EVA

Electronic Vaccination Analysis and Forecast

Amzi! inc.

About Amzi! inc.

- In business for 18 years
- Rule-based software products
- Contract development and consulting
- Specializing in rule-based applications
- Application-specific rule engines
- www.amzi.com

EVA

- A software tool for encoding and deploying vaccination knowledge
- Accurately analyzes past vaccinations
- Accurately forecasts next required vaccinations
- Covers complete range of vaccines
- Quickly and Easily responds to changes and new vaccines

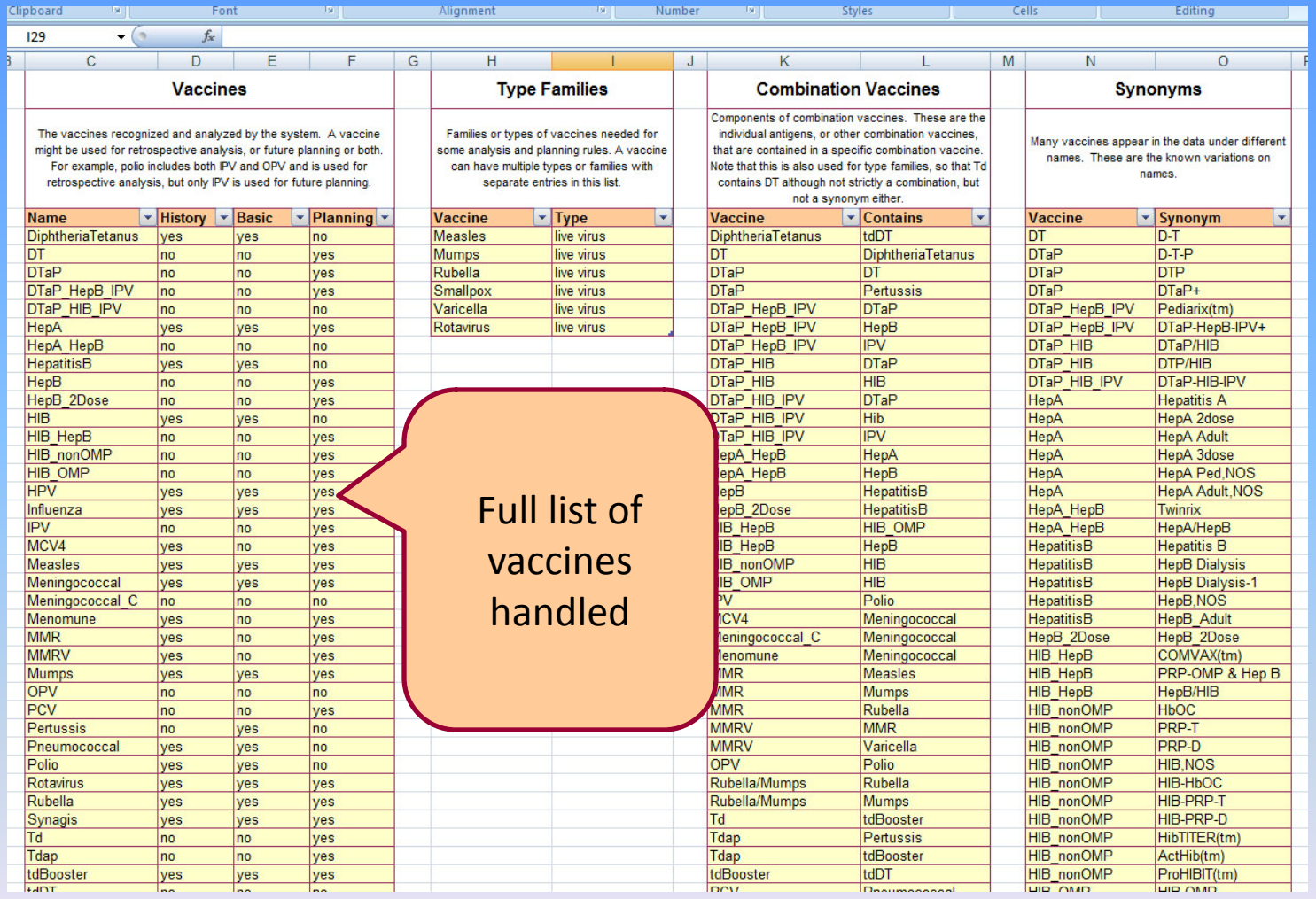
Software Tool for Encoding and Deploying Vaccination Knowledge

- Easy Excel-based user interface for encoding and testing vaccination knowledge
  - Hierarchies of vaccines
  - Tables for basic schedules
  - Rules for exceptions, picking tables, etc.
- Binary export that can be deployed in any computing environment
  - Web – Java, .NET, ...
  - Standalone – Java, Delphi, VB, C++, ...

Covers complete range of vaccines

- Covers all vaccines, MMRV, DTaP, Hib, ...
- Covers combination hierarchies, e.g. Measles -> MMR -> MMRV
- Deals with live virus constraints
- Handles complex late start, missed dose schedules of Hib, PCV, etc.
- Handles different types of vaccines, Hib either OMP or not, Polio IPV or OPV, etc.
- Handles complex combo vaccines, Pediarix, Twinrix, MMRV, etc.
- Seasonal vaccine schedules such as for Flu.

Complete Range of Vaccines



Vaccines

The vaccines recognized and analyzed by the system. A vaccine might be used for retrospective analysis, or future planning or both. For example, polio includes both IPV and OPV and is used for retrospective analysis, but only IPV is used for future planning.

Name	History	Basic	Planning
DiphtheriaTetanus	yes	yes	no
DT	no	no	yes
DTaP	no	no	yes
DTaP_HepB_IPV	no	no	yes
DTaP_HIB_IPV	no	no	no
HepA	yes	yes	yes
HepA_HepB	no	no	no
HepatitisB	yes	yes	no
HepB	no	no	yes
HepB_2Dose	no	no	yes
HIB	yes	yes	no
HIB_HepB	no	no	yes
HIB_nonOMP	no	no	yes
HIB_OMP	no	no	yes
HPV	yes	yes	yes
Influenza	yes	yes	yes
IPV	no	no	yes
MCV4	yes	no	yes
Measles	yes	yes	yes
Meningococcal	yes	yes	yes
Meningococcal_C	no	no	no
Menomune	yes	no	yes
MMR	yes	no	yes
MMRV	yes	no	yes
Mumps	yes	yes	yes
OPV	no	no	no
PCV	no	no	yes
Pertussis	no	yes	no
Pneumococcal	yes	yes	no
Polio	yes	yes	no
Rotavirus	yes	yes	yes
Rubella	yes	yes	yes
Synagis	yes	yes	yes
Td	no	no	yes
Tdap	no	no	yes
tdBooster	yes	yes	yes
tdDT			

Type Families

Families or types of vaccines needed for some analysis and planning rules. A vaccine can have multiple types or families with separate entries in this list.

Vaccine	Type
Measles	live virus
Mumps	live virus
Rubella	live virus
Smallpox	live virus
Varicella	live virus
Rotavirus	live virus

Full list of vaccines handled

Combination Vaccines

Components of combination vaccines. These are the individual antigens, or other combination vaccines, that are contained in a specific combination vaccine. Note that this is also used for type families, so that Td contains DT although not strictly a combination, but not a synonym either.

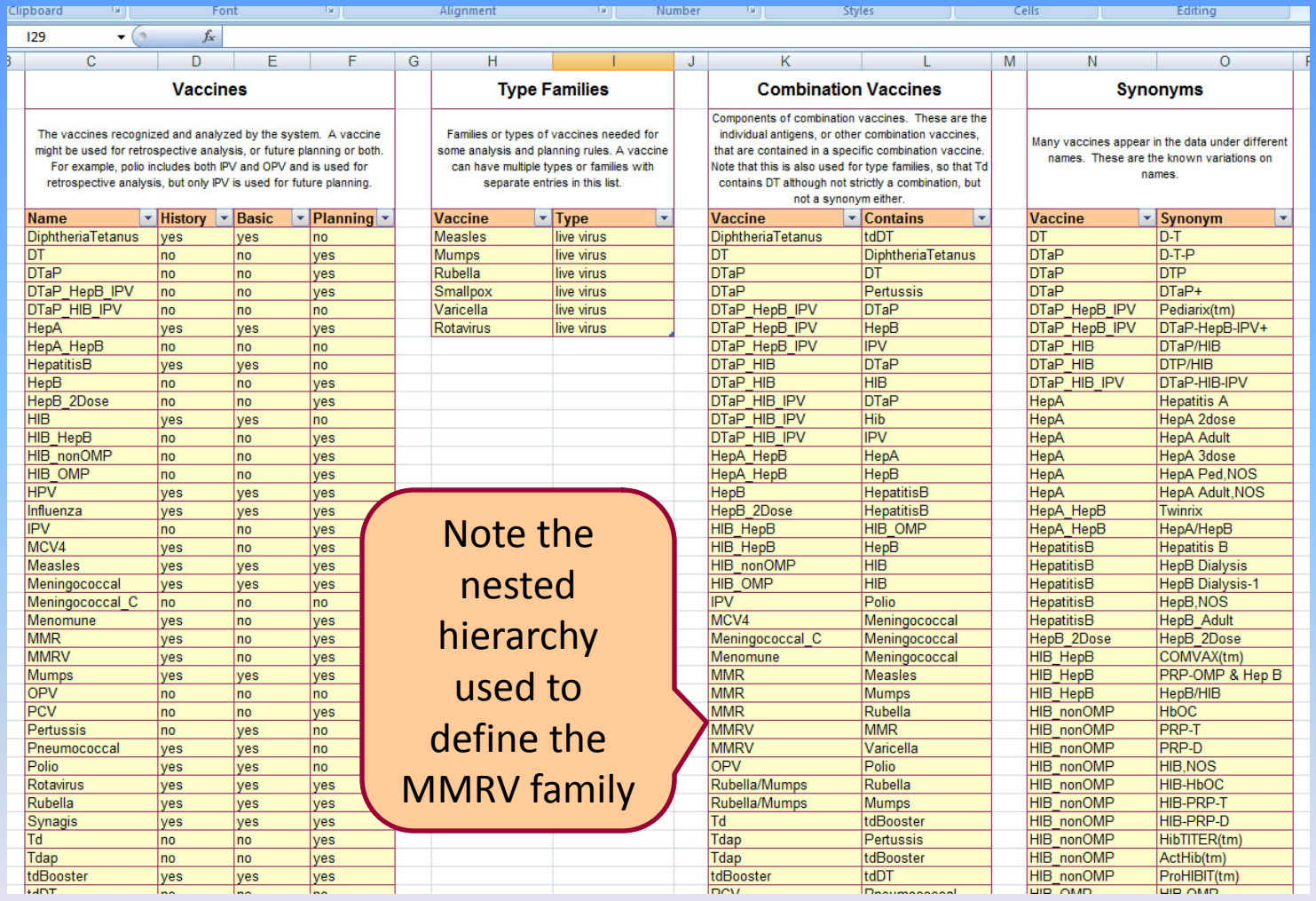
Vaccine	Contains
DiphtheriaTetanus	tdDT
DT	DiphtheriaTetanus
DTaP	DT
DTaP	Pertussis
DTaP_HepB_IPV	DTaP
DTaP_HepB_IPV	HepB
DTaP_HepB_IPV	IPV
DTaP_HIB	DTaP
DTaP_HIB	HIB
DTaP_HIB_IPV	DTaP
DTaP_HIB_IPV	Hib
DTaP_HIB_IPV	IPV
HepA_HepB	HepA
HepA_HepB	HepB
HepB	HepatitisB
HepB_2Dose	HepatitisB
HIB_HepB	HIB_OMP
HIB_HepB	HepB
HIB_nonOMP	HIB
HIB_OMP	HIB
IPV	Polio
MCV4	Meningococcal
Meningococcal_C	Meningococcal
Menomune	Meningococcal
MMR	Measles
MMR	Mumps
MMR	Rubella
MMRV	MMR
MMRV	Varicella
OPV	Polio
Rubella/Mumps	Rubella
Rubella/Mumps	Mumps
Td	tdBooster
Tdap	Pertussis
Tdap	tdBooster
tdBooster	tdDT
PCV	Pneumococcal

Synonyms

Many vaccines appear in the data under different names. These are the known variations on names.

Vaccine	Synonym
DT	D-T
DTaP	D-T-P
DTaP	DTP
DTaP	DTaP+
DTaP_HepB_IPV	Pediarix(tm)
DTaP_HepB_IPV	DTaP-HepB-IPV+
DTaP_HIB	DTaP/HIB
DTaP_HIB	DTP/HIB
DTaP_HIB_IPV	DTaP-HIB-IPV
HepA	Hepatitis A
HepA	HepA 2dose
HepA	HepA Adult
HepA	HepA 3dose
HepA	HepA Ped,NOS
HepA	HepA Adult,NOS
HepA_HepB	Twinrix
HepA_HepB	HepA/HepB
HepatitisB	Hepatitis B
HepatitisB	HepB Dialysis
HepatitisB	HepB Dialysis-1
HepatitisB	HepB,NOS
HepatitisB	HepB_Adult
HepB_2Dose	HepB_2Dose
HIB_HepB	COMVAX(tm)
HIB_HepB	PRP-OMP & Hep B
HIB_HepB	HepB/HIB
HIB_nonOMP	HbOC
HIB_nonOMP	PRP-T
HIB_nonOMP	PRP-D
HIB_nonOMP	HIB,NOS
HIB_nonOMP	HIB-HbOC
HIB_nonOMP	HIB-PRP-T
HIB_nonOMP	HIB-PRP-D
HIB_nonOMP	HibTITER(tm)
HIB_nonOMP	ActHib(tm)
HIB_nonOMP	ProHIBIT(tm)
HIB_OMP	

Handles Combo Vaccine Hierarchies



Vaccines

The vaccines recognized and analyzed by the system. A vaccine might be used for retrospective analysis, or future planning or both. For example, polio includes both IPV and OPV and is used for retrospective analysis, but only IPV is used for future planning.

Name	History	Basic	Planning
DiphtheriaTetanus	yes	yes	no
DT	no	no	yes
DTaP	no	no	yes
DTaP_HepB_IPV	no	no	yes
DTaP_HIB_IPV	no	no	no
HepA	yes	yes	yes
HepA_HepB	no	no	no
HepatitisB	yes	yes	no
HepB	no	no	yes
HepB_2Dose	no	no	yes
HIB	yes	yes	no
HIB_HepB	no	no	yes
HIB_nonOMP	no	no	yes
HIB_OMP	no	no	yes
HPV	yes	yes	yes
Influenza	yes	yes	yes
IPV	no	no	yes
MCV4	yes	no	yes
Measles	yes	yes	yes
Meningococcal	yes	yes	yes
Meningococcal_C	no	no	no
Menomune	yes	no	yes
MMR	yes	no	yes
MMRV	yes	no	yes
Mumps	yes	yes	yes
OPV	no	no	no
PCV	no	no	yes
Pertussis	no	yes	no
Pneumococcal	yes	yes	no
Polio	yes	yes	no
Rotavirus	yes	yes	yes
Rubella	yes	yes	yes
Synagis	yes	yes	yes
Td	no	no	yes
Tdap	no	no	yes
tdBooster	yes	yes	yes

Type Families

Families or types of vaccines needed for some analysis and planning rules. A vaccine can have multiple types or families with separate entries in this list.

Vaccine	Type
Measles	live virus
Mumps	live virus
Rubella	live virus
Smallpox	live virus
Varicella	live virus
Rotavirus	live virus

Combination Vaccines

Components of combination vaccines. These are the individual antigens, or other combination vaccines, that are contained in a specific combination vaccine. Note that this is also used for type families, so that Td contains DT although not strictly a combination, but not a synonym either.

Vaccine	Contains
DiphtheriaTetanus	tdDT
DT	DiphtheriaTetanus
DTaP	DT
DTaP	Pertussis
DTaP_HepB_IPV	DTaP
DTaP_HepB_IPV	HepB
DTaP_HepB_IPV	IPV
DTaP_HIB	DTaP
DTaP_HIB	HIB
DTaP_HIB_IPV	DTaP
DTaP_HIB_IPV	Hib
DTaP_HIB_IPV	IPV
HepA_HepB	HepA
HepA_HepB	HepB
HepB	HepatitisB
HepB_2Dose	HepatitisB
HIB_HepB	HIB_OMP
HIB_HepB	HepB
HIB_nonOMP	HIB
HIB_OMP	HIB
IPV	Polio
MCV4	Meningococcal
Meningococcal_C	Meningococcal
Menomune	Meningococcal
MMR	Measles
MMR	Mumps
MMR	Rubella
MMRV	MMR
MMRV	Varicella
OPV	Polio
Rubella/Mumps	Rubella
Rubella/Mumps	Mumps
Td	tdBooster
Tdap	Pertussis
Tdap	tdBooster
tdBooster	tdDT

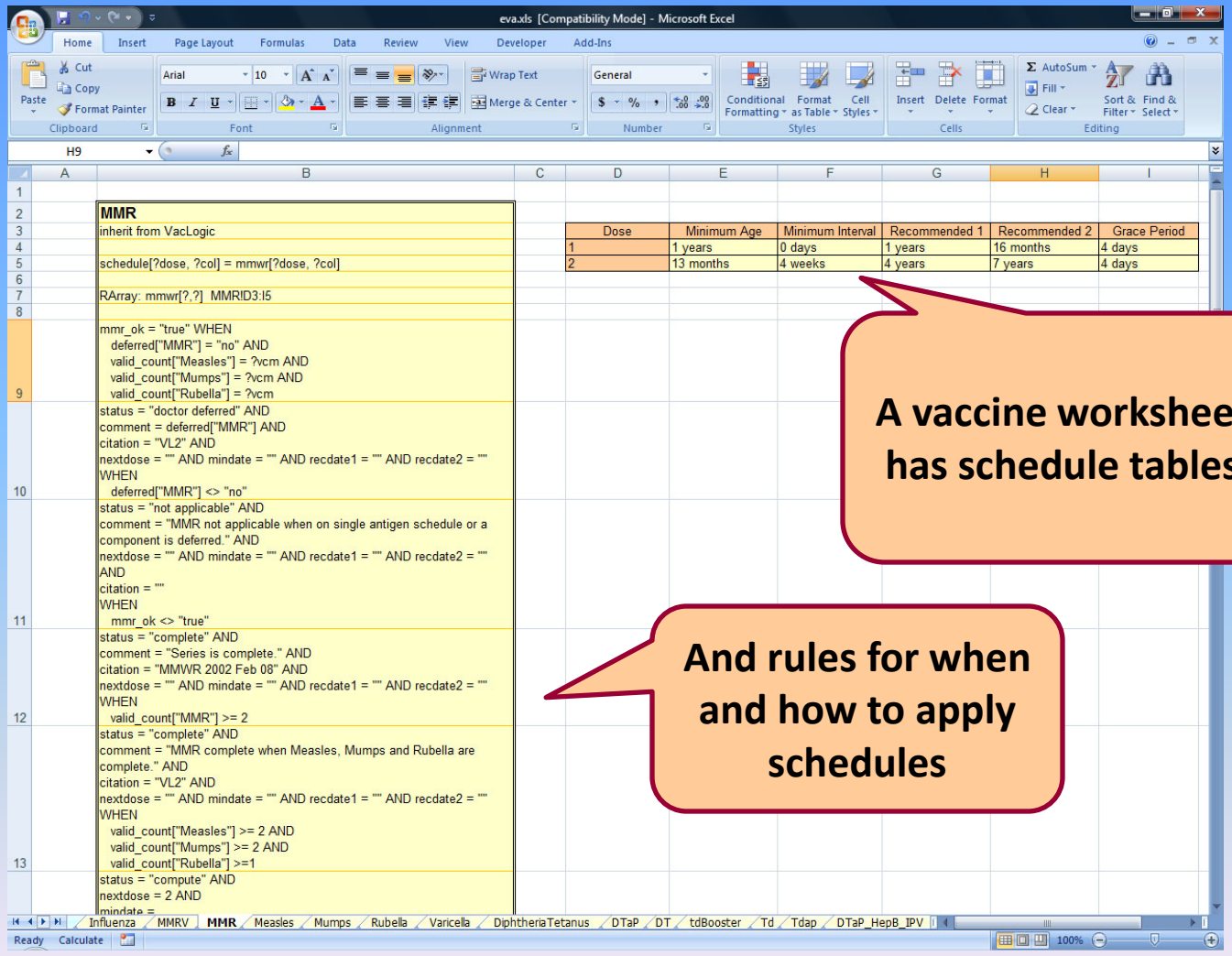
Synonyms

Many vaccines appear in the data under different names. These are the known variations on names.

Vaccine	Synonym
DT	D-T
DTaP	D-T-P
DTaP	DTP
DTaP	DTaP+
DTaP_HepB_IPV	Pediarix(tm)
DTaP_HepB_IPV	DTaP-HepB-IPV+
DTaP_HIB	DTaP/HIB
DTaP_HIB	DTP/HIB
DTaP_HIB_IPV	DTaP-HIB-IPV
HepA	Hepatitis A
HepA	HepA 2dose
HepA	HepA Adult
HepA	HepA 3dose
HepA	HepA Ped,NOS
HepA	HepA Adult,NOS
HepA_HepB	Twinrix
HepA_HepB	HepA/HepB
HepatitisB	Hepatitis B
HepatitisB	HepB Dialysis
HepatitisB	HepB Dialysis-1
HepatitisB	HepB,NOS
HepatitisB	HepB_Adult
HepB_2Dose	HepB_2Dose
HIB_HepB	COMVAX(tm)
HIB_HepB	PRP-OMP & Hep B
HIB_HepB	HepB/HIB
HIB_nonOMP	HbOC
HIB_nonOMP	PRP-T
HIB_nonOMP	PRP-D
HIB_nonOMP	HIB,NOS
HIB_nonOMP	HIB-HbOC
HIB_nonOMP	HIB-PRP-T
HIB_nonOMP	HIB-PRP-D
HIB_nonOMP	HibTITER(tm)
HIB_nonOMP	ActHib(tm)
HIB_nonOMP	ProHIBIT(tm)

Note the nested hierarchy used to define the MMRV family

Each Vaccine has a Worksheet



DTaP Worksheet Schedule

MMWR 2002 Feb 08

Dose	Minimum Age	Minimum Interval	Recommended 1	Recommended 2	Grace Period
1	6 weeks	0 days	2 months	3 months	4 days
2	10 weeks	4 weeks	4 months	5 months	4 days
3	14 weeks	4 weeks	6 months	7 months	4 days
4	12 months	6 months	15 months	19 months	4 days
5	4 years	6 months	4 years	7 years	4 days

Complex Hib non-OMP schedules

Normal Schedule

Dose	Minimum Age	Minimum Interval	Recommended 1	Recommended 2	Grace Period
1	6 weeks	0 days	2 months	3 months	4 days
2	10 weeks	4 weeks	4 months	5 months	4 days
3	14 weeks	4 weeks	6 months	7 months	4 days
4	12 months	8 weeks	15 months	16 months	4 days

Late Start Schedules

Dose	Minimum Age	Minimum Interval	Recommended 1	Recommended 2	Grace Period
1	2 months	0 days	2 months	7 months	4 days
2	0 months	4 weeks	4 months	5 months	4 days
3	0 months	4 weeks	6 months	7 months	4 days
4	12 months	8 weeks	12 months	16 months	4 days

Dose	Minimum Age	Minimum Interval	Recommended 1	Recommended 2	Grace Period
1	7 months	0 days	7 months	12 months	4 days
2	0 months	4 weeks	9 months	10 months	4 days
3	12 months	8 weeks	12 months	19 months	4 days

Dose	Minimum Age	Minimum Interval	Recommended 1	Recommended 2	Grace Period
1	12 months	0 days	12 months	15 months	4 days
2	12 months + 8 weeks	8 weeks	14 months	19 months	4 days

Dose	Minimum Age	Minimum Interval	Recommended 1	Recommended 2	Grace Period
1	15 months	0 days	15 months	5 years	4 days

Interrupted Schedules

Dose	Minimum Age	Minimum Interval	Recommended 1	Recommended 2	Grace Period
3	7 months	8 weeks	7 months	12 months	4 days
4	12 months	8 weeks	12 months	16 months	4 days

Dose	Minimum Age	Minimum Interval	Recommended 1	Recommended 2	Grace Period
3	12 months	8 weeks	12 months	16 months	4 days

DTaP Rules for Series Completion

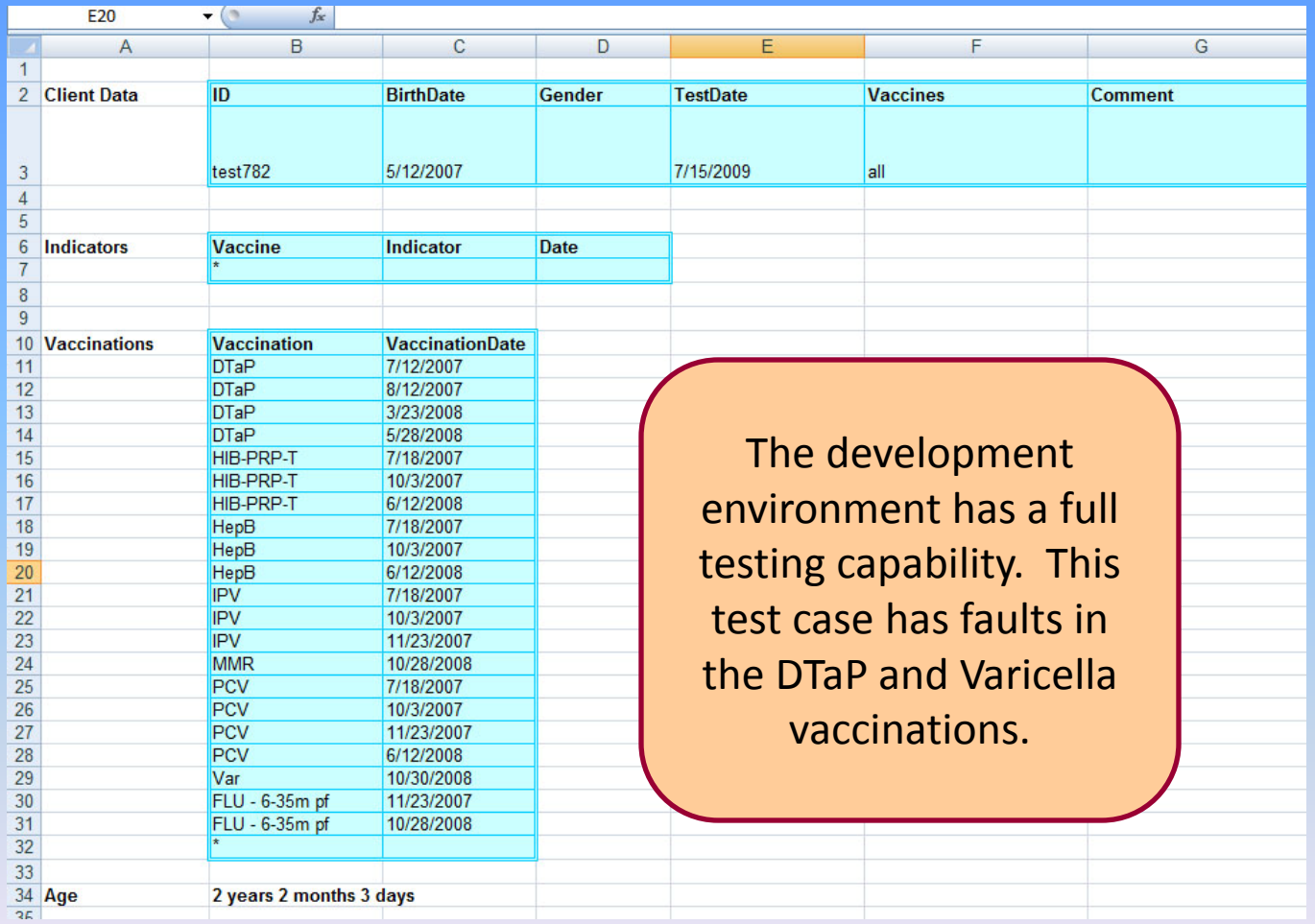
```
16    deferred["DTaP"] <> "no"
      status = "complete" AND
      comment = "Complete 4 dose pediatric Diphtheria Tetanus Pertussis schedule. The last dose
      was received after 4 years of age." AND
      citation = "DHS DTaP 2003 March" AND
      nextdose = "" AND mindate = "" AND recdate1 = "" AND recdate2 = ""
      WHEN
17      valid_count["DT"] >= 4 AND
        last_dose["DT"] >= birthdate + 4 years
      status = "complete" AND
      comment = "Complete five dose DTaP schedule." AND
      citation = "DHS DTaP 2003 March" AND
      nextdose = "" AND mindate = "" AND recdate1 = "" AND recdate2 = ""
      WHEN
18      valid_count["DT"] >= 5
      status = "complete" AND
      comment = "No more than 6 DTaP doses should be given by age 7." AND
      citation = "DHS DTaP 2003 March" AND
      nextdose = "" AND mindate = "" AND recdate1 = "" AND recdate2 = ""
      WHEN
19      valid_count["DT"] >= 6 AND
        last_dose["DT"] < birthdate + 7 years

      status = "complete" AND
      comment = "DTaP catch-up schedule complete when 3rd dose given after 7 years of age." AND
      citation = "DHS Td 2003 March" AND
      nextdose = "" AND mindate = "" AND recdate1 = "" AND recdate2 = ""
      WHEN
20      valid_count["DT"] >= 3 AND
        last_dose["DT"] >= birthdate + 7 years
      status = "complete" AND
      comment = "DTaP not indicated after 7 years of age. If needed use Td. After 10 years old use
      Boostrix Tdap. " AND
      citation = "VL2" AND
      nextdose = "" AND mindate = "" AND recdate1 = "" AND recdate2 = ""
      WHEN
21      age >= 7 years
      # status = 'not applicable' AND
```

Hib non-OMP Rules for Selecting an Interrupted Schedule

```
47  there were enough doses but some were given too soon.
    interrupted = "7-11 months, 1 prior" WHEN
      Hib:use_PRP_OMP AND
      age >= 7 months AND
      age < 12 months AND
48    full_count["HIB_OMP"] = 1
    interrupted = "7-11 months, 2 prior" WHEN
      NOT Hib:use_PRP_OMP AND
      age >= 7 months AND
      age < 12 months AND
      full_count["Hib"] = 2 AND
49    first_dose["Hib"] >= birthdate + 7 months
    interrupted = "12-14 months, 2 prior" WHEN
      age >= 12 months AND
      age < 15 months AND
      full_count["Hib"] = 2 AND
50    last_dose["Hib"] < birthdate + 12 months
    interrupted = "12-14 months, 1 prior" WHEN
      age >= 12 months AND
      age < 15 months AND
      full_count["Hib"] = 1 AND
51    last_dose["Hib"] < birthdate + 12 months
    interrupted = "missing schedule" WHEN
      NOT Hib:use_PRP_OMP AND
      full_count["Hib"] <= 2 AND
      age >= 7 months AND
52    age < 12 months
53  interrupted = "not interrupted"
54
```

Input Data



	A	B	C	D	E	F	G
1							
2	Client Data	ID	BirthDate	Gender	TestDate	Vaccines	Comment
3		test782	5/12/2007		7/15/2009	all	
4							
5							
6	Indicators	Vaccine	Indicator	Date			
7		*					
8							
9							
10	Vaccinations	Vaccination	VaccinationDate				
11		DTaP	7/12/2007				
12		DTaP	8/12/2007				
13		DTaP	3/23/2008				
14		DTaP	5/28/2008				
15		HIB-PRP-T	7/18/2007				
16		HIB-PRP-T	10/3/2007				
17		HIB-PRP-T	6/12/2008				
18		HepB	7/18/2007				
19		HepB	10/3/2007				
20		HepB	6/12/2008				
21		IPV	7/18/2007				
22		IPV	10/3/2007				
23		IPV	11/23/2007				
24		MMR	10/28/2008				
25		PCV	7/18/2007				
26		PCV	10/3/2007				
27		PCV	11/23/2007				
28		PCV	6/12/2008				
29		Var	10/30/2008				
30		FLU - 6-35m pf	11/23/2007				
31		FLU - 6-35m pf	10/28/2008				
32		*					
33							
34	Age	2 years 2 months 3 days					

The development environment has a full testing capability. This test case has faults in the DTaP and Varicella vaccinations.

Accurately analyzes past vaccinations

- Within recommended ranges
- Early but OK
- Late but OK
- Too early to count
- Doctor exempted
- Redundant
- Extra

Output Historical Analysis

Calculated History	Vaccination	Dose	DateGiven	Status	Comment	AgeGiven
	DiphtheriaTetanus	1	7/12/2007	OK	Recommended age range	2 months
	DiphtheriaTetanus	2	8/12/2007	OK	Minimum Interval	3 months
	DiphtheriaTetanus	3	3/23/2008	OK	After recommended range	10 months 11 days
	DiphtheriaTetanus	X4	5/28/2008	X	Before min. interval	1 year 16 days
	HepatitisB	1	7/18/2007	OK	Recommended age range	2 months 6 days
	HepatitisB	2	10/3/2007	OK	Recommended age range	4 months 3 weeks
	HepatitisB	3	6/12/2008	OK	Recommended age range	1 year 1 month
	HIB	1	7/18/2007	OK	Recommended age range	2 months 6 days
	HIB	2	10/3/2007	OK	Recommended age range	4 months 3 weeks
	HIB	3	6/12/2008	OK	After recommended range	1 year 1 month
	Influenza	1	11/23/2007	OK	Recommended age range	6 months 11 days
	Influenza	2	10/28/2008	OK	Recommended age range	1 year 5 months 16 days
	Measles	1	10/28/2008	OK	After recommended range	1 year 5 months 16 days
	MMR	1	10/28/2008	OK	After recommended range	1 year 5 months 16 days
	Mumps	1	10/28/2008	OK	After recommended range	1 year 5 months 16 days
	Pneumococcal	1	7/18/2007	OK	Recommended age range	2 months 6 days
	Pneumococcal	2	10/3/2007	OK	Recommended age range	4 months 3 weeks
	Pneumococcal	3	11/23/2007	OK	Recommended age range	6 months 11 days
	Pneumococcal	4	6/12/2008	OK	Recommended age range	1 year 1 month
	Polio	1	7/18/2007	OK	Recommended age range	2 months 6 days
	Polio	2	10/3/2007	OK	Recommended age range	4 months 3 weeks
	Polio	3	11/23/2007	OK	Recommended age range	6 months 11 days
	Rubella	1	10/28/2008	OK	After recommended range	1 year 5 months 16 days
	Varicella	X1	10/30/2008	X	Before min. live virus interval	1 year 5 months 18 days

Accurately forecasts next required vaccinations

- Status
  - Complete
  - Due
  - Eligible (not due yet, but OK to give)
  - Current
  - Behind
- Optimal range for next dose
- Earliest date for next dose
- Comments about dose, reflecting issues related to combo vaccines etc.
- Citations for recommendation

Output Forecast Plan

	Calculated Plan	Vaccination	Status	Dose	Earliest	OptimalStart	OptimalEnd	Citation	Comment
121		DTaP	behind	4	11/28/2008	11/28/2008	12/12/2008	MMWR 2002 Feb 08	On standard DTaP schedu
122					1 year 6 months 16 days	1 year 6 months 16 days	1 year 7 months		
123		Varicella	behind	1	11/27/2008	11/27/2008	11/27/2008	MMWR 2002 Feb 08	Varicella due.
124					1 year 6 months 15 days	1 year 6 months 15 days	1 year 6 months 15 days		
125		HepA	due	1	5/12/2008	5/12/2008	5/12/2107	VL2	HepA recommended for tra those living in areas where recommended.
126					1 year	1 year	100 years		
127		Measles	eligible	2	11/27/2008	5/12/2011	5/12/2014	MMWR 2002 Feb 08	MMR: On standard schedu
128					1 year 6 months 15 days	4 years	7 years		
129		MMR	eligible	2	11/27/2008	5/12/2011	5/12/2014	MMWR 2002 Feb 08	On standard schedule.
130					1 year 6 months 15 days	4 years	7 years		
131		Mumps	eligible	2	11/27/2008	5/12/2011	5/12/2014	MMWR 2002 Feb 08	MMR: On standard schedu
132					1 year 6 months 15 days	4 years	7 years		
133		Influenza	current	3	10/1/2009	10/1/2009	3/31/2010	VL2	Second influenza is recom
134					2 years 4 months 19 days	2 years 4 months 19 days	2 years 10 months 19 days		
135		IPV	current	4	5/12/2011	5/12/2011	5/12/2014	VL2	On standard polio vaccine
136					4 years	4 years	7 years		
137		HepB	complete					VL2	Series complete. Patient h valid doses.
138									
139		HIB_nonOMP	complete					VL2	Series Complete. Booster received after 12 months o
140									
141		PCV	complete					VL2	PCV series is complete.
142									
143		Rubella	complete					VL2	Rubella complete when 1 v given.

Quickly and Easily responds to changes and new vaccines

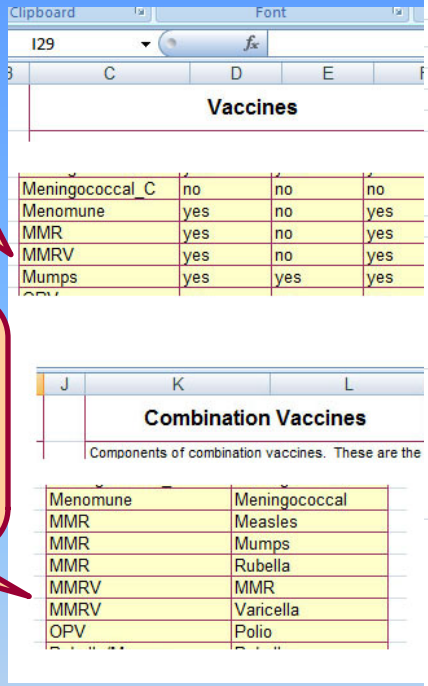
- Initial coding of all vaccines took less than one month
- Changes since then include:
  - Rotavirus – added in less than half hour (a new vaccine)
  - HPV – added in less than an hour (required adding gender as a field for reasoning)
  - MMRV – around 15 minutes (built on existing MMR and Varicella rules)

Adding MMRV

Step 1: Add to list of vaccines

Step 2: Define MMRV components

Step 3: Create new worksheet



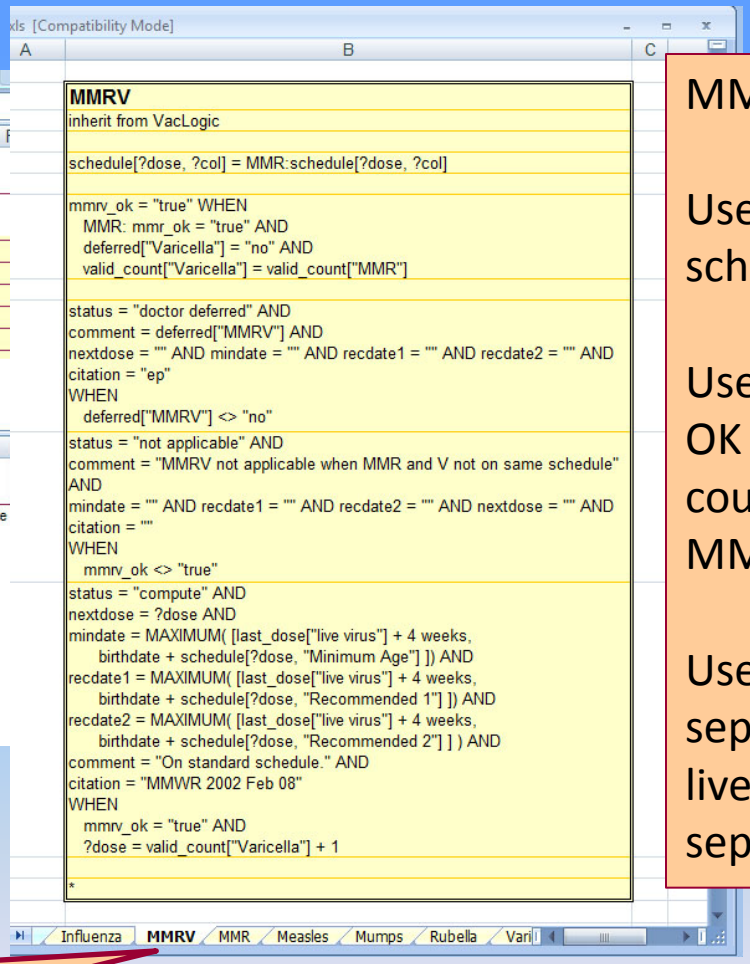
Vaccines

Meningococcal_C	no	no	no
Menomune	yes	no	yes
MMR	yes	no	yes
MMRV	yes	no	yes
Mumps	yes	yes	yes

Combination Vaccines

Components of combination vaccines. These are the

Menomune	Meningococcal
MMR	Measles
MMR	Mumps
MMR	Rubella
MMRV	MMR
MMRV	Varicella
OPV	Polio



```
MMRV
inherit from VacLogic

schedule[?dose, ?col] = MMR:schedule[?dose, ?col]

mmrv_ok = "true" WHEN
   MMR: mmr_ok = "true" AND
   deferred["Varicella"] = "no" AND
   valid_count["Varicella"] = valid_count["MMR"]

status = "doctor deferred" AND
comment = deferred["MMRV"] AND
nextdose = "" AND mindate = "" AND recdate1 = "" AND recdate2 = "" AND
citation = "ep"
WHEN
   deferred["MMRV"] <> "no"
status = "not applicable" AND
comment = "MMRV not applicable when MMR and V not on same schedule"
AND
mindate = "" AND recdate1 = "" AND recdate2 = "" AND nextdose = "" AND
citation = ""
WHEN
   mmrv_ok <> "true"
status = "compute" AND
nextdose = ?dose AND
mindate = MAXIMUM( [last_dose["live virus"] + 4 weeks,
      birthdate + schedule[?dose, "Minimum Age"] ]) AND
recdate1 = MAXIMUM( [last_dose["live virus"] + 4 weeks,
      birthdate + schedule[?dose, "Recommended 1"] ]) AND
recdate2 = MAXIMUM( [last_dose["live virus"] + 4 weeks,
      birthdate + schedule[?dose, "Recommended 2"] ] ) AND
comment = "On standard schedule." AND
citation = "MMWR 2002 Feb 08"
WHEN
   mmrv_ok = "true" AND
   ?dose = valid_count["Varicella"] + 1

*
```

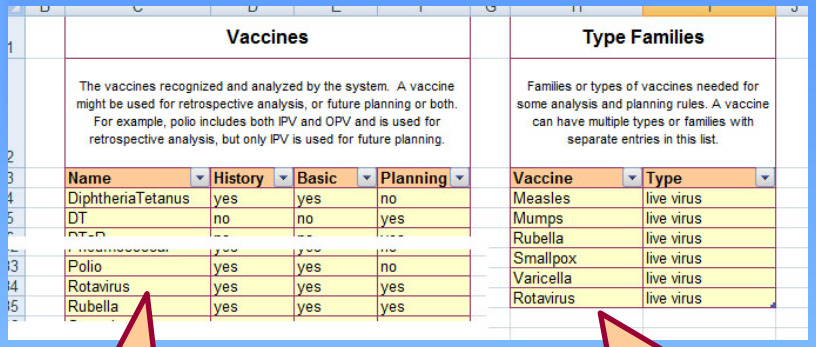
MMRV Rules:

Use the same schedule as MMR.

Use when MMR is OK and Varicella count is same as MMR count.

Use the schedule separations or last live virus separation.

Adding Rotavirus



Vaccines

The vaccines recognized and analyzed by the system. A vaccine might be used for retrospective analysis, or future planning or both. For example, polio includes both IPV and OPV and is used for retrospective analysis, but only IPV is used for future planning.

Name	History	Basic	Planning
DiphtheriaTetanus	yes	yes	no
DT	no	no	yes
Polio	yes	yes	no
Rotavirus	yes	yes	yes
Rubella	yes	yes	yes

Type Families

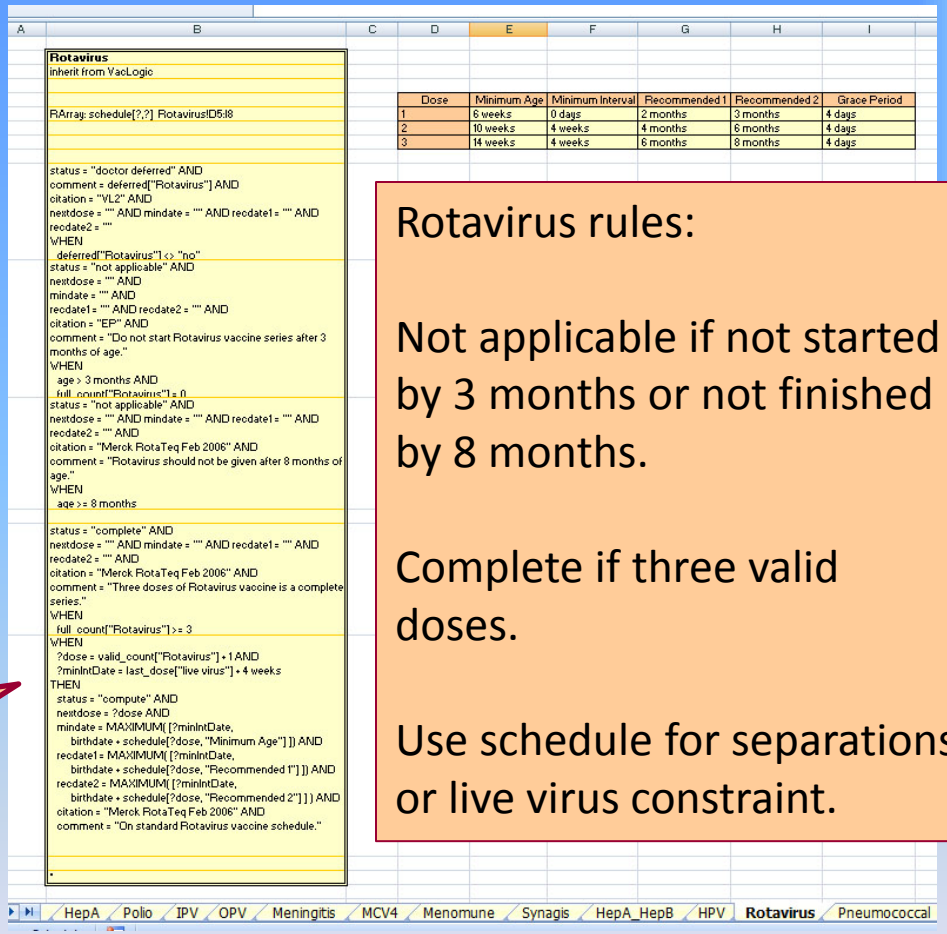
Families or types of vaccines needed for some analysis and planning rules. A vaccine can have multiple types or families with separate entries in this list.

Vaccine	Type
Measles	live virus
Mumps	live virus
Rubella	live virus
Smallpox	live virus
Varicella	live virus
Rotavirus	live virus

Step 1:
Add to list
of vaccines

Step 2:
Define as a live virus
vaccine

Step 3:
Add the schedule and rules
to a new worksheet



```
Rotavirus
inherit from VacLogic

RArray: schedule[?,?] Rotavirus!D5:I8

status = "doctor deferred" AND
comment = deferred["Rotavirus"] AND
citation = "VL2" AND
nextdose = "" AND mindate = "" AND recdate1 = "" AND
recdate2 = ""
WHEN
  deferred["Rotavirus"] <> "no"
status = "not applicable" AND
nextdose = "" AND
mindate = "" AND
recdate1 = "" AND recdate2 = "" AND
citation = "EP" AND
comment = "Do not start Rotavirus vaccine series after 3
months of age."
WHEN
  age > 3 months AND
  full_count["Rotavirus"] = 0
status = "not applicable" AND
nextdose = "" AND mindate = "" AND recdate1 = "" AND
recdate2 = "" AND
citation = "Merck RotaTeq Feb 2006" AND
comment = "Rotavirus should not be given after 8 months of
age."
WHEN
  age >= 8 months

status = "complete" AND
nextdose = "" AND mindate = "" AND recdate1 = "" AND
recdate2 = "" AND
citation = "Merck RotaTeq Feb 2006" AND
comment = "Three doses of Rotavirus vaccine is a complete
series."
WHEN
  full_count["Rotavirus"] >= 3
WHEN
  ?dose = valid_count["Rotavirus"] + 1 AND
  ?minIntDate = last_dose["live virus"] + 4 weeks
THEN
  status = "compute" AND
  nextdose = ?dose AND
  mindate = MAXIMUM( [?minIntDate,
      birthdate + schedule[?dose, "Minimum Age"] ] ) AND
  recdate1 = MAXIMUM( [?minIntDate,
      birthdate + schedule[?dose, "Recommended 1"] ] ) AND
  recdate2 = MAXIMUM( [?minIntDate,
      birthdate + schedule[?dose, "Recommended 2"] ] ) AND
  citation = "Merck RotaTeq Feb 2006" AND
  comment = "On standard Rotavirus vaccine schedule."
```

Dose	Minimum Age	Minimum Interval	Recommended 1	Recommended 2	Grace Period
1	6 weeks	0 days	2 months	3 months	4 days
2	10 weeks	4 weeks	4 months	6 months	4 days
3	14 weeks	4 weeks	6 months	8 months	4 days

HepA | Polio | IPV | OPV | Meningitis | MCV4 | Menomune | Synagis | HepA_HepB | HPV | **Rotavirus** | Pneumococcal

Rotavirus rules:

Not applicable if not started by 3 months or not finished by 8 months.

Complete if three valid doses.

Use schedule for separations or live virus constraint.

Accurate

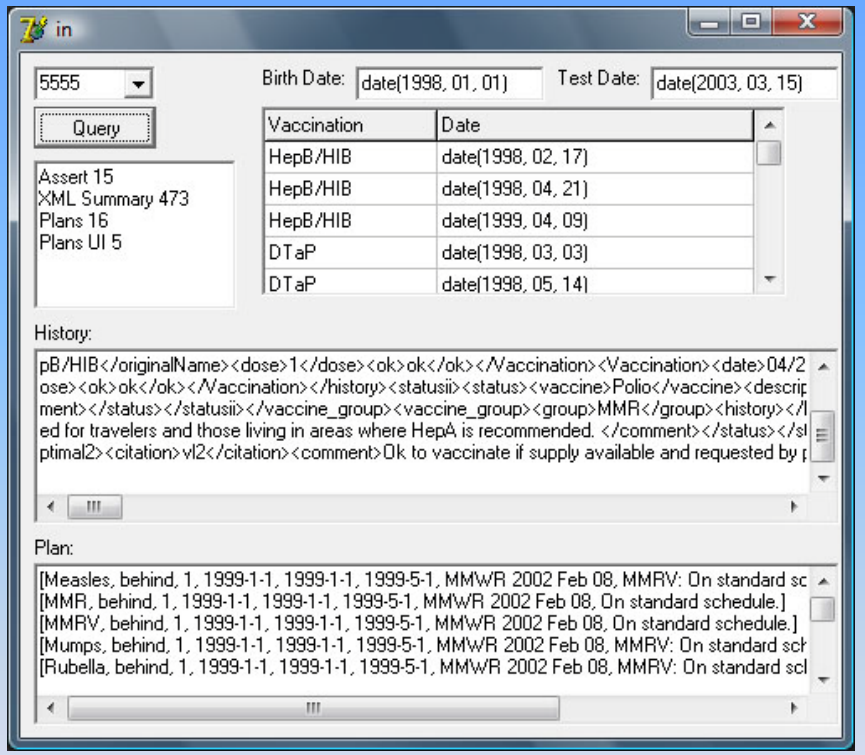
- Easily vetted by vaccine experts who can read the rules directly without programmer intervention
- Citations available for all rules
- Full testing capability in Excel-based tool
- Libraries of test cases, with expected results, stored for automatic analysis of the effects of any changes

Deploy Anywhere

- Windows and/or Unix
- C++, VB, Delphi, Java, .NET, ...
- Uses XML for inputs and outputs

Simple Deployment Example

- Runs in Delphi using binary export from development environment
- Takes vaccination inputs
- Outputs raw XML historical analysis
- Outputs forecast plan as a list of lists



EVA

- The perfect tool for vaccination analysis and forecast
- Handles the most complex scenarios
- Yet easily updated for constantly changing vaccines and combinations
- Knowledge can be read and maintained directly by vaccine experts, not programmers
- Knowledge can be easily deployed in any computing environment