

## Scenario for Vegetable Oil Fortification with Vitamin A in 75 Countries

### What if...

- All vegetable oil consumed in 75 countries included in DARs for which FAO data is available were fortified to a level of 60 IU/gr retinol palmitate as currently practiced by WFP and Bi-lateral Aid Programs.
- Average retention of vitamin A through storage and cooking is assumed to be 60%.

### What Would it Do?

- Based on average oil consumption indicated by FAO Food Balance Sheets for 75 countries, this will provide 44% (weighted) of WHO Safe Level for vitamin A (2000 IU/dy)

Average Oil Consumption Grams/dy	X Vitamin A @ 60 IU/gr	= 75 Countries average added 4.3 mg/dy	/Estimated Average Requirement: 2000 IU/dy	= Average 44% WHO Safe Level (population weighted)
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### What's the Result?

- Added vitamin A provided through oil is roughly presumed to lower prevalence of Vitamin A Deficiency 20%
- Analysis with Damage Assessment Report (DAR) methodology indicates 20% lower prevalence of vitamin A deficiency may result in 154,000 fewer deaths in children under 5 years of age annually.

### What would it Cost?

- The cost of fortifying all oil consumed in these 75 countries was based on a fortificant cost of \$3.12 per MT oil. Associated costs were derived as a proportion of fortificant mix costs follows:

National Food Consumption in MT/YR (FAO)	X Cost of Fortificant mix at \$3.12 per MT of Oil Produced	X 5% for Capital & Start-up amortized over 10 years	X 5% for Recurring In-Plant Costs	X 6% Government Food Control & Monitoring Costs	X 10% for Social Marketing and Public Education
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- Based on this methodology, annual costs for 75 countries are estimated at \$70.4 million annually.

## Projected Costs for Fortification of Vegetable Oil with Vitamin A in 75 Countries included in Damage Assessment Reports

	Volume Oil to be Fortified	Cost of Vitamin A Fortificant Premix	Production Costs		Government Costs			Total Estimated Annual Cost
			Annualized Capital Costs Over 10 yrs	Quality Control & In-Plant Administrative	Regulation Enforcement Food Control	Nutrition Surveillance Monitoring	Social Marketing, Advocacy & Public Education	
	FAO FBS 2001 Nat Food Use (2001)	Added @ 60 IU/gr Retinol Palmitate	<i>As Percentage of Vitamin A Fortificant Premix Costs</i>					
	000 MT	Added \$3.12 /MT Oil	@ 5%		@ 3%		@ 10%	
Angola	108	\$335,774	\$16,789	\$16,789	\$10,073	\$10,073	\$33,577	\$423,076
Armenia	15	\$45,770	\$2,289	\$2,289	\$1,373	\$1,373	\$4,577	\$57,671
Azerbaijan,	19	\$58,968	\$2,948	\$2,948	\$1,769	\$1,769	\$5,897	\$74,300
Bangladesh	897	\$2,797,579	\$139,879	\$139,879	\$83,927	\$83,927	\$279,758	\$3,524,950
Benin	31	\$95,254	\$4,763	\$4,763	\$2,858	\$2,858	\$9,525	\$120,020
Bolivia	47	\$146,890	\$7,344	\$7,344	\$4,407	\$4,407	\$14,689	\$185,081
Botswana	11	\$34,882	\$1,744	\$1,744	\$1,046	\$1,046	\$3,488	\$43,951
Brazil	2,297	\$7,165,985	\$358,299	\$358,299	\$214,980	\$214,980	\$716,598	\$9,029,141
Burkina Faso	66	\$205,265	\$10,263	\$10,263	\$6,158	\$6,158	\$20,526	\$258,634
Burundi	4	\$13,915	\$696	\$696	\$417	\$417	\$1,392	\$17,533
Cambodia	40	\$124,550	\$6,228	\$6,228	\$3,737	\$3,737	\$12,455	\$156,934
Cameroon	105	\$326,477	\$16,324	\$16,324	\$9,794	\$9,794	\$32,648	\$411,361
CAR	42	\$130,853	\$6,543	\$6,543	\$3,926	\$3,926	\$13,085	\$164,875
Chad	48	\$151,102	\$7,555	\$7,555	\$4,533	\$4,533	\$15,110	\$190,388
Congo, DR	230	\$717,163	\$35,858	\$35,858	\$21,515	\$21,515	\$71,716	\$903,626
Congo, Rep	39	\$121,056	\$6,053	\$6,053	\$3,632	\$3,632	\$12,106	\$152,531
Dominican Rep	151	\$470,496	\$23,525	\$23,525	\$14,115	\$14,115	\$47,050	\$592,825
Egypt	451	\$1,406,652	\$70,333	\$70,333	\$42,200	\$42,200	\$140,665	\$1,772,382
El Salvador	37	\$115,315	\$5,766	\$5,766	\$3,459	\$3,459	\$11,532	\$145,297
Eritrea	30	\$92,102	\$4,605	\$4,605	\$2,763	\$2,763	\$9,210	\$116,049
Ethiopia	118	\$369,408	\$18,470	\$18,470	\$11,082	\$11,082	\$36,941	\$465,454

	Volume Oil to be Fortified	Cost of Vitamin A Fortificant Premix	Production Costs		Government Cost			Total Estimated Annual Cost
	FAO FBS 2001 Nat Food Use (2001)	Added @ 60 IU/gr Retinol Palmitate	Annualized Capital Costs Over 10 yrs	Quality Control & In-Plant Administrative	Regulation Enforcement Food Control	Nutrition Surveillance Monitoring	Social Marketing, Advocacy & Public Education	
			As Percentage of Vitamin A Fortificant Premix Costs					
	000 MT	\$3.12/MT Oil	@ 5%		@ 3%		@ 10%	
Gabon	12	\$36,379	\$1,819	\$1,819	\$1,091	\$1,091	\$3,638	\$45,838
Gambia	28	\$88,421	\$4,421	\$4,421	\$2,653	\$2,653	\$8,842	\$111,410
Georgia	23	\$70,387	\$3,519	\$3,519	\$2,112	\$2,112	\$7,039	\$88,688
Ghana	113	\$353,122	\$17,656	\$17,656	\$10,594	\$10,594	\$35,312	\$444,933
Guatemala	83	\$257,806	\$12,890	\$12,890	\$7,734	\$7,734	\$25,781	\$324,835
Guinea	111	\$345,228	\$17,261	\$17,261	\$10,357	\$10,357	\$34,523	\$434,987
Guinea-Bissau	16	\$48,766	\$2,438	\$2,438	\$1,463	\$1,463	\$4,877	\$61,445
Haiti	60	\$187,231	\$9,362	\$9,362	\$5,617	\$5,617	\$18,723	\$235,911
Honduras	70	\$217,246	\$10,862	\$10,862	\$6,517	\$6,517	\$21,725	\$273,729
Indonesia	2,246	\$7,006,210	\$350,310	\$350,310	\$210,186	\$210,186	\$700,621	\$8,827,824
Iran, Islamic Rep of	609	\$1,899,206	\$94,960	\$94,960	\$56,976	\$56,976	\$189,921	\$2,393,000
Kazakhstan	132	\$412,433	\$20,622	\$20,622	\$12,373	\$12,373	\$41,243	\$519,665
Kenya	228	\$712,546	\$35,627	\$35,627	\$21,376	\$21,376	\$71,255	\$897,807
Kyrgyzstan	17	\$53,726	\$2,686	\$2,686	\$1,612	\$1,612	\$5,373	\$67,695
Laos	7	\$22,807	\$1,140	\$1,140	\$684	\$684	\$2,281	\$28,737
Lebanon	65	\$202,644	\$10,132	\$10,132	\$6,079	\$6,079	\$20,264	\$255,331
Lesotho	5	\$16,162	\$808	\$808	\$485	\$485	\$1,616	\$20,364
Liberia	44	\$136,126	\$6,806	\$6,806	\$4,084	\$4,084	\$13,613	\$171,518
Madagascar	54	\$166,951	\$8,348	\$8,348	\$5,009	\$5,009	\$16,695	\$210,359
Malawi	23	\$72,852	\$3,643	\$3,643	\$2,186	\$2,186	\$7,285	\$91,794
Mali	87	\$272,407	\$13,620	\$13,620	\$8,172	\$8,172	\$27,241	\$343,233
Mauritania	33	\$104,458	\$5,223	\$5,223	\$3,134	\$3,134	\$10,446	\$131,617
Mongolia	10	\$30,264	\$1,513	\$1,513	\$908	\$908	\$3,026	\$38,133

	<b>Volume Oil to be Fortified</b>	<b>Cost of Vitamin A Fortificant Premix</b>	<b>Production Costs</b>		<b>Government Costs</b>			<b>Total Estimated Annual Cost</b>
	FAO FBS 2001 Nat Food Use (2001)	Added @ 60 IU/gr Retinol Palmitate	Annualized Capital Costs Over 10 yrs	Quality Control & In-Plant Administrative	Regulation Enforcement Food Control	Nutrition Surveillance Monitoring	Social Marketing, Advocacy & Public Education	
			As Percentage of Vitamin A Fortificant Premix Costs					
	000 MT	\$3.12/MT Oil	@ 5%		@ 3%		@ 10%	
Morocco	332	\$1,036,121	\$51,806	\$51,806	\$31,084	\$31,084	\$103,612	\$1,305,512
Mozambique	142	\$444,070	\$22,203	\$22,203	\$13,322	\$13,322	\$44,407	\$559,528
Myanmar	418	\$1,304,035	\$65,202	\$65,202	\$39,121	\$39,121	\$130,404	\$1,643,084
Namibia	6	\$18,970	\$948	\$948	\$569	\$569	\$1,897	\$23,902
Nepal	136	\$425,225	\$21,261	\$21,261	\$12,757	\$12,757	\$42,522	\$535,783
Nicaragua	50	\$157,030	\$7,851	\$7,851	\$4,711	\$4,711	\$15,703	\$197,857
Niger	45	\$139,402	\$6,970	\$6,970	\$4,182	\$4,182	\$13,940	\$175,646
Nigeria	1,629	\$5,081,014	\$254,051	\$254,051	\$152,430	\$152,430	\$508,101	\$6,402,077
Pakistan	1,658	\$5,171,993	\$258,600	\$258,600	\$155,160	\$155,160	\$517,199	\$6,516,711
Papua	27	\$84,864	\$4,243	\$4,243	\$2,546	\$2,546	\$8,486	\$106,929
Paraguay	86	\$269,662	\$13,483	\$13,483	\$8,090	\$8,090	\$26,966	\$339,774
Peru	162	\$506,095	\$25,305	\$25,305	\$15,183	\$15,183	\$50,610	\$637,680
Philippines	388	\$1,211,902	\$60,595	\$60,595	\$36,357	\$36,357	\$121,190	\$1,526,996
Rwanda	15	\$47,736	\$2,387	\$2,387	\$1,432	\$1,432	\$4,774	\$60,147
Senegal	153	\$475,862	\$23,793	\$23,793	\$14,276	\$14,276	\$47,586	\$599,587
Sierra Leone	57	\$177,122	\$8,856	\$8,856	\$5,314	\$5,314	\$17,712	\$223,174
South Africa	636	\$1,984,726	\$99,236	\$99,236	\$59,542	\$59,542	\$198,473	\$2,500,754
Swaziland	5	\$14,102	\$705	\$705	\$423	\$423	\$1,410	\$17,769
Syrian	323	\$1,007,698	\$50,385	\$50,385	\$30,231	\$30,231	\$100,770	\$1,269,699
Tajikistan	44	\$137,873	\$6,894	\$6,894	\$4,136	\$4,136	\$13,787	\$173,720
Thailand	370	\$1,154,868	\$57,743	\$57,743	\$34,646	\$34,646	\$115,487	\$1,455,134
Togo	43	\$135,096	\$6,755	\$6,755	\$4,053	\$4,053	\$13,510	\$170,221
Turkey	1,239	\$3,864,713	\$193,236	\$193,236	\$115,941	\$115,941	\$386,471	\$4,869,538

	Volume Oil to be Fortified	Cost of Vitamin A Fortificant Premix	Production Costs		Government Costs			Total Estimated Annual Cost
			Annualized Capital Costs Over 10 yrs	Quality Control & In-Plant Administrative	Regulation Enforcement Food Control	Nutrition Surveillance Monitoring	Social Marketing, Advocacy & Public Education	
			As Percentage of Vitamin A Fortificant Premix Costs					
	000 MT	\$3.12/MT Oil	@ 5%		@ 3%		@ 10%	
Turkmenistan	55	\$172,130	\$8,607	\$8,607	\$5,164	\$5,164	\$17,213	\$216,884
Uganda	31	\$95,441	\$4,772	\$4,772	\$2,863	\$2,863	\$9,544	\$120,255
Uzbekistan	229	\$714,574	\$35,729	\$35,729	\$21,437	\$21,437	\$71,457	\$900,363
Venezuela	296	\$922,709	\$46,135	\$46,135	\$27,681	\$27,681	\$92,271	\$1,162,613
Viet Nam	185	\$577,231	\$28,862	\$28,862	\$17,317	\$17,317	\$57,723	\$727,311
Yemen	111	\$344,760	\$17,238	\$17,238	\$10,343	\$10,343	\$34,476	\$434,398
Zambia	53	\$164,455	\$8,223	\$8,223	\$4,934	\$4,934	\$16,446	\$207,214
Zimbabwe	133	\$415,740	\$20,787	\$20,787	\$12,472	\$12,472	\$41,574	\$523,832
<b>Total Cost</b>								<b>\$70,429,020</b>

## Projected Impact for Fortification of Vegetable Oil with Vitamin A in 75 Countries included in Damage Assessment Reports

75 Countries in DAR	Average Oil Consumption		Average Vitamin A Added to Diet		Population Weighting	
	FAO Food Balance Sheets 2001		Added @ 60 IU/gr w/ 60% Retention	% Added Vitamin A Needs @ WHO Safe Level	National Population	Index: Pop x % needs
	kg/yr	g/dy	IU/dy	% 2000 IU	'000,000	#
Angola	7.96	21.8	785	39%	12.386	4.86
Armenia	3.87	10.6	382	19%	3.112	0.59
Azerbaijan,	2.33	6.4	230	11%	8.157	0.94
Bangladesh	6.39	17.5	630	32%	137.952	43.47
Benin	4.74	13.0	468	23%	6.222	1.45
Bolivia	5.53	15.2	545	27%	8.317	2.27
Botswana	7.19	19.7	709	35%	1.725	0.61
Brazil	13.31	36.5	1313	66%	171.796	112.76
Burkina Faso	5.55	15.2	547	27%	11.905	3.26
Burundi	0.69	1.9	68	3%	6.267	0.21
Cambodia	2.97	8.1	293	15%	13.147	1.93
Cameroon	6.88	18.8	679	34%	15.117	5.13
CAR	11.09	30.4	1094	55%	3.715	2.03
Chad	5.95	16.3	587	29%	7.861	2.31
Congo, Dem Rep	12.48	34.2	1231	62%	3.447	2.12
Congo, Rep of	4.38	12.0	432	22%	48.571	10.49
Dominican Rep	17.73	48.6	1749	87%	8.353	7.30
Egypt	6.53	17.9	644	32%	67.784	21.83
El Salvador	5.77	15.8	569	28%	6.209	1.77
Eritrea	7.74	21.2	763	38%	3.712	1.42
Ethiopia	1.84	5.0	181	9%	65.59	5.95
Gabon	9.24	25.3	911	46%	1.258	0.57

## Projected Impact for Fortification of Vegetable Oil with Vitamin A in 75 Countries included in Damage Assessment Reports

75 Countries in DAR	Average Oil Consumption		Average Vitamin A Added to Diet		Population Weighting	
	FAO Food Balance Sheets 2001		Added @ 60 IU/gr w/ 60% Retention	% Added Vitamin A Needs @ WHO Safe Level	National Population	Index: Pop x % needs
	kg/yr	g/dy	IU/dy	% 2000 IU	'000,000	
Gambia	4.31	11.8	425	21%	1.312	0.28
Georgia	21.2	58.1	2091	105%	5.262	5.50
Ghana	5.74	15.7	566	28%	19.593	5.55
Guatemala	7.07	19.4	697	35%	11.423	3.98
Guinea	13.37	36.6	1319	66%	8.117	5.35
Guinea-Bissau	12.74	34.9	1257	63%	1.367	0.86
Haiti	7.26	19.9	716	36%	8.005	2.87
Honduras	10.59	29.0	1044	52%	6.457	3.37
Indonesia	10.45	28.6	1031	52%	211.559	109.03
Iran	8.53	23.4	841	42%	66.443	27.95
Kazakhstan	8.21	22.5	810	40%	15.64	6.33
Kenya	7.3	20.0	720	36%	30.549	11.00
Kyrgyzstan	3.45	9.5	340	17%	4.921	0.84
Laos	1.35	3.7	133	7%	5.279	0.35
Lebanon	18.26	50.0	1801	90%	3.478	3.13
Lesotho	2.52	6.9	249	12%	1.785	0.22
Liberia	14.04	38.5	1385	69%	2.943	2.04
Madagascar	3.26	8.9	322	16%	15.97	2.57
Malawi	2.02	5.5	199	10%	11.37	1.13
Mali	7.48	20.5	738	37%	11.904	4.39
Mauritania	12.19	33.4	1202	60%	2.645	1.59
Mongolia	3.79	10.4	374	19%	2.5	0.47
Morocco	10.91	29.9	1076	54%	29.108	15.66

75 Countries in DAR	Average Oil Consumption		Average Vitamin A Added to Diet		Population Weighting	
	FAO Food Balance Sheets 2001		Added @ 60 IU/gr w/ 60% Retention	% Added Vitamin A Needs @ WHO Safe Level	National Population	Index: Pop x % needs
	kg/yr	g/dy	IU/dy	% 2000 IU	'000,000	
Mozambique	7.63	20.9	753	38%	17.861	6.72
Myanmar	8.64	23.7	852	43%	47.544	20.26
Namibia	3.4	9.3	335	17%	1.894	0.32
Nepal	5.78	15.8	570	29%	23.518	6.70
Nicaragua	9.66	26.5	953	48%	5.073	2.42
Niger	3.98	10.9	393	20%	10.742	2.11
Nigeria	13.93	38.2	1374	69%	114.746	78.83
Pakistan	11.43	31.3	1127	56%	142.654	80.41
Papua New Guinea	5.53	15.2	545	27%	5.334	1.45
Paraguay	15.33	42.0	1512	76%	5.47	4.14
Peru	6.22	17.0	613	31%	25.952	7.96
Philippines	5.04	13.8	497	25%	75.711	18.82
Rwanda	1.92	5.3	189	9%	7.724	0.73
Senegal	15.79	43.3	1557	78%	9.393	7.31
Sierra Leone	12.38	33.9	1221	61%	4.415	2.70
South Africa	14.53	39.8	1433	72%	44	31.53
Swaziland	4.82	13.2	475	24%	1.044	0.25
Syria	19.45	53.3	1918	96%	16.56	15.88
Tajikistan	7.2	19.7	710	36%	6.089	2.16
Thailand	5.82	15.9	574	29%	60.925	17.49
Togo	9.3	25.5	917	46%	4.562	2.09
Turkey	18.32	50.2	1807	90%	68.281	61.69
Turkmenistan	11.41	31.3	1125	56%	4.643	2.61

75 Countries in DAR	Average Oil Consumption		Average Vitamin A Added to Diet		Population Weighting	
	kg/yr	g/dy	Added @ 60 IU/gr w/ 60% Retention IU/dy	% Added Vitamin A Needs @ WHO Safe Level % 2000 IU	National Population '000,000	Index: Pop x % needs
Uganda	1.27	3.5	125	6%	23.487	1.47
Uzbekistan	9.07	24.8	895	45%	24.913	11.14
Venezuela	12.01	32.9	1185	59%	24.277	14.38
Viet Nam	2.34	6.4	231	12%	78.137	9.02
Yemen	5.78	15.8	570	29%	18.017	5.14
Zambia	4.95	13.6	488	24%	10.419	2.54
Zimbabwe	10.37	28.4	1023	51%	12.65	6.47
<b>75 Country Average for % Vitamin A Needs Delivered</b>				<b>40%</b>		
<b>Population Weighted Average for % Vitamin A Needs Delivered</b>						<b>43.92%</b>

## Projected Reductions in Child Mortality after Oil Fortification with Vitamin A

	Baseline: (DAR 2003)	Improved Scenario after Oil Fortification		Baseline: (DAR 2003)	Improved Scenario after Oil Fortification		Baseline: (DAR 2003)	Improved Scenario after Oil Fortification
	Annual U5 Child Deaths Due to VAD	U5 Child Deaths Due to 20% Reduction		Annual U5 Child Deaths Due to VAD	U5 Child Deaths Due to 20% Reduction		Annual U5 Child Deaths Due to VAD	U5 Child Deaths Due to 20% Reduction
Angola	33983	6797	Guinea	9552	1910	Pakistan	55980	11196
Armenia	26	5	Guinea-Bissau	1770	354	Papua NGuinea	1676	335
Azerbaijan	1115	223	Haiti	3182	636	Paraguay	145	29
Bangladesh	28231	5646	Honduras	290	58	Peru	1099	220
Benin	8815	1763	Indonesia	14191	2838	Philippines	4486	897
Bolivia	1200	240	Iran	3060	612	Rwanda	9410	1882
Botswana	520	104	Kazakhstan	982	196	Senegal	9484	1897
Brazil	4224	845	Kenya	23412	4682	Sierra Leone	13226	2645
Burkina Faso	19944	3989	Kyrgyzstan	296	59	South Africa	5856	1171
Burundi	8475	1695	Laos.	1850	370	Swaziland	632	126
Cambodia	8074	1615	Lebanon	90	18	Syria	679	136
Cameroon	10530	2106	Lesotho	1102	220	Tajikistan	579	116
CAR	5042	1008	Liberia	5005	1001	Thailand	1384	277
Chad	12665	2533	Madagascar	13538	2708	Togo	3240	648
Congo DR	1589	318	Malawi	15790	3158	Turkey	2631	526
Congo, Rep.	76210	15242	Mali	23759	4752	Turkmenistan	560	112
Dominican Rep.	365	73	Mauritania	1420	284	Uganda	28922	5784
Egypt	4442	888	Mongolia	320	64	Uzbekistan	3716	743
El Salvador	245	49	Morocco	1769	354	Venezuela	315	63
Eritrea	1747	349	Mozambique	14342	2868	Viet Nam	1960	392
Ethiopia	50845	10169	Myanmar	13149	2630	Yemen	10388	2078
Gabon	450	90	Namibia	522	104	Zambia	18977	3795
Gambia	1008	202	Nepal	6880	1376	Zimbabwe	4893	979
Georgia	43	9	Nicaragua	163	33	<b>TOTAL</b>	<b>771,466</b>	<b>154,293</b>
Ghana	11774	2355	Niger	25940	5188			

Guatemala	1444	289	Nigeria	115849	23170