



# Simulating Amerindian Admixture in U.S. Caucasians and African-Americans

E. Valaitis<sup>1</sup> and L. Martin

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<sup>1</sup> Dr. Eduardas Valaitis received his Doctorate in Statistics from Yale University, CT and is currently an Assistant Professor in the Department of Mathematics and Statistics at American University, DC.



## Introduction

This study measures the effect of various proportions of Northeast Amerindian admixture in U.S. Caucasian and African-American populations on: (1) the distribution of primary world region affiliations within admixed populations; and (2) the distribution of match scores within admixed populations. The results of these simulated mixtures provide a fuller context in which individual DNA Tribes match scores can be evaluated for evidence of Native American genetic ancestry.

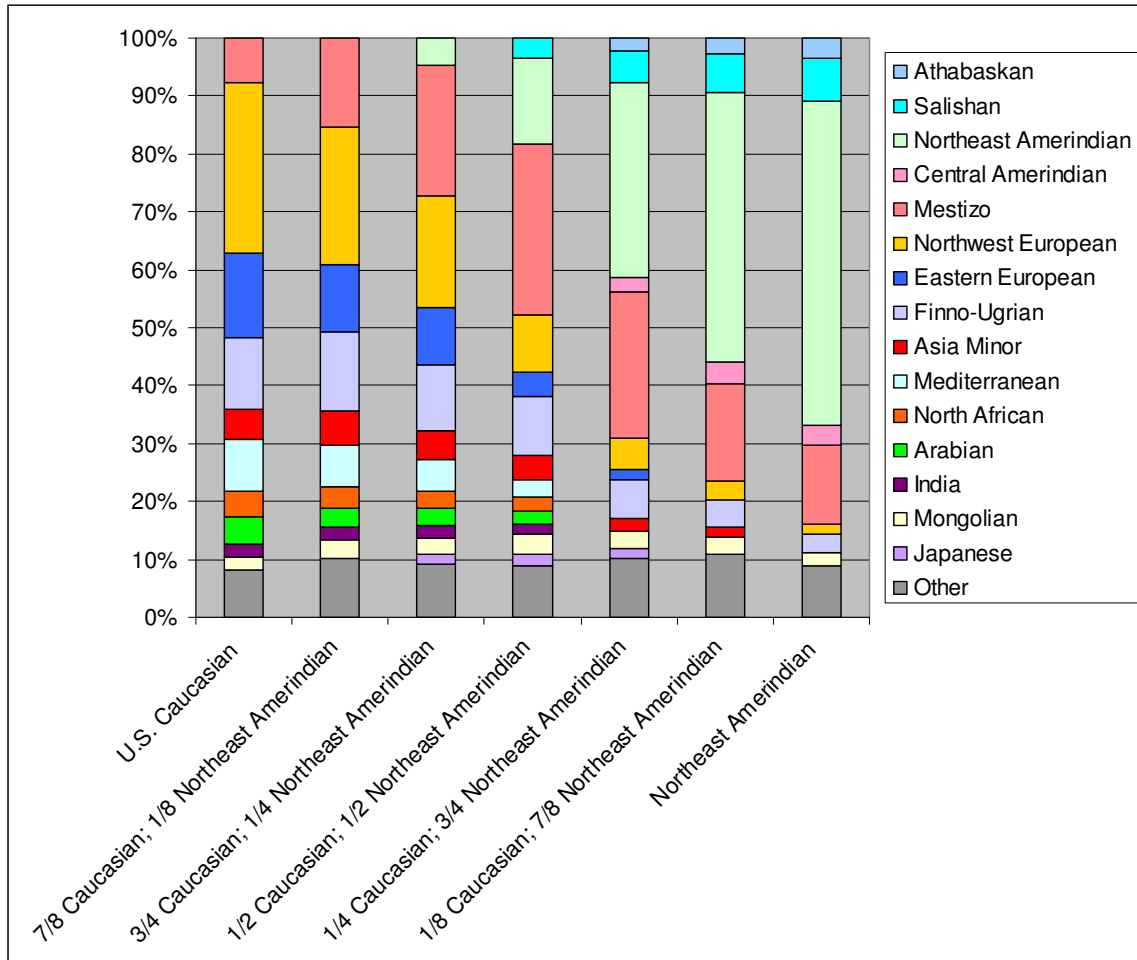
Reference populations are U.S. Caucasian and African-American population samples as well as Northeastern Amerindians reflecting Saskatchewan Cree, Ontario Ojibwa and general Minnesota Native American population samples. These populations are chosen to represent major North American racial groups as they actually exist today, including low levels of genetic admixture. This choice of reference samples is designed to simulate real world descendants of admixed North Americans and identify what range of match scores and world region affiliations can be expected.

## Part 1: World Region Composition of Simulated Admixtures

***Method:** U.S. Caucasian, African-American and Northeast Amerindian reference populations were used to simulate admixed populations of varying proportions of Northeastern Amerindian ancestry. For each admixed population, simulated allele frequency data was used to generate 4,000 individual genetic profiles. Each simulated profile was processed by the DNA Tribes algorithm, which measured the simulated individual's occurrence frequency in each world region. The strongest regional match was then identified for each individual. These primary matches were then tallied for all simulated profiles to produce regional affiliation proportions. When all world regions scored below 1.0, the primary affiliation was listed as "Generic Human."*

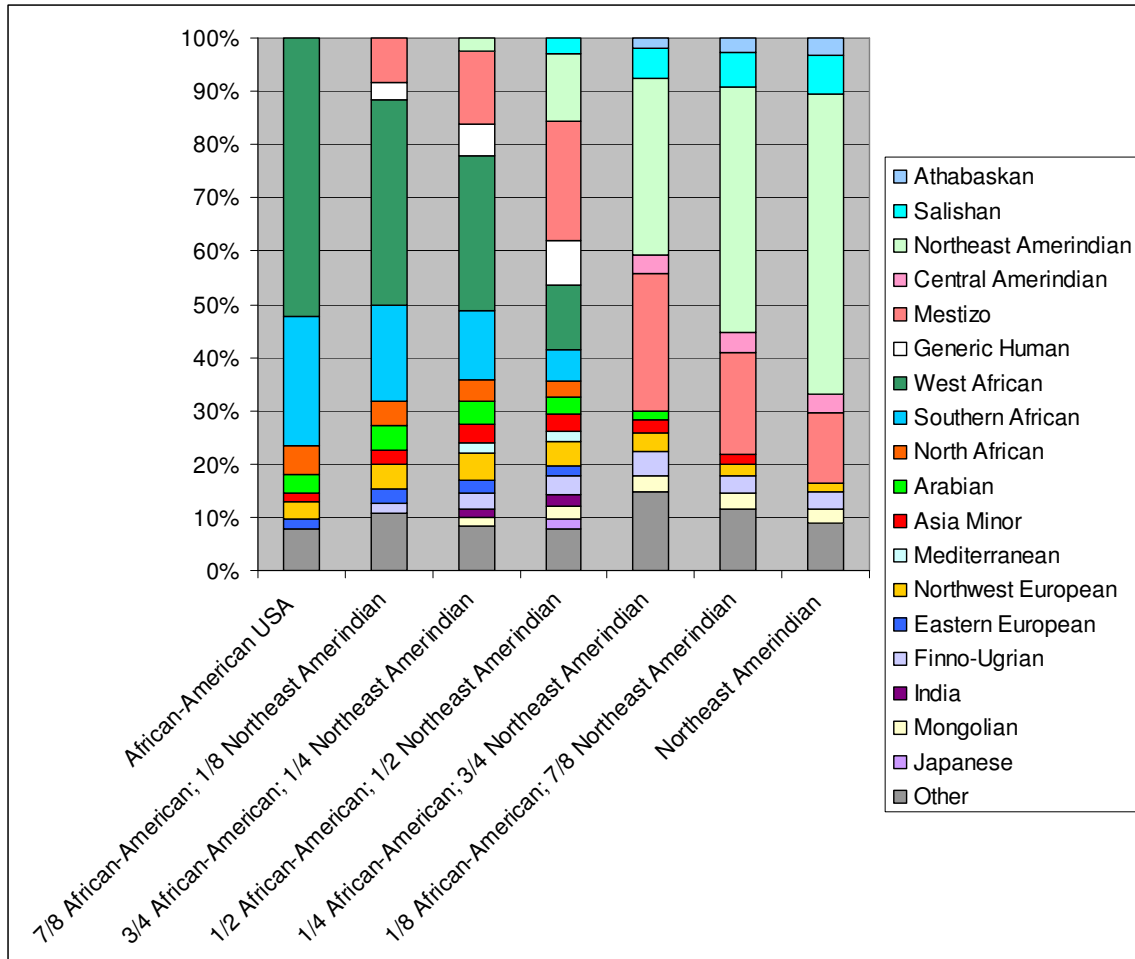
**Results:** World region affiliations by percentile are listed below for each reference population. Comparative results for major world regions are then listed to illustrate the impact of various portions of Northeast Amerindian admixture on these reference populations. Each population is represented by a graph colored according to its world region affiliations. For instance, on the next page, approximately 29% of individuals who are half Caucasian and half Northeast Amerindian belong primarily to the Mestizo world region.

**World Region Composition of Admixed U.S. Caucasian Populations**



**Comments:** Higher proportions of Northeast Amerindian admixture correspond to higher percentages of individuals affiliated with Amerindian and Mestizo world regions, and lower percentages of individuals affiliated with European and Near Eastern world regions.

## World Region Composition of Admixed African-American Populations



**Comments:** Higher proportions of Northeast Amerindian admixture correspond to higher percentages of individuals affiliated with Amerindian and Mestizo world regions, and lower percentages of individuals affiliated with African world regions. Simulated populations composed of one eighth, one quarter and one half Northeast Amerindian include significant percentages of individuals whose world region scores fall below 1.0, listed as “Generic Human.” When all world region scores fall below 1.0, this indicates an individual’s ancestry is more typical of the world in general than of any world region.



## Part 2: World Region Score Ranges for Reference Populations and Simulated Admixtures

**Method:** U.S. Caucasian, African-American and Northeast Amerindian reference populations were used to simulate admixed populations of varying proportions of Northeastern Amerindian ancestry. For each admixed population, simulated allele frequency data was used to generate 4,000 individual genetic profiles. Each simulated profile was processed by the DNA Tribes algorithm, which measured the simulated individual's occurrence frequency in each world region. The distribution of world region match scores within each simulated population was then compiled and listed by percentile.

**Results:** World region affiliations by percentile are listed below for each reference population. Comparative results for major world regions are then listed to illustrate the impact of various portions of Northeast Amerindian admixture on these reference populations:

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### How to use these score tables as a reference for your own results

These score tables provide a context for your own DNA Tribes match scores. For instance, if you are a person of predominantly Caucasian ethnicity who obtains a Northeast Amerindian score of 1.50, you can compare this score to the “ordinary” range (25<sup>th</sup> to 75<sup>th</sup> percentiles) for each proportion of admixture on page 11. This score falls within the ordinary range for individuals who are half Caucasian and half Northeast Amerindian. However, this score could also represent a high score (between the 75<sup>th</sup> and 95<sup>th</sup> percentiles) for individuals who 1/4 Northeast Amerindian, or simply a lower score for individuals with a higher proportion of Northeast Amerindian ancestry.



## Score Range for Reference U.S. Caucasians

	5%	25%	50%	75%	95%
	(very low)	(ordinary)	(ordinary)	(ordinary)	(very high)
Northwest European	0.74	3.28	9.86	28.57	134.36
Mediterranean	0.80	3.14	7.98	19.26	69.52
Eastern European	0.35	2.08	6.81	21.84	118.59
Asia Minor	0.72	2.09	4.23	8.59	20.93
Finno-Ugrian	0.22	1.25	4.11	12.99	58.21
Mestizo	0.39	1.18	2.45	4.92	12.41
Arabian	0.11	0.50	1.46	4.33	20.59
North African	0.03	0.27	1.12	3.79	18.64
India	0.12	0.35	0.76	1.65	4.89
Mongolian	0.01	0.09	0.32	0.84	3.81
Central Amerindian	0.00	0.03	0.10	0.38	2.14
Southeast Asian	0.00	0.02	0.08	0.27	1.56
North India	0.00	0.02	0.08	0.23	1.14
Malay Archipelago	0.00	0.02	0.07	0.27	1.67
Japanese	0.00	0.01	0.07	0.29	1.90
Chinese	0.00	0.01	0.04	0.15	0.95
Tibetan	0.00	0.01	0.04	0.15	0.88
India Tribal	0.00	0.01	0.03	0.12	0.81
Northeast Amerindian	0.00	0.00	0.02	0.12	0.99
West African	0.00	0.00	0.02	0.21	3.76
Australian	0.00	0.00	0.02	0.11	1.83
Southern African	0.00	0.00	0.01	0.13	3.23
Salishan	0.00	0.00	0.00	0.01	0.24
Arctic	0.00	0.00	0.00	0.00	0.01
Amazonian	0.00	0.00	0.00	0.00	0.00
Polynesian	0.00	0.00	0.00	0.01	0.39
Athabaskan	0.00	0.00	0.00	0.01	0.13

**Tips on reading percentile scores:** Individuals within each population exhibit a characteristic range of world region scores. These percentiles provide the range of expected scores for individuals within each group.

For instance, half of all U.S. Caucasians obtain a Northwest European score between 3.28 and 28.57, with a median of 9.86. Northwest European scores within this range could be considered ordinary for Caucasian individuals. Only five percent of Caucasians obtain a score either below 0.74 or above 134.36. These could be considered very low and very high scores within this ethnic group, respectively.



## Score Range for Reference African-Americans

	5%	25%	50%	75%	95%
	(very low)	(ordinary)	(ordinary)	(ordinary)	(very high)
West African	0.61	6.88	42.26	274.53	5,696.56
Southern African	0.36	4.30	26.37	165.84	2,817.25
North African	0.01	0.22	1.35	5.10	23.07
Mediterranean	0.01	0.23	1.33	3.87	14.06
Arabian	0.03	0.32	1.32	4.49	22.03
Asia Minor	0.01	0.15	1.08	3.18	10.44
Northwest European	0.01	0.15	0.90	3.27	16.77
Eastern European	0.01	0.10	0.60	2.46	14.04
Mestizo	0.02	0.16	0.54	1.35	4.33
India	0.00	0.03	0.25	0.87	3.02
Finno-Ugrian	0.00	0.04	0.22	0.89	5.72
Australian	0.00	0.01	0.07	0.40	3.94
Mongolian	0.00	0.00	0.03	0.19	0.97
Japanese	0.00	0.00	0.03	0.16	1.31
Tibetan	0.00	0.00	0.02	0.13	0.99
Malay Archipelago	0.00	0.00	0.02	0.12	0.83
Central Amerindian	0.00	0.00	0.02	0.08	0.59
North India	0.00	0.00	0.01	0.08	0.47
Chinese	0.00	0.00	0.01	0.06	0.48
Southeast Asian	0.00	0.00	0.01	0.07	0.51
Polynesian	0.00	0.00	0.00	0.10	3.58
India Tribal	0.00	0.00	0.00	0.03	0.29
Northeast Amerindian	0.00	0.00	0.00	0.02	0.17
Arctic	0.00	0.00	0.00	0.00	0.01
Amazonian	0.00	0.00	0.00	0.00	0.00
Salishan	0.00	0.00	0.00	0.00	0.05
Athabaskan	0.00	0.00	0.00	0.00	0.01



## Score Range for Reference Northeast Amerindians

	5%	25%	50%	75%	95%
	(very low)	(ordinary)	(ordinary)	(ordinary)	(very high)
Northeast Amerindian	0.35	3.47	15.37	77.41	783.47
Mestizo	0.89	2.51	5.08	9.83	24.33
Central Amerindian	0.13	0.74	2.48	7.86	34.88
Salishan	0.01	0.14	1.13	8.25	116.96
Athabaskan	0.00	0.05	0.46	3.50	68.73
Mongolian	0.02	0.10	0.29	0.83	3.50
Finno-Ugrian	0.01	0.05	0.21	0.91	5.98
Asia Minor	0.00	0.00	0.08	0.74	2.95
Southeast Asian	0.00	0.02	0.06	0.20	1.02
Northwest European	0.00	0.00	0.06	0.75	5.11
Chinese	0.00	0.01	0.05	0.17	0.91
Mediterranean	0.00	0.00	0.05	0.60	3.79
Tibetan	0.00	0.01	0.04	0.16	0.92
Japanese	0.00	0.00	0.03	0.23	1.93
India	0.00	0.00	0.03	0.27	1.20
Malay Archipelago	0.00	0.01	0.03	0.11	0.70
Arctic	0.00	0.00	0.03	0.25	4.93
Eastern European	0.00	0.00	0.02	0.28	2.71
Arabian	0.00	0.00	0.01	0.11	1.11
North African	0.00	0.00	0.00	0.05	1.08
North India	0.00	0.00	0.00	0.02	0.11
Australian	0.00	0.00	0.00	0.00	0.10
India Tribal	0.00	0.00	0.00	0.01	0.11
Amazonian	0.00	0.00	0.00	0.05	19.07
West African	0.00	0.00	0.00	0.01	0.19
Polynesian	0.00	0.00	0.00	0.00	0.07
Southern African	0.00	0.00	0.00	0.00	0.13



## Northwest European Score Range for Simulated Admixtures

	5%	25%	50%	75%	95%
	(very low)	(ordinary)	(ordinary)	(ordinary)	(very high)
<b>U.S. Caucasian</b>	0.74	3.28	9.86	28.57	134.36
1/8 Northeast Amerindian	0.03	1.75	5.74	18.67	86.62
1/4 Northeast Amerindian	0.01	0.79	3.28	11.55	58.65
1/2 Northeast Amerindian	0.00	0.06	1.19	4.34	23.30
3/4 Northeast Amerindian	0.00	0.00	0.37	2.00	11.60
7/8 Northeast Amerindian	0.00	0.00	0.13	1.16	7.83
<b>Northwest Amerindian</b>	0.00	0.00	0.06	0.75	5.11
<b>African-American</b>	0.01	0.15	0.90	3.27	16.77
1/8 Northeast Amerindian	0.00	0.08	0.67	2.73	14.55
1/4 Northeast Amerindian	0.00	0.04	0.48	2.12	12.48
1/2 Northeast Amerindian	0.00	0.01	0.28	1.46	9.39
3/4 Northeast Amerindian	0.00	0.00	0.21	1.19	7.05
7/8 Northeast Amerindian	0.00	0.00	0.13	0.88	5.23
<b>Northwest Amerindian</b>	0.00	0.00	0.06	0.75	5.11

**Tips on reading percentile scores:** Individuals within each population exhibit a characteristic range of world region scores. These percentiles provide the range of expected scores for individuals within each group.

For instance, half of all U.S. Caucasians obtain a Northwest European score between 3.28 and 28.57, with a median of 9.86. Northwest European scores within this range could be considered ordinary for Caucasian individuals. Only five percent of Caucasians obtain a score either below 0.74 or above 134.36. These could be considered very low and very high scores within this ethnic group, respectively.

However, half of all individuals who are half U.S. Caucasian and half Northeast Amerindian obtain a Northwest European score between 0.06 and 4.34, with a median of 1.19. Northwest European scores within this range could be considered ordinary for individuals who are half Caucasian and half Northeast Amerindian. Five percent of these mixed individuals obtain a score either below 0.00 or above 23.30. These could be considered very low and very high scores within this admixed population, respectively.



## West African Score Range for Simulated Admixtures

	5%	25%	50%	75%	95%
	(very low)	(ordinary)	(ordinary)	(ordinary)	(very high)
<b>U.S. Caucasian</b>	0.00	0.00	0.02	0.21	3.76
1/8 Northeast Amerindian	0.00	0.00	0.01	0.12	2.16
1/4 Northeast Amerindian	0.00	0.00	0.01	0.09	1.74
1/2 Northeast Amerindian	0.00	0.00	0.00	0.04	0.69
3/4 Northeast Amerindian	0.00	0.00	0.00	0.02	0.48
7/8 Northeast Amerindian	0.00	0.00	0.00	0.01	0.31
<b>Northeast Amerindian</b>	0.00	0.00	0.00	0.01	0.19
<b>African-American</b>	0.61	6.88	42.26	274.53	5,696.56
1/8 Northeast Amerindian	0.02	0.81	7.17	57.87	1,446.40
1/4 Northeast Amerindian	0.00	0.16	1.95	19.06	480.09
1/2 Northeast Amerindian	0.00	0.00	0.08	1.23	32.05
3/4 Northeast Amerindian	0.00	0.00	0.00	0.06	1.33
7/8 Northeast Amerindian	0.00	0.00	0.00	0.02	0.54
<b>Northeast Amerindian</b>	0.00	0.00	0.00	0.01	0.19

**Tips on reading percentile scores:** Individuals within each population exhibit a characteristic range of world region scores. These percentiles provide the range of expected scores for individuals within each group.

For instance, half of all African-Americans obtain a West African score between 6.88 and 274.53, with a median of 42.26. West African scores within this range could be considered ordinary for African-American individuals. Only five percent of African-Americans obtain a score either below 0.61 or above 5,696.56. These could be considered very low and very high scores within this ethnic group, respectively.

However, half of all individuals who are half African-American and half Northeast Amerindian obtain a West African score between 0.00 and 1.23, with a median of 0.08. West African scores within this range could be considered ordinary for individuals who are half African-American and half Northeast Amerindian. Five percent of these mixed individuals obtain a score either below 0.00 or above 32.05. These could be considered very low and very high scores within this admixed population, respectively.



## Northeast Amerindian Score Range for Simulated Admixtures

	5%	25%	50%	75%	95%
	(very low)	(ordinary)	(ordinary)	(ordinary)	(very high)
<b>U.S. Caucasian</b>	0.00	0.00	0.02	0.12	0.99
1/8 Northeast Amerindian	0.00	0.01	0.06	0.29	2.75
1/4 Northeast Amerindian	0.00	0.03	0.14	0.68	7.39
1/2 Northeast Amerindian	0.01	0.11	0.60	3.01	33.19
3/4 Northeast Amerindian	0.06	0.60	2.94	15.69	137.67
7/8 Northeast Amerindian	0.14	1.45	7.48	38.60	402.48
<b>Northeast Amerindian</b>	0.35	3.47	15.37	77.41	783.47
<b>African-American</b>	0.00	0.00	0.00	0.02	0.17
1/8 Northeast Amerindian	0.00	0.00	0.01	0.06	0.84
1/4 Northeast Amerindian	0.00	0.00	0.02	0.15	2.04
1/2 Northeast Amerindian	0.00	0.03	0.20	1.49	19.24
3/4 Northeast Amerindian	0.04	0.46	2.45	12.83	129.01
7/8 Northeast Amerindian	0.12	1.26	6.41	33.92	338.33
<b>Northeast Amerindian</b>	0.35	3.47	15.37	77.41	783.47

**Tips on reading percentile scores:** Individuals within each population exhibit a characteristic range of world region scores. These percentiles provide the range of expected scores for individuals within each group.

For instance, half of all U.S. Caucasians obtain a Northeast Amerindian score between 0.00 and 0.12, with a median of 0.02. Northeast Amerindian scores within this range could be considered ordinary for Caucasian individuals. Only five percent of Caucasians obtain a score either below 0.00 or above 0.99. These could be considered very low and very high scores within this ethnic group, respectively.

However, half of all individuals who are half U.S. Caucasian and half Northeast Amerindian obtain a Northeast Amerindian score between 0.11 and 3.01, with a median of 0.60. Northeast Amerindian scores within this range could be considered ordinary for individuals who are half Caucasian and half Northeast Amerindian. Five percent of these mixed individuals obtain a score either below 0.01 or above 33.19. These could be considered very low and very high scores within this admixed population, respectively.



## Mestizo Score Range for Simulated Admixtures

	5%	25%	50%	75%	95%
	(very low)	(ordinary)	(ordinary)	(ordinary)	(very high)
<b>U.S. Caucasian</b>	0.39	1.18	2.45	4.92	12.41
1/8 Northeast Amerindian	0.44	1.34	2.81	5.54	14.56
1/4 Northeast Amerindian	0.46	1.44	3.01	5.96	14.93
1/2 Northeast Amerindian	0.59	1.69	3.43	6.95	17.24
3/4 Northeast Amerindian	0.72	2.13	4.33	8.38	21.41
7/8 Northeast Amerindian	0.77	2.28	4.62	8.93	23.70
<b>Northeast Amerindian</b>	0.89	2.51	5.08	9.83	24.33
<b>African-American</b>	0.02	0.16	0.54	1.35	4.33
1/8 Northeast Amerindian	0.02	0.23	0.72	1.77	5.79
1/4 Northeast Amerindian	0.03	0.32	0.93	2.31	6.54
1/2 Northeast Amerindian	0.08	0.63	1.65	3.76	10.35
3/4 Northeast Amerindian	0.59	1.71	3.50	6.87	17.37
7/8 Northeast Amerindian	0.68	2.06	4.17	8.06	19.76
<b>Northeast Amerindian</b>	0.89	2.51	5.08	9.83	24.33

**Tips on reading percentile scores:** Individuals within each population exhibit a characteristic range of world region scores. These percentiles provide the range of expected scores for individuals within each group.

For instance, half of all U.S. Caucasians obtain a Mestizo (mixed Native American and European) score between 1.18 and 4.92, with a median of 2.45. Mestizo scores within this range could be considered ordinary for Caucasian individuals. Only five percent of Caucasians obtain a score either below 0.39 or above 12.41. These could be considered very low and very high scores within this ethnic group, respectively.

However, half of all individuals who are half U.S. Caucasian and half Northeast Amerindian obtain a Mestizo score between 1.69 and 6.95, with a median of 3.43. Mestizo scores within this range could be considered ordinary for individuals who are half Caucasian and half Northeast Amerindian. Five percent of these mixed individuals obtain a score either below 0.59 or above 17.24. These could be considered very low and very high scores within this admixed population, respectively.

**Discussion:** Simulated Northeast Amerindian admixture has the effect of raising Northeast Amerindian scores and lowering the primary world region score for each reference population. For instance, increasing proportions of Northeast Amerindian admixture in U.S. Caucasians correspond to higher Northeast Amerindian and Mestizo score ranges, and lower Northwest European score ranges.



## Summary Comments and Conclusion

Northeast Amerindian admixture is expressed as lower and less frequent Northwest European or West African match scores and primary affiliations, and higher and more frequent Northeast Amerindian and Mestizo match scores and primary affiliations. Score ranges for various proportions of admixture overlap with one another, reflecting the variation in genetic outcomes between admixed individuals. This variety of outcomes reflects individual differences in the quantity of genetic material inherited from lineal ancestors as well as the spectrum of genetic affiliations within living North American ethnic groups.