



Use of the Immunization Calculation Engine (ICE) for Immunization Forecasting

41st VistA Community Meeting
September 8, 2023



1



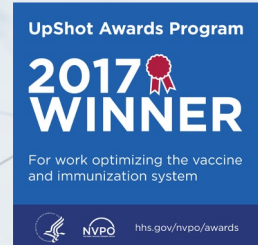
Immunization Calculation Engine (ICE)



2

About ICE

The Immunization Calculation Engine (ICE) open source software supports immunization evaluation and forecasting in alignment with Advisory Committee on Immunization Practices (ACIP) recommendations.



3

3

Original ICE collaborators

- New York City Citywide Immunization Registry
- HLN Consulting, LLC
- Alabama Dept of Public Health
- OpenCDS Team
 - Software platform and toolkit
 - Open source
 - Standards-based
 - Web Service interface
 - Collaborative project: Dr. Kensaku Kawamoto at University of Utah



4

4

ICE software and documentation is freely available

- Documentation, executable software, and source code is publicly accessible
- Standard, permissive open-source license (LGPL v3)

ICE Wiki:

<https://cdsframework.atlassian.net/wiki/spaces/ICE/overview>



5

5

ICE easily integrates with health IT systems

- Designed for integration and use with any system that contains immunization data
- Standards-based architecture and APIs
- Variety of deployment options
- Used in public health, clinical, and research settings



6

6

ICE supports routine immunizations across the lifespan

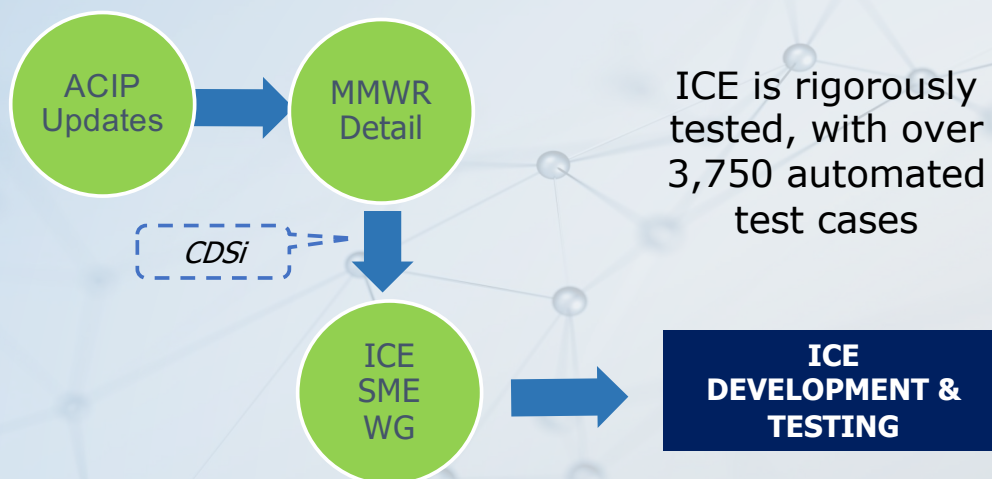
- Addresses routine child, adolescent, and adult immunizations in alignment with ACIP recommendations
- Supports a default immunization schedule with evaluation and forecasting for 17 vaccine groups
 - COVID-19
 - DTP
 - H1N1
 - Hepatitis A
 - Hepatitis B
 - Hib
 - HPV
 - Influenza
 - Meningococcal ACWY
 - Meningococcal B
 - MMR
 - Orthopoxvirus
 - Pneumococcal
 - Polio
 - Rotavirus
 - Varicella
 - Zoster



7

7

ICE adapts to changing recommendations



8

8

"ICE Client" Application is a free test tool to try ICE

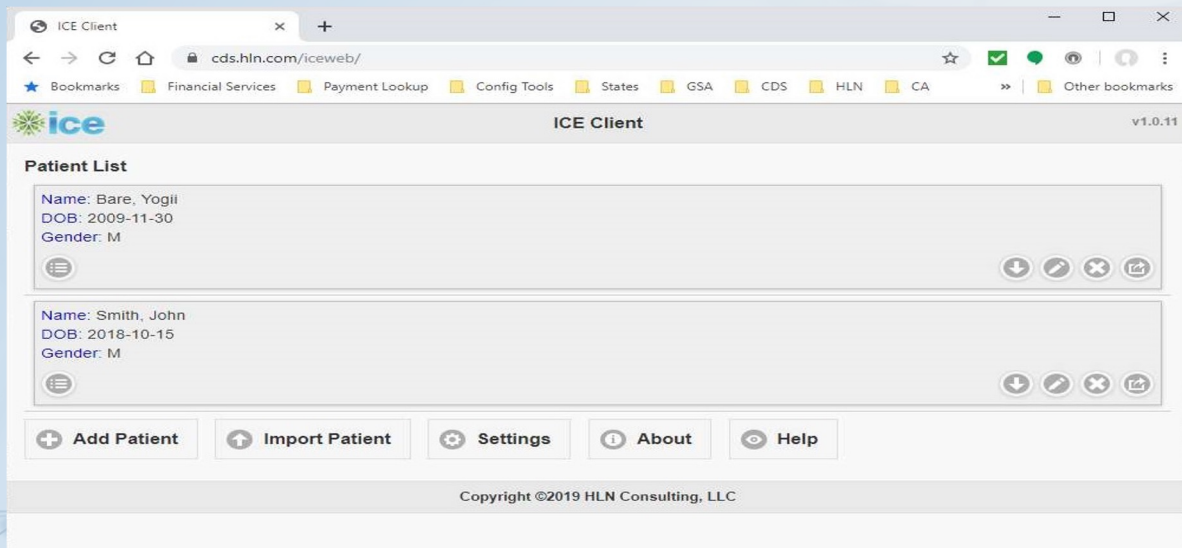
- Browser-based app: <http://cds.hln.com/iceweb/>
- Simple user interface for creating/submitting sample patient data and seeing ICE response/results
- Uses instance of ICE service hosted by HLN
- Shows vMR-formatted version of sample patient data from user, formatted by client app
- Shows raw vMR-formatted output, returned by hosted ICE instance



9

9

ICE Client - Patient list



10

10

ICE Client App - Edit a patient

ice Patient Editor

Note: for dates, use "yyyymmdd" format (e.g. 19301231).

Demographics

First Name: John

Last Name: Smith

Gender: ☒ Male ☐ Female ☐ Other

Birth Date: 20181015

Evaluation Date:

Immunizations & Diseases

Type	Code	Date	Delete
<input checked="" type="checkbox"/> Disease	08: Hep B, adolescent or pe...	20181015	

[Add Row](#)

[Cancel](#) [Save](#)

11

ICE Client - "ICE" the record

ICE Client v1.0.11

Patient List

Name: Bare, Yogli
DOB: 2009-11-30
Gender: M

Name: Smith, John
DOB: 2018-10-15
Gender: M

[Add Patient](#) [Import Patient](#) [Settings](#) [About](#) [Help](#)

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12

ICE Client - Evaluation date, age at evaluation

Name: John Smith
DOB: 2018-10-15
Gender: M
Evaluation Date: 2019-08-19
Age @Evaluation: 0y 10m 4d

Patient Output Grid - Click on the bulleted-list icons for additional details

Vaccine Group	Recommendations	Evaluations
Hep B	Recommendation Date: 2018-11-15 Overdue Date: 2019-02-11 Earliest Date: 2018-11-12 Status: RECOMMENDED Message: DUE_NOW Vaccine Group: Hep B	Date: 2018-10-15 Age: 0y 0m 0d Valid: true Vaccine: Hep B, adolescent or pediatric (08)
DTP	Recommendation Date: 2018-12-15 Overdue Date: 2019-02-11 Earliest Date: 2018-11-26 Status: RECOMMENDED Message: DUE_NOW Vaccine: DTaP NOS (107)	



13

13

ICE Client - Evaluation

Name: John Smith
DOB: 2018-10-15
Gender: M
Evaluation Date: 2019-08-19
Age @Evaluation: 0y 10m 4d

Patient Output Grid - Click on the bulleted-list icons for additional details

Vaccine Group	Recommendations	Evaluations
Hep B	Recommendation Date: 2018-11-15 Overdue Date: 2019-02-11 Earliest Date: 2018-11-12 Status: RECOMMENDED Message: DUE_NOW Vaccine Group: Hep B	Date: 2018-10-15 Age: 0y 0m 0d Valid: true Vaccine: Hep B, adolescent or pediatric (08)
DTP	Recommendation Date: 2018-12-15 Overdue Date: 2019-02-11 Earliest Date: 2018-11-26 Status: RECOMMENDED Message: DUE_NOW Vaccine: DTaP NOS (107)	



14

14

ICE Client - Forecast

Name: John Smith
DOB: 2018-10-15
Gender: M
Evaluation Date: 2019-08-19
Age @Evaluation: 0y 10m 4d

Patient Output Grid - Click on the bulleted-list icons for additional details

Vaccine Group	Recommendations	Evaluations
Hep B	Recommendation Date: 2018-11-15 Overdue Date: 2019-02-11 Earliest Date: 2018-11-12 Status: RECOMMENDED Message: DUE_NOW Vaccine Group: Hep B	Date: 2018-10-15 Age: 0y 0m 0d Valid: true Vaccine: Hep B, adolescent or pediatric (08)
DTP	Recommendation Date: 2018-12-15 Overdue Date: 2019-02-11 Earliest Date: 2018-11-26 Status: RECOMMENDED Message: DUE_NOW Vaccine: DTaP NOS (107)	



15

15

ICE Client - Debug mode

ICE Response Data:

```
{
  "100": {
    "groupName": "Hep B",
    "evaluations": [
      {
        "id": "c311601b-50fd-5e61-cfad-d6eca5ffe3",
        "substanceCode": "08",
        "componentSubstanceCode": "08",
        "administrationTime": "20181015",
        "doseNu"
      }
    ]
  }
}
```

Input VMR:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns3:cdsInput xmlns:ns2="org.opencds.vmr.v1_0.schema.vmr" xmlns:ns3="org.opencds.vmr.v1_0.schema.cdsinput">
  <ns3:cdsInputItem id="c311601b-50fd-5e61-cfad-d6eca5ffe3" substanceCode="08" componentSubstanceCode="08" administrationTime="20181015" doseNumber="1" />
</ns3:cdsInput>
```

Output VMR:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns2:cdsOutput xmlns:ns2="org.opencds.vmr.v1_0.schema.cdsoutput" xmlns:ns3="org.opencds.vmr.v1_0.schema.vmr">
  <ns2:cdsOutputItem id="c311601b-50fd-5e61-cfad-d6eca5ffe3" substanceCode="08" componentSubstanceCode="08" administrationTime="20181015" doseNumber="1" />
</ns2:cdsOutput>
```

SOAP Request:

```
<?xml version="1.0" encoding="utf-8"?>
<S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope">
  <S:Header />
  <S:Body>
    <ns3:cdsInput xmlns:ns3="http://org.opencds.vmr.v1_0.schema.cdsinput" />
  </S:Body>
</S:Envelope>
```

SOAP Response:

```
<soap:Envelope xmlns:soap="http://www.w3.org/2003/05/soap-envelope" />
```



16

16

RI KIDSNET

Welcome to KIDSNET and RICAIR

Search KIDSNET / RICAIR ID : Search

Patient Info

First Name: **MICKEY** Middle: **A** Last: **MOUSE** KIDSNET / RICAIR ID : **7596398**
 Date of Birth: **01/01/2019** Age: **15m 10d** Gender: **MALE**
 KIDSNET Status: **ACTIVE** PCP: **CAPITOL HILL HEALTH CENTER-PCHC**

Parent/Guardian: **MINNIE A MOUSE** Date of Birth: **01/01/1990**

School Requirements: K: **X** 7th: **X** 8th: **X** 9th: **X** 12th: **X**

Change Immunization History

VALID DOSES						NEXT DUE
Influenza	10/15/2019 FLU QUAD 9m 14d	11/01/2019 FLU QUAD 10m 0d [1]				Due Now (On or after 11/09/2019) Dose 2
Hepatitis B 3 valid doses	01/01/2019 HepB ped/adol 0m 0d	03/01/2019 DTaP-HepB-IPV 2m 0d	05/01/2019 DTaP-HepB-IPV 4m 0d [2]	07/01/2019 DTaP-HepB-IPV 6m 0d		End of Series
DTaP/DT/dap/Td 3 valid doses	03/01/2019 DTaP-HepB-IPV 2m 0d	05/01/2019 DTaP-HepB-IPV 4m 0d	07/01/2019 DTaP-HepB-IPV 6m 0d			Due Now (04/01/2020 - 08/28/2020) Dose 4
Pneumo 0 valid doses						Past Due
Polio 3 valid doses	03/01/2019 DTaP-HepB-IPV 2m 0d	05/01/2019 DTaP-HepB-IPV 4m 0d	07/01/2019 DTaP-HepB-IPV 6m 0d			Due in the Future (01/01/2023 - 01/28/2026) Dose 4
Hib 0 valid doses						Due Now (04/01/2020 - 05/28/2020) Dose 1

17

RI KIDSNET

MMR 0 valid doses						Due Now (01/01/2020 - 05/28/2020) Dose 1
Varicella 0 valid doses IMMUNE Varicella						
Zoster 0 valid doses						
Hepatitis A 1 valid doses	01/01/2020 HepA ped/adol 12m 0d	04/01/2020 HepA ped/adol 15m 0d [1]				
MenACWY 0 valid doses						
MenB 0 valid doses						
HPV 0 valid doses						Due in the Future (01/01/2030 - 01/28/2032) Dose 1

CVX: 83 (HepA ped/adol)

Mfg:

Lot #:

Reporting Provider ID: 33

Reporting Provider: CAPITOL HILL HEALTH CENTER-PCHC

Source: ADMINISTERING PROVIDER

Date Created: 04/11/2020

Dose #: 2

Footnote: Minimum Age Not Satisfied

Minimum Acceptable Dose Administration Date: 07/01/2020

18

Known ICE users*

- Physician's Computer Company (piloting, 2023)
- Docket PHR (2022)
- Office Practicum (2022)
- WebChart (2020)
- empower systems (2020)
- athenaPractice EHR (2020)
- Indian Health Service – RPMS EHR (2020)
- AZOVA Vaxigo Clinical System (2020)
- GE Centricity/Health 1 Technologies EHR (2018)
- New York-Presbyterian Hospital/Columbia University Medical Center (2017)
- CareDox PHR (2014)
- eClinicalWorks EHR (2013)
- CDC WIR IIS Software Replacement (when released – 2022)
- Massachusetts Department of Public Health – IIS (2021)
- Virginia Department of Health – Web Vision Public Health EHR (2020)
- New York City Department of Health and Mental Hygiene – Citywide Immunization Registry (2020, in phases)
- Vermont Department of Health – IIS (2020)
- Rhode Island Department of Health – IIS (2020)
- Michigan Department of Health and Human Services – IIS (2018, in phases)
- New Jersey Department of Health – IIS (2018)



19

*To the best of our knowledge

19

ICE resources

- HLN ICE Webpage www.hln.com/ice
- ICE Wiki <https://cdfsframework.atlassian.net/wiki/spaces/ICE/overview>
 - Subscribe to ICE Announcements <https://docs.google.com/forms/d/e/1FAIpQLSeeOLj7arRnJU14vBtJZsCDKOcP-76vIL0PP-KduGqlx1dWO/viewform>
 - ICE Immunization Schedule cdfsframework.atlassian.net/wiki/spaces/ICE/pages/14352468/Default+Immunization+Schedule
 - Executable software distribution and source code cdfsframework.atlassian.net/wiki/spaces/ICE/pages/18972704/Downloads
- Try ICE with the ICE Client App <https://cdfsframework.atlassian.net/wiki/spaces/ICE/pages/27820034/Try+ICE+by+Using+the+ICE+Client+App>
- OpenHealthNews article www.openhealthnews.com/articles/2019/anatomy-public-health-open-source-project-hlns-immunization-calculation-engine-ice



20

20

Contact information

Noam H. Arzt

President, HLN Consulting

arzt@hln.com

www.hln.com/noam

Daryl Chertcoff

ICE Project Manager, HLN Consulting

daryl@hln.com

*Contact the
HLN ICE team at
ice@hln.com*



21

21

Indian Health Service ICE Forecaster

CAPT SURYAM PALANKI

OFFICE OF INFORMATION TECHNOLOGY

DIVISION OF INFORMATION TECHNOLOGY

PHARMACY INFORMATICS CONSULTANT

SEPTEMBER 8, 2023

22

Immunization Component

Immunization Record		State Immunization Profile		Immunizations from Outside Sources		Refresh States																																																																																																																																	
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ICE Forecasting in EHR/RPMS

[illegible]

ICE Supplemental Text

HLN ICE Forecaster v1.37.2 for:

-- IMM HISTORY EVALUATION -----

Date	CVX	Vaccine (combo)	Status - Reason
01/01/2022	218	COV,PfrPed	VALID
01/22/2022	218	COV,PfrPed	VALID
05/22/2022	301	COV,PfrBbp	VALID

-- FORECAST -----

HIGH RISK:

Vaccine	Status
None	

Supplemental Text:

The Pneumococcal evaluations and recommendations in ICE primarily target the routine series. Adults ages 19-64 with underlying medical conditions or other risk factors who have not previously received PCV or whose previous vaccination history is unknown should receive 1 dose of PCV (either PCV20 or PCV15). When PCV15 is used, it should be followed by a dose of PPSV23 at the appropriate interval(s). Patients who previously received a PCV13 should receive PPSV23 as recommended for them before the introduction of PCV15 and PCV20, based on age or risk factors. Refer to ACIP for additional information. The vaccine administered should be a single dose of a Pfizer COVID-19 vaccine.

4

25

ICE Supplemental Text

HLN ICE Forecaster v1.37.2 for:

-- IMM HISTORY EVALUATION -----

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01/01/2022	218	COV,PfrPed	VALID
01/22/2022	218	COV,PfrPed	VALID
05/22/2022	301	COV,PfrBbp	VALID

Supplemental Text:

The timing of the administration of this shot does not follow the guidelines regarding the minimum interval of 5 months required for the 1st Booster Dose.

5

26

Questions?

Erin Roche

ICE Analyst, HLN Consulting
eroche@hln.com

Daryl Chertcoff

ICE Project Manager, HLN Consulting
daryl@hln.com

Capt. Suryam Palanki

Pharmacy Informatics Consultant, Indian Health Service
suryam.palanki@ihs.gov

