

## Data element level validity

Table 1. Data element validity test results, HCCN 1, 2023

Data elements	Age group	Sensitivity	Specificity	PPV	NPV
Sterilization	<b>15-44</b>	<b>0.00</b>	<b>1.00</b>	<b>NA</b>	<b>0.97</b>
Sterilization	21-44	0.00	1.00	NA	0.96
Sterilization	15-20	NA	1.00	NA	1.00
IUD	<b>15-44</b>	<b>0.64</b>	<b>0.99</b>	<b>0.88</b>	<b>0.97</b>
IUD	21-44	0.60	0.99	0.86	0.96
IUD	15-20	1.00	1.00	1.00	1.00
Implantable	<b>15-44</b>	<b>0.76</b>	<b>1.00</b>	<b>1.00</b>	<b>0.96</b>
Implantable	21-44	0.73	1.00	1.00	0.96
Implantable	15-20	0.83	1.00	1.00	0.96
Injectables	<b>15-44</b>	<b>0.89</b>	<b>1.00</b>	<b>1.00</b>	<b>0.99</b>
Injectables	21-44	0.94	1.00	1.00	0.99
Injectables	15-20	0.50	1.00	1.00	0.97
Contraceptive pills	<b>15-44</b>	<b>0.89</b>	<b>0.97</b>	<b>0.81</b>	<b>0.98</b>
Contraceptive pills	21-44	0.93	0.98	0.88	0.99
Contraceptive pills	15-20	0.75	0.93	0.60	0.96
Contraceptive patch	<b>15-44</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>
Contraceptive patch	21-44	1.00	1.00	1.00	1.00
Contraceptive patch	15-20	1.00	1.00	1.00	1.00
Vaginal ring	<b>15-44</b>	<b>NA</b>	<b>1.00</b>	<b>NA</b>	<b>1.00</b>
Vaginal ring	21-44	NA	1.00	NA	1.00
Vaginal ring	15-20	NA	1.00	NA	1.00
Infecund	<b>15-44</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>
Infecund	21-44	1.00	1.00	1.00	1.00
Infecund	15-20	NA	1.00	NA	1.00
Has a qualifying encounter during measurement year	<b>15-44</b>	<b>0.85</b>	<b>1.00</b>	<b>1.00</b>	<b>0.80</b>
Has a qualifying encounter during measurement year	21-44	0.85	1.00	1.00	0.81
Has a qualifying encounter during measurement year	15-20	0.86	1.00	1.00	0.77
SINC response	<b>15-44</b>	<b>0.91</b>	<b>1.00</b>	<b>1.00</b>	<b>0.91</b>
SINC response	21-44	0.89	1.00	1.00	0.89
SINC response	15-20	1.00	1.00	1.00	1.00
Had a prenatal visit during the year prior to the measurement year and 9 months in the measurement year	<b>15-44</b>	<b>0.92</b>	<b>1.00</b>	<b>1.00</b>	<b>0.99</b>
Had a prenatal visit during the year prior to the measurement year and 9 months in the measurement year	21-44	0.91	1.00	1.00	0.99
Had a prenatal visit during the year prior to the measurement year and 9 months in the measurement year	15-20	1.00	1.00	1.00	1.00

Data elements	Age group	Sensitivity	Specificity	PPV	NPV
Had a live birth date during the last 3 months of the prior year and the measurement year	<b>15-44</b>	<b>0.40</b>	<b>1.00</b>	<b>1.00</b>	<b>0.98</b>
Had a live birth date during the last 3 months of the prior year and the measurement year	21-44	0.40	1.00	1.00	0.97
Had a live birth date during the last 3 months of the prior year and the measurement year	15-20	NA	1.00	NA	1.00
Had an estimated delivery date during the last 3 months of the prior year and the measurement year	<b>15-44</b>	<b>0.73</b>	<b>1.00</b>	<b>1.00</b>	<b>0.98</b>
Had an estimated delivery date during the last 3 months of the prior year and the measurement year	21-44	0.73	1.00	1.00	0.97
Had an estimated delivery date during the last 3 months of the prior year and the measurement year	15-20	NA	1.00	NA	1.00
Had a non-live during the last 3 months of the prior year and the measurement year	<b>15-44</b>	<b>0.50</b>	<b>1.00</b>	<b>1.00</b>	<b>0.99</b>
Had a non-live during the last 3 months of the prior year and the measurement year	21-44	0.50	1.00	1.00	0.99
Had a non-live during the last 3 months of the prior year and the measurement year	15-20	NA	1.00	NA	1.00

NA indicates that the validity statistics could not be calculated because the denominator to calculate the statistics was 0. E.g. the patient chart (authoritative source) indicates no women in the 15-20 age group had female sterilization.

Table 2. Data element validity test results, HealthEfficient, 2023

Data elements	Age group	Sensitivity	Specificity	PPV	NPV
Sterilization	15-44	<b>0.25</b>	<b>1.00</b>	<b>1.00</b>	<b>0.98</b>
Sterilization	21-44	0.25	1.00	1.00	0.97
Sterilization	15-20	NA	1.00	NA	1.00
IUD	15-44	<b>0.67</b>	<b>1.00</b>	<b>1.00</b>	<b>0.99</b>
IUD	21-44	0.60	1.00	1.00	0.98
IUD	15-20	1.00	1.00	1.00	1.00
Implantable	15-44	<b>0.67</b>	<b>1.00</b>	<b>1.00</b>	<b>0.99</b>
Implantable	21-44	0.67	1.00	1.00	0.98
Implantable	15-20	NA	1.00	NA	1.00
Injectables	15-44	<b>0.92</b>	<b>1.00</b>	<b>1.00</b>	<b>0.99</b>
Injectables	21-44	0.89	1.00	1.00	0.99
Injectables	15-20	1.00	1.00	1.00	1.00
Contraceptive pills	15-44	<b>0.90</b>	<b>0.99</b>	<b>0.95</b>	<b>0.98</b>
Contraceptive pills	21-44	0.92	0.99	0.92	0.99
Contraceptive pills	15-20	0.86	1.00	1.00	0.96

Data elements	Age group	Sensitivity	Specificity	PPV	NPV
Contraceptive patch	15-44	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>
Contraceptive patch	21-44	1.00	1.00	1.00	1.00
Contraceptive patch	15-20	NA	1.00	NA	1.00
Vaginal ring	15-44	<b>0.00</b>	<b>1.00</b>	<b>NA</b>	<b>0.99</b>
Vaginal ring	21-44	0.00	1.00	NA	0.99
Vaginal ring	15-20	NA	1.00	NA	1.00
Infecund	15-44	<b>NA</b>	<b>1.00</b>	<b>NA</b>	<b>1.00</b>
Infecund	21-44	NA	1.00	NA	1.00
Infecund	15-20	NA	1.00	NA	1.00
Has a qualifying encounter during measurement year	15-44	<b>0.86</b>	<b>0.90</b>	<b>0.96</b>	<b>0.73</b>
Has a qualifying encounter during measurement year	21-44	0.85	0.90	0.96	0.68
Has a qualifying encounter during measurement year	15-20	0.95	0.91	0.95	0.91
SINC response	15-44	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>
SINC response	21-44	1.00	1.00	1.00	1.00
SINC response	15-20	1.00	1.00	1.00	1.00
Had a prenatal visit during the year prior to the measurement year and 9 months in the measurement year	15-44	<b>0.95</b>	<b>0.99</b>	<b>0.95</b>	<b>0.99</b>
Had a prenatal visit during the year prior to the measurement year and 9 months in the measurement year	21-44	0.93	1.00	1.00	0.99
Had a prenatal visit during the year prior to the measurement year and 9 months in the measurement year	15-20	1.00	0.96	0.80	1.00
Had a live birth date during the last 3 months of the prior year and the measurement year	15-44	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>
Had a live birth date during the last 3 months of the prior year and the measurement year	21-44	1.00	1.00	1.00	1.00
Had a live birth date during the last 3 months of the prior year and the measurement year	15-20	1.00	1.00	1.00	1.00
Had an estimated delivery date during the last 3 months of the prior year and the measurement year	15-44	<b>0.70</b>	<b>1.00</b>	<b>1.00</b>	<b>0.98</b>
Had an estimated delivery date during the last 3 months of the prior year and the measurement year	21-44	0.75	1.00	1.00	0.98
Had an estimated delivery date during the last 3 months of the prior year and the measurement year	15-20	0.50	1.00	1.00	0.97
Had a non-live during the last 3 months of the prior year and the measurement year	15-44	<b>NA</b>	<b>1.00</b>	<b>NA</b>	<b>1.00</b>

Data elements	Age group	Sensitivity	Specificity	PPV	NPV
Had a non-live during the last 3 months of the prior year and the measurement year	21-44	NA	1.00	NA	1.00
Had a non-live during the last 3 months of the prior year and the measurement year	15-20	NA	1.00	NA	1.00

NA indicates that the validity statistics could not be calculated because the denominator to calculate the statistics was 0. E.g. the patient chart (authoritative source) indicates no women in the 15-20 age group had female sterilization.

### Empirical validity testing

Tables 3-8 below show summary results of the empirical validity testing. We used two statistical methods in this validity analysis to assess correlations between the contraceptive use measures and related measures at two levels of analysis (facility and clinician group/practice) and stratified by three age categories (i.e., 15-20, 21-44, and 15-44). Results from two methods are shown side-by-side. We ran the analyses using a cutoff to exclude facilities and clinician groups/practices with fewer than 50 eligible patients. For HealthEfficient, due to their small number of facilities (n=3), we only conducted the analysis at the clinician group/practice level. Results are also not reported for the 15-20 age group for HealthEfficient for the same reason (n=9).

Table 3. Correlation between most or moderately effective methods measure and selected related measures, facility, HCCN 1, 2023

-	-	-	-	Multilevel correlation estimation	
Related measures	Age Group	Number of units	Pearson r	Correlation coefficients	95% Confidence Limits (lower, upper)
Cervical Cancer Screening	21-44†	194	<b>.29*</b>	<b>.40*</b>	<b>(.27, .50)</b>
Contraceptive Counseling	15-44	194	<b>.26*</b>	<b>.47*</b>	<b>(.36, .57)</b>
Contraceptive Counseling	21-44	194	.37*	.51*	(.40, .60)
Contraceptive Counseling	15-20	172	.30*	.46*	(.32, .57)

-Cell left blank intentionally

\*Statistically significant at  $p < .05$

†Age range of the related measure differs from that of the contraceptive use measures and the analysis was conducted among the overlapping population only.

Table 4. Correlation between LARC measure and selected related measures, facility, HCCN 1, 2023

-	-	-	-	Multilevel correlation estimation	
Related measures	Age Group	Number of units	Pearson r	Correlation coefficients	95% Confidence Limits (lower, upper)
Cervical Cancer Screening	21-44†	194	<b>.17*</b>	<b>.22*</b>	<b>(.08, .35)</b>
Contraceptive Counseling	15-44	194	<b>.09</b>	<b>.30*</b>	<b>(.15, .42)</b>
Contraceptive Counseling	21-44	194	.07	.28*	(.13, .41)
Contraceptive Counseling	15-20	172	.20*	.41*	(.26, .53)

-Cell left blank intentionally

\*Statistically significant at  $p < .05$

†Age range of the related measure differs from that of the contraceptive use measures and the analysis was conducted among the overlapping population only.

Table 5. Correlation between most or moderately effective methods measure and selected related measures, clinician group/practice, HCCN 1, 2023

-	-	-	-	Multilevel correlation estimation	
Related measures	Age Group	Number of units	Pearson r	Correlation coefficients	95% Confidence Limits (lower, upper)
Cervical Cancer Screening	21-44†	872	<b>.39*</b>	<b>.45*</b>	<b>(.39, .50)</b>
Contraceptive Counseling	15-44	999	<b>.39*</b>	<b>.44*</b>	<b>(.39, .49)</b>
Contraceptive Counseling	21-44	874	.34*	.41*	(.35, .47)
Contraceptive Counseling	15-20	614	.34*	.40*	(.32, .47)

-Cell left blank intentionally

\*Statistically significant at  $p < .05$

†Age range of the related measure differs from that of the contraceptive use measures and the analysis was conducted among the overlapping population only.

Table 6. Correlation between LARC measure and selected related measures, clinician group/practice, HCCN 1, 2023

-	-	-	-	Multilevel correlation estimation	
Related measures	Age Group	Number of clusters	Pearson r	Correlation coefficients	95% Confidence Limits (lower, upper)
Cervical Cancer Screening	21-44†	872	<b>.25*</b>	<b>.31*</b>	<b>(.24, .37)</b>
Contraceptive Counseling	15-44	999	<b>.28*</b>	<b>.37*</b>	<b>(.31, .43)</b>
Contraceptive Counseling	21-44	874	.19*	.33*	(.27, .40)
Contraceptive Counseling	15-20	614	.29*	.39*	(.30, .46)

-Cell left blank intentionally

\*Statistically significant at  $p < .05$

†Age range of the related measure differs from that of the contraceptive use measures and the analysis was conducted among the overlapping population only.

Table 7. Correlation between most or moderately effective methods measure and selected related measures, clinician group/practice, HealthEfficient, 2023

-	-	-	-	Multilevel correlation estimation	
Related measures	Age Group	Number of units	Pearson r	Correlation coefficients	95% Confidence Limits (lower, upper)
Cervical Cancer Screening	21-44†	14	<b>.48</b>	<b>.25</b>	<b>(-.27, .86)</b>
Contraceptive Counseling	15-44	15	<b>.84*</b>	<b>.92*</b>	<b>(.72, .98)</b>
Contraceptive Counseling	21-44	14	.86*	.93*	(.77, .98)
Contraceptive Counseling	15-20	9	NA <sup>§</sup>	NA <sup>§</sup>	NA <sup>§</sup>

-Cell left blank intentionally

\*Statistically significant at  $p < .05$

†Age range of the related measure differs from that of the contraceptive use measures and the analysis was conducted among the overlapping population only

§Estimates not reported from subgroups with fewer than 10 units.

Table 8. Correlation between LARC measure and selected related measures, clinician group/practice, HealthEfficient, 2023

-	-	-	-	Multilevel correlation estimation	
Related measures	Age Group	Number of units	Pearson r	Correlation coefficients	95% Confidence Limits (lower, upper)
Cervical Cancer Screening	21-44†	14	<b>-.13</b>	<b>-.06</b>	<b>(-.55, .43)</b>
Contraceptive Counseling	15-44	15	<b>.64*</b>	<b>.64*</b>	<b>(.17, .85)</b>

-	-	-	-	Multilevel correlation estimation	
Related measures	Age Group	Number of units	Pearson r	Correlation coefficients	95% Confidence Limits (lower, upper)
Contraceptive Counseling	21-44	14	.61*	.71*	(.24, .89)
Contraceptive Counseling	15-20	9	NA <sup>§</sup>	NA <sup>§</sup>	NA <sup>§</sup>

-Cell left blank intentionally

\*Statistically significant at  $p < .05$

†Age range of the related measure differs from that of the contraceptive use measures and the analysis was conducted among the overlapping population only

§Estimates not reported from subgroups with fewer than 10 units.