Issues related to rescoping of the Pediatric Vaccine Stockpile

National Vaccine Advisory Committee

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Topics

- Historical perspective
- Discussion of rescoping of VFC stockpile to be a 6 month VFC program supply vs. national supply
  - Outbreak vs maintenance of supply requirements
  - Estimates of potential impacts of stockpile options
  - Cost implications
- Future activities

Historical Perspective (I)

- 1993 – VFC legislation for stockpile
  - Provide adequate supply of pediatric vaccines to meet unanticipated needs
  - Take into account vaccine shortages and potential for outbreaks
- After 2000 –
  - Goal to stockpile 6 month nat'l supply all vaccines
  - Build up of stockpile partially accomplished

Historical Perspective (II)

- June 2008 – CDC Work Group formed
  - CDC disease and program experts, and economists
  - Developed Pediatric Vaccine Stockpile model *– tool to evaluate potential policy options
- NVAC role
  - Discuss options & present recommendations
  - Presentations to NVAC 6/08 and 9/08

* Leads: Greg Wallace, MD, MS, MPH; Martin Meltzer, MS, PhD; Sundar Shrestha, MS, PhD

Presence of Outbreaks * and Number of Doses Needed

Disease *	Number of doses needed **	
	<1,000	<100,000
Diphtheria	X	
Pertussis		X
Pneumoccal	X	
Meningococcal	X	
Hib	X	
Hepatitis A		X
Hepatitis B	X	
Measles		X
Mumps		X
Rubella	X	
Varicella	X	

*Diseases listed have current or theoretical presence of outbreaks. Diseases with no outbreak potential are not listed (Tetanus, HPV, Rotavirus)

** Number of doses needed in stockpile to cover potential outbreaks over 6-month period; only for children <18 yrs

Outbreak vs Maintenance of Supply Requirements

- Outbreak vaccines require fewer doses than supply for maintenance
  - Consensus of CDC workgroup
- Exception may be polio
  - Outbreak target may exceed throughput capacity
  - CDC collaboration evaluating potential need

Rescoping of Stockpile

- 6-month of VFC program supply vs 6-month national supply
  - VFC supply is ~45% of national supply
- Rationale:
  - Incorporate scientific-based rationale
  - VFC statute provides CDC with flexibility
  - Stockpile should be no larger than needed
    - Minimize risk & maximize utility

Potential Impacts of Stockpile Options

- Impact of 1-yr disruption in vaccine supply & associated morbidity, death, and cost
  - Health impacts determined by Vaccine Stockpile Model, Stockpile WG, and disease experts
  - Morbidity includes hospitalization or other disease specific measure
- Assumptions:
  - Dose per schedule based on full ACIP routine schedule
  - High target: based on 6-month coverage for 4 m cohort
  - Low target: based on 6-month coverage for 50% of high
  - Base demand on current distribution for 0-5 y o vaccines
  - Base demand on one age cohort for 11-12 y o vaccines
  - All outputs are adjusted for demand
  - Degree of shortage: Weighted average probability of shortage for each vaccine
    - Based on number manufacturers, stability of market, history of problems, complexity of production

POTENTIAL HEALTH IMPACTS DUE TO SHORTAGES (# OF PERSONS) BY STOCKPILE TARGET SCENARIO AND VACCINE;
VFC PROGRAM VS NAT'L SUPPLY

	Low SP scenario (VFC)		High SP scenario (National)	
Vaccine	Morbidity	Death	Morbidity	Death
HepB *	4,394	915	2,030	507
Rota	8,440	4	Nil	Nil
DTaP (pediatric) **	538	3	102	1
Hib	34	2	Nil	Nil
PCV7	3	0	Nil	Nil
IPV	0	0	0	0
MMR	43	1	Nil	Nil
VAR	4	0	2	0
HepA	0	0	0	0
Tdap (adolescent)**	10	0	Nil	Nil
HPV	1,283	385	Nil	Nil
MCV4	0	0	Nil	Nil
Total	14,748	1,492	2,134	508

* Includes HepB-Hib vaccine and DTaP-HepB-IPV which is modeled with HepB

** DTaP and Tdap modeled with infant and adolescent pertussis

Model output 1 - HPV

- **Parameters:**
  - **Cohort = 2.1 m; 3 doses per child**
  - **6 m doses to vaccinate 1 cohort/1 yr**
  - **High target = 3 m; Low = 1.5 m**

- **Outputs:**
  - **Wtd av SP drawdown due to shortage = 2.8 m doses**
  - **Low SP: max available from SP = 1.5 m; unmet need 1.3 m doses**
  - **Results in 450,000 adolescents uncovered**
  - **25,650 persons with CIN 1-3, 1,283 with cancer, 384 deaths**

  - **High SP: max available from SP = 3.0 m; unmet need Nil**
  - **Results in no adolescents uncovered; health impact Nil**

Model output 1 - Rota

- Parameters:
  - Cohort = 4.2 m; 3 doses per child
  - 12 m doses to vaccinate 1 cohort/1 yr
  - High target = 6 m; Low = 3.0 m

- Outputs:
  - Wtd av SP drawdown due to shortage = 4.3 m doses
  - Low SP: max available from SP = 3.0 m; unmet need 1.3 m doses
  - Results in 426,273 adolescents uncovered
  - 223,793 persons infected, 8,440 hospitalized, 4 deaths

  - High SP: max available from SP = 6.0 m; unmet need Nil
  - Results in no adolescents uncovered; health impact Nil

A SIGNIFICANT INVESTMENT IS REQUIRED TO INCREASE THE STOCKPILE QUANTITIES TO 6-MONTHS OF VFC OR NATIONAL USAGE

PRELIMINARY

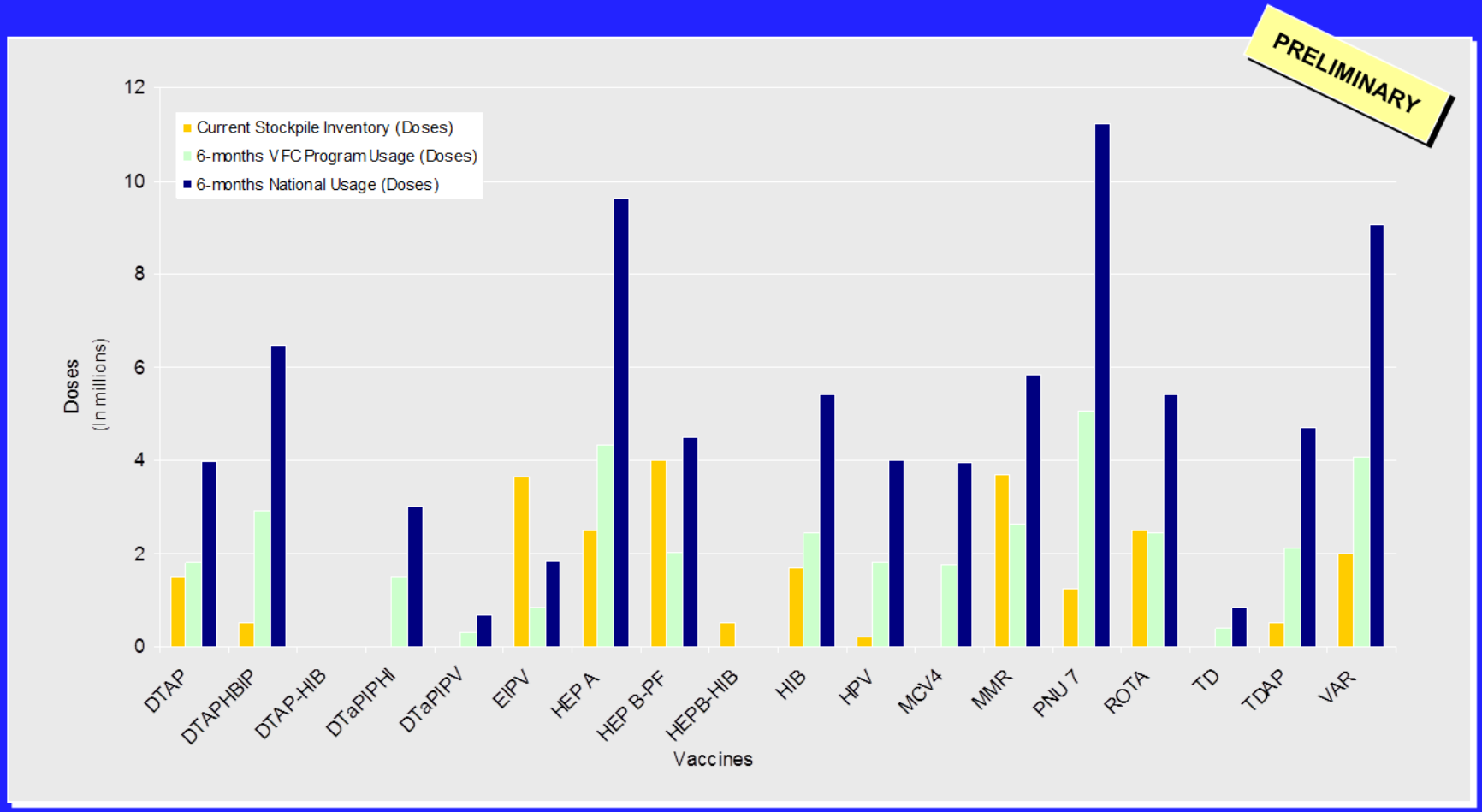
Vaccine	Price Per Dose (weighted average)[1]	Current Stockpile Value[2]	6-Months of Federal (VFC Program) Usage[3]	6-Months of National Usage[3]	Additional Purchases for 6-Months of Federal (VFC Program) Usage[3]	Additional Purchases for 6-Months of National Usage[3]
DTAP	$13.31	$20,625,000	$23,774,928	$52,833,121	$3,803,666	$32,861,858
DTAPHBIP	$48.75	$24,375,000	$141,722,394	$314,938,339	$117,347,394	$290,563,339
DTAPIPHI	$50.10	$0	$75,150,000	$150,300,000	$75,150,000	$150,300,000
DTAPIPV	$32.25	$0	$9,659,520	$21,465,579	$9,659,520	$21,465,579
EIPV	$11.48	$41,959,400	$9,446,609	$20,992,444	$0	$0
HEP A	$12.25	$31,125,000	$53,068,327	$117,929,498	$22,440,577	$87,301,748
HEP B-PF	$9.61	$38,550,000	$19,339,435	$42,976,479	$0	$4,519,719
HEPB-HIB	$28.80	$14,400,000	$0	$0	$0	$0
HIB	$8.89	$19,142,000	$21,695,363	$48,211,870	$6,584,242	$33,100,749
HPV	$100.59	$20,118,000	$181,579,398	$403,509,369	$161,461,398	$383,391,369
MCV4	$76.35	$0	$134,763,547	$299,474,250	$134,763,547	$299,474,250
MMR	$18.26	$67,105,500	$47,833,433	$106,296,412	$0	$39,190,912
PNU7	$66.44	$83,050,000	$335,433,487	$745,407,004	$252,383,487	$662,357,004
ROTA	$61.75	$143,000,000	$150,160,552	$333,689,781	$0	$179,303,417
TD	$17.32	$0	$6,453,484	$14,341,062	$6,453,484	$14,341,062
TDAP	$30.75	$15,375,000	$65,233,144	$144,962,397	$49,858,144	$129,587,397
VARICELLA	$61.50	$123,000,000	$250,257,785	$556,127,855	$127,257,785	$433,127,855
TOTAL		$641,824,900	$1,525,571,407	$3,390,155,292	$967,163,245	$2,777,586,091

[1] The price per dose is a weighted average based on the total doses and total forecasted costs for all brands of each vaccine

[2] The value of the current stockpile is based on the actual brands in the stockpile and their respective price per dose as of 1/21/2009. Assumes 100% probability of complete shortage.

[3] All usage values and additional purchase values are calculated by multiplying the doses needed by the weighted average price per dose for each vaccine.

ADDITIONAL DOSES ARE NEEDED FOR MOST VACCINES TO INCREASE CURRENT STOCKPILE TO 6-MONTHS OF VFC OR NATIONAL USAGE[1]



[1] Federal usage estimates are based on the VFC program usage in FY 2008 and the Federal (VFC Program) usage is assumed to be approximately 45% of National usage, with the exception of Pentacel which is estimated to be 50% of National usage. The implementation of a reduced vaccination schedule will result in a reduction to the quantities illustrated in the chart.

Implications of Policy Change

- Net difference in morbidity/mortality substantial but 99% deaths due two diseases
  - Epi of HepB & HPV would allow some degree of catch-up following resumption of supply
- Cost implications (6-month supply)
  - $1.52 billion versus $3.39 billion
  - Additional $967 million and $2.77 billion to attain VFC program vs nat'l supply
- Advantages
  - Less vaccine at risk, less financial risk, larger proportion of vaccine that can be managed by CDC at McKesson
    - Stored at McKesson: 34% of Nat'l, 75% of VFC supply
- As we rescope, manufacturers need to revisit safety stockpile for private sector

POTENTIAL MINIMUM SCHEDULE IN SHORTAGE SITUATION (I)

Disease	Routine number doses	Minimum number doses
Diphtheria	5 DTaP or DT 1 Tdap or Td	3 DTaP or DT 1Tdap or Td
Tetanus	5 DTaP or DT 1 Tdap or Td	3 DTaP or DT 1Tdap or Td
Pertussis	5 DTaP 1 Tdap	3 DTaP 1 Tdap
Pneumococcal	4 PCV7	3 PCV7
Meningococcal	1 MCV4	1 MCV4
Hib	4 Hib	3 Hib
Hepatitis A	2 HepA	1 HepA

* Number of doses for minimum schedule; over 6 month period

POTENTIAL MINIMUM VACCINE SCHEDULE IN SHORTAGE SITUATION (II)

Disease	Routine number doses	Minimum number doses
Hepatitis B	3 HepB	2 HepB
HPV	3 HPV4	2 HPV4
Polio	4 IPV	2 IPV
Measles	2 MMR	1 MMR
Mumps	2 MMR	1 MMR
Rubella	2 MMR	1 MMR
Rotavirus	2-3 RV	2 RV
Varicella	2 VAR	1 VAR

* Number of doses for minimum schedule; over 6 month period

Minimum schedule in shortage situation

- Options for minimum schedule exist in severe shortage situation
- Not included in Stockpile model
- Minimum schedule would allow for more efficient use of vaccine but would need to be evaluated based on specific scenario

Future Activities

- Preparation of VFC Pediatric Vaccine Stockpile report
- Presentation to OMB
- Budget projections for completion of build-up of stockpiles

Acknowledgements

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National Vaccine Advisory Committee for external peer review

Additional Slides

A number of assumptions were used in the usage estimate calculations (cost estimates)

- Federal (VFC Program) usage is estimated to be approximately 45% of National usage.
  - Federal usage of Pentacel is estimated to be 50% of National usage. This is consistent with the estimates that were used to formulate the FY 2009 vaccine purchase budget.
- FY 2009 usage estimates are based on actual provider orders in FY 2008 and no changes in usage were expected, except for the following:

Pentacel:

  - Estimated usage is 3M doses per year, taken as half of the 6M annualized estimate from Sanofi Pasteur "Hib Supply" document - 8/8/2008
  - It is assumed that a shift in usage to Pentacel will reduce single valent DTaP, HIB and eIPV demand

Kinrix:

  - FY 2009 usage was estimated based on the average weekly order size in late August and early September when Kinrix was added to the VFC vaccination schedule. This is consistent with the estimates that were used to formulate the FY 2009 vaccine purchase budget

HIB:

  - Assumes FY 2008 usage quantities through June 2009, with an additional 350,000 doses of usage from July 2009 to August 2009 to account for the vaccine coming off of shortage

Rotarix:

  - It was assumed that there would be no growth in the usage of ROTA vaccine in FY 2009. However, it was assumed that 25% of the demand for ROTA would shift from Rotateq to the new Rotarix vaccine in FY 2009

"Combination" Vaccines (assumptions for model)

- Only Combination Vaccines Currently in the Stockpile are Included
  - →DTaP-HepB-IPV
  - →HepB-Hib
- Contributes to Shortage Scenario's and Outputs Proportional to Targets
- MMR Modeled with Measles
- DTaP and Tdap Modeled with Infant and Adolescent Pertussis, Respectively

Disease Inputs
Incidence Among Unvaccinated

- **Range of Current Estimates**
  - →**HepB, HepA, HPV (CIN 1-3 with catch-up assumptions)**
- **Range of Pre-Vaccine Estimates**
  - →**Rota, Tdap (pre-adolescent vaccine)**
- **Range of Early Implementation, Current, High Risk, and/or Pre-Vaccine Estimates**
  - →**DTaP, Hib, PCV, IPV, MMR, Var, MCV4**

Disease Inputs
Morbidity Among Unvaccinated

- **Hospitalization Rates**
  - →**Rota, DTaP, Hib, PCV, IPV, MMR, Var, HepA, Tdap, HPV, MCV4**
- **Other Marker for Morbidity Rate**
  - →**Chronic HBV, Cervical CA**
- **Morbidity Rate Ranges based on Similar Assumptions Used for Disease Rates**

A preliminary analysis was performed to identify a rough estimate of the quantities need in stockpile for each vaccine

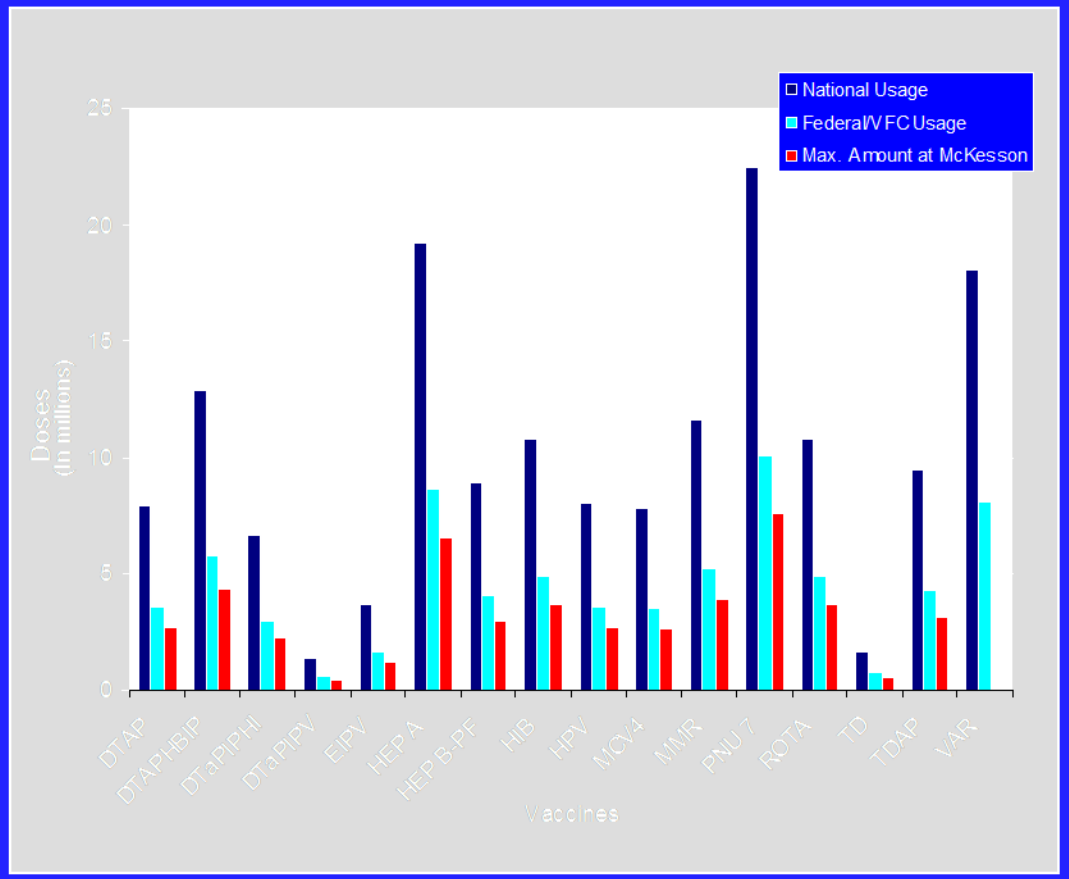
- A few key assumptions were used for this analysis:
  - Federal usage is based on actual orders in FY 2008 (adjustments for new vaccines were factored into usage estimates)
  - Federal usage is 45% of National Usage
  - Vaccines have 12-months of shelf-life at the time of receipt at McKesson and a minimum of 3-months at the time of distribution to the providers
  - The Varivax vaccine will continue to be stored and rotated at Merck due to the storage requirements for this vaccine
- Based on the assumptions used, the percentage of National Usage that can be stored at McKesson is 34% for all vaccines except varicella, while the percentage of Federal/VFC usage that can be stored at McKesson is 75% for all vaccines
- A more detailed analysis will be performed after the Re-Scoping effort is complete
  - The more detailed analysis will include more precise information on the expiration dates for each vaccine, which may help to increase the number of doses that can be rotated through McKesson

Preliminary Analysis of Stockpile Quantities by Vaccine (cont.)

Preliminary Stockpile Quantities based on 6-Months of Usage

Vaccine	Annual National Usage (Doses)	Annual Federal/VFC Usage (Doses)	Max Amount at McKesson (Doses)
DTAP	7,936,372	3,571,371	2,678,528,
DTAPHBIP	12,920,547	5,814,252	4,360,689
DTaPIPHI	6,666,660	3,000,000	2,250,000
DTaPIPV	1,331,199	599,040	449,280
EIPV	3,657,220	1,645,751	1,234,313
HEP A	19,252,067	8,663,439	6,497,579
HEP B-PF	8,940,218	4,023,102	3,017,327
HIB	10,847,664	4,881,454	3,661,090
HPV	8,022,853	3,610,287	2,707,715
MCV4	7,844,774	3,530,152	2,647,614
MMR	11,642,542	5,239,149	3,929,362
PNU 7	22,438,501	10,097,336	7,573,002
ROTA	10,806,971	4,863,142	3,647,356
TD	1,650,295	742,633	556,975
TDAP	9,428,449	4,242,806	3,182,105
VAR	18,085,459	8,138,465	0
TOTAL	161,471,789	72,662,378	48,392,935

Comparison of Stockpile Quantities by Vaccine



Potential health impacts due to shortages (# of persons) by stockpile target scenario and vaccine; VFC Program vs Nat'l supply

	Stockpile scenario: Low (VFC program supply)				Stockpile scenario: High (National supply)			
Vaccine	Not Covered	Disease	Morbidity	Death	Not Covered	Disease	Morbidity	Death
HepB	1,606,098	3,616	3,255	814	572,323	1289	1,160	290
Rota	426,273	223,793	8,440	4	Nil	Nil	Nil	Nil
DTaP (Pediatric)	913,031	821	538	3	173,900	156	102	1
DTaP-HepB-IPV	209,061	0	814	203	286,162	644	580	145
Hib	492,672	37	34	2	Nil	Nil	Nil	Nil
HepB-Hib	160,610	362	325	81	143,081	322	290	72
PCV 7	976,847	9	3	0	Nil	Nil	Nil	Nil
IPV	1,254,365	0	0	0	347,569	0	0	0
MMR	604,331	299	43	1	Nil	Nil	Nil	Nil
VAR	2,615,616	1,707	4	0	1,615,616	1,054	2	0
HepA	3,045,633	5,406	0	0	2,045,633	3,631	0	0
Tdap (Adolescent)	900,000	770	10	0	Nil	Nil	Nil	Nil
HPV	450,000	25,650	1,283	385	Nil	Nil	Nil	Nil
MCV4	800,000	0	0	0	Nil	Nil	Nil	Nil
Total	14,454,537	262,470	14,748	1,492	5,184,284	7,097	2,134	508

Pediatric /Adult	Vaccine	Price/Dose [1]	Current Stockpile Inventory [2] (Doses)	6-months of Federal/VFC Program Usage (Doses)	6-months of National Usage (Doses)
P	DTAP	$ 13.31	1,500,000	1,785,685	3,968,186
P	DTAPHBIP	$ 48.75	500,000	2,907,126	6,460,274
P	DTAP-HIB	$ -	-	-	-
P	DTaPIPHI	$ 50.10	-	1,500,000	3,000,000
P	DTaPIPV	$ 32.25	-	299,520	665,599
P	EIPV	$ 11.48	3,655,000	822,875	1,828,610
P	HEP A	$ 12.25	2,500,000	4,331,719	9,626,033
P	HEP B-PF	$ 9.61	4,000,000	2,011,551	4,470,109
P	HEPB-HIB	$ -	500,000	-	-
P	HIB	$ 8.89	1,700,000	2,440,727	5,423,832
P	HPV	$ 100.59	200,000	1,805,144	4,011,426
P	MCV4	$ 76.35	-	1,765,076	3,922,387
P	MMR	$ 18.26	3,675,000	2,619,575	5,821,271
P	PNU 7	$ 66.44	1,250,000	5,048,668	11,219,251
P	ROTA	$ 61.75	2,500,000	2,431,571	5,403,485
P	TD	$ 17.38	-	371,317	825,147
P	TDAP	$ 30.75	500,000	2,121,403	4,714,224
P	VAR	$ 61.50	2,000,000	4,069,232	9,042,729
		TOTALS:	**24,480,000**	**36,331,189**	**80,402,565**