Rapid Acceleration of Diagnostics - Radical (RADx-rad)

Guidance for the Use of Common Data Elements

Prepared by RADx-rad Data Coordination Center

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1. Introduction

The National Institutes of Health (NIH) launched the RADx-rad program to support innovative, non-traditional diagnostic approaches to address gaps in COVID-19 testing and surveillance. The program is expected to produce more efficient and effective ways to identify the current SARS-CoV-2 virus.

To ensure data collected at RADx-rad are compliant with the FAIR (Findable, Accessible, Interoperable, and Reusable) principles, NIH recommends using Common Data Elements (CDEs) for data collection and data harmonization. CDEs provide a standard way to define study variables/questions, as well as permissive values of each question. The consistent use of CDEs within the RADx program will greatly increase the interoperability and reusability of collected data, thus enabling efficient data integration and data analysis across different cohorts.

NIH has released a minimum set of CDEs required for human participants in prospective studies. Additionally, projects in RADx-rad will collect study variables beyond the minimum set of CDEs required by NIH to meet the needs of their specific research. Therefore, there is an urgent need to define recommended CDEs for different research areas in RADx-rad to ensure that these are taken into consideration during the development of the execution plan and experimental program. This document describes guidance on using NIH CDEs, as well as RADx-rad Data Coordination Center's (DCC) plan on developing additional CDE recommendations for RADx-rad projects.

2. Minimum CDEs Required by NIH for Human Subject Studies

A minimum set of CDEs has been released by NIH for the RADx program (see **Appendix A**). All RADx-rad projects that prospectively collect human participants data are required to collect and use those CDEs in their studies. Guidance for the minimum CDEs is attached as **Appendix B**. DCC understands the minimum CDEs requirement may affect ongoing studies as well as those in planning stages (e.g., awardees may have to amend existing IRB protocols and some questions may affect recruitment processes) and a number of questions have been raised by awardees. Some frequent questions are answered below, and we will continue to work with NIH to address additional concerns.

Some frequent questions and answers about minimum CDEs:

- ***My study involves human subjects; but it uses datasets that already exist (e.g., derived from existing electronic health records). Shall we follow the minimum CDEs requirement?***
  - For study variables in existing datasets that can be mapped to CDEs in the minimum set, DCC will work with awardees to transform those study variables to CDEs. However, it is not required that awardees re-contact subjects to collect minimum CDEs that are missed in the existing dataset.

- ***My study requires collecting many more study variables than the minimum CDEs. Can I do that?***
  - Of course. You can collect any additional study variables that are important for your study, in addition to the minimum CDEs. DCC can work with you to map additional study variables to CDEs if applicable (see below).

- ***Do we need to amend our IRB to include the minimum CDEs?***
  - Yes, you may have to amend your IRB protocols to include the minimum CDEs, if they are not already included in your existing protocols. Feel free to join our weekly office hours on IRB issues.

- ***What ID shall we use for the "IDENTITY" field in the minimum CDEs document?***
  - You can use your own internal study IDs for now. DCC is developing a tool to generate a unique research identifier and we will provide more updates when it is ready to test.

- ***What are the recommended CDEs for additional variables collected in our study? How do I learn more or contribute to the CDEs recommendation?***
  - We will work together with awardees and NIH to develop recommendations to CDEs for each FOA research area. We are setting up meetings with awardees for each FOA group, to discuss CDEs suitable for each research area. Please join us at those meetings so that we can hear your thoughts. We can also work with awardees on a case-by-case basis. Email us or join the Data Core office hours for questions and suggestions.

- ***My study doesn't involve human subjects, as we are detecting viruses from wastewater. What is the plan of CDEs for non-human subject studies?***
  - As described in the above question, we will work with awardees and NIH to develop recommended CDEs for each research area including those do not involve human subjects (e.g., wastewater). Please note those additional CDEs are not required, but highly recommended, in order to improve data interoperability across studies in the same research area.

Process for NIH supervision of collection of RADx-rad minimum CDEs

If an awarded project has difficulty to collect all minimum CDEs and wants to request a modification to the minimum CDEs, please follow the process in **Appendix C**.

3. Plan on Developing Additional CDE Recommendations for RADx-rad Projects

In addition to minimum CDEs required by NIH for human subject studies, many RADx-rad projects collect additional study variables, which should also be standardized in order to allow integrated data analysis across projects. DCC will work with awardees to develop additional CDE recommendations for those study variables. As the RADx-rad initiative covers broad and diverse research areas, different sets of recommended CDEs should be developed for different FOAs for best data characterization. The development process will involve awardees, DCC, and NIH teams. As the development of recommended CDEs takes time, projects that are ready to execute can start data collection without waiting for

the recommended CDEs. DCC will work with awardees to convert collected data to recommend CDEs later. If recommended CDEs are developed before projects start, awardees are encouraged to use the recommended CDEs in their data collection.

CDE Development Workflow for each FOA research area

As shown in Figure 1, starting with data dictionaries from awardees and existing CDEs in the biomedical domain, awardees, DCC, and NIH teams will collaborate to develop a set of common study variables/questions for each specified FOA research area, with mappings to existing or new CDEs. The development of recommended CDEs for each FOA group will be an iterative process, consisting of five steps:

(1) Awardees within the same FOA group will meet with the DCC team, to discuss data collection requirements and available standards (i.e., CDEs or ontologies) in the specified research area. Outcomes of such meetings will include (a) a set of study variables commonly used in the specified research area; and (b) a set of existing CDEs in the research area. DCC is in the process of setting up these meetings.
(2) Awardees will prepare data dictionaries for their studies and map study variables/questions to existing CDEs if possible (otherwise indicate new CDEs are needed)
(3) DCC will review and revise mappings to CDEs provided by awardees in Step 2;
(4) NIH CDE teams may also provide guidance and feedback on mappings to CDEs provided by DCC in Step 3;
(5) Provide CDEs mappings from Step 4 to awardees for additional discussion and review if needed (go back to Step 1).

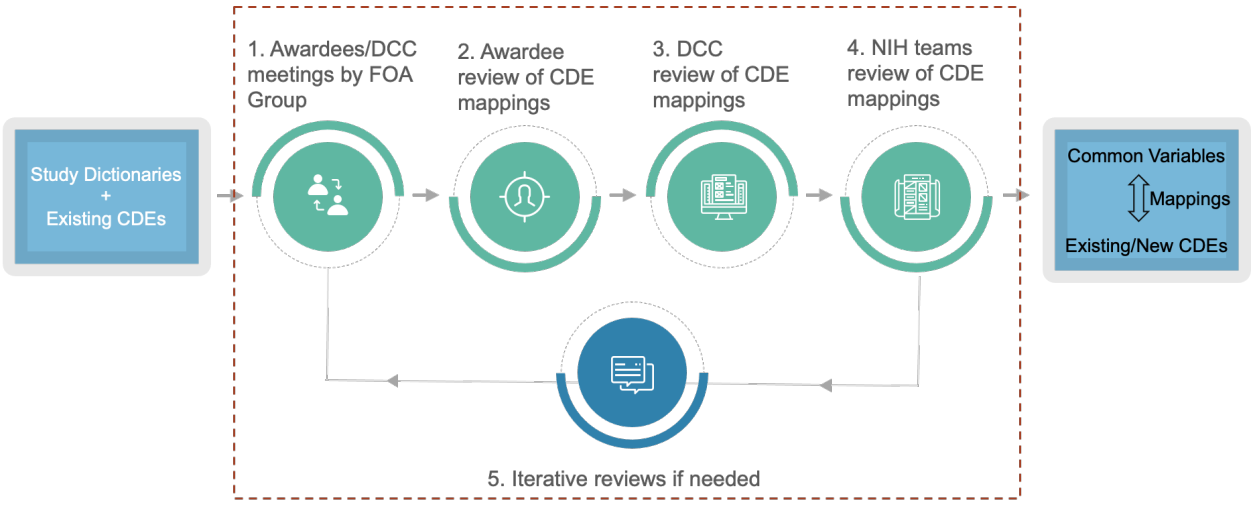

Figure 1. Workflow for developing CDE recommendations for each FOA group

Facilitate CDE Development using a Web-based Mapping Tool

To facilitate the development of CDE recommendations for each FOA group, DCC is developing a web-based application that can provide an auto-mapping function (from

study variables to CDEs) and allow team-based collaboration on reviewing CDE mappings. As shown in Figure 2, awardees can upload a data dictionary to the mapping tool and review the auto-mapping results to come up from the first round of CDE mappings, and then the DCC and the NIH teams can further review and revise the initial mappings via the same web platform. The tentative timeline for releasing the mapping tool will be in the April of 2021.

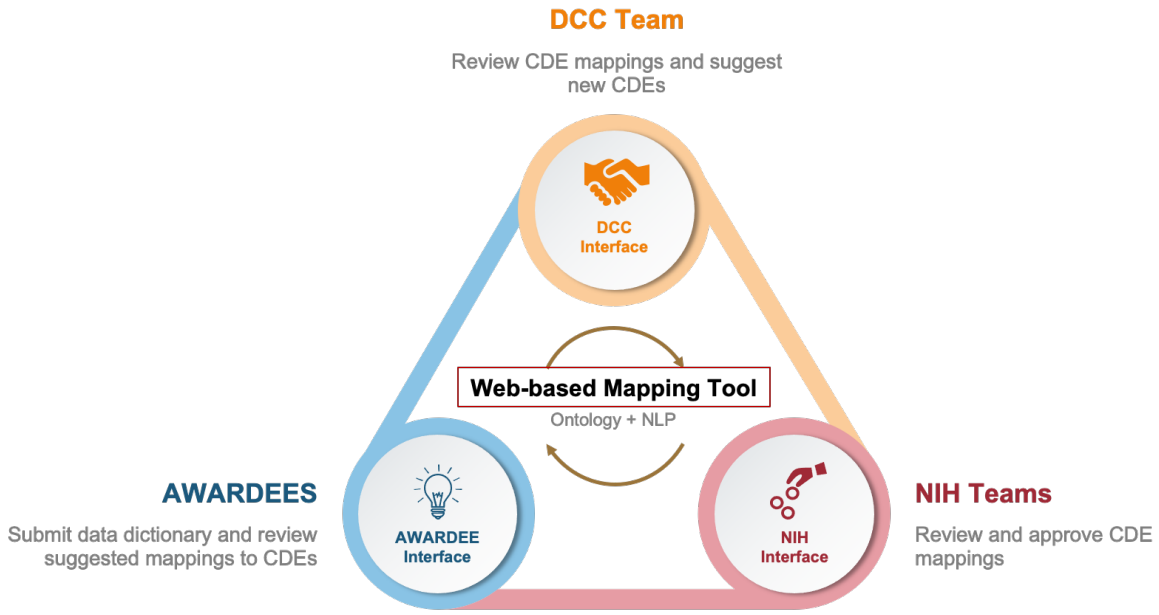

Figure 2. Workflow for developing CDE recommendations for each FOA group

Other CDE Resources

RADx-rad projects often collect study variables/questions beyond the minimum CDEs for human participants. DCC encourages awardees to use existing CDEs for those additional variables as well. DCC will work with the awardees and NIH together to develop the recommended CDEs for their studies (see next section). Meanwhile, awardees can refer to the following NIH recommended CDE repositories to standardize their data collection.

- CDEs from RADx-UP DCC
- NIH Public Health Emergency and Disaster Research (DR2)
- NIH CDE Repository
- PhenX Toolkit

Appendix A

NIH RADx Executive Committee Required Common Data Elements (CDEs)

It is expected that all research involving human subjects funded in the RADx program will collect information on these 12 concepts using these questions and specified response options.

Contact Patti Brennan (pattifbrennan@nih.gov) with any questions.

Concept	Question Text	Allowable Responses
1. Identity		*Project-specific identifier*
2A. Race		
	What is your race? Mark one or more boxes.	☐ American Indian or Alaska Native ☐ Black or African American ☐ Asian ☐ Native Hawaiian or Other Pacific Islander ☐ White ☐ Some other race
2B. Ethnicity		
	Are you of Hispanic or Latino origin?	☐ Yes, of Hispanic or Latino origin ☐ No, not of Hispanic or Latino origin
3. Age		
	What is your age?	*Age in years. For babies less than 1 year old, write 0 as the age*
4. Sex		
	What is your biological sex assigned at birth?	☐ Male ☐ Female ☐ Intersex ☐ None of these describe me
5. Education		
	How many years of education have you completed?	*Years of education from 0 – 20+*
6. Domicile		
	What is your zip code?	*5-digit zip code*
7. Employment		
	Are you employed?	☐ Employed in a permanent position ☐ Employed in a temporary position ☐ Not currently employed

8. Insurance status		
	What kind of health insurance do you have?	☐ Private insurance ☐ Public insurance ☐ None
9. Disability status		
	Are you deaf or do you have serious difficulty hearing?	☐ Yes ☐ No
	Are you blind or do you have serious difficulty seeing, even when wearing glasses?	☐ Yes ☐ No
	Because of a physical, mental, or emotional condition, do you have serious difficulty concentrating, remembering, or making decisions?	☐ Yes ☐ No
	Do you have serious difficulty walking or climbing stairs?	☐ Yes ☐ No
	Do you have difficulty dressing or bathing?	☐ Yes ☐ No
	Because of a physical, mental, or emotional condition, do you have difficulty doing errands alone such as visiting a doctor's office or shopping?	☐ Yes ☐ No
10. Medical history		
	Vaping use	☐ Yes ☐ No
	Nicotine use	☐ Yes ☐ No
	Alcohol use	☐ Yes ☐ No
	Asthma	☐ Yes ☐ No
	Cancer	☐ Yes ☐ No
	Cardiovascular disease	☐ Yes ☐ No
	Chronic kidney disease	☐ Yes ☐ No
	Chronic lung disease	☐ Yes ☐ No
	Diabetes	☐ Yes ☐ No
	Hypertension	☐ Yes ☐ No
	Immunosuppressive condition	☐ Yes

		☐ No
	Serious mental illness	☐ Yes ☐ No
	Sickle cell disease	☐ Yes ☐ No
	Pregnancy status	☐ Currently pregnant ☐ Not pregnant
11. Symptoms		
	Cough	☐ Yes ☐ No
	Fever	☐ Yes ☐ No
	Shortness of breath or difficulty breathing	☐ Yes ☐ No
	Headache	☐ Yes ☐ No
	Muscle ache	☐ Yes ☐ No
	New loss of taste or smell	☐ Yes ☐ No
	Chills	☐ Yes ☐ No
	Excessive fatigue	☐ Yes ☐ No
	Nausea/vomiting	☐ Yes ☐ No
	Diarrhea	☐ Yes ☐ No
	Abdominal pain	☐ Yes ☐ No
	Skin rash	☐ Yes ☐ No
	Conjunctivitis	☐ Yes ☐ No
12. Health status		
	What is your height?	*Height in feet and inches*
	What is your weight?	*Weight in pounds*
	Would you say that (your) health in general is excellent, very good, good, fair or poor?	☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor

Appendix B

Guidance for NIH RADx Executive Committee Required Common Data Elements (CDEs) (3.25.21)

Contact Patti Brennan (pattifbrennan@nih.gov) with any questions.

It is expected that all research involving human subjects funded in the RADx program will collect information on these 12 concepts using these questions and specified response options.

Concept	Stimulus	Response
Identity	None	Project-specific identifier
Race [1]	What race do you identify with?	AI/AN; Asian Black or African American; Native Hawaiian or other Pacific Islander; White
Ethnicity [1]	What ethnicity do you identify with?	Hispanic or Latino; not Hispanic or Latino
Sex	What was your assigned sex at birth?	Male, Female, Intersex
Age	What is your age?	Age in years
Education	How many years of education have you completed?	0 - +20
Domicile	Where do you live?	Zip Code
Employment	Are you employed?	Permanent, temporary or not
Insurance Status	What kind of insurance do you have?	Private, Public, none
Disability status [2]	Are you deaf or do you have serious difficulty hearing?	Yes, no
	Are you blind or do you have serious difficulty seeing, even when wearing glasses?	Yes, no
	Because of a physical, mental, or emotional condition, do you have serious difficulty concentrating, remembering, or making decisions?	Yes, no
	Do you have serious difficulty walking or climbing stairs?	Yes, no
	Do you have difficulty dressing or bathing ?	Yes, no
	Because of a physical, mental, or emotional condition, do you have difficulty doing errands alone such as visiting a doctor's office or shopping?	Yes, no

[1] https://grants.nih.gov/policy/inclusion/women-and-minorities/guidelines.htm

[2] Reported as disabled if the response to any one of the six items is yes. https://www.cdc.gov/brfss/data_documentation/pdf/BRFSS_Data_Users_Guide_on_Disability_Questions_2018-508.pdf

Medical History	Vaping use	Yes, no
	Nicotine use	Yes, no
	Alcohol use	Yes, no
	Asthma	Yes, no
	Cancer	Yes, no
	Cardiovascular disease	Yes, no
	Chronic kidney disease	Yes, no
	Chronic lung disease	Yes, no
	Diabetes	Yes, no
	Hypertension	Yes, no
	Immunosuppressive condition	Yes, no
	Serious mental illness	Yes, no
	Sickle cell disease	Yes, no
	Pregnancy status	Currently pregnant, not
Symptoms	Cough[3]	Yes, no
	Fever[2]	Yes, no
	SoB or Difficulty breathing[2]	Yes, no
	Headache[2]	Yes, no
	Muscle ache[2]	Yes, no
	New Loss of taste or smell[2]	Yes, no
	Chills[2]	Yes, no
	Excessive fatigue[2]	Yes, no
	Nausea/vomiting[2]	Yes, no
	Diarrhea[2]	Yes, no
	Abdominal pain[4]	Yes, no
	Skin rash[3]	Yes, no
	conjunctivitis[3]	Yes, no
Health Status	BMI	Weight & height
	Would you say that (your) health in general is excellent, very good, good, fair or poor? [5]	Excellent, very good, good, fair, poor

For all items:

1. Participants have the right to refuse to respond to any item
2. Various RADx programs or groups of projects may add required items specific to their project (e.g., wastewater assessment, greater specification of education or gender)
3. Researchers are encouraged to consult the Phenx Tool Kit, the NIH Public Health Emergency and Disaster Research Response (DR2) resource or the CDC to identify valid and reliable items and instruments
4. Program officer approval required for modifications that make significant changes in response.

[3] https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html
[4] Added by RADx Executive Committee
[5] https://www.phenxtoolkit.org/protocols/view/770101?origin=search

Appendix C

Process for NIH Supervision of Collection of NIH RADx-rad Minimum Common Data Elements (CDEs)

The process is:

The role of the RADx-rad Discoveries and Data Coordinating Center (DCC) is to track changes in and use of the NIH RADx-rad Minimum CDEs.

The role of the awarding IC Grants Management Officer (GMO) is to monitor the business management aspects of the award and, if NIH approval is required, provide NIH written approval or disapproval of requested changes on behalf of NIH, such as changes to the Terms and Conditions of Award, working closely with the assigned Program Official (PO).

The role of the awarding IC PO is to monitor the programmatic, scientific, and/or technical aspects of the award, including review of CDEs and progress reports, and to provide programmatic recommendations to the IC GMO regarding its post-award administration, such as prior approval requests.

Therefore,

- If a RADx-rad recipient institution proposes an insignificant change in wording or expansion of wording choice to better fit the needs of the community in which the project is being implemented, the recipient institution and project PI should work with the DCC Data Core to ensure that the item(s) retain fidelity to the initial item.
- If NIH approval is required, it must be requested of, and obtained in writing from, the awarding IC GMO in advance of the change as specified in the *NIH Grants Policy Statement (8.1.2)*. For example, if a RADx-rad recipient institution proposes to omit collection of an NIH RADx-rad Minimum CDE, a prior approval request with documentation of the justification should be submitted through the recipient institution's Authorized Organization Official (AOR) to the GMO at the awarding IC.
- If the change is approved, approval should be communicated by the recipient institution to the project PI. The project PI should send a record of the disposition with accompanying documentation to the DCC Data Core for tracking purposes with a copy to the DCC PO (Dr. Yanli Wang) as a record to be archived.

The project POs and DCC PO will track changes, such as changes of the Terms and Conditions of Award and approval not to collect specific NIH RADx-rad Minimum CDEs, for future reference and reporting purposes for the NIH. The DCC will follow the same process for the integrity of the data collection process.