologists and psychiatrists; however, it is important to note that these mental  
401 health professionals should still be engaged in the oversight of screening programs  
402 and in intervening when patients are identified with active risk of suicide. Effective  
403 task-shifting generally involves brief treatment and assessment with the option to  
404 refer for higher levels of care when appropriate.

#### 405 **Conclusions**

406 Our findings showed that the C-SSRS Screen Version, a 6-item measure of suicidal  
407 intensity, was a strong predictor of active plan or intent to attempt suicide and a  
408 feasible strategy for suicide risk screening in a setting where a full clinical interview is  
409 rarely feasible. Items from the BRFL measure that assessed fear of death and  
410 concerns about social reactions to suicide also significantly predicted suicide risk.  
411 These brief measures are appropriate for administration by non-specialists and show  
412 promise for identifying risk of suicide in settings with few mental health providers.  
413 Implementing routine suicide risk screening in HIV care and other high-risk settings  
414 is a low-impact strategy to rapidly improve the assessment of suicide, enhance  
415 linkage to mental health care, and save lives.

416

417

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419

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617 **Table and Figure Captions List**

618 **Table 1:** Socio-demographics characteristics and HIV history (N=80)

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620 **Table 3:** Inter-factor correlations

621 **Figure 1:** Suicide risk severity prediction by the four subscales

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623 **Supplementary Materials Captions List**

624 **Table S1:** 3-Factor solution

625 **Table S2:** 5-Factor solution

626 **Figure S1:** Items endorsement

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628 **Figure S2:** Polychoric matrix

629

630 **Figure S3:** ROC curves

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634 **Tables and Figures**

635

636 **Table 1: Socio-demographics characteristics and HIV history (N=80)**

<i>Characteristics</i>	<i>n (%)</i>
<b>Age [median (Q1, Q3)]</b>	42 (36, 49)
<b>Gender</b>	
Female	62 (77.5)
Male	18 (22.5)
<b>Religion</b>	
Christian	58 (72.5)
Muslim	22 (27.5)
<b>Education</b>	
No formal education	3 (3.8)
Primary	58 (72.5)
Secondary	16 (20.0)
Post-Secondary	3 (3.8)
<b>Relationships status</b>	
Married/Cohabiting	34 (42.5)
Single/Divorced/Widow/Separated	46 (57.5)
<b>Are you currently working?</b>	
No	29 (36.2)
Yes	51 (63.7)
<b>Monthly income [median (Q1, Q3)]</b>	60000 Tsh (30000, 200000)
<b>Were you born with HIV?</b>	
No	76 (95.0)
Yes	3 (3.8)
Don't know	1 (1.3)
<b>Have you ever told another person about your HIV status?</b>	
No	13 (16.2)
Yes	67 (83.8)

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639 **Table 2:** Exploratory factor analysis of the combined items, final 4-factor solution

		Factor 1	Factor 2	Factor 3	Factor 4
seasa2	If you have serious thoughts of killing yourself in the future, how confident are you that you will be able to keep yourself from attempting suicide?	0.94			
seasa4	How certain are you that you could control future thoughts of suicide if you were experiencing physical or emotional pain?	0.89			
seasa1	How confident are you that you will not attempt suicide in the future?	0.87			
seasa5	How certain are you that you could control future suicidal thoughts if you lost an important relationship?	0.84			
seasa6	How certain are you that you could control future suicidal thoughts if you lost a job, could not find employment, or suffered a financial crisis?	0.69			
seasa3	If you have thoughts of killing yourself in the future, how confident are you that you will tell someone?	0.42			
cssrs5	Have you started to work out or worked out the details of how to kill yourself? Do you intend to carry out this plan?		0.94		
cssrs6	Have you ever done anything, started to do anything, or prepared to do anything to end your life?		0.89		
cssrs4	Have you had these thoughts and had some intention of acting on them?		0.84		
cssrs3	Have you been thinking about how you might do this?		0.77		
brfl7	I want to watch my children as they grow			0.82	
brfl5	I love and enjoy my family too much and could not leave them			0.81	
brfl4	The effect on my children could be harmful			0.77	
brfl2	My family depends upon me and needs me			0.76	
brfl12	I believe I can find purpose in life, a reason to live			0.43	
brfl6	My religious beliefs forbid it			0.36	
brfl8	I am concerned about what others would think of me				0.71
brfl10	I am afraid of the actual "act" of killing myself (the pain, blood, violence)				0.67
brfl11	I would not want people to think I did not have control over my life				0.64
brfl9	I consider it morally wrong				0.35
brfl1	I am afraid of death				0.49
brfl3	I do not want to die				0.42

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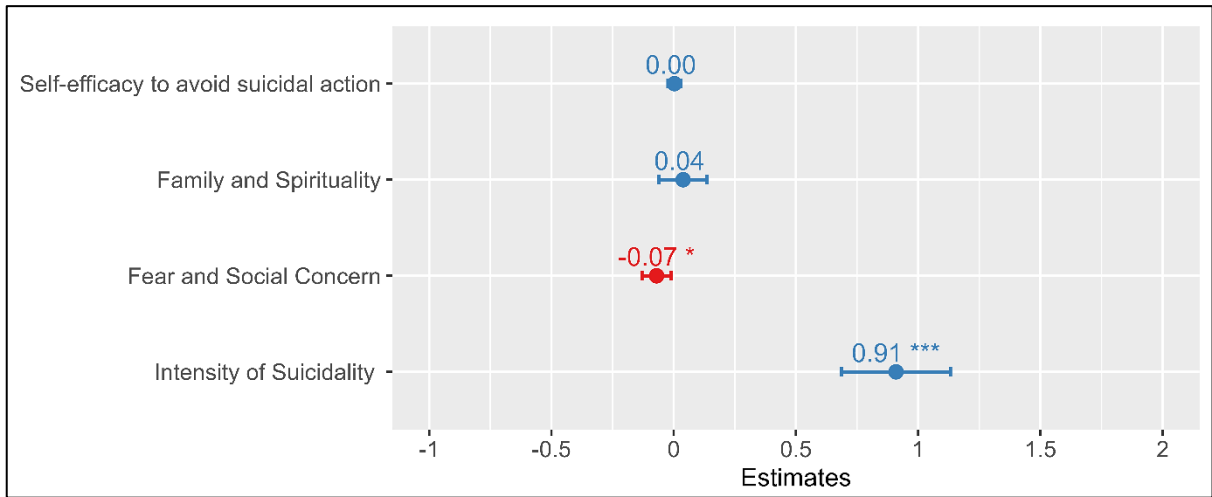
643 **Table 3:** Inter-factor correlations

	Intensity of Suicidality	Family and Spirituality	Fear and Social Concern
Family and Spirituality	-0.17		
Fear and Social Concern	-0.25	0.26	
Self-Efficacy	-0.42	0.39	0.24

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**Figure 1:** Suicide risk severity prediction by the four subscales

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651 **Supplementary Material**

652

653 **Table S1:** 3-Factor solution

		Factor 1	Factor 2	Factor 3
seas a2	If you have serious thoughts of killing yourself in the future, how confident are you that you will be able to keep yourself from attempting suicide?	0.94		
seas a4	How certain are you that you could control future thoughts of suicide if you were experiencing physical or emotional pain?	0.91		
seas a1	How confident are you that you will not attempt suicide in the future?	0.82		
seas a5	How certain are you that you could control future suicidal thoughts if you lost an important relationship?	0.84		
seas a6	How certain are you that you could control future suicidal thoughts if you lost a job, could not find employment, or suffered a financial crisis?	0.70		
seas a3	If you have thoughts of killing yourself in the future, how confident are you that you will tell someone?	0.44		
cssrs 5	Have you started to work out or worked out the details of how to kill yourself? Do you intend to carry out this plan?		0.96	
cssrs 6	Have you ever done anything, started to do anything, or prepared to do anything to end your life?		0.87	
cssrs 4	Have you had these thoughts and had some intention of acting on them?		0.74	
cssrs 3	Have you been thinking about how you might do this?		0.79	
brfl7	I want to watch my children as they grow			0.92
brfl5	I love and enjoy my family too much and could not leave them			0.66
brfl4	The effect on my children could be harmful			0.79
brfl2	My family depends upon me and needs me			0.82
brfl12	I believe I can find purpose in life, a reason to live			0.56
brfl6	My religious beliefs forbid it			0.51
brfl11	I would not want people to think I did not have control over my life			0.52
brfl9	I consider it morally wrong			0.56

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658 **Table S2:** 5-Factor solution

		Fact or 1	Fact or 2	Fact or 3	Fact or 4	Fact or 5
seas a2	If you have serious thoughts of killing yourself in the future, how confident are you that you will be able to keep yourself from attempting suicide?	0.93				
seas a4	How certain are you that you could control future thoughts of suicide if you were experiencing physical or emotional pain?	0.89				
seas a1	How confident are you that you will not attempt suicide in the future?	0.87				
seas a5	How certain are you that you could control future suicidal thoughts if you lost an important relationship?	0.85				
seas a6	How certain are you that you could control future suicidal thoughts if you lost a job, could not find employment, or suffered a financial crisis?	0.68				
seas a3	If you have thoughts of killing yourself in the future, how confident are you that you will tell someone?	0.42				
cssrs 5	Have you started to work out or worked out the details of how to kill yourself? Do you intend to carry out this plan?		0.9 4			
cssrs 6	Have you ever done anything, started to do anything, or prepared to do anything to end your life?		0.8 4			
cssrs 4	Have you had these thoughts and had some intention of acting on them?		0.8 3			
cssrs 3	Have you been thinking about how you might do this?		0.8 1			
brfl7	I want to watch my children as they grow			0.6 8		- 0.4 8
brfl5	I love and enjoy my family too much and could not leave them			0.6 8		
brfl4	The effect on my children could be harmful			0.8 5		
brfl2	My family depends upon me and needs me			0.8 0		
brfl1 2	I believe I can find purpose in life, a reason to live			0.3 5		
brfl6	My religious beliefs forbid it					
brfl8	I am concerned about what others would think of me				0.5 9	

brf10	I am afraid of the actual "act" of killing myself (the pain, blood, violence)				0.68	
brf11	I would not want people to think I did not have control over my life				0.64	
brf19	I consider it morally wrong				0.76	
brf11	I am afraid of death					0.56
brf13	I do not want to die					0.71

659

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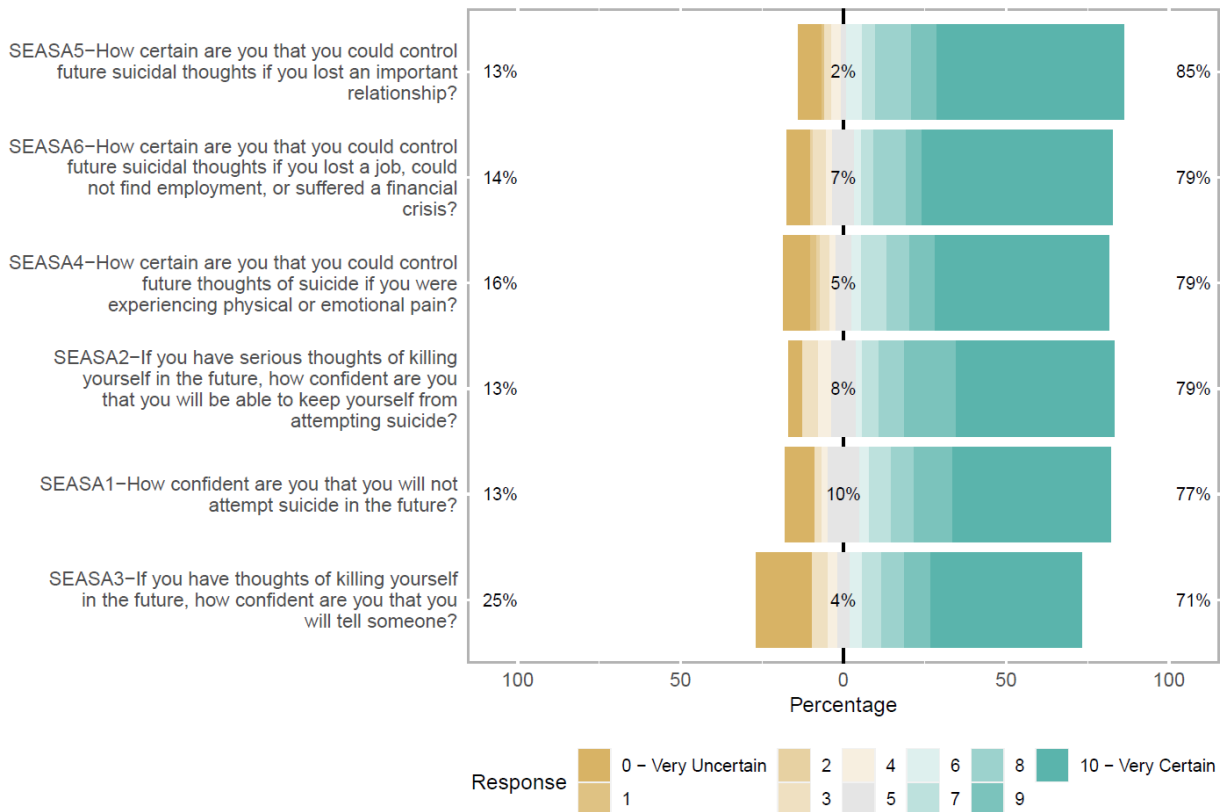
661 **Figure S1: Items Endorsement**

662 a) C-SSRS

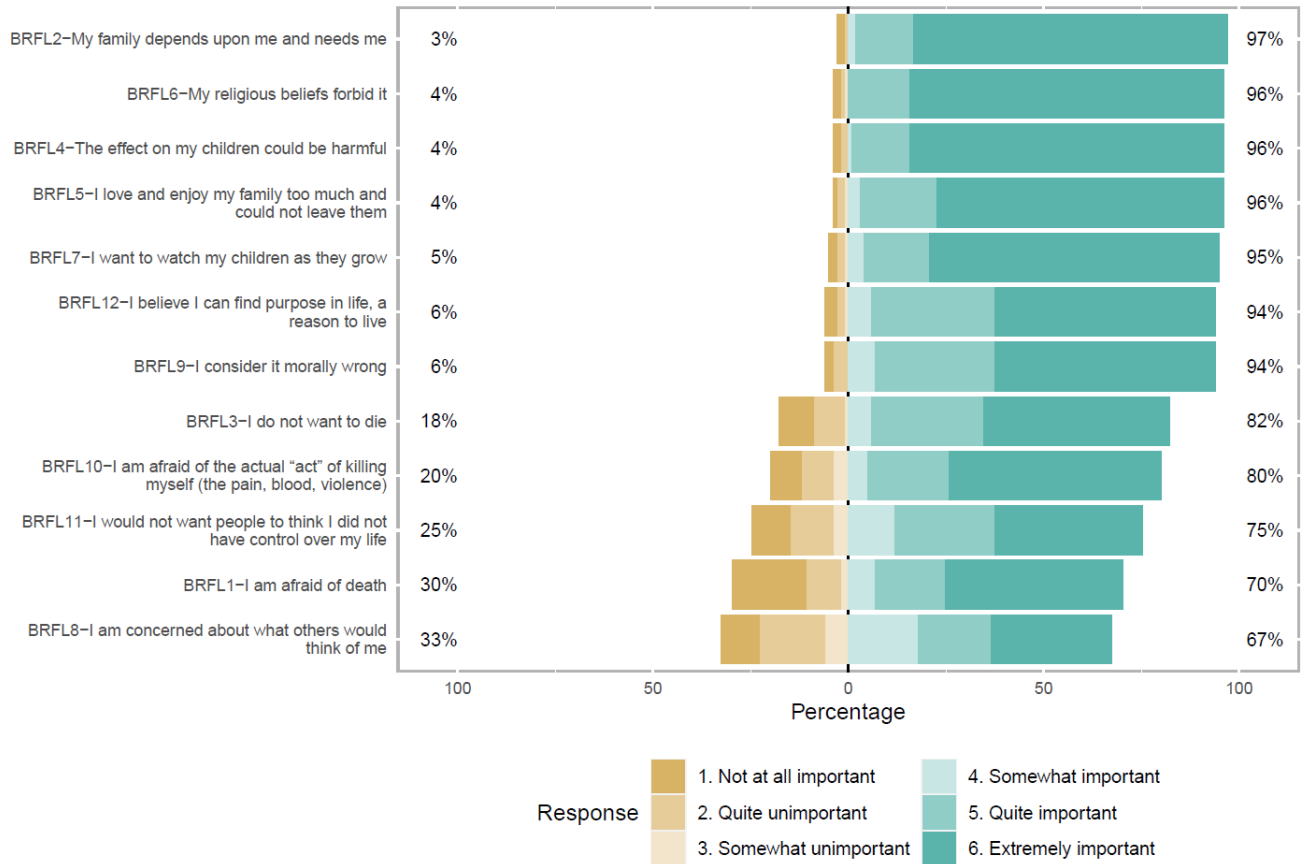
Item	n(%)
Have you wished you were dead or wished you could go to sleep and not wake up?	
Yes	80 (100)
No	0 (0)
Have you had any actual thoughts of killing yourself?	
Yes	67 (83.8)
No	13 (16.2)
Have you been thinking about how you might do this?	
Yes	48 (60.0)
No	32 (40.0)
Have you had these thoughts and had some intention of acting on them?	
Yes	36 (45.0)
No	44 (55.0)
Have you started to work out or worked out the details of how to kill yourself? Do you intend to carry out this plan?	
Yes	22 (27.5)
No	58 (72.5)
Have you ever done anything, started to do anything, or prepared to do anything to end your life?	
Yes	22 (27.5)
No	58 (72.5)

663

664 b) Self-Efficacy to Avoid Suicidal Action

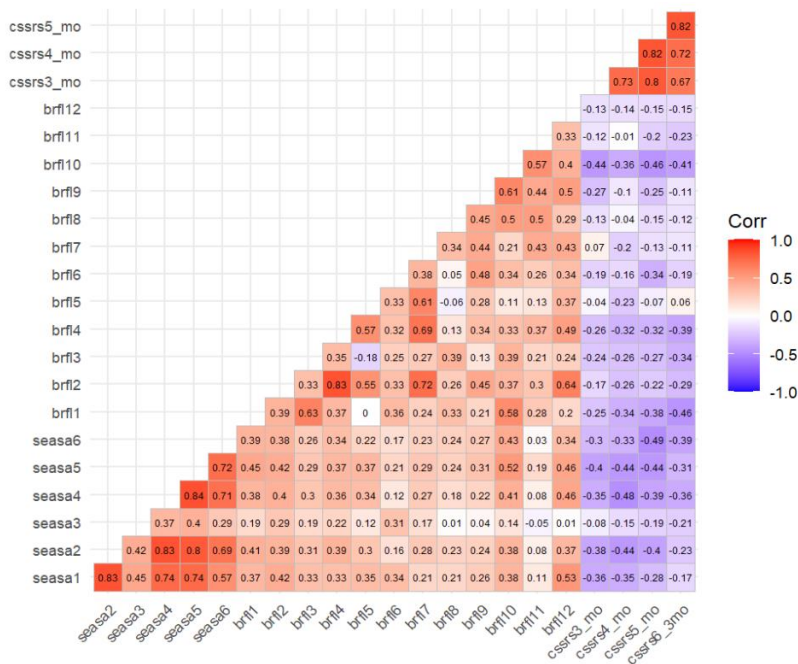


665 c) Brief Reasons for Living (BRFL)



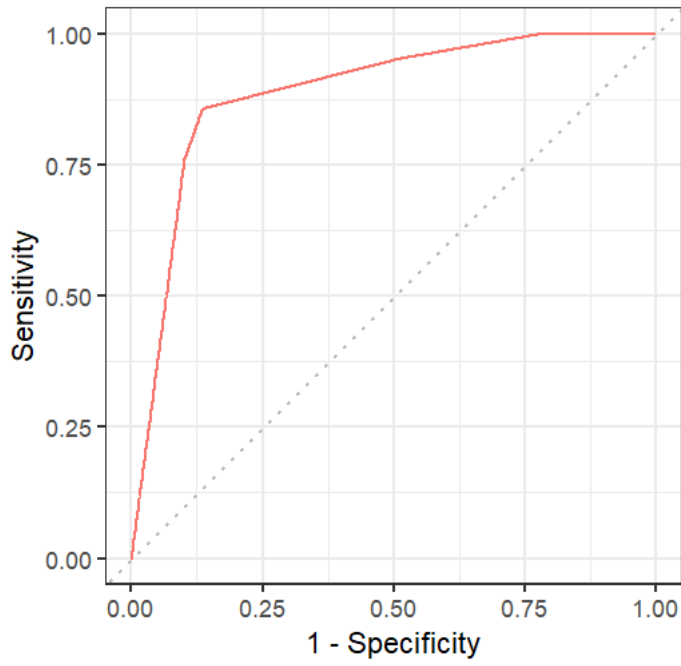
666  
667  
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Figure S2: Polychoric Matrix

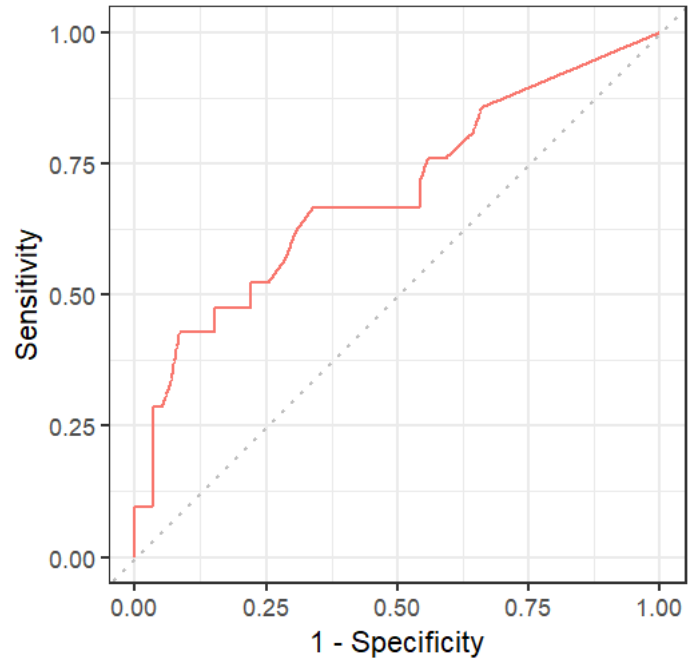




673 **Figure S3: ROC curves**

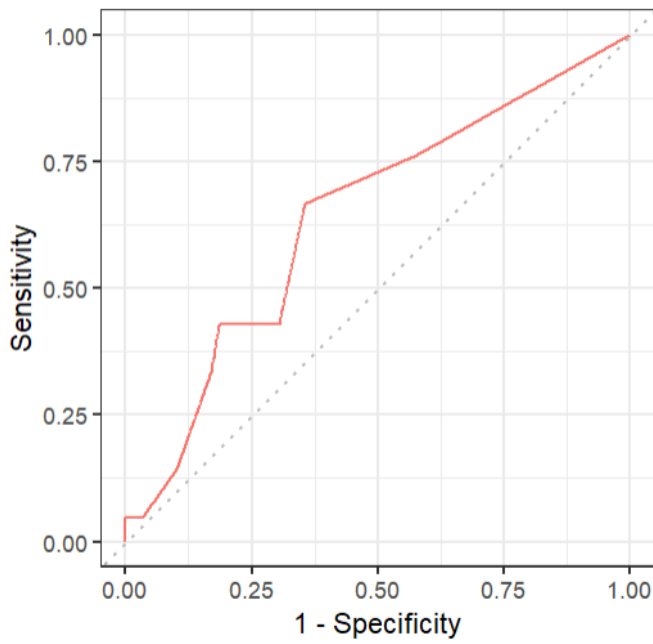


Intensity of suicidality

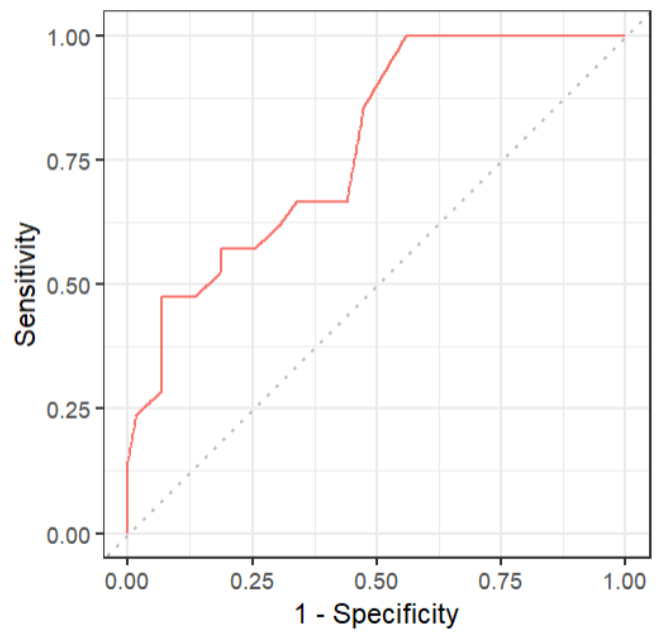


Self-Efficacy

676



Family and spirituality



Fear and social concern

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