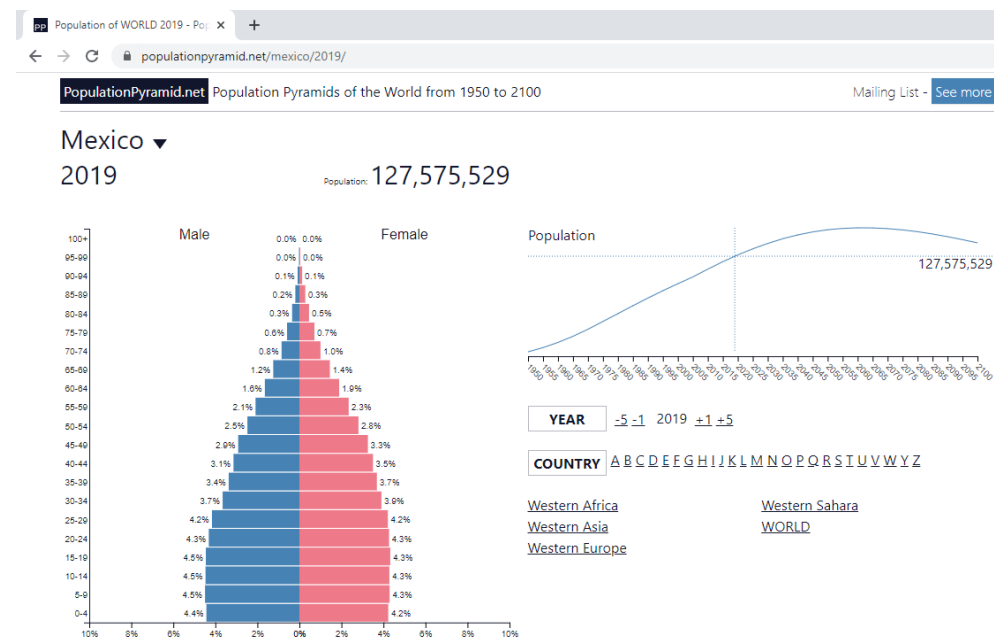
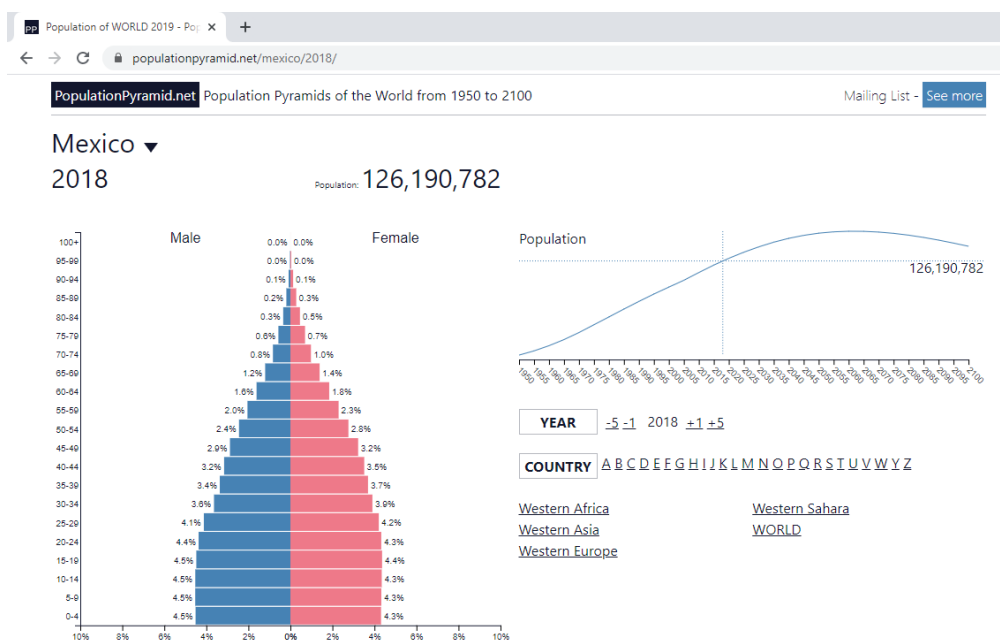


Vitamin A Intake in Mexico Calculations - Collaboration with Ohio State University iGEM team

To analyze the potential impact of introducing GMO maize as a form to enrich the population's intake of vitamin A, we followed the Ohio State University iGEM team's procedure [1].

Step 1. Consult the population breakdown in Mexico and determine the percentages corresponding to each one of them.



Mexican Population's Age Breakdown in 2018 and 2019				
Age breakdown	2018 percentage	2018 total number	2019 percentage	2019 total number
0-6 months	1.1%	1,388,098.60	1.075%	1,371,436.94
7-12 months	1.1%	1,388,098.60	1.075%	1,371,436.96
1-3 years	4.4%	5,552,394.41	4.3%	5,458,747.75
4-8 years	8.8%	11,104,788.82	8.75%	11,162,858.79
9-13 years	8.8%	11,104,788.82	8.8%	11,226,646.55
14+ male	36.425%	45,964,992.34	36.625%	46,724,537.50
14+ female	38.875%	49,056,666.50	39.275%	50,105,289.01

Step 2. Have in mind recommended intake values of vitamin A

Recommended Vitamin A Intake according to Age Group	
Age	Recommended intake
0-6 months	400 mcg
7-12 months	500 mcg
1-3 years	300 mcg
4-8 years	400 mcg
9-13 years	600 mcg
14+ male	900 mcg

14+ female	700 mcg
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*Note: We used the values investigated and reported by the Ohio State University.

Step 3. Estimation of the total mcg of vitamin A to be consumed daily in Mexico

Vitamin A Intake in Mexico in 2018			
Age breakdown	Necessary mcg daily vitamin A consumption	2018 total estimated population	Total mcg of vitamin A to be consumed daily in 2018
0-6 months	400 mcg	1,388,098.60	555,239,440.00
7-12 months	500 mcg	1,388,098.60	694,049,300.00
1-3 years	300 mcg	5,552,394.41	1,665,718,323.00
4-8 years	400 mcg	11,104,788.82	4,441,915,528.00
9-13 years	600 mcg	11,104,788.82	6,662,873,292.00
14+ male	900 mcg	45,964,992.34	41,368,493,106.00
14+ female	700 mcg	49,056,666.50	34,339,666,550.00
Total			89,727,955,539
Total a year			32,750,703,771,735

Vitamin A Intake in Mexico in 2019			
Age breakdown	Necessary mcg daily vitamin A consumption	2019 total estimated population	Total mcg of vitamin A to be consumed daily in 2019
0-6 months	400 mcg	1,371,436.94	548,574,776
7-12 months	500 mcg	1,371,436.96	685,718,480
1-3 years	300 mcg	5,458,747.75	1,637,624,325
4-8 years	400 mcg	11,162,858.79	4,465,143,516
9-13 years	600 mcg	11,226,646.55	6,735,987,930
14+ male	900 mcg	46,724,537.50	42,052,083,750
14+ female	700 mcg	50,105,289.01	35,073,702,307

Total			91,198,835,084
Total a year			33,287,574,805,660

Step 4. Algebraic conversions

Considering that in 2018 27.2 million tons of maize were produced and that in 2019 an estimated of 28.2 million tons were produced [2], the following procedure was made:

- a) **Calculation of the mcg of vitamin A consumed from non-GMO maize per person per day in Mexico in 2018**

27,200,000,000,000 g of maize	11 mcg vit A	1 year	8,197,260,273.97 mcg vitA per day
1 year	100 g of maize	365 days	

8,197,260,273.97 mcg vitA per day nationwide	64.96 mcg of vit A per day per person in Mexico in 2018 if non-GMO maize was consumed
126,190,782 total people in Mexico	

- b) **Estimation of the mcg of vitamin A consumed from GMO maize per person per day in Mexico in 2018**

27,200,000,000,000 g of maize	5 mcg vit A*	1 year	372,602,739,726.03 mcg vitA per day if consuming GMO maize
1 year	1 g of maize*	365 days	

*Note: The new conversion factor as established by the Ohio State iGEM team.

372,602,739,726.03 mcg vitA per day nationwide	2,952.69 mcg of vit A per day per person in Mexico in 2018 if GMO maize was consumed
126,190,782 total people in Mexico	

- c) **Calculation of the mcg of vitamin A consumed from non-GMO maize per person per day in Mexico in 2019**

28,200,000,000,000 g of maize	11 mcg vit A	1 year	8,498,630,136.99 mcg vitA per day
1 year	100 g of maize	365 days	

8,498,630,136.99 mcg vitA per day nationwide	66.62 mcg of vit A per day per person in Mexico in 2019 if non-GMO maize was consumed
127,575,529 total people in Mexico	

d) Estimation of the mcg of vitamin A consumed from GMO maize per person per day in Mexico in 2019

28,200,000,000,000 g of maize	5 mcg vit A*	1 year	386,301,369,863.01 mcg vitA per day if consuming GMO maize
1 year	1 g of maize*	365 days	

386,301,369,863.01 mcg vitA per day nationwide	3,028.02 mcg of vit A per day per person in Mexico in 2019 if GMO maize was consumed
127,575,529 total people in Mexico	

Step 5. Calculation of the estimated surplus or deficit in vitamin A consumption in Mexico in 2018-2019

Estimated deficit in consumption of vitamin A in Mexico in 2018 if non-GMO maize was consumed

Actual consumption - Expected consumption

2,992,000,000,000 actual mcg vitA - 32,750,703,771,735 expected mcg vitA

-29,758,703,771,735 difference in total mcg vitA

-29,758,703,771,735 difference in total mcg vitA/365 days

-81,530,695,265.03 difference in total mcg vitA consumed per day/126,190,782 total people
in Mexico

-646.09 deficit in vitamin A consumption per person per day in Mexico in 2018

**Estimated surplus in consumption of vitamin A in Mexico in 2018 if GMO maize was
consumed**

Actual consumption - Expected consumption

136,000,000,000,000 actual mcg vitA - 32,750,703,771,735 expected mcg vitA

103,249,296,228,265 difference in total mcg vitA

103,249,296,228,265 difference in total mcg vitA/365 days

282,874,784,187.04 difference in total mcg vitA consumed per day/126,190,782 total
people in Mexico

2,241.64 surplus in vitamin A consumption per person per day in Mexico in 2018

**Estimated deficit in consumption of vitamin A in Mexico in 2019 if non-GMO maize was
consumed**

Actual consumption - Expected consumption

3,102,000,000,000 actual mcg vitA - 33,287,574,805,660 expected mcg vitA

-30,185,574,805,660 difference in total mcg vitA

-30,185,574,805,660 difference in total mcg vitA/365 days

-82,700,204,947.01 difference in total mcg vitA consumed per day/127,575,529 total people
in Mexico

-648.25 deficit in vitamin A consumption per person per day in Mexico in 2019

**Estimated surplus in consumption of vitamin A in Mexico in 2019 if GMO maize was
consumed**

Actual consumption - Expected consumption

141,000,000,000,000 actual mcg vitA - 33,287,574,805,660 expected mcg vitA

107,712,425,194,340 difference in total mcg vitA

107,712,425,194,340 difference in total mcg vitA/365 days

295,102,534,779.01 difference in total mcg vitA consumed per day/127,575,529 total people in Mexico

2,312.94 surplus in vitamin A consumption per person per day in Mexico in 2019

Conclusion

As it can be observed, there is a clear surplus in vitamin A consumption if GMO maize was to be used. Using this GMO crop can help in fighting malnutrition problems, in this case vitamin A intake, throughout national territory. Therefore, the misconception around genetically modified organisms and biotechnology as a whole in Mexico should change for the legislations and population to embrace these beneficial technologies.

References

- [1] Ohio State University iGEM team. (2020). Hp Modelig Steps. Retrieved from: <https://2020.igem.org/Team:OhioState/Model>
- [2] Dirección de Investigación y Evaluación Económica y Sectorial. (2019). Maíz 2019 [Archivo PDF]. Fideicomisos Instituidos en Relación con la Agricultura. Recuperado de: <https://www.inforural.com.mx/wp-content/uploads/2019/11/Panorama-Agroalimentario-Ma%C3%ADz-2019.pdf>