FINAL REPORT AND RECOMMENDATIONS OF THE IMMUNIZATION INFORMATION SYSTEM IMPLEMENTATION AND ALIGNMENT DESIGN GROUP

August 14, 2017

Report prepared for:

Connecticut Health IT Advisory Council

Authored by:

Thomas Agresta, MD, MBI
M. Alex Geertsma, MD
Deirdre Gruber, MSN, FNP-BC
Hyung Paek, MD

Prepared by:
Christina Coughlin, Facilitator
Carol Robinson, CEO

CedarBridge Group LLC
515 NW Saltzman Rd. #661
Portland, OR 97229
www.cedarbridgegroup.com

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Acknowledgements

The State of Connecticut is deeply grateful to all those who participated in the Immunization Information System (IIS) Implementation and Alignment Design Group. You generously shared your time and expertise to represent the various stakeholder groups with interests in and needs for an IIS that is a sustainable, efficient, and shared health information technology (health IT) enabled solution. Your time and energy to provide recommendations to support the implementation of the Department of Public Health's (DPH) IIS plans and ensure the alignment of a new IIS system with the current health information exchange (HIE) planning effort will help improve the health and wellbeing of the people of Connecticut.

Executive Summary

The *Final Report and Recommendations of the Immunization Information System (IIS) Implementation and Alignment Design Group (IIS Design Group)* is the work of a stakeholder IIS Design Group, which was chartered by the Health Information Technology Advisory Council (Health IT Advisory Council) on June 15, 2017. The objective of the IIS Design Group was to make recommendations to ensure the alignment between the procurement and implementation of a new IIS platform and the planning for statewide HIE services in order to meet stakeholder needs.

Over the course of five weekly meetings, and significant work beyond these meetings, the IIS Design Group met its objectives by developing the following elements of this report:

1. Stakeholder and Value Proposition Overview
2. Priority use cases
3. Recommendations around next steps and future activities to be presented to the Health IT Advisory Council for further deliberation and approval at its August 17, 2017 meeting.

The IIS Design Group's recommendations include:

- Implement priority use cases
- Leverage and align efforts with HIE services
- Maximize collaboration and planning across federal programs
- Provide ongoing stakeholder engagement
- Propose necessary legislative updates
- Opportunities for financial sustainability
- Need for technical assistance to support provider organizations
- Need for training and education to support clinicians and clinic staff

This report represents the conclusion of the present IIS Design Group's work. However, the IIS Design Group recommends that an additional **planning group consisting of representatives of the Health Information Technology Officer's (HITO) office, the Department of Public Health (DPH), and other relevant stakeholders** be formed to ensure that the planning of the implementation of the new IIS platform is aligned with the current planning around health information exchange (HIE) services. The importance of this alignment was highlighted throughout the discussions of the IIS Design Group, with a focus on providing a shared technical infrastructure that can provide streamlined connectivity for providers, support federal and state reporting needs, and maximize the use of available resources.

The work of this IIS Design Group is a positive step forward in achieving the goal of a robust, interoperable IIS that will meet the CDC functional requirements and the needs of all Connecticut stakeholders.

Introduction and Background

Legislation Regarding Health Information Technology in Connecticut

The work of the Immunization Information System (IIS) Implementation and Alignment Design Group (IIS Design Group) is ultimately governed by Connecticut state legislation. Connecticut's health information technology (health IT) activity is regulated under Public Act 16-77, which replaced the previously-enacted Public Act 15-146. This law establishes Connecticut's Health Information Technology Advisory Council (Health IT Advisory Council) to advise the Health Information Technology Officer (HITO) in developing policy recommendations and priorities to advance the state's health IT and health information exchange (HIE) efforts and goals. In addition, the Health IT Advisory Council advises the HITO in the development and implementation of the statewide health IT plan. The Health IT Advisory Council also advises the HITO regarding the development of appropriate governance, oversight, and accountability measures to ensure success in achieving the state's health IT and HIE goals. The Health IT Advisory Council chartered the IIS Design Group to inform their work.

The law also contains provisions for:

- Enhancing interstate and intrastate interoperability using standards and protocols;
- Establishing electronic data standards;
- Requiring privacy standards (HIPAA) and limiting the use of individuals' Social Security Numbers;
- Coordinating health IT and HIE activities to ensure consistent and collaborative cross-agency planning and implementation; and
- Promoting the reuse of enterprise health IT assets, such as a Provider Directory, an Enterprise Master Person Index, Direct Secure Messaging, and Health Information Service Provider (HISP).

Stakeholder Engagement

The HITO is legislatively charged with the planning, design, implementation, and oversight of HIE services for the State of Connecticut. The HITO has responsibility for coordinating all state health IT initiatives.

As part of the planning and design phase of this work, the HITO undertook a four-month stakeholder engagement and environmental scan to assess the current state and desired future state of the health IT environment in Connecticut.[1] One of the key objectives of this environmental scan was to identify the health IT and HIE opportunities of the greatest value to stakeholders to help advance better health and better healthcare in Connecticut. Through this engagement process, **providers and hospitals ranked public health reporting as an area with opportunities for the state to expand and/or improve its services, as well as to continue to address the need for streamlined public health reporting, particularly to the Connecticut Immunization Registry and Tracking System (CIRTS)[2].**

[1] http://portal.ct.gov/en/Office-of-the-Lt-Governor/Health-IT-Advisory-Council/Health-IT-Reports-and-Recomendations

[2] http://www.ct.gov/dph/cwp/view.asp?a=3136&Q=467374&PM=1

Connecticut Immunization Registry and Tracking System (CIRTS) Gap Analysis and Decision Points

In March 2017, the **Centers for Disease Control and Prevention (CDC) conducted a gap analysis of CIRTS that reported on the system's limitations in meeting standards required to support bi-directional information exchange (interoperability)** and enabling new functionality required by the CDC (e.g., vaccine ordering and tracking). At the start of the IIS Design Group, the State of Connecticut Department of Public Health (DPH) was reviewing commercial off-the-shelf vendor options for a new IIS that could provide more robust functionality and better meet CDC functional standards including the ability to integrate and support interoperability with electronic health record systems (EHRs) for those providers who administer vaccines. Due to the synchronous timing of the CDC report, the expectation that DPH would upgrade the registry to meet existing and future standards, and the importance of addressing the needs of stakeholders captured in the environmental scan findings, **the HITO decided to form the time-limited IIS Design Group, with the support of the Commissioner of the Department of Public Health. The IIS Design Group was tasked to provide recommendations to the Health IT Advisory Council and define a clear pathway to support the implementation of the DPH IIS plans and ensure alignment with the current HIE planning effort** to support interoperability between providers, healthcare organizations, CIRTS, and a future statewide HIE shared services.

Chartering of IIS Design Group

In response to the importance of assuring alignment between the procurement and implementation of a new IIS platform and the planning for statewide HIE services, the Connecticut Health IT Advisory Council chartered the formation of an IIS Design Group[3] on June 15, 2017, with the following purpose:

1. To familiarize the IIS Design Group members with the high-level functional standards of an IIS based on the current and anticipated CDC functional standards and the work DPH has already completed to identify use cases, existing gaps, existing and future functionality, and proposed implementation timelines. The goal was to provide the group with a baseline of knowledge about the IIS, DPH mandates, uses of the IIS, and current and future functional requirements.

2. With that foundation, **the IIS Design Group was asked to identify any additional stakeholder needs for the IIS and determine the prioritization of those needs. This will allow DPH to create or enhance the appropriate use cases and business requirements in the new IIS implementation. In addition, the group was asked to define the high-level stakeholder needs for how the IIS would become a sustainable, efficient, and shared statewide health-IT enabled solution.** The IIS Design Group also asked to **focus on the needs of DPH, consumers, and providers to support all relevant activities with immunizations** and identify any technical assistance needed by providers and DPH to successfully implement electronic reporting to the IIS.

3. The IIS Design Group reviewed a high-level timeline and action plan that incorporates the identified needs of all stakeholders to be considered for the new IIS implementation.

4. The IIS Design Group recommendations identify any additional follow-up activities to address issues identified during the IIS Design Group process.

[3] http://portal.ct.gov/Office-of-the-Lt-Governor/Health-IT-Advisory-Council/Health-IT-Advisory-Council---Immunization-Design-Group-2017

The goals and objectives outlined in the IIS Design Group's charter included:

1. Review the high level functional requirements of an IIS, using existing and future CDC functional standards, as a foundation to identify issues, risks, and gaps.
2. Identify and prioritize any additional stakeholder needs that will be used to create new or enhance existing use cases and business requirements for the new IIS.
3. Identify any additional stakeholders that are not already captured in the existing IIS roadmap and define their potential roles in the process.
4. Review a high-level timeline and action plan to implement and provide IIS services.
5. Identify the technical assistance framework necessary for providers and DPH to successfully implement electronic reporting to the IIS.
6. Provide recommendations that align with CDC functional standards, and meet the requirements of DPH, providers, and consumers.
7. Identify value propositions of a health IT-enabled IIS solution for key stakeholders, including but not limited to DPH.
8. Consider financial sustainability models and define the financial gaps.

Stakeholder Representation and Membership of IIS Design Group

The IIS Design Group was sponsored by the HITO, governed by the Health IT Advisory Council, and supported by DPH and CedarBridge Group, in consultation with the Office of the Lieutenant Governor and the Commissioner of the Department of Public Health. The list of IIS Design Group members, and the description of stakeholder representation can be seen in Table 1 below:

Table 1: IIS Design Group Members

Name/Role	Stakeholder Representation
Thomas Agresta, MD, MBI	Healthcare provider at a primary care setting and a Professor and Director of Medical Informatics for Family Medicine at UConn Health; designee for the Health IT Advisory Council
Martin A. Geertsma, MD	Pediatrician providing healthcare services at a Federally Qualified Health Center (FQHC) with direct patient care responsibility
Deirdre Gruber, MSN, FNP-BC	School Nurse Supervisor at a large Local Health Department that manages the delivery of immunizations, and promotes a healthy school environment by monitoring immunizations ensuring appropriate exclusion for infectious illnesses, and reporting communicable disease, as required by law
Hyung Paek, MD	Medical Director of Information Technology at a health system and healthcare provider in a FQHC with direct patient care responsibilities

IIS Design Group Process

The IIS Design Group conducted its work across a period of two months in a series of five meetings. The kick-off meeting on July 7, 2017 afforded the opportunity for all participants to introduce themselves, the stakeholder group(s) they represent, and their interest in supporting a robust IIS for the State of Connecticut.

In the following meetings, the IIS Design Group worked through successive cycles of identification, discussion, and validation of various topics, as depicted in Table 2.

Table 2: Timeline for IIS Design Group Process

Milestone/Deliverable	Date
Session 1: Kick-Off Meeting – validate charter, roles and responsibilities, and timeline of IIS Design Group; receive update on current status of IIS system; identify value propositions	7/7/17
Session 2: Discuss value propositions, high level review of CDC IIS functional standards and overall services; begin to identify issues, obstacles, gaps	7/13/17
Session 3: Determine stakeholder needs and prioritization; identify additional stakeholders and their roles; review high level implementation roadmap	7/20/17
Session 4: Continue to review role of HIE services in supporting IIS interoperability and considerations for financial sustainability models	7/27/17
Session 5: Identify priorities and draft recommendations	8/4/17

For each meeting, the IIS Design Group reviewed and affirmed the agenda and work plan for the meeting, and validated the outcomes of the previous session's work as presented by the facilitator, offering any final suggestions or feedback. At each meeting, newly-introduced topics were reviewed and discussed. Between meetings, IIS Design Group members had the opportunity to work on shared documents that were then reviewed and validated as a group, and formulated recommendations to the HITO and to the Health IT Advisory Council, as described below.

Key Deliverables of IIS Design Group

IIS Design Group deliberations and discussions were collated into two discrete deliverables:

- Stakeholder and Value Proposition Overview
- Priority Use Cases

Stakeholder and Value Proposition Overview

The IIS Design Group discussed the range of stakeholders for the IIS over several meetings, and developed an overview that attempts to define the wide-range of stakeholders that need to be

considered and integrated into the planning, implementation, and deployment surrounding the new IIS platform, as well as some of the key functionality that each stakeholder segment needs from the IIS in order for that segment to find value in the IIS. Other value propositions are based on the outcomes that will be derived from a robust IIS that will led to higher immunization rates across the entire population.

The results of these discussions can be found in Table 3 below. In some cases, such as Provider Organizations, there is a high-level category and then some subgroups, i.e., Federally Qualified Health Centers, that may have additional value propositions specific to that stakeholder. The IIS Design Group felt it important to have a general Provider category, but augment that with Clinic Staff, Provider Organizations, and subgroups of organizational types to be able to capture specific use cases and value propositions that may be relevant to specific segments. In order to capture those, but not repeat common value propositions across all provider organizations, there is a general provider organization category which includes the common value propositions, and then subcategories where only the value propositions that are not common to all provider organizations are included.

While the IIS Design prioritized a small number of high-value use cases, all of the value propositions and use cases articulated in Table 3 hold value for stakeholders and over time should be included in the planning and implementation of additional IIS use cases and services.

Table 3: Stakeholder and Value Proposition Overview

Stakeholder	Value Propositions
Consumers	Efficiencies ● Streamlined access to records with the ability to print an immunization form for school or camp ● Reduced return visits for repeat immunizations due to improved forecasting and better adherence to immunization schedule for individual patients ● Ability to download local copies of records using a standardized application programming interface (API), including mobile phone technologies ● Ability to more easily determine immunization status of patients exposed to a vaccine-preventable disease Quality Improvement ● Ability to track immunizations ● Ability to inform more accurate records if there are missing immunizations in the IIS ● Ability to be a more active participant and engaged in understanding and improving individual and family health ● Ability to optimize immunization forecasting will decrease likelihood of missed opportunities to provide vaccines and/or vaccinations given too soon Population Health ● Presence of more up-to-date immunizations across the community will lead to less vaccine-preventable illnesses, resulting in teachers

	and staff being out sick less often, and people showing up to work sick less often Cost Savings ● Reduced wasted time and effort locating paper records ● Improved immunization schedules with a goal of decreased morbidity and mortality resulting in less doctor, emergency department, and hospital visits and thus lower out-of-pocket cost to consumers ● Reduction in unnecessary repeat immunizations of patients with a consolidated health record will avoid out-of-pocket expenses and loss of wages and productivity ● Optimal immunization forecasting with a goal to decrease time spent determining outstanding immunizations that are due Other ● Ability to provide data and information in the most appropriate form to whomever is authorized and has a need for the information ● Reduced pain to patients and reduced inconvenience to patients and parents/caregivers when immunizations must be repeated
Providers	Efficiencies ● A high degree of integration between the IIS and EHRs will provide the highest value to providers ● Ability for the IIS to be interactive with EHRs to support real-time problem solving or forecasting involving gaps in or missing immunizations. This could be via the automation of the American Academy of Pediatrics (AAP) Bright Futures tables that delineate in great detail solutions to problems with gaps, delays, and missing immunizations. ● Allow pre-planning visits with staff that could improve workflows, such as permitting staff to give immunizations at different times during the visit instead of only at the end of the visit ● Ability to populate digital versions of blue/yellow forms in EHRs with user-friendly access for clinicians, nurses, etc., and the potential for electronic signature at the end of the form so it can be handled by staff after the physical exam is completed. This could allow the form to be electronically transferred and not have to be printed out, signed, and then faxed or mailed. ● Ability to more easily determine immune status of patients exposed to a vaccine preventable disease ● Eliminate need to manually enter data into the IIS or separately check the IIS if the information is accessible from the EHR ● Support predictive immunization ordering with an administrative report to help ensure the proper quantities of different vaccines are available for upcoming months Quality Improvement ● Support improved adherence rates with suggested schedules

	● Provide the ability to track across populations and tailor outreach for reminders/recalls ● Ability to support quality review, especially with new immunizations ● Provide improved ability of reminders for adult immunizations that are often missed (i.e., Zoster) ● Support enhanced problem solving for different patient cases regarding gaps in or missing immunizations. ● Improved forecasting of immunization stock can help minimize waste and supply chain inefficiencies ● Facilitate the validation and syncing of immunization decision rules between the IIS and a provider's EHR ● Allow decision support to clinicians for individual patient immunizations and for immunization schedules for patient populations ● Provide visualization of integrated data from public health surveillance programs with local immunization rates, to improve forecasting of near term immunization needs ● Support improved forecasting of what vaccines should be given to reduce return visits for repeat immunizations, leading to improved trust of providers Population Health ● More up-to-date immunizations leading to healthier populations and reduced unnecessary patient visits ● Provide proactive reminders for providers to immunize greater number of "at risk" populations (i.e., giving patients with diabetes the pneumonia vaccine at an earlier age) providing the immunity of immune compromised individuals ● Improved herd immunity, leading to healthier populations Cost Savings ● Decreased need to transcribe data from paper to electronic versions, and less scanning of documents ● Reduced repeat vaccinations ● Reduced office work due to automation of individual vaccine schedules and automation of vaccine ordering. Worker's time can be re-allocated to higher-functioning roles. ● Optimal immunization forecasting will decrease time spent determining individual immunization schedules Other The importance of data quality can't be over-stressed; if providers and others find the data to be unreliable they will stop using the system
Clinic Staff	Efficiencies ● Enable pre-planning visits with clinicians to improve workflow for more efficient patient visits

	● Integration with the EHR to include automated Bright Futures AAP regular and catch-up tables, in those offices where nurses administer immunizations (which are most offices) will allow nurses to: 1. Schedule and correctly immunize patients requiring immunizations but not requiring provider visit, thereby saving provider visits. 2. Prevent the administration of incorrect, unneeded vaccines, including variants in schedule attributable to different or new versions of vaccines.
All Provider Organizations	Efficiencies ● Ability to track immunization status across organization ● Ability to get reliable data from other organizations quickly ● For organizations involved with value based payments/pay for performance linked to accurate immunization data for quality payments, ability to provide documentation to Accountable Care Organization (ACO) or other entity in a timelier manner than claims data would be available ● Support prediction of immunization ordering with an administrative report to help ensure the proper quantities of different immunizations are on hand for the coming month, and avoid supply chain inefficiency; ability to integrate with forecasting ● Maximize the use of staff, and allow clinicians to use time more efficiently Quality Improvement ● Ability to track immunizations through dashboard for gap analysis to support outreach ● Minimize errors introduced by transcription of paper records, e.g. new patients to practice ● Better support for quality improvement projects since real-time data will be available ● Ability to run reports to see if there is need for training to comply with recommendations ● Ability to provide targeted training and education when benchmarking reports indicate a need, or with the rollout of new vaccines which may impact different functions within the organization ● Ability to support quality review and benchmarking, especially with new vaccines Population Health ● More up-to-date immunizations leading to healthier populations ● Improved tracking of immunization status against disease occurrence for research and operational purposes Cost Savings ● Ability to minimize number of duplicative immunizations ● Ability to minimize clinician time spent determining individual schedules

	● Improved vaccine tracking ● Support improved prediction of appropriate staffing levels and locations for immunization clinics, i.e., flu clinics ● Ability to reduce time and effort required for tracking compliance with mandatory flu or other mandatory vaccinations if employee can send a "snapshot" of their immunizations
Non-Primary Care Settings, such as "Walk-in," Retail, Urgent Care, Travel Clinics	Efficiencies ● Ability to access immunization records and educate patients about any needed vaccines to avoid need for follow-up visit Quality Improvement ● Support linkage back to medical home/primary care provider (PCP) to support continuity of care and consistency of preventative services. Population Health ● Ability to reach "at risk" populations to achieve better immunization rates for those without medical homes Other ● Travel immunizations require different forecasting; a linkage to Center for Disease Control and Prevention (CDC) for help with forecasting could be helpful
Federally Qualified Health Centers (FQHCs)	Quality Improvement ● Increased ability to meet Uniform Data System (UDS) measures Population Health ● Improved immunization adherence in vulnerable populations
Public Health	Efficiencies ● Expansion of IIS population to adolescents and adults ● Provide substantial opportunity to share technology services such as identity management and provider management across all public health functions ● Ability to more easily determine immune status of patients exposed to a vaccine-preventable disease Quality Improvement ● More comprehensive records to serve as reliable source of information for quality improvement programs ● Ability to track across populations and tailor outreach ● Improved forecasting of disease spread and opportunity to educate populations and individuals with the goal of containing disease outbreaks of vaccine-preventable diseases ● Improved data quality and ability to design some predictive analytic outbreak scenarios for planning purposes ● Standardization of public health data both for entry and retrieval ● Support mass immunization efforts during outbreak and pandemic flu responses

	Population Health ● Improved herd immunity, leading to healthier populations ● Support of disease surveillance efforts related to geography, birth cohorts, and other aggregates ● Would like to see integration of surveillance data like flu from CDC with local vaccination rate to improve forecasting of near future vaccine needs ● Provides data to determine populations who are under-immunized, and support targeted outreach to those areas Cost Savings ● Focus resources to reduce impact of vaccine-preventable diseases ● Share costs and resources with state consortium ● Marked reduction in state resources needed to "enter" immunization data from paper records and staff can be reduced or re-deployed to help improve immunization rates Other ● Use data to determine gaps by provider/practice/population ● Gain data to better understand social determinants of health
Local Health Departments (some of which run vaccine clinics and SBHCs)	Efficiencies ● Ability to access immunization records ● Ability to connect EHR (if there is one) to the IIS ● Ability to enter data related to immunization clinics and services provided at municipal levels ● Ability to more easily determine immunization status of patients exposed to a vaccine-preventable disease Quality Improvement ● Help improve immunization rates ● Bi-directional data flow for immunization records ● Support mass immunization efforts during outbreak and pandemic flu responses Population Health ● Improved herd immunity across “at risk” population who may not have a medical home ● Standardized recording and archiving of immunization data for mass immunization efforts ● Provides data to determine populations who are under-immunized, and support targeted outreach to those areas ● Can track and contain epidemics more easily if public health reporting and IIS are connected Cost Savings ● State-level IIS decreases cost of record archiving at local level (both paper records and digital systems)

	● Less time intensive on staff to retrieve records for patients ● Reduce unnecessary repeat immunizations due to lack of record consolidation Other ● Improves point-of-care services delivered at municipal clinics
Federal and State Government	At the federal level, this category includes the Center for Disease Control and Prevention (CDC), and at the state level includes, among others, the Department of Public Health, the Department of Social Services (including Medicaid), the Department of Children and Families, and the Department of Education. Efficiencies ● Ability for improved integration and support for reporting requirements for Vaccines for Children and publicly purchased immunizations ● Provide data analysis for real-time tracking and reporting of state and federal vaccination standards and regulations Quality Improvement ● Improved traceability of funding to ensure appropriate levels of spending ● Improved ability to track dose-level accountability ● Support interstate and interagency data sharing (i.e., with New York) ● Support mass immunization efforts during outbreak and pandemic flu responses ● Streamlined reporting by local, state, and federal agencies Population Health ● Enhanced capability for meeting Healthy People 2020 and other federal and state population health goals Cost Savings ● Consortium of states working together on IIS can leverage federal funding by using shared functionality and leverage ability to share costs to develop new modules
Schools	Efficiencies ● Ability to provide single, uniform data presentation that is easy to interpret will save time checking records ● Ability for Parents/guardians/students/graduates to be able to access system to obtain records ● Improved accuracy in data received from one source rather than many ● Ability to prevent duplication of immunization due to lack of records / record consolidation Quality Improvement

	● Better adherence and tracking will avoid students being excluded from school for lack of records of required vaccines ● Allow for resources to be shifted to participate in outreach and education to improve immunization rates ● Support improved reporting processes to aid in compliance with annual immunization mandates ● Support immunization assessment during the school registration process regardless of location- i.e., registration at district central office, school buildings, intake centers Population Health ● Improved herd immunity, leading to healthier populations including less sick children and days of school missed ● Ability to evaluate risk for outbreaks across an entire school or school system (i.e., flu vaccine rates) ● Ability to track exemption status in particular school and district populations Cost Savings ● Reduced staff needed to check records ● Registry provided at state level reduces cost of IT infrastructure needs to house immunization data electronically by individual districts
Childcare/Preschools	Efficiencies ● Reduced employee sick time among childcare workers, if there is better adherence for flu vaccines, etc. ● Ability to provide single, uniform data presentation that is easy to interpret will save time checking records Quality Improvement ● Better adherence and tracking will avoid students being excluded from school for lack of records of required immunization ● Support improved reporting processes to aid in compliance with annual immunization mandates ● Support comparison across childcare and preschools to identify by site or neighborhood where outreach is most needed Population Health ● Improved herd immunity, leading to healthier population ● Ability to evaluate risk for outbreaks across an entire school (i.e., flu vaccine rates) ● Ability to track exemption status in particular school and district populations Cost Savings ● Reduced employee sick time ● Reduced staff time locating records

Target Populations	Target populations may include children in foster care, incarcerated youth, refugee populations, the homeless population, families in domestic violence shelters, and other populations that may have specialized immunization needs which may include gaps in immunizations, a lack of a medical home, and care received from multiple providers. Efficiencies ● Support streamlined access to records regardless of where a person receives care ● Provide more comprehensive, accurate records developed through standardization instead of relying on various locations/providers/ agencies Quality Improvement ● Provide increased accuracy of tracking administered immunizations ● Ability to support clients and ensure catch-up immunizations ● Ability to capture immunizations delivered in these specialty environments ● Allow for a more accurate referral when a person leaves the specialty environment and healthcare is transferred to another provider/agency ● Enhance ability to measure success of targeted outreach efforts, especially for difficult to track populations Population Health ● Improved herd immunity in vulnerable populations Cost Savings ● Less time and staff to track down records ● Ability to reduce the possibility of the duplicative immunizations Other ● Important to consider that tracking for some of these populations can be very sensitive (i.e., domestic violence shelters)
Payers	Efficiencies ● Ability to track across organizations Quality Improvement ● Support improved adherence with suggested schedules ● Support decreased morbidity and mortality due to vaccine-preventable diseases ● Ability to track quality measures that might be part of value-based payment structures Population Health ● Improved herd immunity, leading to healthier populations Cost Savings

	● Ability to reduce duplicative immunizations ● Ability to support shared savings models ● Less payments to providers to treat sick patients Other ● Ability to share payment data could be used to check data quality
Medicare and Medicaid	Efficiencies ● Ability to track across organizations Quality Improvement ● Support improved adherence with suggested schedules ● Result of decreased morbidity and mortality from vaccine-preventable diseases Population Health ● Improved herd immunity, leading to healthier populations Cost Savings ● Access to information means less duplicative immunizations ● Less payments to providers to treat sick patients Other ● Ability to share payment data could be used to check data quality
Pharmacies	Efficiencies ● Allow for immunization effectiveness monitoring, and the ability to access the information will lead to greater support from primary care providers for pharmacists to administer vaccines ● Ability to check adult immunization records ● Offers consumers additional access points to receive vaccines which may increase immunization rates Quality Improvement ● Support increase of adherence of adult immunizations Other ● Provide for additional revenue
Employers	Efficiencies ● Higher vaccination rates, will lead to less vaccine-preventable diseases and reduced employee sick time ● Healthcare employers will be able to ensure that employees have received an immunization that is essential for work, i.e., Hepatitis B, flu vaccine ● Allow for easier tracking of immunizations administered at an on-site flu shot clinic ● Fewer employees will need to take children in for duplicative immunizations

	Cost Savings ● Improved access to a comprehensive IIS will lead to less duplicative immunizations covered by an employer sponsored health plan
Pharmaceutical Companies	Quality Improvement ● Support production and enhancements of immunizations ● Better tracking of who gets which vaccine and ability to track effectiveness based on outbreaks in different areas Other ● Provide additional revenue ● Enhanced stock projections

IIS Priority Use Cases

There are many important use cases that were discussed by the IIS Design Group, and are captured in the Stakeholder and Value Proposition Overview. The following were determined to be high-value use cases that should be prioritized for the new IIS platform:

- A lifetime IIS (birth through adult) needs to be interoperable with EHRs and able to support the following two priority use cases:
    - Ability for providers to send information about immunization history directory from their EHR to the IIS
    - Ability for providers, consumers, and other authorized users to be able to query and retrieve immunization history from the IIS to support real-time access at the point of care. For providers, this should be enabled through their EHRs. For consumers access could be through a web portal or mobile application.
- The IIS should be customized with templates for Connecticut-specific forms for school and preschool needs
- The IIS should support the ability for clinicians and staff to determine what vaccines should be given at which patient visits (vaccine forecasting), including the following specialized cases beyond standard forecasting needs:
    - Problem solving for catchup and other non-standard schedule needs
    - Ability to manage immunizations for patients with chronic diseases and support targeted outreach
    - Decision support for high-risk patients who should not receive immunizations because of other treatments
- The IIS should support vaccine inventory tracking to support ordering

An additional use case supporting immunizations for international travel and travel clinics were discussed, especially since primary care providers may need to support these needs if travel clinics are no longer available or accessible in some communities. However, this seems to be a lower priority use case than the others listed above.

Recommendations

The IIS Design Group deliberated and identified the following recommendations to help support the planning and implementation of the new IIS platform, and the essential collaboration that will be required to ensure alignment with HIE services.

Recommendation #1: Implement Priority Use Cases

The IIS Design Group recommends that the business and technical requirements necessary to support the priority use cases identified during the IIS Design Group process be implemented as quickly as possible to provide value across the IIS stakeholders.

Recommendation #2: Leverage and Align Efforts with HIE services

The IIS Design Group recommends that the following HIE shared services be implemented to support the IIS priority use cases:

- Identity management (patient, provider, and organization matching)
- Short-term and long-term options for a transport layer to connect to provider organizations
    - SOAP, HTTPS, SFTP, API, etc.
- Data transformation to support data quality assurance and normalization
- Interoperability with other systems, i.e., surveillance, ability to query other IIS from other states and jurisdictions
- Patient attribution to PCP/medical home
- SMART on FHIR applications, utilizing open APIs to help support easier deployment of tools, i.e. dashboards, within EHR environments, as well as explore options to allow patients and families to easily access records

The IIS Design Group recommends that a joint planning committee including HITO, DPH, and other relevant stakeholders be established as quickly as possible to ensure there is alignment beginning with the planning for the deployment of the new IIS platform and HIE shared services with a goal of expediting the deployment of IIS Phase 2 (bi-directional connections with EHRs) supported by the HIE services listed above.

As part of this recommendation, it is important to align and leverage both technical and financial resources. There should be careful consideration to how alignment with HIE services can support financial sustainability because the costs of some of the shared services, e.g. identity management, can be shared across many stakeholders. Coordination and planning is necessary to achieve the financial sustainability required to deliver the basic technology infrastructure needed in the state and which will be needed by other projects currently underway such as the Electronic Clinical Quality Metrics Reporting System. This may be something that should be explored across all public health domains that may intersect with HIE services to maximize efficiencies and leverage resources around data governance,

technical infrastructure, staffing, and other elements that could support sustainability and growth across public health.

Recommendation #3: Maximize Collaboration and Planning Across Federal Programs

The IIS Design Group recommends joint conversations be initiated, or continued if they are already happening, to ensure collaboration between Connecticut agencies including DPH, Department of Social Services, the HITO, and others with federal partners including CDC, the Office of the National Coordinator for Health Information Technology (ONC), and the Centers for Medicare and Medicaid Services (CMS). Collaboration supports transparency with the federal agencies about how Connecticut is approaching various health IT projects, including the alignment between the new IIS platform and the planning around HIE services in order to maximize the options available to Connecticut. This will be especially relevant for the IAPD.

Recommendation #4: Provide Ongoing Stakeholder Engagement

The IIS Design Group recommends ongoing stakeholder engagement be part of the planning, implementation, and ongoing operations of the IIS. There may be different ways that this engagement could be effectively structured and the IIS Design Group did not want to limit flexibility for efficient and effective structures. However, the IIS Design Group does suggest that an Agile development structure be utilized during the design and implementation phase with rapid sprint cycles to gather feedback from stakeholders on how features work and what customization would be most beneficial in Connecticut. There should also be an ongoing user group comprised of a wide-range of stakeholders to facilitate outreach, education, and training once the IIS is in production.

Recommendation #5: Provide Necessary Legislative Updates

The IIS Design Group recommends legislation be introduced in 2018 to establish a lifetime registry (birth through adult). It will be important that the legislation promotes a graduated approach so that when the IIS system can receive data from EHRs and pharmacies, electronic exchange can start without delay or the need to wait for additional legislation, but without penalties if the capability is not in place. Careful consideration must be given to the timing of requiring manual entry to the IIS for those providers who are not able to connect electronically. The Design Group suggested that legislative updates be coordinated with the Legislative Representatives on the Health IT Advisory Council.

It will also be important for there to be a thorough review of legislation to identify any other issues between public health requirements and HIE activities so that they addressed in the 2018 legislative session, including issues around privacy, who has access to data and which types of data, and other relevant topics that may emerge during planning conversations.

Recommendation #6: Opportunities for Financial sustainability

The IIS Design Group asserts that Connecticut needs to prioritize and support the infrastructure needed to support the health of Connecticut's population and recommends that the state invest resources in analytics of the data that will be available through the IIS and other systems, with a goal of reducing health disparities. In addition, the IIS Design Group agrees that the decision to select a vendor that operates through a consortium model will help with the long-term financial sustainability of the IIS, and

leveraging HIE services across multiple use cases and stakeholders will also spread the cost of the shared services.

Recommendation #7: Need for Technical Assistance to Support Provider Organizations

The IIS Design Group recommends that comprehensive technical assistance be offered to providers to support the work needed by EHR vendors to connect to the IIS, whether or not it is provided through HIE shared services. This needs to be a top priority in the planning and coordination discussions as data transport options are investigated. The IIS Design Group recommends that the joint planning committee including the HITO, DPH, and other relevant stakeholders cover this topic, and make sure that the necessary resources are included in any funding requests through the IAPD process.

Recommendation #8: Need for Ongoing Education and Training to Support Clinicians and Clinic Staff

The IIS Design Group recommends that adequate resources be allocated to ensure that clinicians, staff, and organizations receive education and trainings about the features of the new IIS and how to maximize its use. It will be important for the IIS program staff to think through the most efficient ways to structure this effort, and perhaps the work should be stratified according to need or stakeholder type. For example, organizational or practice IT staff may initially require the most training, then perhaps physician leaders within practices next, and regular providers and staff may be able to get started with basic functional knowledge. However, needs may also vary depending on the functionality under consideration. In some cases, nurses would be the primary focus for training around vaccine ordering. While this recommendation may be listed last, it is critical to the successful deployment of the new IIS. Initial, and ongoing, training opportunities to engage those stakeholders administering immunizations or accessing the IIS to track information in a way that helps them integrate the IIS into their workflows will be essential. There will continue to be concerns about whether the IIS is meeting the needs of all stakeholders without ongoing touchpoints.

In addition to the recommendations developed as part of the IIS Design Group process, there were a number of issues that will require further exploration once the new IIS is up and running with bi-directional connections with many Connecticut providers. These include:

- Exploring the possibility of school nurses being able to assess whether the child needs an updated form each year, perhaps by providing some mechanism to analyze the existing data
- Exploring the potential for the IIS to capture clinical details in a standard format, especially when there are unique patient care situations

Summary and Next Steps

The IIS Design Group is pleased to have been able to meet the charge, goals, and objectives of its charter in the timeframe provided.

Together, the work products and the accompanying recommendations build a strong foundation for the next steps toward implementing an IIS that will meet the needs of all stakeholders. However, there is still much work to be done to realize a robust, interoperable IIS that will meet the CDC's functional requirements and the needs of Connecticut stakeholders.

Glossary/Acronyms

Term	Description
ACO	Accountable Care Organization. An ACO is a healthcare organization characterized by a payment and care delivery model that seeks to tie provider reimbursements to quality metrics and reductions in the total cost of care for an assigned population of patients.
Bright Futures Guidelines	An American Academy of Pediatrics program to support primary care practices (medical homes) in providing well-child and adolescent care according to *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*. The guidelines include immunization recommendations.
CDC	Center for Disease Control and Prevention. The federal agency of the US Department of Health and Human Services (HHS) that works to protect public health and safety. It provides information to enhance health decisions and promotes health through partnerships with state health departments and other organizations.
CIRTS	Connecticut Immunization Registry and Tracking System. The Immunization Information System for the State of Connecticut.
CMS	Centers for Medicare and Medicaid Services. The federal agency within the US Department of Health and Human Services (HHS) that administers the Medicare program and works in partnership with state governments to administer Medicaid, the Children's Health Insurance Program (CHIP), and health insurance portability standards.
DPH	Department of Public Health. Connecticut state agency focusing on public health.
EHR	Electronic Health Record. An EHR is an electronic version of a patient's medical history, maintained by a provider over time, which usually includes key clinical data relevant to that person's care under a particular provider, including demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports.
FQHC	Federally Qualified Health Center. Non-profit health clinic located in a medically underserved area which meets federal requirements including providing services regardless of patients' ability to pay and charge for services on a sliding fee scale.
Forecasting	The process by which a provider determines the schedule and timing of vaccines for patients based on national guidelines.
Health Information Technology Advisory Council	The Connecticut Health Information Technology Advisory Council provide counsel and input to the HITO. The Council's membership and responsibilities were established through PA 16-77.
HIE	Health Information Exchange. The term "HIE" can be used as a verb (the electronic exchange of health-related data) or as a noun (organizations dedicated to the secure exchange of health-related data). HIE organizations (or groups of organizations) are responsible for coordinating the exchange of protected health information in a region, state, or the nation. HIEs are also known as Health Information Organizations (HIOs).

HITO	Health Information Technology Officer. With PA 16-77, the position of the HITO was established and charged with the following: (1) Overseeing the development and implementation of the State-wide Health Information Exchange; (2) coordinating the state's health IT and HIE efforts to ensure consistent and collaborative cross-agency planning and implementation; and (3) serving as the state liaison to, and working collaboratively with, the statewide HIE, to ensure consistency between the statewide health IT plan and the statewide HIE and to support the state's health IT and HIE goals; within existing resources and in consultation with the State Health IT Advisory Council.
IIS	Immunization Information System.
Immunization	Used interchangeably with “inoculation” and “vaccination” to mean the use of vaccines to induce immunity in a person against a vaccine-preventable disease.
Interoperability	Interoperability refers to the ability for systems to exchange data and operate in a coordinated, seamless manner.
ONC	Office of the National Coordinator for Health Information Technology. The federal agency within the US Department of Health and Human Services (HHS) which promote a national health Information Technology infrastructure and oversees its development.
SBHC	School Based Health Center. A primary care clinic based on a school campus, sometimes run by a local health department or federally qualified health center.
Vaccine	A biological preparation used to establish or improve immunity to a particular disease, typically of killed or live (but weakened) microorganisms. Vaccines get introduced into the body most often through an injection (shot), but may also be given orally or through a nasal spray.
Vaccine-preventable disease	A disease that can be preventable or significantly reduced by the use of a vaccine.