Supplementary Figure S1: Correlation between NMR and Prevalence of DD (Taiwan 1997-2008)

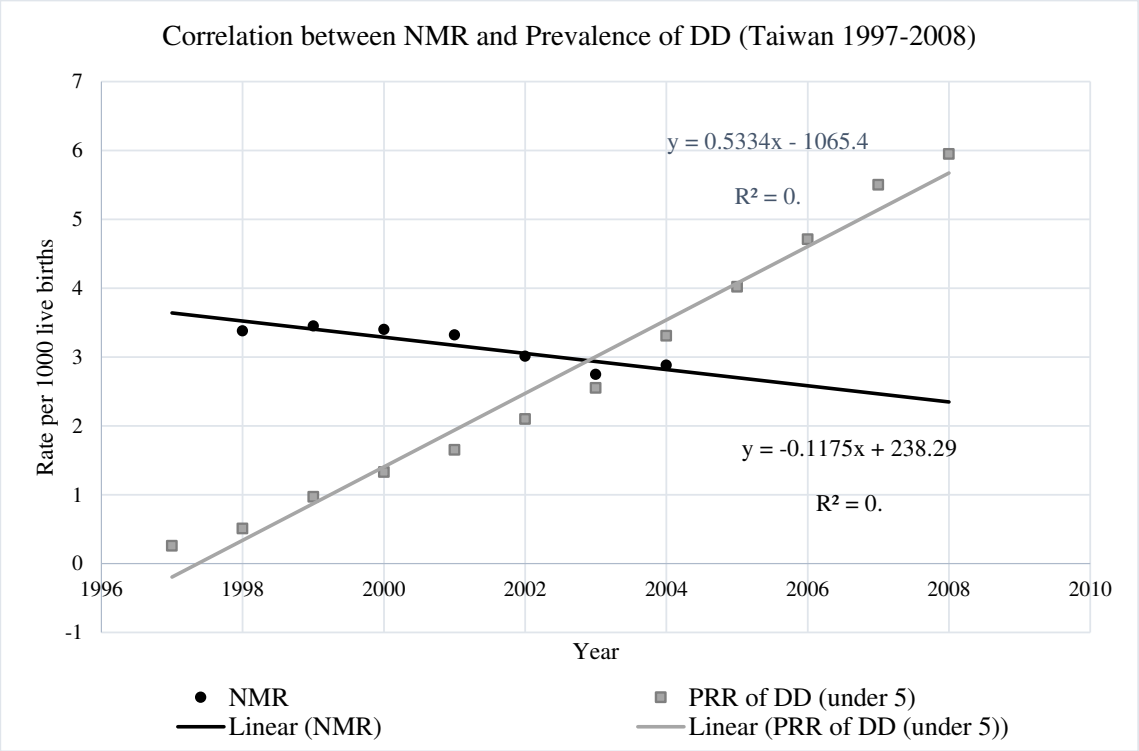

Figure S1: Correlation between neonatal mortality rate and prevalence of developmental delay (Taiwan 1997-2008)

Footnote: We have used prevalence of developmental delay among under 5 children (1997-2008) from a nation-wide population based retrospective study [18] and neonatal mortality rate (1998-2004) from another study [19]. It was revealed that the prevalence of developmental delay is positively associated with time and negatively associated with NMR. So, it can be said that, with time, while neonatal mortality rate is reducing, the prevalence of developmental delay is gradually increasing.

Supplementary Table S1: Medline search strategy

MEDLINE: Systematic review - screening for disorders in children in LMIC (as at 05.03.18)

Notes: No date or language limits applied.

Database: Ovid MEDLINE <1946 to 2018 February 28> (Phase 1)

Search Strategy:
---
1 exp Mass Screening/ (114856)
2 screen$.tw. (543259)
3 exp DIAGNOSIS/ (7780076)
4 (early adj5 (diagnos$ or identif$ or detect$ or discover$)).tw. (179324)
5 1 or 2 or 3 or 4 (8132793)
6 exp "Surveys and Questionnaires"/ (881308)
7 (survey$ or questionnaire$).tw. (745680)
8 (instrument$ or tool$).tw. (665937)
9 6 or 7 or 8 (1849661)
10 5 and 9 (774120)
11 exp Neurodevelopmental Disorders/ (162135)
12 exp Motor Disorders/ (197)
13 exp Cerebral Palsy/ (18455)
14 (cerebral adj pals$).tw. (17316)
15 CP.tw. (36947)
16 exp Cognitive Dysfunction/ (7530)
17 exp Communication Disorders/ (59072)
18 ((development$ or motor$ or speech$ or cogniti$ or behav$) adj5 (disorder$ or disabilit$ or condition$ or impair$ or deficit$)).tw. (200268)
19 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 (415783)
20 10 and 19 (27683)
21 exp Developing Countries/ (69408)
22 exp ASIA/ (698877)
23 exp AFRICA/ (230576)
24 exp South America/ (134532)
25 asia$.tw. (100200)
26 africa$.tw. (169185)
27 (south adj1 america$).tw. (14876)
28 (low adj2 income adj2 countr$).tw. (4196)
29 (middle adj2 income adj2 countr$).tw. (7713)
30 LMIC.tw. (649)
31 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 (1214625)
32 20 and 31 (2207)
33 limit 32 to humans (2185)
34 remove duplicates from 33 (2183)
35 limit 34 to "all child (0 to 18 years)" (1270)
36 exp INFANT/ (1056001)
37 exp CHILD/ (1753019)
38 exp ADOLESCENT/ (1842871)
39 (paediatric$ or pediatric$ or child$ or adolescen$ or teen$ or infant$ or baby or babies).tw. (1586099)
40 36 or 37 or 38 or 39 (3520016)
41 34 and 40 (1313)
42 35 or 41 (1313)
****

Database: Ovid MEDLINE(R) ALL <1946 to July 13, 2020> (Phase 2)

Search Strategy:
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1 exp Mass Screening/ (127799)
2 screen$.tw. (748410)
3 exp DIAGNOSIS/ (8521264)
4 (early adj5 (diagnos$ or identif$ or detect$ or discover$)).tw. (247525)
5 1 or 2 or 3 or 4 (9082816)
6 exp "Surveys and Questionnaires"/ (1030942)
7 (survey$ or questionnaire$).tw. (1039336)
8 (instrument$ or tool$).tw. (981681)
9 6 or 7 or 8 (2492583)
10 5 and 9 (930528)
11 exp Neurodevelopmental Disorders/ (180714)
12 exp Motor Disorders/ (480)
13 exp Cerebral Palsy/ (20558)
14 (cerebral adj pals$).tw. (22436)
15 CP.tw. (54326)
16 exp Cognitive Dysfunction/ (17245)
17 exp Communication Disorders/ (63349)
18 ((development$ or motor$ or speech$ or cogniti$ or behav$) adj5 (disorder$ or disabilit$ or condition$ or impair$ or deficit$)).tw. (283402)
19 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 (537248)
20 10 and 19 (34449)
21 exp Developing Countries/ (74723)
22 exp ASIA/ (832820)
23 exp AFRICA/ (265707)
24 exp South America/ (161136)
25 asia$.tw. (146545)
26 africa$.tw. (228897)
27 (south adj1 america$).tw. (21374)
28 (low adj2 income adj2 countr$).tw. (7421)
29 (middle adj2 income adj2 countr$).tw. (18310)
30 LMIC.tw. (1795)
31 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 (1497552)
32 20 and 31 (2846)
33 limit 32 to humans (2778)
34 limit 33 to "all child (0 to 18 years)" (1553)
35 exp INFANT/ (1136560)
36 exp CHILD/ (1905000)
37 exp ADOLESCENT/ (2022225)
38 (paediatric$ or pediatric$ or child$ or adolescen$ or teen$ or infant$ or baby or babies).tw. (1999177)
39 35 or 36 or 37 or 38 (4073700)
40 33 and 39 (1614)
41 34 or 40 (1614)
42 limit 41 to yr="2018 -Current" (242)
****

Supplementary Table S2: List of key definitions regarding study selection

Key words	Definitions
Assessment	Assessment is a process for defining the nature of that problem, determining a diagnosis, and developing specific treatment recommendations for addressing the problem or diagnosis.
Developmental Assessment	In-depth examination of child's development conducted by developmental pediatrician/ child psychologist
Developmental Delay	A condition where a child does not reach it's developmental milestones at the expected times
Developmental Disability	The severe and chronic form of developmental delay which is expected to continue indefinitely and substantially restricts the individual's daily living activities
Developmental Domain	A collective term used to describe different aspects of brain growth and development
Developmental Monitoring	Observing child's developmental progress by parents/ caregivers
Developmental Screening	Looking for specific developmental concern by doctors/ healthcare professionals using brief questionnaire/ checklist
Disability	any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being.
Gray Literature	Research that is either unpublished or has been published in non-commercial form. Example: government reports, conference proceedings, pre-prints and post-prints of articles, theses and dissertations, etc.
Hand Searching	The page-by-page examination of journal issues, conference proceedings, reference lists of journal articles and other publications for relevant studies
Impairment	any loss or abnormality of psychological, physiological or anatomical structure or function.
Item	List of activities under a screening tool or questionnaire
Monitoring	monitoring involves routine evaluation of changes to health or health risks
Original Article	It is the report of a study written by the researchers who conducted the study
Psychometric Properties	Psychometric properties refer to the reliability and validity of a test
Reliability	Reliability refers to the extent to which an assessment/ screening tool produces stable and consistent results
Review Article	Critical and constructive analysis of existing published literature in a field, considered as secondary literature.
Screening	Screening is a process for evaluating the possible presence of a particular problem. The outcome is normally a simple yes or no
Sensitivity	The ability of a test to correctly identify those who have the disease
specificity	The ability of a test to correctly identify those who do not have the disease
Surveillance	Ongoing systematic collection of health data essential to the planning, implementation and evaluation of the public health practice closely integrated with the timely dissemination of these data to those who need to know
Validity	The ability of a test to distinguish between who has a disease and who does not

Supplementary Table S3: Quality Assessment Tool for Diagnostic Accuracy Studies-2 rating of the selected studies (Part 1)

	[38]	[39]	[40]	[41]	[42]	[43]	[44]	[45]	[46]
DOMAIN 1: PATIENT SELECTION									
A. Risk of Bias									
Was a consecutive or random sample of patients enrolled?	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Was a case-control design avoided?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Did the study avoid inappropriate exclusions?	Yes	Unclear	Unclear	Unclear	Unclear	Unclear	Yes	Yes	Yes
Could the selection of patients have introduced bias?	High	Unclear	Unclear	Unclear	Unclear	Unclear	Low	High	High
B. Concerns regarding applicability									
Is there concern that the included patients do not match the review question?	Low	Low	Low	Low	Low	Low	Low	Low	Low
DOMAIN 2: INDEX TEST(S)									
A. Risk of Bias									
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
If a threshold was used, was it pre-specified?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Could the conduct or interpretation of the index test have introduced bias?	Low	Low	Low	Low	Low	Low	Low	Low	Low
B. Concerns regarding applicability									
Is there concern that the index test, its conduct, or interpretation differ from the review question?	Low	Low	Low	Low	Low	Low	Low	Low	Low
DOMAIN 3: REFERENCE STANDARD									
A. Risk of Bias									
Is the reference standard likely to correctly classify the target condition?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were the reference standard results interpreted without knowledge of the results of the index test?	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes
Could the reference standard, its conduct, or its interpretation have introduced bias?	Low	Low	Low	Low	Low	Unclear	Low	Low	Low
B. Concerns regarding applicability									
Is there concern that the target condition as defined by the reference standard does not match the review question?	Low	Low	Low	Low	Low	Low	Low	Low	Low
DOMAIN 4: FLOW AND TIMING									
A. Risk of Bias									
Was there an appropriate interval between index test(s) and reference standard?	No	Yes	Yes	Yes	Yes	Yes	Unclear	Unclear	Unclear
Did all patients receive a reference standard?	Yes	Yes	Yes	No	Yes	No	No	No	Yes
Did patients receive the same reference standard?	Yes	Yea	Yea	Yes	Yea	Yes	Yes	Yes	No
Were all patients included in the analysis?	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes
Could the patient flow have introduced bias?	Low	Low	Low	Low	Low	High	Unclear	Unclear	Low

Supplementary Table S3: Quality Assessment Tool for Diagnostic Accuracy Studies-2 rating of the selected studies (Part 2)

	[47]	[48]	[49]	[50]	[51]	[52]	[53]	[54]	[55]
DOMAIN 1: PATIENT SELECTION									
A. Risk of Bias									
Was a consecutive or random sample of patients enrolled?	No	No	No	No	Yes	No	Yes	Yes	Yes
Was a case-control design avoided?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Did the study avoid inappropriate exclusions?	Yes	Yes	Yes	Yes	Yes	Unclear	Unclear	Yes	Yes
Could the selection of patients have introduced bias?	High	High	High	High	Low	Unclear	Unclear	Low	Low
B. Concerns regarding applicability									
Is there concern that the included patients do not match the review question?	Low	Low	Low	Low	Low	Low	Low	Low	Low
DOMAIN 2: INDEX TEST(S)									
A. Risk of Bias									
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
If a threshold was used, was it pre-specified?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Could the conduct or interpretation of the index test have introduced bias?	Low	Low	Low	Low	Low	Low	Low	Low	Low
B. Concerns regarding applicability									
Is there concern that the index test, its conduct, or interpretation differ from the review question?	Low	Low	Low	Low	Low	Low	Low	Low	Low
DOMAIN 3: REFERENCE STANDARD									
A. Risk of Bias									
Is the reference standard likely to correctly classify the target condition?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were the reference standard results interpreted without knowledge of the results of the index test?	Unclear	Yes	Yes	Unclear	Yes	Unclear	Unclear	Yes	Yes
Could the reference standard, its conduct, or its interpretation have introduced bias?	Unclear	Low	Low	Unclear	Low	Unclear	Unclear	Low	Low
B. Concerns regarding applicability									
Is there concern that the target condition as defined by the reference standard does not match the review question?	Low	Low	Low	Low	Low	Low	Low	Low	Low
DOMAIN 4: FLOW AND TIMING									
A. Risk of Bias									
Was there an appropriate interval between index test(s) and reference standard?	Unclear	Yes	Unclear	Unclear	Unclear	Unclear	Yes	Unclear	Yes
Did all patients receive a reference standard?	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No
Did patients receive the same reference standard?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were all patients included in the analysis?	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Could the patient flow have introduced bias?	Low	Low	Low	Low	High	Low	Low	High	Low

Supplementary Table S4: Newcastle-Ottawa Scale scores of the selected studies

	[38]	[39]	[40]	[41]	[42]	[43]	[44]	[45]	[46]	[47]	[48]	[49]	[50]	[51]	[52]	[53]	[54]	[55]
Selection: (Maximum 5 stars)																		
Representativeness of the sample	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Sample size		**	**				*										**	*
Non-respondents	Not Applicable																	
Ascertainment of the exposure	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
Comparability: (Maximum 2 stars)																		
The subjects in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled	Not Applicable																	
Outcome: (Maximum 3 stars)																		
Assessment of the outcome	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
Statistical test	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*

Supplementary Table S5: Selection criteria used for participation in the studies

Ref.	Inclusion Criteria	Exclusion Criteria
[38]	Children attending the study hospital	Children without a proper birth record Children not accompanied by a caregiver at the time of evaluation
[39]	Children living in the study area	Not applicable
[40]	Parents willing to participate	Not applicable
[41]	Children living in the study area	Not applicable
[42]	Very Low Birth Wight Children treated in NICU of the study hospital	Not applicable
[43]	Children living in the study area	Not applicable
[44]	Children whose parents/ primary caregiver gave consent	Ill children Children uncooperative for testing
[45]	Afrikaans, Tswana or English speaking parents or guardian	Children suspected or diagnosed with mental retardation, autism or neuromotor delay
[46]	Children attending the study hospital	Children with acute illness Children not accompanied by parents Children whose parents did not give consent to participate
[47]	Children with apparently normal development	Children with acute and chronic disease Children not accompanied by a caregiver Children with illiterate caregiver
[48]	Parents completed primary education Parents able to read Hindi Parents living with the child	Premature children Children with acute severe illness Previous diagnosis of developmental disorder
[49]	Children attending the study hospital	Premature children Previous diagnosis of developmental delay Children with a visual/hearing problem The accompanying parent does not understand the Thai language
[50]	Parents willing to participate	Chronically ill children Previous diagnosis of developmental delay
[51]	Children living in the study area	Children whose parents did not give consent to participate
[52]	Afrikaans or English speaking parents Parents visiting the primary health care clinics Parents asked to participate	Not applicable
[53]	Children born to mothers enrolled in "Malaria in Pregnancy Preventive Alternative Drugs" trial	Non-singleton births
[54]	**Community:** Children living in the study area **Hospital:** Children attending the study hospital	Not applicable
[55]	Not applicable	Children with congenital malformation, acute illness and mental retardation

Supplementary Table S6: List of Rejected Studies and Tools

	Ref	Tool	Reason of Rejection
1.	Biasini et al. 2015	12 month Screener	Tool Development Intervention study
2.	Wirz et al. 2005	ACCESS Portfolio	Disability Screening tool Sensitivity-Specificity not measured
3.	Ngoun et al. 2012	AHC DMAT	Tool development 1-6 years Sensitivity-Specificity not measured
4.	Kwun et al. 2014	ASQ	Validated in non LIMC country
5.	Salomonsson et al. 2010	ASQ:SE	Validated in non LIMC country
6.	Bian et al. 2017	ASQ:SE	Translation and adaptation Sensitivity-Specificity not measured
7.	Parveen et al. 2014	BSID-II	Assessment tool Tool adaptation
8.	Ranjitkar et al. 2018	Bayley III	Efficacy of vitamin B12 supplementation on growth and neurodevelopment
9.	Rizzoli-Córdoba et el. 2015	BDI-2 ST	Prevalence study English translation is not available
10.	Kishore et al. 2018	BDST	Correlation Study Sensitivity-Specificity not measured
11.	Pathak et al. 1991	BDST	Preparing developmental curve Sensitivity-Specificity not measured
12.	Guedes et al. 2011	BINS	Sensitivity-Specificity not clearly documented
13.	Sheldrick et al. 2013	BPSC	Validated in non LIMC country
14.	Glascoe et al. 2005	Brigance-II	Validated in non LIMC country
15.	Ireton et al.1996	CDR-PQ	Validated in non LIMC country
16.	Liao et al. 2008	CDIIT	Validated in non LIMC country
17.	McCoy et al. 2017	CREDI	Tool development, Correlation study
18.	Altafim et al. 2018	CREDI	Sensitivity-Specificity not measured
19.	Wetherby et al. 2003	CSBS-DP	Validated in non LIMC country
20.	Nair et al. 2009	DATA	Tool development and standardization Sensitivity-Specificity not measured
21.	Nair et al. 2012	DATA II	Tool development
22.	Luiz et al. 2004	DDST II	3-6 years Correlation study
23.	Wijedasa et al. 2011	DDST II	Adaptation and standardization
24.	Shahshahani et al. 2010	DDST II	0-6 years
25.	Scherzer et al 2009	DMChart	0-8 years Sensitivity-Specificity not measured
26.	Abubakar et al. 2009	DMChecklist	Correlation study Sensitivity-Specificity not measured
27.	Prado et al. 2014	DMCchecklist II	Correlation study Sensitivity-Specificity not measured
28.	Chopra et al. 1999	DSS	Disability Screening tool 0-6 years
29.	Velez et al. 2007	EAD 1	Prevalence Study
30.	Rao et al. 2014	EAP ECDS	Assessment tool 36-71 months
31.	Janus et al. 2007	EDI	4-6 years

			Validated in non LIMC country
32.	Verdisco et al. 2015	Engle	Correlation study Sensitivity-Specificity not measured
33.	Schafer et al. 2014	ERIC	Validated in non LIMC country
34.	Meisels etal. 1993	ESI-R	3-6 years Validated in non LIMC country
35.	Lenkarski et al. 2001	ESP	Validated in non LIMC country
36.	Hatakenaka et al. 2016	ESSENCE-Q	0-6 years Validated in non LIMC country
37.	Munir et al. 1999	IBAS	Assessment tool 1-10 years
38.	Gulati et al. 2014	INCLEN-NDST	2-9 years
39.	Fernandes et al. 2014 Murray et al. 2018	Intergrowth-21	Assessment tool
40.	Abubakar et al. 2008	KDI	Assessment tool Part of sample consists of children with NDD
41.	Gladstone et al. 2008 Gladstone et al. 2010	MDAT	Assessment tool 0-6 years
42.	Hwang et al. 2015	MuSiC	Validated in non LIMC country
43.	Arya et al. 1991	NIMH-DSS	0-6 years
44.	Schroeder et al. 2014	PCQ	Sensitivity-Specificity not clearly documented
45.	Malik et al. 2007	PDST	Sensitivity-Specificity not measured
46.	Sheldrick et al. 2012	PPSC	1.5-5.5 years Tool development Validated in non LIMC country
47.	Simonian and Tarnowski 2001	PSC	4-16 years
48.	Boyede et al.2016	Red Cross	Validated among HIV infected children
49.	Islam et al. 2016	RNDA	Assessment tool Prediction
50.	Ara et al. 2015	RNDA	Prevalence of NDI
51.	Khan et al. 2014	RNDA	Assessment 2-9 years
52.	Haataja et al. 2002	Shoklo	Assessment tool Validated in non LIMC cohort
53.	Sheldrick and Perrin 2013	SWYC	Tool development
54.	Wu et al. 2012	TQP	Association study
55.	Pérez-Escamilla 2017		Spanish

Supplementary Table S7: Example of culture-sensitive BSID-II items for Bangladeshi infants (adopted from [70])

	Original	Culture Sensitive
Picture	Pomfret	Ilish
	Star	National Flag
	House with chimney	Tin-shed house
Material	Sugar pellet	Iron tablets
	Small toy (rabbit)	Small doll (boy or girl)
	Thomas The Tank Engine Visits a Farm	Shishur Jotno' from 'Meena Raju Series'
	Sugar pellet	Iron tablets
Word	Auto	Vo
	Leaf	Pata/ Shak

Supplementary Table S8: Basic properties of ASQ and PEDS (adopted from [76])

Characteristic	PEDS	ASQ
Screening approach	Parents' developmental concerns	Parents provide information about child's skills
Age Range	0 to 96 months	1 to 66 months
Questionnaire	One	21 sets of questionnaire for 21 age groups
Developmental domains	Gross motor, Fine motor, Cognitive, Expressive language, Receptive language, Self-help, Social-emotional, Behavior, School, Other	Gross motor, Fine motor, Problem solving, Communication, Personal-social
Format	10 questions covering 9 developmental concerns Response options: no/yes/a little	30 questions covering 5 developmental domains Response options: yes/sometimes/not yet
Example of item	Expressive language: "Do you have any concerns about how your child talks and makes speech sounds?"	Communication skill at 18 months: "Does your child say 8 or more words in addition to 'Mama' and 'Dada'?"
Time to screen	5 min of parent time 1–2 min for provider/staff to score	10–15 min of parent time 1–2 min for provider/staff to score