Table 1 | Overview of priority research areas to prevent or treat mental health, neurological and substance-use disorders and associated risks arising in adolescence in low- and middle-income counties

MNS disorders and other key challenges to neural development	Identification and prioritization at community, province or national level	Epidemiology and causal understanding specific to LMICs	Development and evaluation of prevention programmes that are appropriate to LMICs	Development and evaluation of interventions or treatments that are appropriate to LMICs	Resources needed and capacity-building required in LMICs (including personnel, systems and appropriate measures)
Overall MNS disability	Implement WG and UNICEF disability measures for children and young adults in national surveys and research Adopt use of the WHODAS Youth instrument Evaluate using surveys and research	Include neurodisability and participation as outcomes in cross-sectional and longitudinal multi-site studies using comparable methods Link research priorities to gaps indicated in national surveys Disaggregate adolescent age group in child and adult studies	Programmes can be linked to national findings on disability	Evaluate programmes to ensure productive inclusion in education for those with neurodisability and full societal participation	Develop links between researchers and international and national organizations to conduct surveys to implement research priorities for adolescents
Inhibited development of executive function	*	Conduct comparative studies of cognitive development in high-income countries and LMICs, including the differential timing of hormonal changes and development of executive function	Prevention programmes from high-income countries especially useful in low-income groups, evidence for yoga, martial arts, sport and specific low cost/technology classroom activities	*	Further development of specific psychometric research tools that are appropriate to adolescents in LMICs is needed
Mental health and behavioural disorders					
Depression or anxiety	Population and school-based surveys to screen for mental disorders	*	Evaluate whether early intervention or prevention is effective	Evaluate systems for treatment of psychiatric disorders, linking to	Use of trained primary care and community workers using algorithms and protocols

			where multiple risk factors co-exist, or school initiatives, programmes for school retention or community- or family-based programmes are effective	identification through screening programmes Evidence is required to test whether and which early interventions prevent later recurrence	
Psychosis	Screening approaches need development and evaluation:,for example use of the Mood Disorder questionnaire for bipolar disorder	Improve early detection	Test effectiveness of Family Focussed Therapy Clinical High Risk in LMICs.	Test whether family interventions using non-specialists are effective for bipolar disorder	If research shows primary care and community workers can treat or prevent early manifestations of psychosis, there is a need to train teachers, nurses or other non-specialists
Post traumatic stress disorder	*	Understand protective factors and resilience in child soldiers	*	Research in LMICs evaluating Narrative Exposure Therapy and other school and community-based treatments Test if interventions could be delivered by teachers, nurses or other non-specialists	If research shows primary care and community workers can treat or prevent persistence of symptoms , there is a need to train teachers, nurses or other non-specialists
Substance and alcohol abuse	Self-report surveys where none exist	Evidence is needed for culture specific patterns of drug and alcohol use, and risks for binge drinking	Research into cash transfer and enhanced school curricula to support school completion and delay adoption Study impact of community and school sports programmes on early initiation of substance use	Develop effective programmes for binge drinkers, since alcohol dependence is not the key issue in adolescents	If research shows primary care and community workers can treat or prevent early onset, there is a need to train teachers, nurses or other non-specialists
Conduct disorder	Use of measures that are validated in LMICs in relevant surveys of prevalence is needed	*	*	Evaluation of parent and teacher targeted community and behaviour modification programmes Development and	*

				evaluation of peer support programmes are needed	
Neurological disorders					
Neurodevelopmental disorders with onset in adolescence	Surveys of learning difficulties on transition from primary to secondary school are needed	Understanding aetiology and manifestation of neurodevelopmental disabilities emerging in adolescence	Dependent on understanding aetiology	Evaluate effectiveness of vocation-oriented formal education alongside literacy and numeracy	There is a need to develop effective instruments to identify late-emerging neurodevelopmental disorders
TBI with neurocognitive loss and/or motor paralysis	Initiate routine collection of data on fatal and non-fatal TBI stratifying by age, differentiating adolescence from childhood	Investigate the occurrence of TBI in adolescence Study barriers to adoption of safety elements (for example, helmets or other protective gear) in risky environments for adolescents	Development and evaluation of programmes for transportation safety, largely outside the health sector	*	Develop and evaluate systems, providing safety elements (for example, helmets and other protective gear) in risky environments for adolescents
Epilepsy	Use of national surveys to determine prevalence and to prioritize efforts to prevent and to treat	Studies to understand aetiology in areas of high prevalence	Regular treatment to prevent helminth infection leading to neurocysticercosis and epilepsy	Research into provision of, and access to, more effective drugs Research to diminish stigma of diagnosis and promote inclusion and participation for adolescents with epilepsy	Evaluation is needed of role of mid-level health workers (with treatment algorithms) who are trained in use of school health programmes
Neurocognitive and hearing loss due to meningitis A	*	*	Implementation science to scale up use of vaccine	Support to those surviving infection with disability including schooling and vocational training	*
Potentially modifiable social risk factors					
Early childbearing	Data are already routinely collected by UNICEF	Investigate the impact of early childbearing on cognitive development and mental health in adolescent mothers	Policy research into changing cultural and political norms to reduce child marriage and early childbearing	Develop and test interventions to treat depression in adolescent mothers	*

School environment and inclusion (bullying, violence, school dropout and poor educational progression)	UNICEF already collect information on school completion	Evidence that school programmes can reduce substance and alcohol use, and development of mental health disorders Important to study factors leading to school retention, school failure or exclusion	Development of educational programmes suited to LMICs, which promote completion of secondary school with academic and technical achievements, and which test effectiveness of school-based programmes to prevent constellation of MNS risks	Research into programmes to promote school inclusion of disabled adolescents leading to good educational progression Research to investigate educational structures, curricula, support systems to ensure secondary education completion for all adolescents	Enhanced training for teachers to take on broader role
Interfamilial violence	*	Need studies of prevalence, impact of abuse of adolescents and of adolescent partner violence, including MNS outcomes	Evaluation of community-based parenting programmes to reduce child abuse Evaluation of school based programmes required	Evaluation of programmes to support victims and reduce long-term MNS outcomes	*
Exposure to community and societal violence Induction of adolescent soldiers	*	Study multi-tiered pathways to inform intervention Research with longer term outcomes from programmes needed	Test peer support programmes similar to those used for HIV	Effective programmes to support victims especially boys - there is evidence that girls benefit more from these interventions)	*
HIV	Expand routinely collected data	Early sexual activity and substance use are associated with HIV infection	Longer schooling reduces HIV infection especially in girls Test methods such as cash transfer to enable entry into, and completion of, secondary schooling	Extend exploration and evaluation of innovative pilot work on family support to promote mental health of adolescents at risk (VUKA/CHAMP).	*

Key to Acronyms: LMICs, low- and middle-income countries; MNS, mental health, neurological and substance-use disorders; PTSD, post traumatic stress disorder, TBI, traumatic brain injury; WG, Washington Group on Disability Statistics; WHODAS, World Health Organization Disability Assessment Schedule.

* Where squares are blank, the authors did not make specific recommendations at this time