

# School-Based Telehealth Network Grant Program Measures: Results and Recommendations

Prepared by the RTRC University of Southern Maine Team:

Kimberley Fox, MPA

Amanda Burgess, MPPM

Karen Pearson, MLIS, MA

George Shaler, MPH

With input from the RTRC SB TNGP Advisory Team:

Marcia M. Ward, PhD, University of Iowa

Kimberly Merchant, MA, University of Iowa

Steve North, MD, Center for Rural Health Innovation

Christopher Shea, PhD, University of North Carolina – Chapel Hill



Rural Telehealth Research Center  
Partners:  
University of Iowa  
University of North Carolina – Chapel Hill  
University of Southern Maine

## Acknowledgement

The authors would like to thank our fellow project team members Marcia Ward and Kim Merchant of the University of Iowa, Christopher Shea of the University of North Carolina at Chapel Hill, and Steve North of the Center for Rural Health Innovations for their expertise and guidance in conceptualizing and developing this project and scoring measures. We also would like to thank Hayley Love and her colleagues at the School-Based Health Alliance, Paula Wiegel and A. Clinton MacKinney of the University of Iowa, and Andrew Soloman and Michael Edwards of the Northeast Telehealth Resource Center for offering their expertise and participating in Round 2 scoring. Finally, we want to thank all of the SB TNGP grantees that volunteered their time to score and provide input on potential SB TNGP measures.

## EXECUTIVE SUMMARY

In September 2016, the Federal Office of Rural Health Policy (FORHP) Office for the Advancement of Telehealth (OAT) awarded grants through its Telehealth Network Grant Program (TNGP) to 21 grantees across the country to demonstrate how telehealth can expand access to, and coordinate and improve the quality of, health care services offered through school-based health centers (SBHCs). Grants were targeted to rural, frontier, and underserved communities providing telehealth services for children, with a particular focus on five clinical areas: asthma, behavioral health, diabetes, obesity reduction and prevention, and oral health.

As part of this initiative, FORHP commissioned the Rural Telehealth Research Center (RTRC) to provide guidance on a set of measures that could be used for a cross-grantee evaluation of the School-Based Telehealth Network Grant Program (SB TNGP). These measures supplement and build off existing measures and research to assess school-based telehealth's effectiveness in expanding and enhancing SBHC access, quality, and cost effectiveness. To that end, the principal goal of this project was to define measures to evaluate school-based telehealth that will inform future policy changes and sustainability efforts by engaging in the following activities:

- Development of an inventory of potential SB TNGP measures based on related school-based health, child health, and/or telehealth measures recommended by key stakeholders and grantees or identified in the literature;
- Defining a methodology for evaluating this inventory of measures to determine which are most relevant and applicable for evaluating the SB TNGP initiative and, using this methodology;
- Identifying a list of core recommended measures that could be collected and reported by SB TNGP grantees for a cross-grantee evaluation.

### Steps in measure inventory development

After clarifying our process and goals with FORHP and OAT staff and becoming familiar with the grantee proposals, we gathered potential measures. We conducted an environmental scan to identify relevant measures from stakeholder agencies and organizations. We also reviewed the grant applications to determine what grantees currently track or plan to track under the SB TNGP grant, and conducted a review of the evidence-based and grey literature to supplement measures identified through the environmental scan. The measures extracted from our environmental scan and literature review were compiled in a spreadsheet and reviewed for scoring.

Prior to scoring, the inventory of measures was categorized into 23 measure "domains" based in part on schemes used by the National Quality Measures Clearinghouse and the School-Based Health Alliance, including the five clinical focus areas of the grant (asthma, behavioral health, diabetes, obesity reduction and prevention, and oral health), other clinical areas (e.g. acute care, substance use), and relevant non-clinical topics (e.g. access, school performance, telehealth process and structure, cost effectiveness).

Measures were sorted into domains, and then sub-domains, through an iterative review process. Throughout the scoring process the research team collapsed domains and sub-domains as needed, based on scoring outcomes.

### Measure evaluation and results

Our method for identifying candidate SB TNGP evaluation measures was guided by the following key principles that ultimately informed the evaluation criteria by which measures were scored. To the extent possible within our inventory of existing measures, we strove to identify a core set of measures that achieves the following six objectives:

1. Addresses goals and objectives of the SB TNGP initiative including increasing, expanding or improving access to, coordination, and quality of, health care delivered through SBHCs in rural communities; training of health care providers; quality of health information available to health care providers, patients, and families; clinical care for specific childhood conditions including asthma, behavioral health, diabetes, obesity reduction and prevention, and oral health; and cost effectiveness and return on investment.
2. Builds off or enhances existing Performance Improvement Measurement System (PIMS) measures, with a focus on clinical outcomes.
3. Relates to conditions or interventions commonly treated or provided in school-based or telehealth settings, conditions that if left untreated place children at high risk, and conditions or interventions for which there is opportunity for improvement in access and/or quality through telehealth.
4. Aligns with existing measures and is usable for quality improvement efforts by grantees and their partners/stakeholders to support sustainability.
5. Meets evaluation criteria related to reliability and validity, measure specification, and feasibility of data collection for students receiving telehealth, and has the potential to be collected for students not receiving telehealth services.
6. Minimizes burden of data collection by grantees.

Our inventory of measures for scoring began with a total of 1,220 measures—533 clinical measures in 11 domains and 687 non-clinical measures in 12 domains. After three rounds of scoring by the research team, external experts, and the grantees, the final recommended set of 27 SB TNGP performance measures included 17 clinical measures and 10 non-clinical measures (see Table below).

**Table. Final recommended measures by domain**

Domain	Number of Measures
<b>Targeted clinical measures (N = 17)</b>	
Asthma	4
Behavioral Health	3
Diabetes	3
Healthy Weight	3
Oral Health	4
<b>Non-clinical measures (N = 10)</b>	
Access	4
Prevention	1
Telehealth Process and Structure	1
School Performance	1
Cost effectiveness/Cost saving	3
<b>TOTAL</b>	<b>27</b>

This report describes the methodology and process for identifying the inventory of potential SB TNGP measures and domains of focus; the multi-round review process including the specific criteria, scoring processes, and minimum thresholds used in each round to evaluate the measures for inclusion in an evaluation of SB TNGP grantees; and the final list of recommended SB TNGP measures identified through this process. We also identified gaps in current measures to assess the benefit of school-based telehealth services. A separate report discusses lessons learned from this effort that may be helpful for future FORHP and OAT initiatives to identify measures for inclusion in future FOAs or TNGP cooperative agreements.

## I. INTRODUCTION

In September 2016, the Federal Office of Rural Health Policy (FORHP) Office for the Advancement of Telehealth (OAT) awarded grants through its Telehealth Network Grant Program (TNGP) to 21 grantees across the country to demonstrate how telehealth can expand access to, and coordinate and improve the quality of, health care services offered through school-based health centers (SBHCs). As specified in the Funding Opportunity Announcement (FOA HRSA-16-102), grants were targeted to rural, frontier, and underserved communities providing telehealth services for children, with a particular focus on five clinical areas: asthma, behavioral health, diabetes, obesity reduction and prevention, and oral health.

As part of this initiative, in September 2016 FORHP commissioned the Rural Telehealth Research Center (RTRC) to provide guidance on a set of measures that could be used for a cross-grantee evaluation of the School-Based Telehealth Network Grant Program (SB TNGP).

The goals of this effort were to:

- Develop an inventory of potential SB TNGP measures based on related school-based health, child health, and/or telehealth measures recommended by key stakeholders and grantees or identified in the literature.
- Define a methodology for evaluating this inventory of measures to determine which are most relevant and applicable for evaluating the SB TNGP initiative and, using this methodology.
- Identify a list of core recommended measures that could be collected and reported by SB TNGP grantees for a cross-grantee evaluation.

This report describes the methodology and process for identifying the inventory of potential SB TNGP measures and domains of focus; the multi-round review process including the specific criteria, scoring processes, and minimum thresholds used in each round to evaluate the measures for inclusion in an evaluation of SB TNGP grantees; and the final list of recommended SB TNGP measures identified through this process. We also identified gaps in current measures to assess the benefit of school-based telehealth services. A separate report discusses lessons learned from this effort that may be helpful for future FORHP and OAT initiatives to identify measures for inclusion in future FOAs or TNGP cooperative agreements.

## II. BACKGROUND AND GUIDING PRINCIPLES

Despite their proliferation in both urban and rural areas over the last two decades, evaluations of SBHCs have found that many schools still face barriers in getting needed services or follow-up referrals for children and adolescents due to limited capacity to provide necessary specialty services (i.e. mental health, oral health), challenges with reimbursement, difficulties engaging parents in on-site preventive health education, and/or lack of funding to support a comprehensive SBHC model in all schools.<sup>1</sup> These problems are magnified in rural, underserved areas where parents have to drive long distances and take time off work to bring children to follow-up services. School-based telehealth offers a potential opportunity to expand and enhance access to services,<sup>2,3</sup> but its use is still relatively limited (0.2% of SBHCs).<sup>4</sup> As a result, further evidence regarding the effectiveness of providing rural telehealth generally, and specifically in school-based settings, is needed.<sup>5-7</sup>

FORHP's SB TNGP grants that seek to expand telehealth in school-based settings could help to increase the availability and use of these services. Critical to these efforts, however, is the need to design rigorous evaluations and monitoring measures that build off and supplement existing measurement and research to assess school-based telehealth's effectiveness in expanding and enhancing SBHC access,

quality, and cost effectiveness. While studies of on-site school-based health care have demonstrated increased student access to health and preventive service use, high rates of student and parent satisfaction, and some improvements in chronic care management,<sup>8</sup> many have called for more rigorous studies and evaluations to establish a standardized set of SBHC health indicators and to determine which SBHC components—including telehealth—are most effective in meeting the needs of the communities they are designed to serve.<sup>9-12</sup> To that end, the principal goal of this project was to define measures to evaluate school-based telehealth that will inform future policy changes and sustainability efforts.

Our method for identifying candidate SB TNGP evaluation measures was guided by the following key principles that ultimately informed the evaluation criteria by which measures were scored. To the extent possible within our inventory of existing measures, we strove to identify a core set of measures that achieves the following objectives:

1. Addresses goals and objectives of the SB TNGP initiative as identified by FORHP in the original solicitation and during project planning. These include to increase, expand, or improve:
  - Access to, coordination, and quality of health care delivered through SBHCs in rural communities
  - Training of health care providers
  - Quality of health information available to health care providers, patients, and families
  - Clinical care for specific childhood conditions including asthma, behavioral health, diabetes, obesity reduction and prevention, and oral health
  - Cost effectiveness and return on investment

Within these goals, we prioritized outcome measures in the five targeted clinical categories (asthma, behavioral health, diabetes, obesity reduction and prevention, and oral health), with the goal of ultimately recommending at least two measures in each clinical category.

2. Builds off or enhance existing Performance Improvement Measurement System (PIMS) measures, with a focus on clinical outcomes.
3. Relates to conditions or interventions commonly treated or provided in school-based or telehealth settings, conditions that if left untreated place children at high risk, and conditions or interventions for which there is opportunity for improvement in access and/or quality through telehealth.
4. Aligns with existing measures and is usable for quality improvement efforts by grantees and their partners/stakeholders to support sustainability.
5. Meets evaluation criteria related to reliability and validity, measure specification, and feasibility of data collection for students receiving telehealth, and has the potential to be collected for students not receiving telehealth services.
6. Minimizes burden of data collection by grantees.

Although guided by these principles, our efforts were constrained by several factors. Most importantly, we were limited to evaluating existing performance measures. We did not have the resources to develop and test new measures specific to capturing the impact of school-based telehealth in rural areas. In our review of the literature, we were also limited by the level of detail describing measure specifications included in published articles, which in some cases meant that measures culled from the

literature did not meet the minimum measure specification threshold scores, eliminating them from later rounds of review. We also lacked the resources to conduct an independent review of the scientific evidence for each measure considered for this project. If the recommended measures prove inadequate, we may need to do a more comprehensive review of the evidence and/or consider development of new measures. Finally, as evidence is evolving in the area of school-based research, given the relatively limited number of scientifically tested measures, particularly for non-clinical process measures, we had to relax several of the guidelines noted above to ensure sufficient numbers of measures in priority non-clinical domains. While we also tried to develop clear scoring criteria definitions, many of the evaluation criteria required subjective judgment by reviewers that may not have been consistently applied.

### **III. MEASURE INVENTORY DEVELOPMENT AND EVALUATION METHODOLOGY**

We began our process by meeting with FORHP and OAT staff to review the goals of the SB TNGP initiative and reviewing grantee proposals and summary descriptions to assess cross-grantee target populations, clinical focus areas, and proposed use of telehealth services. We reviewed the current OAT PIMS measures that SB TNGP grantees are required to report, and we used them as a starting point for our measures inventory. We also investigated other related school-based mental health and SBHC measure initiatives being supported under cooperative agreements from the Health Resources and Services Administration's (HRSA's) Maternal Child Health Bureau, including efforts at the School-Based Health Alliance (SBHA) and the University of Maryland's Center for School Mental Health. Building off this existing measures work, we then conducted an environmental scan of measures required or recommended by other key stakeholder groups (e.g., state-level agencies, National Association of School Nurses, California Telehealth Resource Center, etc.) and a literature review to identify studies of pediatric telehealth generally or specifically in school-based settings to develop an inventory of potential candidate measures for the SB TNGP initiative. This environmental scan was also used to assess the degree to which measures aligned across key stakeholders to minimize reporting burden on grantees, as discussed in more detail in Section D.

#### **A. Environmental scan of existing stakeholder measures**

To establish a list of relevant measures developed and/or recommended by stakeholder groups beyond those required or recommended by OAT/PIMS, SBHA, and the University of Maryland's Center for School Mental Health the research team first developed a list of organizations involved in the development or endorsement of performance and outcome measures and/or focused on the advancement and improvement of SBHCs and/or telehealth. The research team started the process of developing this list by reviewing the list of organizations that were reviewed for measures for the University of Iowa's Evidence-Based Tele-emergency Network Grant Program project. Members of the SB TNGP research team recommended additional organizations focused on the development of SBHC or telehealth measures for review, yielding a list of 31 agencies and organizations for review (see Appendix A for the full list of stakeholder groups/agencies reviewed).

A researcher reviewed the websites for each of the 31 agencies and organizations. Review included comprehensive browsing of the websites for relevant measures and searches for specific search terms: telehealth, telemedicine, pediatric, and school-based health center. For the measure sources listed below, we pre-screened measures using the following exclusion criteria:

1. Agency for Health Research and Quality (AHRQ)—Given that the initial search of AHRQ's National Quality Measure Clearinghouse using the identified search terms yielded thousands of

results, we further refined our search to relevant measures from this targeted list of organizations included in the Clearinghouse:

- Child and Adolescent Health Measurement Initiative (including the National Survey of Children’s Health and the Young Adult Health Care Survey)
  - Dental Quality Alliance
  - Health Resources and Services Administration (HRSA) Health Disparities Collaborative (including the asthma, depression, and diabetes collaboratives)
  - Maternal and Child Health Bureau of HRSA
  - Physician Consortium for Performance Improvement
  - Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium
2. Children's Health Insurance Program Reauthorization Act (CHIPRA) Core Measures—We further refined search criteria of CHIPRA Core Measures by excluding all maternal and perinatal health measures.
  3. Healthcare Effectiveness Data and Information Set (HEDIS)—The project team excluded all HEDIS measures that the National Committee for Quality Assurance identified as only being applicable to Medicare.

Ultimately, 427 measures were collected from 24 stakeholder groups for whom we were able to identify related measures that are required or recommended.

Based on our guiding principle to align SB TNGP measures, to the extent possible, with existing reporting requirements, we also sought to identify measures that grantees may be required to report as SBHCs within their states. To assist in this process, SBHA provided a matrix of state-mandated SBHC measures in 10 states that they had identified as part of a measure search process in 2015. The measures are required to be collected and reported by SBHCs to school-based health center program offices in these states (i.e. Colorado, Connecticut, Illinois, Louisiana, Maine, Massachusetts, Michigan, New Mexico, New York, and Oregon.) From the measures required in these 10 states, the research team identified 88 relevant potential SB TNGP measures.

We also reviewed the 21 SB TNGP grant applications for measures that grantees indicated they currently track or plan to track under the SB TNGP grant. Each proposal was searched for the following terms: measure, indicator, and evaluation. In addition, two sections of each proposal—“evaluation and technical support capacity” and “work plan”—were closely reviewed for measures. This review of grant applications yielded 315 potential measures.

All relevant measures that were identified from stakeholder organizations, states, and grantees through this process were compiled into a spreadsheet database that listed, when available, the following information for each measure: citation, recommending/sponsoring organization, measure description, calculation (numerator and denominator when available), rationale, and data source/collection method.

## **B. Literature review**

The goal of our literature review was to supplement measures identified through the environmental scan by searching evidence-based literature related to school-based or pediatric health care to identify additional measures that could be used for a cross-grantee evaluation of the SB TNGP. Our search strategy encompassed the published peer-reviewed literature available through existing article databases, including PubMed, CINAHL, Cochrane Database, and ERIC. Additionally, we searched Google



Scholar and the grey literature for additional studies, reports, and presentations to help inform our selection of SBHC-focused measures. We used a wide variety of search terms related to telehealth and schools, including telehealth, telemedicine, school(s), school-based health center, health, health services, adolescent(s), and pediatric health. We also included search terms for rural, data collection, measures, and the specific SB TNGP focus conditions of asthma, obesity, diabetes, oral health, behavioral or mental health in combination with the telehealth and school search terminology. We limited our search to studies published in English. Screening criteria included whether the articles focused on telehealth and school-age children as we were primarily looking for studies that provided measures that intersected these topics, targeting empirically-based studies.

We examined the records retrieved through these broad and comprehensive searches without limiting our search by date to give us an overall sense of the trend in the literature on reporting measures relevant to SBHCs and telehealth. Reference lists from relevant articles and systematic reviews were searched by hand for additional articles to inform our measure selection. As a result of our conversations with FORHP during the project, we also conducted a search on cost-effectiveness literature relative to telehealth to glean potential measures relevant to this project.

Because the evidence-based literature for telehealth in schools is not robust, we broadened our search to include general studies of the impact of telehealth more broadly to assess whether these measures could be applied to the school-based setting. In addition to the searches on the databases referenced above we also searched literature identified in the Telebehavioral Health Institute's extensive bibliography on telemental health and behavioral telehealth.

In total, our research team reviewed 250 titles, abstracts, reports, web sites, presentations, and full-text articles. From these, the team identified 63 unique articles for further review, which yielded 556 measures (see Appendix B for the list of articles selected for inclusion). Measures identified in the literature were added to the measures inventory.

### **C. Categorization by domain and sub-domain**

Prior to scoring we categorized the inventory of measures into 23 measure "domains," based in part on categorization schemes used by the National Quality Measures Clearinghouse and the SBHA. The 23 domains encompassed the five clinical focus areas of the grant (asthma, behavioral health, diabetes, obesity reduction and prevention, and oral health), other clinical areas (e.g. acute care, substance use), and relevant non-clinical topics (e.g. satisfaction, school performance).

Each domain was made up of sub-domains, or categories of closely related measures. For example, the behavioral health domain was made up of sub-domains including "antipsychotics," "anxiety screening," "PHQ-9 utilization," "suicide risk assessment," and "trauma screening" among others. Leading up to the first round of scoring there were 148 sub-domains across the 23 domains, including an uncategorized sub-domain within each domain for measures that did not easily fit into a sub-domain.

Measures were sorted into domains, and then sub-domains, through an iterative review process between four researchers on the University of Southern Maine research team. Throughout the scoring process the research team collapsed domains and sub-domains as needed, based on scoring outcomes.

### **D. Scoring criteria and review process for clinical and non-clinical measures**

Our methodology for evaluating the inventory of measures builds off selection criteria guidelines used by the National Quality Forum (NQF) with some modifications tailored to address SB TNGP goals and recognize the limitations of evidence-based research in this area to meet NQF scientific criteria. Modifications were informed by criteria utilized by the University of Iowa's Evidence-Based Tele-emergency Network Grant Program project and input received from the SBHA. In total, we identified

four broad categories that included 10 specific selection criteria for assessing the benefit of potential measures for SB TNGP evaluation (see Table 1 for full list of criteria and descriptions). Measures were scored on these criteria using a three-round scoring process for both clinical and non-clinical measures.

**Table 1. SB TNGP Measure Selection Criteria and Scoring Method**

Criteria	Description	Scoring method	Scoring Round
<b>Criteria 1: Importance to measure and report for school-based telehealth practice</b>			
Amenable to telehealth	Measure is related to an intervention for which the use of telehealth technology has been or could be applied.	Yes/No	2
High patient risk	Measure is related to an intervention where the child is at high risk if not treated.	Yes/No	2
High volume	Measure is related to an intervention that is commonly provided in school-based settings.	Yes/No	2
Opportunity for improvement	Measure assesses an intervention for which access to, cost, or quality of care can be improved.	<ul style="list-style-type: none"> <li>• High (2) = Significant opportunity to improve access, quality, or reduce costs</li> <li>• Medium (1) = Some opportunity to improve access, quality, or reduce costs</li> <li>• Low (0) = Minimal opportunity to improve access, quality, or reduce costs</li> </ul>	2
<b>Criteria 2: Sensitivity to school-based health or telehealth services</b>			
Rigor	Measure can accurately capture what it is intended to measure	<ul style="list-style-type: none"> <li>• High (2) = Likely accurately captures what it is intended to measure</li> <li>• Medium (1) = Likely mixed results on measure accuracy</li> <li>• Low (0) = Likely does not accurately capture what it is intended to measure</li> </ul>	2
<b>Criteria 3: Feasibility of collecting</b>			
Data collection	Information is routinely generated and/or can be collected and reported by school-based or telehealth settings without undue burden	<ul style="list-style-type: none"> <li>• High (2) = Feasibility of collecting and reporting is high</li> <li>• Medium (1) = Feasibility of collecting and reporting is moderate</li> <li>• Low (0) = Feasibility of collecting and reporting is minimal</li> </ul>	2 & 3
Measure specification	Measure has a clearly defined set of specifications for the data elements required to calculate the measure	<ul style="list-style-type: none"> <li>• 2 = Fully specified</li> <li>• 1 = Partially specified</li> <li>• 0 = Not at all specified</li> </ul>	1
<b>Criteria 4: Usability for quality improvement and FORHP evaluative needs</b>			
Alignment	Measure is used by other federal/state agencies or school-based or telehealth associations to which grantees may need to report/are reporting	Score is based on the number of organizations represented within each sub-domain. <ul style="list-style-type: none"> <li>• 3 = 6+ alignments (7+ organizations)</li> <li>• 2 = 3-5 alignments (4-6 organizations)</li> <li>• 1 = 1-2 alignments (2-3 organizations)</li> <li>• 0 = no alignment (1 organization)</li> </ul>	1

Utility for intended stakeholders	Measure is useful to grantees/providers/payers to measure value of telehealth in SB setting.	<ul style="list-style-type: none"> <li>• High (2) = Very useful in measuring value of telehealth in SB setting</li> <li>• Medium (1) = Somewhat useful in measuring value in SB setting</li> <li>• Low (0) = Not useful or of limited use in measuring value</li> </ul>	3
Utility for study/grant objectives	Measure is useful to assess expanded access, quality and/or reduced cost of care and can be used to assess the business case/ROI of school-based telehealth services for sustainability	<ul style="list-style-type: none"> <li>• Access: Useful to assess expanded health access in rural areas.</li> <li>• Training: Useful to assess whether more health care providers have been trained.</li> <li>• Quality: Useful to assess improved quality of health and health information to support patient care/decision making.</li> <li>• Clinical Outcomes: Useful to assess improvements in targeted clinical areas/reduce disparities.</li> </ul> <p><i>Scoring: Yes/No</i></p>	1

#### IV. SUMMARY OF MEASURE EVALUATION RESULTS

During the first round of scoring four members of the University of Southern Maine SB TNGP research team scored a total of 1,220 measures—533 clinical measures in 11 domains and 687 non-clinical measures in 12 domains. For Round 1, reviewers scored measures on three criteria: measure specification, alignment, and utility for study/grant objectives (see Table 1 for criteria definitions and scoring method). Non-clinical measures were scored in Round 1 using the same criteria as those used in Round 1 for clinical measures with the exception that we slightly modified the scoring scale for utility from a Yes/No scale to a three-point scale to allow for greater flexibility and variability in defining the level of utility. Each domain was randomly assigned to two team members for scoring. Scores for measure specification and alignment were averaged between the two scorers. Any disagreements between the two scorers on the utility criteria (a Yes/No scale) were discussed by the scorers and reconciled.

The research team established the following minimum threshold for moving a measure on to Round 2:

- Measure specificity: Average score greater than one (i.e. measure was partially or fully specified)
- Utility: Yes (clinical measures) or average score greater than one (non-clinical) (i.e. useful measure for targeted FORHP SB TNGP goals)
- Alignment: Average score greater than zero (i.e. more than one organization uses this measure or recommends using this measure)

A measure was moved on to Round 2 if the measure met all three of these minimum criteria. In the process of each round of review, some domains or subdomains were eliminated or consolidated due to the limited number of measures and/or overlap of measures in related domains/subdomains (e.g. the chronic care management domain was eliminated during Round 1 because measures in that category did not meet the minimum threshold scoring criteria cutoff.) As shown in Table 2, 455 measures met the Round 1 minimum threshold criteria and were moved to Round 2.

**Table 2. Number of Measures Scored in Each Round, by Domain**

Number of measures scored in each round, by domain				
Domain	Round 1	Round 2	Round 3	Recommended Measures
Access/Enrollment	66	11		
Access*			13	4
Acute Care	9	4	2	
Asthma	91	45	8	4
Behavioral Health	125	100	12	3
Care Coordination	56	13	3	
Care Substitution	15	6		
Chronic Care Management	4			
Cost Effectiveness/ Cost Saving	155	38	8	3
Diabetes	37	17	5	3
Health Education	14			
Obesity/Healthy Weight	97	47	5	3
Oral Health	46	15	6	4
Prevention**			19	1
Process-Structure	70	6		
Reproductive Health/STDs	31	16		
Risk Screening/Needs Assessment	21	8		
Satisfaction	76	12	8	
School Performance	14	3	1	1
Substance Use	31	27		
Sustainability	13	10	1	
Telehealth Process & Structure	101	26	8	1
Utilization	84	21		
Well-Child Visit/Prevention	41	28		
Workforce	23	2	1	
<b>Total</b>	<b>1,220</b>	<b>455</b>	<b>100</b>	<b>27</b>

\*Includes the former "Access-Enrollment" and "Utilization" domains.  
 \*\*Includes the former "Reproductive Health," "Risk Screening-Needs Assessment," "Substance Use," and "Well Child Visit-Prevention" domains.

The second round of scoring was conducted by the research team members at the University of Iowa and University of North Carolina, clinical subject expert Steve North, MD, and representatives from the SBHA and the Northeast Telehealth Resource Center. Seven reviewers scored the clinical measures on six criteria including the degree to which the measure was related to an intervention 1) commonly provided in school-based settings (high volume), 2) where the child is at high risk if not treated (high patient risk, 3) for which the use of telehealth technology has been or could be applied in a SB setting (amenable to telehealth), and 4) for which access to, cost, or quality of care can be improved (opportunity for improvement). The reviewers also considered if a measure 5) can accurately capture what it is intended to measure (rigor), and if 6) information is routinely generated and/or can be collected and reported by school-based or telehealth settings without undue burden (data collection).

Measure scores and reviewer comments from seven scorers were combined and then divided by the number of scorers who scored each measure (scorers were not required to score measures for which they felt they did not have expertise). Based on average reviewer scores, review of comments, and discussion with the review team, we established the following minimum thresholds for moving measures on to Round 3:

- High volume: Average score greater than .50 (Yes-No/0-1 scale)
- High patient risk: Average score greater than .50 (Yes-No/0-1 scale)
- High volume: Average score greater than .75 (Yes-No/0-1 scale) OR High patient risk: Average score greater than .75 (Yes-No/0-1 scale)<sup>1</sup>
- Amenable to telehealth: Average score greater than zero (Yes-No/0-1 scale)
- Opportunity for improvement: Average score greater than 1.5 (0-2 scale)
- Rigor: Average score greater than 1.25 (0-2 scale)
- Data collection: Average score greater than 1 (0-2 scale)

Given duplication/similarities in measures across domains and sub-domains, prior to moving measures forward for Round 3 grantee review, the research team conducted a cross-domain consolidation process whereby domains with similar or duplicate measures identified or where there were relatively few measures, were consolidated. We also reviewed the full list of measures from prior rounds of review for any clinical outcome measures that may have been deleted in earlier rounds. After this process, 100 measures in 15 domains moved on for Round 3 grantee review.

For Round 3, all grantees were invited to voluntarily participate in scoring. Ultimately, 18 of the 21 SB TNGP grantees participated in the scoring process. Grantees were asked to score measures on two criteria using a three-point high, medium, low scale: 1) the measure is routinely generated and/or can be collected and reported by school-based or telehealth settings without undue burden (data collection) and 2) the measure is useful to grantees and their partners to measure value of telehealth in SBHC setting for sustainability (utility for intended stakeholders). Grantees were not requested to score all measures, but only those for which they felt they had expertise or that were pertinent to their grant area of focus (e.g. grantees focused solely on oral health could only score on oral health measures). Grantees were also asked to provide comments on the specific measures to indicate any concerns or make suggestions for measure improvement. Grantee scores were combined and averaged based on the number of scorers for each measure. The full research team used these scores in selecting the final list of recommended measures to inform an evaluation of the SB TNGP initiative.

The final review process by the SB TNGP full research team involved reviewing averaged grantee scores across and within criteria, considering the number of grantees that scored each measure, and the comments provided on the measures. In our review of comments, we identified measures or measure concepts that had merit but may need further clarification in terms of specification, which may have contributed to lower grantee scores than would have been the case with the clarification.

For PIMS measures that moved forward through the three-round review process, we also looked at data currently reported by grantees to assess whether and how definitions for these measures could be modified in order to improve reporting accuracy. Reflecting on our initial guiding principles for measure

---

<sup>1</sup> For Round 3 we established two sets of minimum thresholds related to high-volume and patient risk scores to assess how many measures would be moved forward under each scenario (using a .5 or .75 cut off point on both criteria). Since the initial .5 cut off point for both criteria eliminated too many measures, the team ultimately decided to merge the minimum threshold to include any measure that scored over .75 on either of the criteria. For example, a measure could get a .8 on high volume and a .4 on high patient risk and it would still make it through to the next round.

selection and our intention to enhance PIMS measures with a particular focus on clinical measures, we sought to include measures that covered all of the SB TNGP goals including the five clinical conditions of focus and other SB TNGP goals of improving access, quality of health information, training, and cost effectiveness.

## V. RECOMMENDED MEASURES

Table 3 presents the recommended set of 27 SB TNGP performance measures for evaluation. The final recommended set includes 17 clinical measures—three to four in each of the five targeted clinical focus area of the SB TNGP grants—and 10 non-clinical measures, including four related to access, one related to prevention, one measuring telehealth process, one related to measuring school attendance and ability to stay in school, and three related to cost savings.

**Table 3. Description of recommended measures**

Brief description (N = 27)		Domain
#	Targeted clinical measures (N = 17)	
1	Percentage of students enrolled at the SBHC with asthma that have asthma severity classification assessed in the measurement period	Asthma
2	Percentage of students enrolled at the SBHC with asthma that have an asthma action plan on file in the measurement period	Asthma
3	Percentage of students enrolled at the SBHC with persistent asthma who are on appropriate medication in the measurement period	Asthma
4	Percentage of students enrolled at the SBHC with asthma with rescue medication on file at the SBHC in the measurement period	Asthma
5	Percentage of students enrolled at the SBHC who have been screened in the measurement period with an age appropriate risk assessment that includes a depression screening and follow-up is documented if necessary	Behavioral Health
6	Percentage of students enrolled at the SBHC identified as being depressed who self-report improved mental health in follow-up counseling or medical visits in the measurement period	Behavioral Health
7	Percentage of students enrolled at the SBHC with a diagnosis of major depressive disorder with an assessment for suicide risk in the measurement period	Behavioral Health
8	Percentage of students enrolled at the SBHC with diabetes with documented self-management goals in the measurement period	Diabetes
9	Percentage of students enrolled at the SBHC with diabetes with a documented HbA1c test done in the measurement period	Diabetes
10	Average HbA1c value during the measurement period for students enrolled at the SBHC with diabetes	Diabetes
11	Percentage of students enrolled at the SBHC who have been diagnosed as obese (i.e., a BMI-for-age >85th percentile) in the measurement period	Healthy Weight
12	Percentage of students enrolled at the SBHC with a BMI greater than or equal to 85th percentile who had a blood pressure percentile documented and classified as normal or abnormal in the measurement period	Healthy Weight
13	Percentage of students enrolled at the SBHC who had an outpatient visit with a PCP or OB/GYN in the measurement period and who had evidence of the following during the measurement: 1. Percentage of patients with height, weight, and BMI percentile documentation	Healthy Weight

	2. Percentage of patients with counseling for nutrition 3. Percentage of patients with counseling for physical activity	
14	Percentage of students enrolled at the SBHC who received an oral health evaluation/ screening in the measurement period	Oral Health
15	Percentage of students enrolled in the SBHC who received a school-based dental screening in the measurement period and were diagnosed with tooth decay	Oral Health
16	Percentage of students enrolled in the SBHC who were referred for follow-up oral health services in the measurement period	Oral Health
17	Percentage of students enrolled in the SBHC who received a sealant on a permanent second molar tooth as a school-based dental service in the measurement period	Oral Health
<b>Non-Clinical Measures (N = 10)</b>		
18	Percentage of students enrolled in the SBHC in the measurement period	Access
19	Percentage of students enrolled in the SBHC receiving telehealth services by service type and setting in the measurement period	Access
20	Number of SBHC telehealth encounters by service type and site in the measurement period	Access
21	Percentage of students enrolled in the SBHC with an identified PCP in the measurement period	Access
22	Percentage of student enrolled in the SBHC who completed a comprehensive risk assessment in which the provider discussed common health risk behaviors in the measurement period	Prevention
23	Percentage of SBHC telehealth visits that were not completed due to technical issues in the measurement period	Telehealth Process and Structure
24	Number of school days missed in the measurement period for students enrolled in the SBHC	School Performance
25	Percentage of SBHC patient encounters in the measurement period where student is: 1) returned to class; 2) is sent home; 3) transferred to emergency/urgent care; 4) referred to PCP; 5) referred to specialty care; and 6) no subsequent face-to-face care is necessary within a defined measurement period	Cost effectiveness/ Cost saving
26	Patient travel miles saved through the use of telehealth in the measurement period; estimated associated costs	Cost effectiveness/ Cost saving
27	Estimated reduction or avoidance in patient travel costs as a result of avoided face-to-face post telehealth care in the measurement period	Cost effectiveness/ Cost saving

### A. Condition-specific clinical measures

Recommended condition-specific clinical measures include both process and outcome measures where possible. The identification of clinical outcome measures was constrained both by limitations of the current research and development of pediatric and SBHC outcome measures and based on input provided by grantees about their utility and/or feasibility of gathering and reporting these data in school-based settings.

## ***Asthma***

Measures 1 through 4 are asthma measures that assess the degree to which students enrolled in the SBHCs have access to recommended evidence-based diagnosis, care, and treatment for this condition. They include the percentage of students enrolled that 1) are diagnosed with asthma with a severity classification assessed, 2) have an asthma action plan on file/in place, 3) for those with persistent asthma, the percentage on appropriate asthma medication, and 4) the percentage who have rescue medication on file with the SBHC. All of these asthma measures received the highest average grantee score in terms of utility and ability to collect the data. Other proposed asthma measures scored in Round 3 that measure patient outcomes—such as pulmonary function test scores or student reported asthma symptom free days—ultimately were not included in our recommended list due to significantly lower average grantee scores and grantee comments that raised concern about the sensitivity to telehealth of the proposed intervention and/or the undue burden it would place on grantees to collect (e.g. acquiring spirometry scores when not collected through telehealth program). In response to grantee comments, we also clarified measure specifications to indicate when the measure denominator was all children enrolled in the SBHC.

## ***Behavioral health***

Measures 5-7 are behavioral health process and outcome measures that measure access to standardized recommended risk assessments, mental health screenings, and needed follow-up care; regular suicide risk assessment for students at high-risk; and symptom relief for those suffering with depression. Measure 5 is the percentage of SBHC users screened with an age-appropriate risk assessment that includes a depression screening and for which a follow-up plan is documented for those with a positive screen. Measure 7 is the percentage of patient visits for SBHC patients with a diagnosis of major depressive disorder with an assessment for suicide risk. Both of these measures received average scores of 3.0 or higher by grantees in Round 3. In response to grantee comments, we modified Measure 5 to be less proscriptive regarding the specific screen required, such as the PHQ-9 or PHQ-2, as not all grantees are using this tool and substituted broader language to allow for any age-appropriate risk assessment. Measure 6 is the percentage of SBHC enrolled students identified as being depressed who self-report improved mental health in follow-up counseling or medical visits. This measure received higher Round 3 grantee scores than other behavioral health outcome measures that referenced specific tools or specific point increases to measure improvement between visits because certain tools are not universally used by grantees.

## ***Diabetes***

Measures 8 through 10 focus on diabetes care for children in SBHCs and are intended to measure the degree to which access to appropriate testing and treatment is improved as a result of the SB TNGP grant program. In general, fewer grantees scored diabetes measures in Round 3 due to the fact that fewer grantees targeted this clinical condition as part of their telehealth intervention. As with the previous recommended clinical measures, diabetes measures would only be required to be reported by grantees targeting care for this clinical condition as part of their telehealth intervention.

Measure 8 is the percentage of diabetic patients enrolled in the SBHC with documented self-management goals in the measurement period. This measure received an average score of 3.3 by grantees in Round 3 review and, along with Measure 10—the average HbA1c value for those identified diabetic SBHC patients in the clinical information system—was the highest scored diabetes measures by grantees that scored on these measures. Measure 9—the percentage of SBHC diabetic patients with a documented HbA1c test in the measurement period—is broadly agreed upon as a measure of quality for diabetes care and can be used to measure whether access to appropriate testing has improved.



In our final selection process, we also looked at the existing PIMS diabetes outcome measure to assess whether it should be included. This measure had been eliminated in previous rounds of scoring due to low scores on the high-volume and feasibility of data collection criteria. In reviewing PIMS data submitted by SB TNGP grantees, only three grantees reported on the PIMS diabetes measure and for these, the numbers reported appeared much larger than is likely and may reflect misinterpretation of what should be reported. Given anticipated small numbers of patients with diabetes and even lower numbers likely to have HbA1c levels above 7%, we believe collecting the average HbA1c value (Measure 9) rather than number of patients above 7% will yield larger numbers for evaluation.

### ***Healthy weight***

Measures 11 through 13 are process and outcome measures of childhood obesity that will meet our study objective of measuring whether obesity prevention, identification, and follow-up care have improved as a result of the SB TNGP program. Measure 11 measures the prevalence of SBHC users diagnosed as obese (i.e. Body Mass Index (BMI) greater than the 85<sup>th</sup> percentile) within the measurement period. Measure 12 is the percentage of SBHC users with a BMI greater than or equal to the 85<sup>th</sup> percentile who had blood pressure percentile documented. Measure 13 includes three sub-measures including the percentage of SBHC users with an outpatient visit with a primary care provider (PCP) or obstetrician/gynecologist (OB/GYN) who had 1) evidence of height, weight, and BMI percentile documented, 2) received nutrition counseling, and 3) received counseling for physical activity.

These healthy weight measures were generally among the highest scored by grantees for this domain. However, several grantees raised concerns about the sensitivity of these measures to telehealth and their ability to get data from the primary care provider (PCP) if the well-child visit was not done at the SBHC, which may require further clarification during the measure specification process.

### ***Oral health***

Measures 14 through 17 are process measures to assess whether access to oral health screening, diagnosis, early identification, and treatment has increased as a result of the SB TNGP grant program. As with other clinical measures, these would only be required to be reported by grantees that are providing telehealth services related to oral health.

All four of these measures focus on the degree to which recommended screenings are being provided, including the percentage of children enrolled in the SBHC who received an oral health evaluation or screening within the measurement period (Measure 14), received a school-based dental health screening and were diagnosed with tooth decay (Measure 15), who were referred for follow-up oral health services (Measure 16), and who received a sealant on a permanent molar tooth through the school-based dental service (Measure 17).

## **B. Non-clinical measures**

Per our guiding principles, in addition to clinical measures, we also sought to include measures to address whether SB TNGP grants were successfully able to address other non-clinical goals including:

- Access to, coordination, and improved quality of health care delivered through SBHCs in rural communities
- Training of health care providers
- Quality of health information available to health care providers, patients, and families
- Cost effectiveness

## ***Access***

Measures 18 through 21 are access measures that assess the degree to which SB TNGP services have increased access to school-based health and primary care services in general and specifically to services delivered through telehealth. Measure 18 is the percentage of students enrolled in the SBHC by school site during the measurement period, which, with expanded availability of telehealth services, is expected to increase over time. Measure 19 is the percentage of students enrolled in the SBHC that received telehealth services during the measurement period by type of service type (i.e. asthma, behavioral health, oral health, obesity, or diabetes) and site. Measure 20 is the number of telehealth encounters provided during the measurement period by service, setting, and site, which can help assess variation in utilization of specific telehealth services. Measure 21 is the percentage of enrollees with an identified PCP, a widely recognized measure of child health access. All of these access measures received the highest average grantee scores in terms of utility and ability to collect the data. The two access-related PIMS measures that were scored by grantees in Round 3 (i.e. the number of consultants providing care in the reporting period compared to the previous period and the number of encounters by specialty/service, by patient care setting, and by type of telemedicine encounter) received lower average scores due to grantees' concerns that the measures did not capture what they were intended to measure (i.e. # of consultants providing care across periods) or that the measures overlapped with another measure that was less specific and thus would be easier to collect (i.e. # of encounters by patient care setting and by type of telemedicine encounter vs. # of encounters by service, setting and site).

## ***Prevention***

Measure 22 measures the degree to which SB TNGP services have helped improve the quality of preventive care provided to students enrolled in the SBHC as measured by the percentage of student who completed a comprehensive risk assessment in which the provider discussed common health risk behaviors. This measure received slightly lower average scores by grantees than immunization and well-child visit preventive measures. However, in contrast to comprehensive risk assessment, grantees' comments suggested that while immunization and well-child visit rates were useful to measuring school-based health, it was not clear how they measured the effectiveness of telehealth.

## ***Telehealth process and structure***

Given that most SB TNGP grantees are in the early stages of implementing telehealth services in school sites, and many are using telehealth for the first time, telehealth process and structure measures are useful for assessing technical telehealth implementation issues. Measure 23—the percentage of SBHC telehealth visits that were not completed due to technical issues during the measurement period—received the highest average score of 3.3 from grantees. This measure will be useful in assessing the degree to which technical issues are reduced over time.

## ***School performance***

One potential benefit of school-based telehealth services that could support their sustainability is the degree to which they are able to provide needed clinical services in the school setting, allowing students to remain in school rather than missing school to seek face-to-face medical care. Measure 24 focuses on school attendance and measures the number of school days missed within the measurement period for students enrolled in the SBHC. As the only measure included in this domain for Round 3 review, it was seen as an important measure concept to include. However, it did receive lower average scores than many other recommended measures in part due to concerns about the data collection source (e.g. getting school records on absences or administering surveys) which may need to be modified in the final measure specification process.

### ***Cost effectiveness/Cost savings***

Measures 25 through 27 measure the cost effectiveness of school-based telehealth in terms of the disposition of the patient and the travel costs required for students to get face-to-face services at the remote site if telehealth services were not available. Measure 25 is the percentage of SBHC patient encounters within the measurement period where the student is returned to class, sent home, referred to emergency/urgent care, primary care, or specialty care, or where no face-to-face follow-up is necessary. Measures 26 and 27 are measures that are adapted from the existing PIMS avoided travel measure, which received the highest average score by grantees of cost-effectiveness measures in Round 3. Based on our review of PIMS data submitted by grantees to date, we found that some grantees were not accurately reporting or over-reporting the travel miles saved by using an average distance between sites rather than site-specific distances for specific encounters. Thus we adapted the PIMS avoided/saved measure into two separate measures. Measure 26 is patient travel miles saved through the use of telehealth based on distance to the remote site that was avoided as a result of telehealth. Measure 27 is the estimated reduction or avoidance of patient travel costs associated with follow-up care post telehealth based on patient disposition captured in Measure 25.

Proposed non-clinical measures are expected to be reported by all grantees, while clinical measures would only be required for grantees targeting the associated clinical condition. For example, grantees that are solely focused on teledentistry would only be required to report on the oral health measures. During the tool development phase, we will add a response category of “not applicable” for grantees that do not provide the services related to the measure.

### ***Non-clinical measures not recommended***

While we were able to recommend at least one measure related to most of FORHP’s SB TNGP goals (e.g. all five targeted clinical conditions, access, quality, and cost effectiveness), no telehealth training process or outcome measures met the minimum threshold criteria to be recommended for inclusion. As a result FORHP may want to continue to require grantees to report on the existing PIMS training measures and/or review the training-related data submitted by grantees thus far to assess the value of maintaining this as a required measure for reporting. We would note that some of the clinical quality measures (e.g. whether suicide risk is conducted for children diagnosed with major depressive disorder) could be proxies for measuring telehealth training impact in terms of whether the clinicians are following appropriate recommended guidelines.

Measures of patient and provider satisfaction scored highly during Round 3 grantee review, however, the research team ultimately did not recommend that patient or provider satisfaction measures be included in required SB TNGP measures. Based on our review of the literature, we found considerable existing evidence in the telehealth literature generally and in the school-based or other pediatric telehealth literature, that patients and providers are satisfied with telehealth services relative to face-to-face, so we did not believe collecting satisfaction-related measures would contribute to the evidence-base. We also found that satisfaction tools used for existing studies were not well-specified in the published articles and would require additional contact with authors that our timeframe did not permit. If FORHP were to allow grantees to voluntarily report satisfaction measures, the research team could conduct a more thorough review of satisfaction tools to recommend a standard tool that could be used across grantees.

### **C. Input on existing PIMS measures and suggested enhancements**

As indicated above, we included measures currently collected in the PIMS for OAT in our inventory of measures. Existing PIMS measure specifications were drawn from an OAT-provided document titled, “Performance Improvement Measurement System for the Office for the Advancement of Telehealth.”

Grantees are currently required to report PIMS measures on an aggregate basis bi-annually. Existing PIMS measures are primarily process measures, but also include a few clinical measures. As part of our review of PIMS measures, we analyzed PIMS data reported by the grantees for the first six months of their projects, to assess the degree to which they were being reported and the need for greater clarification on measures that may have been misinterpreted in reporting.

During the multi-round review process, most PIMS measures did not meet the minimum threshold for specified criteria. For example, two of the PIMS measures were eliminated in the first round of scoring because they did not meet the minimum threshold for the “utility” criterion. An additional eight PIMS measures did not meet minimum threshold to advance to the third round of scoring—primarily due to low scores on the “data collection” and “opportunity for improvement” criteria or because they were similar or duplicative of other higher scored measures in that domain and were eliminated in the final consolidation process. The four remaining PIMS measures were scored by grantees during the third round of scoring, and only two of the measures (patient travel miles saved and number of telehealth encounters by service) were included in the final recommended list of measures (with some modification to definitions). The average scores for the four PIMS measures that made it to Round 3 review ranged from 2.5 to 3.8 on a four-point scale.

#### **D. Key challenges and measure gaps in SB TNGP measure selection**

In evaluating potential SB TNGP measures, we were limited by the state-of-the-art in child health measurement generally and specifically in school-based health or telehealth. We found that validated measures that had been tested and used in other environments were not necessarily applicable or appropriate for school-based settings or for assessing child health and needed to be adapted. While some of the measures have been validated in some type of telehealth setting, other measures have not been rigorously tested. Some of the measures were chosen because the author, source document, measure specificity, description and/or rationale were detailed and they appeared to align with the initiative. Further clarification should be sought for these measures when it comes to instrument development and data collection methodologies.

We also found it challenging to identify detailed selection criteria given the diversity of measures identified. The broad selection and scoring criteria used placed more responsibility on reviewers who had a wide range of expertise to interpret them, which may have increased subjectivity and decreased inter-rater reliability. For some measures, there was wide variation across reviewers’ scores and/or differences in scoring for relatively similar measures by the same reviewer. The prioritization of including the alignment criteria in the first round of measure review may also have unintentionally removed some potentially good measures from further review because only one organization recommended the measure.

Finally, the ability to collect comparison group measurements was not factored into the scoring process. To evaluate the benefit of SB telehealth, comparison groups within the grantee programs will be necessary. For example to demonstrate the value of SB telehealth for diabetic patients a comparison group of diabetic patients that does not access telehealth services will be needed. Ultimately some of the measures may need to be revised if a comparison group cannot be located.

## **VI. NEXT STEPS FOR SB TNGP EVALUATION**

Once FORHP approves the final SB TNGP list of measures, in the next stage of our work, the research team will develop a research protocol and define the measure specifications of each of these performance measures and the data elements needed to calculate them. While some of these

specifications are available for NQF-endorsed and other SB TNGP selected measures, we will have to develop or define our own specifications for measures that are not as clearly specified. We also plan to create or modify the data collection tool by which grantees will report the measures and establish a process and timeline for beginning data collection from grantees.

As part of the specification process, we will also identify whether measures will be collected at the individual patient level or at the aggregate program or site level and will identify the mechanism or tool for grantees to report them – either through modifications to the existing PIMS reporting system or through a separate Microsoft Excel-based tool to be developed, building off the existing tool being used for the Evidence-Based Tele-emergency Network Grant Program that members of the research team are currently overseeing. The Excel tool will provide a structure for grantees to calculate their performance results, including reporting the de-identified patient data needed to calculate performance measures based on every student that received SB TNGP services, including those receiving telehealth services and those treated through face-to-face SB services.

## References

1. Silberberg M, Fox K, Quinn W, Cantor J. *Evaluation of the Newark School-Based Youth Services Program: Part 1 Report of Stakeholder Perceptions*. New Brunswick, NJ: Rutgers University, Center for State Health Policy;2000.
2. Alverson D, Hall-Barrow J, Dion D, et al. *15 Million Kids in Health Care Deserts: Can Telehealth Make a Difference?* New York, NY: Children's Health Fund; April 21, 2016.
3. Martin A, North S. *School-Based Health Care Via Telemedicine*. Online webinar presentation: Health-e-Schools and Center for Rural Health Innovation; July, 2015.
4. School-Based Health Alliance. *2013-14 Digital Census Report*. 2015. Available at: <http://censusreport.sbh4all.org/#growth>. Accessed August 29, 2016.
5. Gilman M, Stensland J. Telehealth and Medicare: Payment Policy, Current Use, and Prospects for Growth. *Medicare Medicaid Res Rev*. 2013;3(4):E1-E14.
6. Lambert D, Gale J, Hansen A, Croll Z, Hartley D. *Telehealth in Today's Rural Health System*. Portland, ME: Maine Rural Health Research Center; December, 2013.
7. Rural Health Advisory Committee, Work Group on a New Rural Health Care Delivery Model. *Rural Health Care: New Delivery Model Recommendations*. St. Paul, MN: Office of Rural Health and Primary Care; January, 2009.
8. Crespo RD, Shaler GA. Assessment of School-Based Health Centers in a Rural State: The West Virginia Experience. *J Adolesc Health*. Mar 2000;26(3):187-193.
9. Bersamin M, Garbers S, Gold M, et al. Measuring Success: Evaluation Designs and Approaches to Assessing the Impact of School-Based Health Centers. *J Adolesc Health*. 2016;58(1):3-10.
10. Keeton V, Soleimanpour S, Brindis CD. School-Based Health Centers in an Era of Health Care Reform: Building on History. *Curr Probl Pediatr Adolesc Health Care*. 2012;42(6):132-156.
11. Mason-Jones AJ, Crisp C, Momberg M, Koech J, De Koker P, Mathews C. A Systematic Review of the Role of School-Based Healthcare in Adolescent Sexual, Reproductive, and Mental Health. *Syst Rev*. 2012;1:49.
12. Silberberg M, Cantor JC. Making the Case for School-Based Health: Where Do We Stand? *J Health Polit Policy Law*. Feb 2008;33(1):3-37.

## APPENDIX A. STAKEHOLDER GROUPS

Stakeholder Groups
<b>Federal entities</b>
Agency for Healthcare Research & Quality <ul style="list-style-type: none"> <li>• <i>National Quality Measures Clearinghouse</i></li> </ul> Centers for Medicare and Medicaid Services <ul style="list-style-type: none"> <li>• <i>2016 Core Set of Children’s Health Care Quality Measures for Medicaid and CHIP</i></li> </ul> Health Resources and Services Administration <ul style="list-style-type: none"> <li>• <i>Health Center Uniform Data System</i></li> <li>• <i>Office for the Advancement of Telehealth, PIMS measures</i></li> </ul>
<b>States with SBHC measures identified by SBHA</b>
Colorado Connecticut Illinois Louisiana Maine Massachusetts Michigan New Mexico New York Oregon
<b>Stakeholders</b>
California School-Based Health Alliance California Telehealth Resource Center (of the Consortium of Telehealth Resource Centers) Center for Health and Health Care in Schools Center for School Mental Health Colorado Association of School-Based Health Care Connecticut Association of School-Based Health Centers National Association of School Nurses National Committee for Quality Assurance <ul style="list-style-type: none"> <li>• <i>Healthcare Effectiveness Data and Information Set</i></li> </ul> National Quality Forum School-Based Health Alliance University of Iowa
<b>Stakeholders reviewed that yielded no applicable measures</b>
American Telemedicine Association Indiana School Health Network Kentucky Youth Advocates School-Based Health Alliance State Affiliates (Arkansas, Georgia, Illinois, Louisiana, Maryland, Michigan, New Mexico, New York, North Carolina, Oregon, Washington, West Virginia) Institute for Healthcare Improvement Texas Association of School-Based Health Centers The Children’s Partnership

## APPENDIX B. ARTICLES REVIEWED FOR SCORING

- Allison MA, Crane LA, Beaty BL, Davidson AJ, Melinkovich P, Kempe A. School-Based Health Centers: Improving Access and Quality of Care for Low-Income Adolescents. *Pediatrics*. Oct 2007;120(4):e887-894.
- Assimacopoulos A, Alam R, Arbo M, et al. A Brief Retrospective Review of Medical Records Comparing Outcomes for Inpatients Treated Via Telehealth Versus in-Person Protocols: Is Telehealth Equally Effective as in-Person Visits for Treating Neutropenic Fever, Bacterial Pneumonia, and Infected Bacterial Wounds? *Telemed J E Health*. Oct 2008;14(8):762-768.
- Banos RM, Cebolla A, Oliver E, Alcaniz M, Botella C. Efficacy and Acceptability of an Internet Platform to Improve the Learning of Nutritional Knowledge in Children: The Etiobe Mates. *Health Educ Res*. Apr 2013;28(2):234-248.
- Belmont JM, Mattioli LF. Accuracy of Analog Telephonic Stethoscopy for Pediatric Telecardiology. *Pediatrics*. 2003;112(4):780-786.
- Bergman DA, Sharek PJ, Ekegren K, Thyne S, Mayer M, Saunders M. The Use of Telemedicine Access to Schools to Facilitate Expert Assessment of Children with Asthma. *Int J Telemed Appl*. 2008:159276.
- Botasso M, Sanches SG, Bento RF, Samelli AG. Teleaudiometry as a Screening Method in School Children. *Clinics (Sao Paulo)*. Apr 2015;70(4):283-288.
- Broder E, Manson E, Boydell K, Teshima J. Use of Telepsychiatry for Child Psychiatric Issues: First 500 Cases. *CPA Bulletin*. 2004;36(3):11-15.
- Bynum AB, Irwin CA, Cranford CO, Denny GS. The Impact of Telemedicine on Patients' Cost Savings: Some Preliminary Findings. *Telemed J E Health*. Winter 2003;9(4):361-367.
- Calear AL, Christensen H, Mackinnon A, Griffiths KM, O'Kearney R. The Youthmood Project: A Cluster Randomized Controlled Trial of an Online Cognitive Behavioral Program with Adolescents. *J Consult Clin Psychol*. Dec 2009;77(6):1021-1032.
- Cunningham DL, Connors EH, Lever N, Stephan SH. Providers' Perspectives: Utilizing Telepsychiatry in Schools. *Telemed J E Health*. Oct 2013;19(10):794-799.
- Davis AM, James RL, Boles RE, Goetz JR, Belmont J, Malone B. The Use of Telemedicine in the Treatment of Paediatric Obesity: Feasibility and Acceptability. *Matern Child Nutr*. Jan 2011;7(1):71-79.
- Doolittle GC, Williams AR, Cook DJ. An Estimation of Costs of a Pediatric Telemedicine Practice in Public Schools. *Med Care*. Jan 2003;41(1):100-109.
- Elford DR, White H, St John K, Maddigan B, Ghandi M, Bowering R. A Prospective Satisfaction Study and Cost Analysis of a Pilot Child Telepsychiatry Service in Newfoundland. *J Telemed Telecare*. 2001;7(2):73-81.
- Elford R, White H, Bowering R, et al. A Randomized, Controlled Trial of Child Psychiatric Assessments Conducted Using Videoconferencing. *J Telemed Telecare*. 2000;6(2):73-82.
- Eminovic N, Dijkgraaf MG, Berghout RM, Prins AH, Bindels PJ, de Keizer NF. A Cost Minimisation Analysis in Teledermatology: Model-Based Approach. *BMC Health Serv Res*. Aug 25 2010;10:251.
- Fox KC, Connor P, McCullers E, Waters T. Effect of a Behavioural Health and Specialty Care Telemedicine Programme on Goal Attainment for Youths in Juvenile Detention. *J Telemed Telecare*. 2008;14(5):227-230.

Gallagher TE. Augmentation of Special-Needs Services and Information to Students and Teachers "Assist"--a Telehealth Innovation Providing School-Based Medical Interventions. *Hawaii Med J.* Oct 2004;63(10):300-309.

Garrett CC, Hocking J, Chen MY, Fairley CK, Kirkman M. Young People's Views on the Potential Use of Telemedicine Consultations for Sexual Health: Results of a National Survey. *BMC Infect Dis.* 2011;11:285.

Glueckauf R, Fritz S, Ecklund-Johnson E, Liss H, Dages P, Carney P. Videoconferencing-Based Family Counseling for Rural Teenagers with Epilepsy: Phase 1 Findings. *Rehabil Psychol.* 2002;47(1):49-72.

Grogan-Johnson S, Alvares R, Rowan L, Creaghead N. A Pilot Study Comparing the Effectiveness of Speech Language Therapy Provided by Telemedicine with Conventional on-Site Therapy. *J Telemed Telecare.* 2010;16(3):134-139.

Guo JJ, Jang R, Keller KN, McCracken AL, Pan W, Cluxton RJ. Impact of School-Based Health Centers on Children with Asthma. *J Adolesc Health.* 10// 2005;37(4):266-274.

Harper DC. Telemedicine for Children with Disabilities. *Child Health Care.* Winter2006 2006;35(1):11-27.

Hilty DM, Ferrer DC, Parish MB, Johnston B, Callahan EJ, Yellowlees PM. The Effectiveness of Telemental Health: A 2013 Review. *Telemed J E Health.* Jun 2013;19(6):444-454.

Himle MB, Freitag M, Walther M, Franklin SA, Ely L, Woods DW. A Randomized Pilot Trial Comparing Videoconference Versus Face-to-Face Delivery of Behavior Therapy for Childhood Tic Disorders. *Behav Res Ther.* 2012;50(9):565-570.

Horn BP, Barragan GN, Fore C, Bonham CA. A Cost Comparison of Travel Models and Behavioural Telemedicine for Rural, Native American Populations in New Mexico. *J Telemed Telecare.* Jan 2016;22(1):47-55.

Izquierdo R, Morin PC, Bratt K, et al. School-Centered Telemedicine for Children with Type 1 Diabetes Mellitus. *J Pediatr.* Sep 2009;155(3):374-379.

Jones M, Luce KH, Osborne MI, et al. Randomized, Controlled Trial of an Internet-Facilitated Intervention for Reducing Binge Eating and Overweight in Adolescents. *Pediatrics.* Mar 2008;121(3):453-462.

Kennedy C, Yellowlees P. A Community-Based Approach to Evaluation of Health Outcomes and Costs for Telepsychiatry in a Rural Population: Preliminary Results. *J Telemed Telecare.* 2000;6 Suppl 1:S155-157.

Kennedy C, Yellowlees P. The Effectiveness of Telepsychiatry Measured Using the Health of the Nation Outcome Scale and the Mental Health Inventory. *J Telemed Telecare.* 2003;9(1):12-16.

Lancaster P, Krumm M, Ribera J, Klich R. Remote Hearing Screenings Via Telehealth in a Rural Elementary School. *Am J Audiol.* Dec 2008;17(2):114-122.

Lessard JA, Knox R. Telehealth in a Rural School-Based Health Center. *J Sch Nurs.* Apr 2000;16(2):38-41.

Loane MA, Bloomer SE, Corbett R, et al. A Randomized Controlled Trial Assessing the Health Economics of Realtime Teledermatology Compared with Conventional Care: An Urban Versus Rural Perspective. *J Telemed Telecare.* 2001;7(2):108-118.

Malasanos TH, Burlingame JB, Youngblade L, Patel BD, Muir AB. Improved Access to Subspecialist Diabetes Care by Telemedicine: Cost Savings and Care Measures in the First Two Years of the FITE Diabetes Project. *J Telemed Telecare.* 2005;11 Suppl 1:74-76.

Mansour ME, Rose B, Toole K, Luzader CP, Atherton HD. Pursuing Perfection: An Asthma Quality Improvement Initiative in School-Based Health Centers with Community Partners. *Public Health Rep.*



November 1, 2008 2008;123(6):717-730.

March S, Spence SH, Donovan CL. The Efficacy of an Internet-Based Cognitive-Behavioral Therapy Intervention for Child Anxiety Disorders. *J Pediatr Psychol*. Jun 2009;34(5):474-487.

Marcin JP, Ellis J, Mawis R, Nagrampa E, Nesbitt TS, Dimand RJ. Using Telemedicine to Provide Pediatric Subspecialty Care to Children with Special Health Care Needs in an Underserved Rural Community. *Pediatrics*. Jan 2004;113(1 Pt 1):1-6.

McConnochie K, Wood N, Herendeen N, ten Hoopen C, Denk L, Neuderfer J. Integrating Telemedicine in Urban Pediatric Primary Care: Provider Perspectives and Performance. *Telemed J E Health*. Apr 2010;16(3):280-288.

McConnochie KM, Ronis SD, Wood NE, Ng PK. Effectiveness and Safety of Acute Care Telemedicine for Children with Regular and Special Healthcare Needs. *Telemed J E Health*. Aug 2015;21(8):611-621.

McConnochie KM, Wood NE, Herendeen NE, ten Hoopen CB, Roghmann KJ. Telemedicine in Urban and Suburban Childcare and Elementary Schools Lightens Family Burdens. *Telemed J E Health*. Jun 2010;16(5):533-542.

McConnochie KM, Wood NE, Kitzman HJ, Herendeen NE, Roy J, Roghmann KJ. Telemedicine Reduces Absence Resulting from Illness in Urban Child Care: Evaluation of an Innovation. *Pediatrics*. 2005;115(5):1273-1282.

McIntosh S, Cirillo D, Wood N, Dozier AM, Alarie C, McConnochie KM. Patient Evaluation of an Acute Care Pediatric Telemedicine Service in Urban Neighborhoods. *Telemed J E Health*. Dec 2014;20(12):1121-1126.

Namakian M, Subar P, Glassman P, Quade R, Harrington M. In-Person Versus "Virtual" Dental Examination: Congruence between Decision-Making Modalities. *J Calif Dent Assoc*. Jul 2012;40(7):587-595.

Nelson E-L, Barnard M, Cain S. Treating Childhood Depression over Videoconferencing. *Telemedicine Journal And E-Health: The Official Journal Of The American Telemedicine Association*. 2003;9(1):49-55.

Nelson E-L, Barnard M, Cain S. Feasibility of Telemedicine Intervention for Childhood Depression. *Counselling & Psychotherapy Research*. 2006;6(3):125-129.

Nelson E-L, Duncan AB, Peacock G, Bui T. Telemedicine and Adherence to National Guidelines for Adhd Evaluation: A Case Study. *Psychol Serv*. 2012;9(3):293-297.

O'Kearney R, Gibson M, Christensen H, Griffiths KM. Effects of a Cognitive-Behavioural Internet Program on Depression, Vulnerability to Depression and Stigma in Adolescent Males: A School-Based Controlled Trial. *Cogn Behav Ther*. 2006;35(1):43-54.

O'Kearney R, Kang K, Christensen H, Griffiths K. A Controlled Trial of a School-Based Internet Program for Reducing Depressive Symptoms in Adolescent Girls. *Depress Anxiety*. 2009;26(1):65-72.

O'Reilly R, Bishop J, Maddox K, Hutchinson L, Fisman M, Takhar J. Is Telepsychiatry Equivalent to Face-to-Face Psychiatry? Results from a Randomized Controlled Equivalence Trial. *Psychiatr Serv*. Jun 2007;58(6):836-843.

Pretorius N, Arcelus J, Beecham J, et al. Cognitive-Behavioural Therapy for Adolescents with Bulimic Symptomatology: The Acceptability and Effectiveness of Internet-Based Delivery. *Behav Res Ther*. Sep 2009;47(9):729-736.

Romano MJ, Hernandez J, Gaylor A, Howard S, Knox R. Improvement in Asthma Symptoms and Quality

of Life in Pediatric Patients through Specialty Care Delivered Via Telemedicine. *Telemed J E Health*. Winter 2001;7(4):281-286.

Ruskin PE, Silver-Aylaiian M, Kling MA, et al. Treatment Outcomes in Depression: Comparison of Remote Treatment through Telepsychiatry to in-Person Treatment. *Am J Psychiatry*. 2004;161(8):1471-1476.

Shaikh U, Cole SL, Marcin JP, Nesbitt TS. Clinical Management and Patient Outcomes among Children and Adolescents Receiving Telemedicine Consultations for Obesity. *Telemed J E Health*. Jun 2008;14(5):434-440.

Shealy KM, Davidson TM, Jones AM, Lopez CM, de Arellano MA. Delivering an Evidence-Based Mental Health Treatment to Underserved Populations Using Telemedicine: The Case of a Trauma-Affected Adolescent in a Rural Setting. *Cogn Behav Pract*. 8// 2015;22(3):331-344.

Shore JH, Brooks E, Savin DM, Manson SM, Libby AM. An Economic Evaluation of Telehealth Data Collection with Rural Populations. *Psychiatr Serv*. Jun 2007;58(6):830-835.

Sousa P, Fonseca H, Gaspar P, Gaspar F. Controlled Trial of an Internet-Based Intervention for Overweight Teens (Next.Step): Effectiveness Analysis. *Eur J Pediatr*. 2015;174(9):1143-1157.

Spaulding R, Belz N, DeLurgio S, Williams AR. Cost Savings of Telemedicine Utilization for Child Psychiatry in a Rural Kansas Community. *Telemed J E Health*. Oct 2010;16(8):867-871.

Stain HJ, Payne K, Thienel R, Michie P, Carr V, Kelly B. The Feasibility of Videoconferencing for Neuropsychological Assessments of Rural Youth Experiencing Early Psychosis. *J Telemed Telecare*. 2011;17(6):328-331.

Stensland J, Speedie SM, Ideker M, House J, Thompson T. The Relative Cost of Outpatient Telemedicine Services. *Telemed J*. Fall 1999;5(3):245-256.

Storch EA, Ehrenreich May J, Wood JJ, et al. Multiple Informant Agreement on the Anxiety Disorders Interview Schedule in Youth with Autism Spectrum Disorders. *J Child Adolesc Psychopharmacol*. Aug 2012;22(4):292-299.

Wootton R, Bloomer SE, Corbett R, et al. Multicentre Randomised Control Trial Comparing Real Time Teledermatology with Conventional Outpatient Dermatological Care: Societal Cost-Benefit Analysis. *BMJ*. May 06 2000;320(7244):1252-1256.

Yellowlees PM, Hilty DM, Marks SL, Neufeld J, Bourgeois JA. A Retrospective Analysis of a Child and Adolescent Emental Health Program. *J Am Acad Child Adolesc Psychiatry*. 2008;47(1):103-107.

Young TL, Ireson C. Effectiveness of School-Based Telehealth Care in Urban and Rural Elementary Schools. *Pediatrics*. Nov 2003;112(5):1088-1094.

Yaylor C. Clinical Outcomes in Telepsychiatry. *J Telemed Telecare*. 1999;5 Suppl 1:S59-60.

This study was supported by the Federal Office of Rural Health Policy (FORHP), Health Resources and Services Administration (HRSA), U.S. Department of Health and Human Services (HHS) under cooperative agreement number 6 UICRH29074-01-01. The information and conclusions in this report are those of the authors and no inferred endorsement by FORHP, HRSA, or HHS.

Research partners: University of Iowa, University of North Carolina, and University of Southern Maine.

