Degree of European Inheritance in Speakers of Indigenous Languages in Mexico

Herencia europea en grupos indígenas en México

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Abstract

This study analyzed 23 markers of the Y-chromosome on 11 groups of contemporary indigenous language speakers from Mexico. In a sample of 503 individuals, we found the proportion of Old-World haplotypes to be 23 %. This percentage is the consequence of the colonizing domain established in the country during the early centuries after the conquest of Mexico by the Spaniards and was accentuated by the nationalist society of the 20th century. Among the different forms of violence that provoked the introgression of Old-World paternal lineages in Mexican indigenous populations, we highlight the violation of women.

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Keywords: Indigenous Mexicans, women discrimination, non-Native-Amerindian heredity, Y-chromosome, STRs.

Resumen

En este estudio analizamos 23 marcadores del cromosoma Y en 11 grupos contemporáneos de hablantes de lenguas indígenas de México. En una muestra de 503 individuos, encontramos una proporción de haplotipos provenientes del Viejo Mundo de 23 %. Este porcentaje es consecuencia del dominio de la colonización establecido en los primeros siglos posteriores a la conquista de México por los españoles el cual fue acentuado por la sociedad nacionalista del siglo xx. Entre las diferentes formas de violencia que provocaron la introgresión de linajes paternos del Viejo Mundo en las poblaciones indígenas mexicanas, resaltamos la violación de las mujeres.

Palabras clave: Indígenas mexicanos, discriminación de mujeres, herencia no amerindia, cromosoma Y, STRs.

Introduction

The short tandem repeats (STRs) of the Y-chromosome are sequences of DNA (2-6 bp) dispersed across the whole human genome. In indigenous Mexicans, STRs have been reported by studies on Mayas, 16 STRs (Perez-Benedico et al. 2016); groups from the North and Northeast, 15 STRs (Rangel-Villalobos et al. 2013), and six groups from Central and Central-North Mexico, 19 STRs and 21 SNPs (Gómez et al. 2021). In their historical and cultural context, here we present data on Old-World ancestry for 11 current indigenous groups from different regions of Mexico. We depart defining indigenous populations from their ancestral belonging and cultural identity. It is the sense of belonging, and not the features and forms of behavior, that configure an original or indigenous population as a differentiated social entity. In the current indigenous legal framework, indigenous subjects will be identified through self-definition and recognition of their social group. However, in Mexico, the National Institute of Statistics and Geography

(Inegi), an official source for the registration of the Mexican population, continues to recognize the original or indigenous population with the linguistic criteria under the term "indigenous language speakers", so we follow this criterion. In this country, there are 68 recognized indigenous languages, with over 364 dialect variants, which are spoken by some 6 695 228 people, approximately 6.6 % of the total population of Mexico (Inegi 2020). The numbers of people speaking different indigenous languages vary widely, from over 500 000 in the cases of Nahuatl, Mayan, Mixtec, Tzotzil, and Tzeltal, to those that are on the verge of extinction, such as Ayapaneko, with a total of 21 speakers in 2010 (INPI 2020).

Geographically, since pre-Columbian times, the country's higher concentrations of native-language speakers, were located in Central, Southern, and South-Eastern Mexico (Gerhard 1986, 1991, 1996; Inegi 2020).

Since their first contact with the New World, Europeans began establishing a population classification system according to its origins (Spanish, black or indigenous, and the mixtures between them), which resulted in more than 16 categories.[1] This system had the purpose of political and economic control by promoting the belief that there were upper and lower castes, with the closer proximity to the Spanish conveying a greater possibility of accessing the dome of the colonial society hierarchy (Aguirre 1991: 49). After the Independence of Mexico, when power transferred from the Spanish to the descendants of Spanish settlers, the new society called criolla (Creoles), accentuated the importance of choosing a partner from one's own social stratum, i.e., the natives were in the lowest stratum and the Spaniards in the highest; the rest of the population were placed according to a scale of "racial whitening". The people of combined European and Indigenous American ancestry were called *mestizos* or admixed people. Thus, the upper classes, constituted by Spaniards and Creoles, discriminated as much against mestizos as against indigenous people, while mestizos discriminated against indigenous people (Castellanos 2000).

[1] Anonymous, *Cuadro de castas*, 18th Century, oil on canvas, 148 x 105 cm, Museo Nacional de Virreinato, Tepotzotlan, <https://lugares.inah.gob.mx/es/museos-inah/museo/museo-piezas/8409-8409-10-241348-cuadro-de-castas.html?lugar_id=475>.

Under the nationalist political project together with the indigenous movement in the 20th century, the miscegenation was privileged, and the idea of a Mexico formed by a "mestizo majority" (París 1999) was accused with the claim that society assumed its identity based on its belonging to the territory. Indigenous communities were perceived as minorities that should be assimilated into the mestizo majority to create a culturally homogeneous nation (*ibid.*). This conception became so strong due to the long duration of the subordination relationships involved, that discriminatory attitudes in Mexican society became embedded in all groups and social strata.

For their part, indigenous women were in the most vulnerable and discriminated position on the social scale. The patriarchal behavior of New Spain (the patronymic identity of colonial Mexico) was undergirded by the perception that the masculine was linked to success, power, and courage, while the feminine and indigenous, on the other hand, were linked to the weak and subordinate (Burín 2000: 131). For indigenous women, these constructs meant, in addition to exploitation and contempt, a higher likelihood of sexual abuse (a pervasive outcome in many colonized societies). Lerner (1986: 80) suggested that such violence could have been used by the conquerors to symbolically castrate the men of the conquered group, with the subjugation and humiliation of their women comprising symbolic capital that the conqueror legitimized by assuming self-superiority.

Segato (2014) points out that, in European values, virility combines sexual access with pornographic gaze and harm; men attributed guilt and dishonor to the natives when they were sexually violated; for example, the nudity of the natives was considered libidinous in contrast to the modesty of European "ladies." Thus, in the process of colonial expansion, the body and sexuality became relevant to the appropriation of the territory. In general, in the New Spanish society, influenced by the medieval patriarchal guidelines of Saint Paul, women's social position was legitimized through submission, and they were segregated based on the perception that they were physically and mentally inferior to men (Suárez 2006). Women were subject to satisfy men, and through "benevolent" sexism, they were persuaded that being fragile was a virtue that involved praising characteristics (considered) exclusive to the feminine, like being sentimental and weak for their docility being guaranteed (Janos and Espinosa 2018). Until recently, women from

the upper and middle classes were expected to pride themselves on having patience with men, being gracious to male attention, devoting themselves totally to their partners (who should be the center of each woman's attention and life), being dependent on men, and constantly making sacrifices to maintain their life-long union (Suárez 2006). Thus, for a woman, the meaning of life, as imposed by the patriarchal vision, focused on satisfying her husband and procreating, thereby consolidating her identity as a woman-wife-mother (Suárez 2006). In this context, native women, whose cultural codes were different, were regarded as illegitimate, and exposed to the abuses of the misogynist societies posterior to the Spanish conquest.

The form and speed of the great miscegenation that occurred in Mexico was generally determined by the social and demographic characteristics of each region and group. In Castañeda (2014) we see, for example, that in the California by approximately 1770, the friar Junípero Serra reported frequent abuses by soldiers in missions and indigenous prisons, but his pleas to political leaders to contain such violence went unheeded. Despite the many Catholic precepts forbidding rape, kidnapping, and adultery, such practices were frequent, committed by both Spaniards and mestizos. These events took place in most of the indigenous settlements and were apparently accentuated in the areas farthest from the control of administrative centers. Some examples were the case in the Yucatán Peninsula, where the Spanish developed a self-sufficient, individualistic, and regionalist society (Gerhard 1991: 13-17), and in the regions of Pochutla and Chole's, where slavery included the execrable practice of *derecho de pernada* (right of the lord, *jus primae noctis*) that, even very recently, landowners kept in force. These violent actions refer to practices of sexual abuse exercised by an authority figure such as a landlord, administrator, political boss, or employer, against women in a dependent condition (e.g., indigenous people, peasants, or workers) (Alejos and Martínez 2007: 18; Rosales 2010: 113). Efforts have been useless to protect the most vulnerable women through legislation.

By the end of the 18th century, the contempt for women had worsened, with them now being valued only for their reproductive capacity; a woman's honor was institutionalized depending on her sexual accessibility; women were expected to be virgins before marriage and faithful to their husbands to ensure a legitimate heir (Lerner 1986: 80).

They were forcefully labeled: those who were considered worthy were married or remained virgins, while the native women represented immorality by being associated with otherness: evil, corrupt sexuality, inferiority, and uselessness, which justified their treatment as property, without rights or protection available to any man. In the words of Segato (2014), women went from living in a low-impact patriarchy before the conquest of Mexico to a high-impact and violent one after the conquest.

In pre-Hispanic times, the predominant worldview among indigenous Mexican groups was one of duality, where opposites complemented with the feminine and the masculine constituting an indissoluble whole (López-Austin 1989: 58-59). Jáuregui (2003) analyzed how the pre-Hispanic model of the cosmos –schematized into the four cardinal directions and a center point– expresses a hierarchical dualism that extends across several sets of relationships: East-North/West-South, day/night, dry/rainy seasons, sun/moon, sky/earth, hot/cold, right/left, each dualism contains a corresponding male and female. Further, in ritual practices, the light forces, such as the sun, dryness, heat, etc., associated with the masculine, were perceived as superior, whilst the dark ones were associated with the feminine and perceived as inferior. This symbolism implies a powerful social mechanism that allows to reproduce the hierarchical forms in communal coexistence. Similarly, Neurath (1998: 70, 320, 392), based on Bloch (1986), explained that these societies considered the violent acts of sacrifice and copulation to represent the triumph of the sun. Neurath alludes to this Mesoamerican symbolism in his analysis of the Huichol ceremonial dance during the planting festival. In such acts, there is a hierarchical synthesis of opposites that underpins the internal system of authority. The up/down axis associated with these acts differentiates the higher-ranking group of shamans, elders, and men of knowledge from the lower-ranking group of youths and women (Neurath 1998: 337). Literature shows that, in Mesoamerican society, men held the most important positions, while a small number of women held some power (*ibid.*).

The relations between genders were deeply asymmetric, as the women were prevented from engaging in jobs and activities

that implied autonomy, prestige, authority, wealth, or power (Rodríguez 2006). However, the intergender inequalities were not as stark as those established under the patriarchy of the Spanish regime (Olivera 2003: 211, 216-217). On the other hand, regardless of how these women conceived their own freedom to choose a partner, many accepted husbands assigned to them by authorities who aimed to establish alliances with other groups. Following Olivera, it can be surmised that it was not difficult for such women to continue this old tradition under the direction of new conquerors.

After the first contact and war-like confrontations with the Spanish, the rulers of Tabasco and Tlaxcala eventually agreed on an alliance with the Spanish, and assisted their attack on the Aztecs, for which they offered military support, supplies, and women (Díaz del Castillo 1939: 141-143, 237, 262-267). Paleta (2006) points out that once the conquest was consolidated, Mesoamerican women were converted into dependent subjects regarded as having a perverse nature that they had to get rid of, ceasing to have a role as the complementary element in the dual deities of the ancient worldview. In this regard, Bourdieu (2000: 23-24) states that the social and cultural expropriation of the female body has been a mechanism used to guarantee the continuity of the groups through procreation and parenting for the biological reality serving as an argument in the different worldviews to establish the relationship of domination of men over women.

In demographic terms, there were few women who arrived from Europe at the time of the viceroyalty (Boyd-Bowman 1976; McCaa 2000; González-Sobrino et al. 2016; Silva-Zolezzi et al. 2009), so the first intermingling of cultures resulted from negotiations between native men belonging to the nobility and conquerors to facilitate the new administration.

The ethno-social mobilization of the native women was intense, and many of them joined the groups who held power. Spanish men who married the young heiresses to lands or chiefdoms of pre-Hispanic nobility benefited from laws that allocated a wife's inheritance to her husband (Gonzalbo 1994: 107). However, noble or not, many native women nevertheless decided to separate from their parents or husbands to live with the Spanish, adopt the new religion, and become pregnant (Díaz del Castillo 1939). The indigenous women, accustomed

to traditions where mixed marriages implied political alliances, did not regard living temporarily or indefinitely out of marriage as an issue, and it was in this way that miscegenation occurred among conquered native women and conquering Spanish men. The situation changed when the colony was more consolidated. The mestizos relegated to the dominated group, and the colonizers began to form closed circles of friendship, labor, and power characterized by social distancing from the majority. This group comprised indigenous people, mestizos, Africans, and Asians (Aguirre Beltrán 1991: 49).

In the colonial society prejudices and moralism in regard with sexual relations and marriage prevailed, but in the practice, that meant free rein to prostitution and abuse. The native women were always most vulnerable, while the European, and some mestizo women, integrated into the power-holding groups, remained protected from and practically inaccessible to indigenous men and impoverished mestizos. Many women from the poor population were taken as concubines by the power-holding groups, causing women from the empowered strata –in defense of their legitimacy and that of their children– to join the oppression against other women.

Markers of the Y-chromosome and the migrations

Genetic diversity in populations is highly influenced by the behaviors of migrants and is possible to track gene flow among populations by mapping the geographic distribution of lineages into their phylogeny, i.e., their ancestry-descendance relationships (Jobling and Tyler-Smith 2003). Through analysis of the 1881 census of England and Wales, in 1885 Ravenstein noted that most movements were by men, initially over short distances and in stages, but later increasing with developments in commercial, industrial, and transport sectors (Arango 1985). As a result of circumstances such as location, historical period, and exposure to other factors, some groups have moved more than others. Far in the past, it was men who moved more than women, as they were more likely to perform roles such as explorers, merchants, and soldiers.

One strategy for tracking such historical movements is analyzing genetic markers on the Y-chromosome that in mammals is paternally

inherited and thus, tracks masculine lineages. There are many different motivations to study the Y-chromosome, including evolutionary, medical, historical, and forensic interests. Scholars have great interest in analyzing the high number of polymorphisms found in humans so far (Hammer 1995; Jobling and Tyler-Smith 2003; Karafet et al. 2008; Underhill et al. 2000; Y Chromosome Consortium 2002; Zegura et al. 2004). Among the most popular approaches to study the variation in the Y Chromosome is the analysis of short tandem repeats (STRs), which comprise microsatellites of 2-6 bp grouped in blocks of up to 50 repeats (Weber and May 1989; Hancock 1999); STRs analysis allows to observe differences at the subpopulation level in different geographic regions. A Short Tandem Repeat–Based Phylogeny for the human Y-chromosome has been reconstructed with the pedigree data from 11 000 paternity-tested autosomal STR-allele, identifying a brand of African ancestry (Forster et al. 2000).

When seeking to interpret Y-chromosome related data, it is important to consider historical demographic changes that can have strong effects on allele frequencies and the distribution of nucleotide differences within populations (Jobling and Tyler-Smith 2003). Historical data can help to confirm whether a genetic similarity is due to groups sharing a common ancestor or intermingling groups with no common ancestry. For this reason, a) the polymorphisms to be studied must be informative regarding interpopulation and intrapopulation variability and these variabilities must be distinguished, and b) it is necessary to establish the haplotype frequencies at the population and subpopulation level to estimate the probability of individuals to belong to a certain group (Roewer et al. 1996).

In the present research, we analyze the variability among 11 Mexican groups, speakers of indigenous languages, using 23 STRs of the Y-chromosome regarding the percentage of European, Asian, and African inheritance. For the European markers, we analyze the dispersion from a historical and gender perspective as observed from the patterns of gene diversity. Such European dispersion is likely to be strongly associated with the patriarchal and classist attitudes of discrimination that have long existed in the country (see Bergström et al. 2020 about panel of global populations as instrumental in understanding the history of human populations).

Materials and methods

Saliva samples were collected from 503 unrelated men from five macro-regions of the country: 1) north: 19 Yaquis, 30 Tarahumaras; 2) north-east: 52 Tepehuans, 58 Coras, 55 Huichols; 3) center-east: 20 Huastecs; 4) south: 40 Chinantecs, 52 Mixtecs, 44 Mixes, and 47 Zapotecs; 5) south-east: 86 Mayans (figure 1).

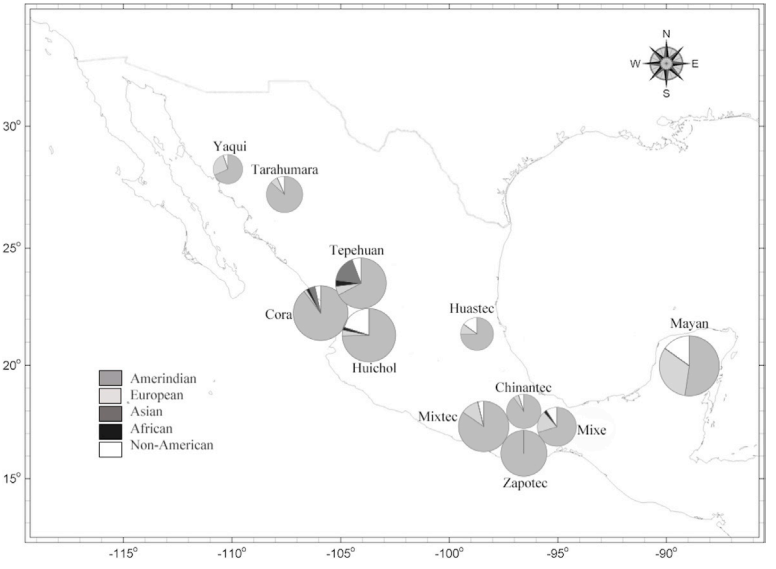

Figure 1. Continental inheritance of studied groups. Northern (Yaqui, Tarahumara); north-west (Cora, Huichol, Tepehuan); center-east (Huastec); south (Chinantec, Mixtec, Zapotec, Mixe); south-east (Mayan).

Consent was obtained from all participants in this study. The approval of an ethics committee from the Instituto de Investigaciones Antropológicas of the Universidad Nacional Autónoma de México was obtained; letters of informed consent, written in both Spanish and in the indigenous language of each group, were signed by each participant using either a written signature or their fingerprint. Each participant was older than 18 years, not related to any other participant, and had both parents and all four grandparents from the same group as himself/herself. Each group analyzed was named after the language it speaks. DNA was extracted from saliva using the Oragene DNA Saliva

Kit (DNA Genotek). The samples were quantified using the Investigator Quantiplex kit (Qiagen, Germany) and the 7 500 Real-Time PCR System, following the manufacturers' instructions. The samples were brought to a concentration of 1 ng/µl and amplified using the PowerPlex® Y23 System kit (Promega), again following the manufacturer's instructions. The PCR products underwent capillary electrophoresis in an ABI 3500 Genetic Analyzer (ThermoFischer, USA) using POP-7 and, for the designation of alleles, analyses were performed using the GeneMapper ID-X software (v.1.5). Continental origins were established using the Y-STR Haplotype Reference Database (yhrd.com; Willuweit and Roewer 2015).

Results

We studied 503 individuals of which 385 showed Native-American ancestry (haplogroup Q, 76.5 %), and 118 showed non-Native-American ancestry (23.4 %). Fifty-nine individuals (11.7 %) showed European or Caucasian inheritance with haplogroups R, J, I, T, G, five individuals (1.0 %) showed African heredity (haplogroup E), eleven (2.19 %) showed Asian heredity (without haplogroup specification), and forty-three (8.5 %) belong to the Old-World (without specification). The Zapotecs did not present non-American heredity with these markers, but such heredity has been observed in previous studies that used single nucleotide polymorphism markers (González-Sobrino et al. 2016). The continental inheritance in each group is presented in table 1 (see supplementary table 2).

The largest non-Native-American presence was European, and it was most abundant in the Mayan group (32.6 %). There was very little European presence in the Cora, Tarahumara, Huichol, Huastec, and Chinantec groups (table 1). In general, both African and Asian ancestry were low. The Tepehuan and Cora groups showed more Asian haplotypes than other groups; African inheritance was observed in the Tepehuan, Cora, Huichol, Mixe and Mayan groups.

A total of 274 founder haplotypes with 18 to 23 similar variants of the Y23 System kit were observed: 192 (70.1 %) Q (native), and 82 non-Q (29.9 %) (Old-World); 87 haplotypes (31.8 % of the total) were shared among 317 individuals (63.0 %) of the total sample: 72 (26.3 %)

Table I.
American and non-American haplotype composition of the Y-chromosome by percentages.

Group	*N*	*American (% within group)*	*Europe (% within group)*	*Africa (% within group)*	*Asia (% within group)*	*Old World without specification (% within group)*
Yaqui	19	13 (68.5)	5 (26.3)	0	0	1 (5.3)
Tarahumara	30	26 (86.7)	2 (6.7)	0	0	2 (6.7)
Tepehuan	52	35 (67.3)	3 (5.8)	2 (3.8)	9 (17.3)	3 (5.8)
Cora	58	52 (89.7)	1 (1.7)	1 (1.7)	2 (3.4)	2 (3.4)
Huichol	55	41 (74.5)	2 (3.6)	1 (1.8)	0	11 (20.0)
Huastec	20	15 (75.0)	2 (10.0)	0	0	3 (15.0)
Chinantec	40	36 (90.0)	2 (5.0)	0	0	2 (5.0)
Mixtec	52	44 (84.6)	6 (11.5)	0	0	2 (3.8)
Mixe	44	31 (70.5)	8 (18.2)	1 (2.3)	0	4 (9.1)
Mayan	86	45 (52.3)	28 (32.6)	0	0	13 (15.0)
Zapotec	47	47 (100)	0	0	0	0
Total	503	385 (76.5)	59 (11.7)	5 (1.0)	11 (2.19)	43 (8.5)

Q in 266 individuals (52.9 % of total sample), and 15 (5.5 %) non-Q in 51 individuals (10.1 % of total sample). Ten indigenous haplotypes are shared by groups: from north and north-west, Q32 (Tarahumara and Huichol), Q16, Q11 (Cora and Tepehuan), Q19, Q38 (Cora and Huichol); from south, Q80 (Chinanteco and Mixe), Q83 (Chinanteco and Mixteco), Q46 (Chinanteco and Zapoteco); from different regions, Q5 (Tarahumara and Huasteco), Q85 (Chinanteco and Mayan). Except the latter two cases, the haplotypes always are shared within the same region. The identical haplotypes with 23 variants are only shared within each group (except Q19* of Cora and Huichol). Two haplotypes are shared by many individuals in two groups: Q33 among 18 Huichols, and Q74 among 19 Zapotecs. The rest of the indigenous haplotypes are shared between two and eight people. Then, with the Native-American haplotypes, the characterization at the group level

could be performed. Regarding Native-American inheritance, the results showed separation between the large regions, some degree of closeness between the groups within each region, and isolation across each group. In reference to foreign heredity, strong European dispersion was observed together with some African and Asian heredity, but with less presence than the European heredity.

Discussion

The results observed in the present study showed a range of 0-47 % non-Native-American inheritance across the 11 groups analyzed. The presence of non-Native-American heredity in these groups could be the result of many different processes of population introgression across history. The genetic admixture, however, appears mostly the result of violent external interferences in the studied ethnic groups. According to all historical sources, the introgression of European paternal lineages in the currently isolated indigenous populations correspond to the sexual abuse that prevailed both during the viceroyalty, in times of conflict, and was also committed by ranchers and people in the vicinities of indigenous communities (Rosales 2010). In more recent times, sexual abuse has been committed by mestizos carrying non-indigenous heredity from one or several past generations. Some cases could also have been consensual marriages and integrations of foreign individuals, such as outlaws, political exiled, as well as Asians and Africans seeking to escape slavery, into indigenous communities.

The highest level of foreign non-Amerindian paternal lineages (47.67 %) was observed among the Mayans. Compared to the center of Mexico, in Yucatán, where the Mayans live, there was greater segregation between the conquered and the conquerors because Yucatán lacked mines and had poor arable soil, meaning that few enterprises could be established on the area's resources. Consequently, the region was marginalized in the economy of the Spanish colonies and, to obtain wealth, the *encomenderos* (patrons in charge) depended on tribute (Gerhard 1991: 13-17) for Yucatán becoming a stately society in which there was more exploitation. A great uprising known as the "Caste War of Yucatán" in 1847, and the animosity between the sides was such, that all Mayans were considered mortal enemies. Although the uprising

ended in 1851, conflict continued until 1901, when the descendants of the rebels who had taken refuge in Quintana Roo were definitively defeated. In this area social segregation was based on ethnic identity (Molina 2018), and even today a feeling of superiority persists, not only among those who perceive themselves as "white," but also among those who identify themselves as non-Mayans.

After the Maya group, the Tepehuan, Mixe, Huichol, and Yaqui show the second largest percentage of non-Native-American heredity (25.5-32.6 %). In addition to their European inheritance, the Tepehuans, Coras –and probably Huichol with Old-World haplotypes– show more Asian ancestry.

Northern Mexico contrasted with pre-Hispanic Mesoamerica in terms of the size of the territory, the number of inhabitants, and the social organization. Northern Mexico did not have strong structures of Mesoamerican domination, and was inhabited by a small number of scattered and diverse groups of semi-farmers and hunter-gatherers (Deeds 1992) who faced the conquerors in a different way. In the mountains of Nueva Galicia in Northwestern Mexico, many communities were not subjugated until 1722, when the Spanish gained interest for mining in the region with the consequent arrival of an armed force in 1531. Beltrán de Guzmán engaged in extreme violence that later instigated strong clashes known as the Mixtón War. The Chichimeca War occurred in 1590 (Valencia 1994), the Tepehuan War occurred in 1616-1619, and rebellions of non-evangelized Tarahumara occurred between 1621-1622, then allied with other groups from 1666 to 1680. During the viceroyalty, many natives refused to join the system or negotiated concessions to maintain relative political-religious autonomy and their languages. Thus, there was great dispersion towards the most inaccessible areas in the mountains and coasts as well as many population displacements to both missions and refuges (Flores et al. 2003). The term "Tepehuan" was used by the Spanish to refer to the largest indigenous group in the area; today, the southern Tepehuans share the Gran Nayar culture with the Cora, Huichols, and Mexicaneros (Saucedo 2004). After the Chichimeca War, between 1590-1600, population movements continued, including groups from Central Mexico to work in the northern mines and *haciendas*. Further, Tlaxcaltecs and Mexicanos were sent to act as frontier militia, to the Tepehuans' and Huichols' areas to serve as agents of civilization, and were encouraged to form

colonies in the vicinities of Tepic and Acaponeta in Nayarit (Gerhard 1996: 55, 66-67). Around 1860, there was a great rebellion of Tepehuans, Cora, Mexicaneros, and Huichols led by Manuel Lozada, and in the 20th century, further population movements, related to the Cristero War and the agricultural boom of 1930-1940, occurred. At this point, the population in northern Nayarit increased (Pacheco 1999). All these events gave rise to gene flow in the northwest. The Tepehuan and Huichol groups showed a higher proportion of foreign paternal heredity compared to the Coras and Tarahumaras that showed a very low degree of foreign heredity.

The Yaqui group, inhabiting northwestern Sonora, showed 31.6 % foreign heredity. In pre-Hispanic times, they were dispersed along the Yaqui River, and during the Viceroyalty, they were distributed across eight towns (Nentuig [1764] 1977: 43). The Yaqui's territory was an attractive region, and during the *Porfiriato*, efforts were made to fully exploit the Yaqui Valley (Cárdenas 2017), leading to a massive influx of European and Chinese immigrants and the displacement of Yaquis to different regions (Muñoz 2021), which led to the Yaqui War of 1870. It has been alleged that, in this war, the Yaqui kidnapped Chinese, Pimas, Mayos, and non-indigenous women and children to integrate them into their society. Despite this conflict, foreigners arrived massively in the state of Sonora, and miscegenation occurred between all kinds of people of different origins, both by consensus and by force on the part of both sides. In particular, the Yaqui were characterized by rebelling against submission, for which they were persecuted by several different governments, so a large number of Yaquis were moved to California (Spicer 1994). In 1897, some Yaqui were sent to the tobacco plantations of Oaxaca, and by 1900, some were sent to the henequen, coconut, and sugar plantations of the Yucatán Peninsula. In 1915, some Yaqui were sent to the Marías Islands, and some were enlisted in the army to support the revolutionaries in Guaymas and Guadalajara; many fled to the mountains or to the United States. During the Calles government (1924-1928), Yaqui were deported to states in the center of the republic, and 400 were even sent to Africa to support the Spanish Foreign Legion against the Moroccan rebels (Lagarda 2012); two Yaquis married African women and one of their grandchildren later traveled to Sonora (Muñoz 2021). Yaqui resistance continued until 1927 when they were again attacked by post-revolutionaries (Cárdenas 2017).

Finally, in 1937, Yaqui were granted title to their lands (Velasco 2015: 32). The Yaqui is thus a group that was forced to live outside their territory for a long time, had offspring with external individuals. Today, although not welcomed by this group, marriages between Yaquis and mestizos and between Yaquis and Mayos are frequent (Moctezuma et al. 2003). Interestingly, it is possible that the Yaquis' European heredity comes from their relationships with the Mayos, a group that was more strongly integrated into the non-indigenous universe (Muñóz 2021).

Other circumstances affected the south of the country, which had a high population density since pre-Hispanic times, and contained groups with a social organization based on agriculture and marked hierarchical strata (McCaa 2000). At the beginning of the 16th century, these groups coexisted, maintaining strong local identities, and engaging in territorial struggles. Such characteristics were accentuated with the entry of the Spanish (Montaño 2003). Mixtecs and Zapotecs were tributaries of the Mexica groups and allied with the Spaniards and Tlaxcaltecs to attack their enemies. The Mixes and the Chinantecs that remained outside the Mexica domination did not engage with the Spanish or participated in negotiations and were consequently dispossessed of their land. After experiencing epidemics, depopulation, and exploitation, the Mixes took refuge in the most remote areas on the state border between Oaxaca and Veracruz (Barros 2007). In contrast, from the first decade after the arrival of the Spanish, the characteristics of the Zapotec society helped this group quickly adapt to the new bureaucracy, and they requested titles both to their lands and to those of others; they also claimed the possessions of the Mixes as if they were their own (Chance 1989: 46). During the Viceroyalty, few Spanish owners lived in the region, meaning that local caciques had some administrative power. The population distribution in the region remained relatively unchanged since the time of the conquest (Barros 2007), although the colonial *hacienda* system impacted each group in different ways (Chance 1989: 13, 14). Between 1880 and 1910, French, German, Spanish, and Belgian companies established branches of small industries in the region that attracted employees, diverse workers, foreign engineers, and merchants from other areas. These newcomers included people from China (Dalton 2004: 198-200). In this study, the European dispersion of foreign heredity differed across each southern

group; the greatest heredity from the non-American was present in the Mixes (29.5 %), followed by the Mixtecs (15.4 %), the Chinantecs (10.0 %), and the Zapotecs that exhibited no foreign paternal lineages.

In sum, the groups studied differ genetically due to their history, in how their geography and use of living strategies contributed to their survival, in their isolation, and in the social processes causing genetic intermingling with non-indigenous people. Isolation seems to be more at the group than regional level, although we can see similarities according to STRs frequencies at the regional level. Anyway, all indigenous populations in Mexico suffered subjugation and discrimination, initially by the Spanish during the colony, and thereafter by the general Mexican population. Although some foreign heredity was introduced by people who emigrated and later returned with offspring they had with foreigners, the largest proportion of the observed biological non-Amerindian heredity appears due to sexual abuse by men from outside the indigenous communities. The probability of formal marriages with foreign men who integrated into the communities was low as this would require groups to forfeit land and/or communal authority to a stranger. Additionally, few foreigners or mestizos would be interested in belonging to these populations given the great disadvantage of being members of indigenous communities in the Mexican society. It is thus more likely that indigenous women were the ones who left their communities.

Finally, it is necessary to emphasize the importance of specifying how much of the genetic pool of indigenous groups is not indigenous or aboriginal, since it is often assumed that samples of groups speaking indigenous languages are carriers of completely aboriginal genetic variation.

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Supplementary Table 2.
Y chromosome Non-Amerindian Haplotypes

Group	N	Haplotype	Continent	ID Equal 18-23 Y-STR*	N Equal 23 Y-STR	DYS576	DYS389I	DYS448	DYS389II	DYS19	DYS391	DYS481	DYS549	DYS533	DYS438	DYS437	DYS570	DYS635	DYS390	DYS439	DYS392	DYS643	DYS393	DYS458	DYS385a	DYS456	DYSYGATAH4	DYS385b
Yaq	6	J	Eur	Y		17	13	19	29	14	11	21	12	12	12	15	18	23	24	12	13	10	13	18	11	15	12	14
Yaq		J	Eur	Y		17	13	19	29	14	11	21	12	12	12	15	18	23	24	12	13	10	13	15	11	15	12	14
Yaq		R1b	Eur	1		18	12	19	28	14	11	22	13	12	12	14	17	23	24	11	13	10	13	18	11	15	12	13
Yaq		R1b	Eur	1		16	13	18	28	14	10	22	12	12	13	15	17	23	24	13	13	10	13	17	12	17	12	14
Yaq		R1b	Eur	1		17	13	20	29	14.2	10	24	11	12	9	16	17	22	23	10	11	9	12	17	14	17	11	16
Yaq		R1b	Eur	1		17	12	19	29	16	9	28	13	12	10	16	19	21	22	11	12	11	13	16	15	16	11	0
Tar	4		Eur	L		14	13	20	30	13	10	28	11	11	10	14	25	21	25	10	11	12	13	17	14	16	12	16
Tar		T*		1		14	13	19	30	15	11	23	12	12	9	13	17	21	23	11	13	10	13	17	15	14	11	16
Tar		T*		1		15	13	19	29	14.2	10	22	14	12	9	14	18	21	23	11	14	10	13	18	15	17	11	16
Tar		R	Eur	1		18	14	18	31	14	11	23	13	12	12	14	17	23	25	12	13	10	13	16	11	15	11	14
Tep	17	OW		1		18	13	20	32	14.2	10	24	12	11	10	14	17	21	23	11	11	9	12	17	13	14	11	18
Tep		OW		1		17	13	19	30	13	10	28	14	11	11	14	18	22	24	12	16	12	14	16.3	13	16	11	17
Tep		OW		1		20	13	20	30	13	10	25	11	12	11	14	19	22	23	12	18	11	13	16.3	16	15	11	17
Tep			Asia	C	6	17	13	20	30	15	11	24	12	14	11	16	18	21	24	11	14	10	13	16	14	15	11	16
Tep		E	Afr	R		15	13	21	31	15	10	25	10	11	11	14	20	21	21	11	11	14	13	15	16	15	12	17
Tep		E	Afr	R		15	13	21	31	15	10	25	10	11	11	14	20	21	21	11	11	13	13	19	16	15	12	17
Tep			Asia	P		17	14	21	30	13	10	26	14	11	11	14	16	22	23	11	14	10	12	15	15	14	12	0
Tep			Asia	P	2	16	14	21	31	13	10	26	14	11	11	14	16	23	23	11	14	11	12	15	15	14	12	0
Tep		R1b	Eur	X		17	13	19	28	14	10	22	13	12	12	15	17	23	23	13	14	10	12	16	11	15	13	15
Tep		R1b	Eur	X		17	13	19	28	14	10	22	13	12	12	15	17	23	23	13	14	10	12	18	11	15	13	15
Tep		R1b	Eur	1		16	13	19	28	14	10	22	12	12	12	15	17	23	24	12	14	11	12	18	11	16	13	15
Hui	14	O-W		T	3	16	13	20	29	14	10	24	12	13	11	16	19	21	24	11	14	10	13	16	13	15	11	14
Hui		O-W		T	5	16	13	20	29	14	10	24	12	13	11	16	19	21	24	11	14	10	13	16	13	15	11	16
Hui		O-W		T	2	16	13	20	29	14	10	24	12	13	11	16	19	21	23	11	14	10	13	16	13	15	11	16
Hui		T		T		16	13	20	29	14.2	10	24	12	13	11	16	19	21	24	11	14	10	13	16	13	15	11	16
Hui		J	Eur	1		16	13	20	30	14.2	11	22	13	11	9	16	16	23	23	11	11	10	12	17	13	15	11	18
Hui		O-W		1		18	13	21	30	14.2	10	22	13	12	10	14	18	20	22	13	11	12	13	17	18	15	12	19
Hui		E	Afr	1		14	13	21	30	15	11	28	11	11	11	14	20	21	21	12	11	14	13	17	16	16	12	17
Cor	6	O-W		1		18	13	18	30	15	10	25	12	14	11	15	17	21	24	11	14	10	14	16	15	15	11	16
Cor		R1b	Eur	1		18	13	19	29	14	10	22	13	15	12	15	17	23	24	13	13	10	13	16	11	16	12	14
Cor		G*		1		17	12	20	27	13	9	24	12	11	11	14	20	22	24	11	13	10	13	19	14	14	11	17
Cor			Asia	1		18	13	20	30	14.2	10	24	12	14	11	14	17	21	24	11	14	9	13	17	15	15	11	17
Cor		OW		1		15	13	21	30	15	9	25	12	11	10	16	16	22	21	12	11	11	14	17	12	15	11	13
Cor			Asia	P		16	14	21	31	13	10	26	14	11	11	14	16	23	23	11	14	11	12	18	15	14	12	15
Hua	5	I2a1	Eur	K	2	16	13	19	27	16	10	23	12	11	11	14	17	22	24	11	14	10	13	15	15	17	12	16
Hua		O-W		1		20	13	20	29	13	10	24	12	11	11	14	17	22	23	11	15	10	13	14	14	17	12	17
Hua		O-W		1		19	13	20	30	13	10	24	12	11	11	14	16	22	23	12	14	9	13	14	14	15	12	20
Hua		O-W		N		18	13	20	30	14.2	10	22	12	12	10	14	20	23	24	13	11	12	13	17.2	16	17	12	18
Mxt	8	R1b	Eur	Z		17	13	19	29	14	11	23	13	12	12	15	19	23	24	12	13	10	13	17	11	15	12	14
Mxt		R	Eur	1		17	13	19	30	13	10	25	12	12	11	14	17	22	23	11	11	11	13	18	16	15	13	0

Group	N	Haplotype	Continent	ID Equal 18-23 Y-STR*	N Equal 23 Y-STR	DYS576	DYS389I	DYS448	DYS389II	DYS19	DYS391	DYS481	DYS549	DYS533	DYS438	DYS437	DYS570	DYS635	DYS390	DYS439	DYS392	DYS643	DYS393	DYS458	DYS385a	DYS456	DYSYGATAH4	DYS385b
Mxt		R	Eur	W		19	14	19	30	14	11	22	12	12	12	15	17	23	23	12	13	10	13	16	11	15	12	14
Mxt		O-W		1		19	14	19	30	14	11	22	12	12	12	15	17	23	23	12	13	10	13	17	11	15	12	14
Mxt		R1b	Eur	U		17	13	19	31	13	10	21	13	12	12	14	20	22	25	12	14	10	13	16	14	15	12	19
Mxt		O-W		U		18	13	19	32	13	10	21	13	11	12	14	20	22	25	12	14	10	13	15	14	15	12	19
Mxt		R	Eur	U		18	13	19	32	13	10	21	13	11	12	14	20	22	25	12	14	10	13	16	14	15	12	19
Mxt		R1b	Eur	1		16	13	20	31	13	10	24	12	12	10	14	17	20	23	12	11	14	13	16	16	16	10	17
Mxe	13	R1b	Eur	1		19	13	18	29	14	10	22	12	12	12	15	16	23	24	12	13	10	13	16	12	16	12	14
Mxe		R1b	Eur	M		18	14	18	31	14	10	22	13	12	9	14	17	24	25	12	13	10	13	15	11	16	11	14
Mxe		R1b	Eur	M		18	14	18	31	14	10	22	13	12	9	14	17	24	25	12	13	10	13	17	11	16	11	14
Mxe		O-W		1		19	12	19	28	15	11	22	13	12	12	15	17	23	24	11	13	10	13	17	11	16	11	14
Mxe		R	Eur	1		18	13	19	29	14	10	22	13	11	12	15	16	23	23	11	13	9	13	17	12	16	12	14
Mxe		Eur	Eur	1		17	13	19	29	15	10	24	13	12	12	15	17	24	24	12	13	9	13	16	11	15	12	14
Mxe		R1b	Eur	W		18	14	19	30	14	11	22	12	12	12	15	17	23	23	12	13	10	13	16	11	15	12	14
Mxe		R	Eur	1		18	14	19	30	14	11	22	13	12	12	15	16	23	24	11	13	10	13	15	11	15	12	15
Mxe		E*	Afr	1		20	13	19	30	14.2	11	24	11	12	11	14	14	24	23	11	15	9	13	16	16	15	13	16
Mxe		G*		1		17	12	20	29	13	9	27	12	11	10	14	18	21	24	11	11	12	13	17	16	15	12	0
Mxe		OW		N		17	13	20	30	13	10	22	12	12	10	14	20	22	24	11	11	12	13	17.2	16	17	12	16
Mxe		OW		1		16	13	21	29	16	10	27	12	13	11	14	19	21	25	11	11	11	13	16	13	15	11	13
Mxe		OW		1		20	13	21	32	12	10	24	12	11	9	14	16	22	24	11	14	9	12	17	12	15	12	14
Chnt	4	R1b	Eur	1		16	12	19	28	14	11	22	13	12	12	15	16	23	24	12	13	10	13	16	11	15	12	0
Chnt		OW		1		20	13	19	29	14	10	25	12	11	11	14	14	22	24	11	11	10	13	16	12	15	14	15
Chnt		G*		1		18	14	20	30	13	9	27	11	11	10	14	22	21	24	10	11	12	13	16	13	16	12	14
Chnt		O-W		1		18	12	21	28	15	10	21	12	9	10	15	18	21	22	11	11	13	14	17	12	16	12	14
May		O-W		1		17	13	17	29	13	10	23	12	11	10	14	15	22	24	12	14	10	13	16	15	16	11	0
May		R	Eur	1		21	13	18	29	13	10	25	12	12	12	14	18	23	23	12	14	10	14	16	16	16	13	0
May		R1b	Eur	1		19	13	18	29	14	11	22	13	12	12	14	17	23	24	12	13	10	13	16	11	16	11	13
May		R1b	Eur	1		16	14	18	30	14	12	22	13	12	12	14	17	23	24	11	13	10	13	17	11	15	11	14
May		R1b	Eur	1		18	14	18	30	15	11	22	14	11	12	14	17	23	24	12	13	10	14	17	11	16	11	14
May		O-W		1		16	14	18	31	14	11	22	12	12	12	14	17	23	24	12	13	10	14	15	11	16	11	14
May		J	Eur	1		20	13	18	32	13	11	23	12	12	11	14	15	22	24	12	14	10	13	15	16	16	11	17
May		O-W		A2	18	12	19	28	14	10	25	12	11	11	14	15	22	25	12	14	10	13	16	13	16	13	15	
May		R1b	Eur	1		18	13	19	29	14	11	22	11	11	12	15	15	23	25	11	13	11	13	19	11	16	12	14
May		R1b	Eur	Y		18	13	19	29	14	11	21	12	12	12	15	18	23	24	12	13	10	13	17	11	16	12	14
May		R1b	Eur	Y		18	13	19	29	14	11	22	12	12	12	15	18	23	24	12	13	11	12	17	11	15	12	14
May		R1b	Eur	1		17	13	19	29	14	11	22	12	12	12	15	18	24	23	12	13	10	13	17	11	16	12	14
May		R1b	Eur	Z		18	13	19	29	14	11	24	13	12	12	15	17	23	25	12	13	10	13	16	11	15	12	14
May		R1b	Eur	Z		18	13	19	29	14	11	22	13	12	12	15	20	23	24	12	13	10	13	14	11	15	12	14
May		R1b	Eur	1		16	13	19	29	14	11	24	13	13	12	15	18	23	24	12	13	11	13	16	11	16	12	14
May		R1b	Eur	1		19	13	19	29	13	12	23	14	11	12	15	17	23	24	12	13	10	12	18	11	16	12	14
May		R1b	Eur	1		19	13	19	29	14	10	24	14	12	12	15	18	23	24	13	14	10	13	16	12	15	12	13
May		R1b	Eur	1		17	13	19	29	14	11	22	14	12	12	15	18	24	23	12	13	10	13	16	11	17	12	14
May		R	Eur	1		18	14	19	30	13	10	24	12	12	12	14	21	23	23	13	15	10	13	18	14	15	13	17
May		R	Eur	V		17	14	19	30	14	10	23	12	13	12	15	17	23	24	11	13	10	13	15	11	16	12	15
May		R1b	Eur	V		17	14	19	30	14	10	23	12	13	12	15	17	23	24	11	13	10	13	17	11	16	12	15

Group	N	Haplotype	Continent	ID Equal 18-23 Y-STR*	N Equal 23 Y-STR	DYS576	DYS389I	DYS448	DYS389II	DYS19	DYS391	DYS481	DYS549	DYS533	DYS438	DYS437	DYS570	DYS635	DYS390	DYS439	DYS392	DYS643	DYS393	DYS458	DYS385a	DYS456	DYSYGATAH4	DYS385b
May		R1b	Eur	V	2	17	14	19	30	14	10	23	12	13	12	15	17	23	24	11	13	10	13	18	11	16	12	15
May		J2a1	Eur	1		19	13	19	30	15	10	23	13	12	8	15	19	21	25	11	11	9	12	15	14	12	11	16
May		T*		1		18	14	19	31	14.2	11	22	15	12	9	14	18	21	23	11	13	10	13	17	14	16	11	16
May		T		L		14	13	19	31	15	11	23	12	12	9	13	16	20	23	11	13	10	13	17	15	14	11	16
May		O-W		1		17	12	20	28	14	11	22	15	13	12	15	17	23	24	13	13	10	12	17	11	16	13	14
May		I*	Eur	1		17	12	20	29	13	10	25	12	11	10	14	17	22	24	11	15	10	12	16	12	16	13	15
May		J1a2	Eur	1		18	13	20	29	14.2	10	25	12	11	10	14	18	20	23	12	11	9	12	15	14	15	11	16
May	41	G2a		1		14	12	20	29	15	10	21	12	9	10	16	18	20	23	10	11	11	15	15	14	15	12	0
May		O-W		1		17	13	20	30	13	10	23	12	12	10	14	21	22	24	11	11	12	13	14	16	17	12	16
May		O-W		1		15	14	20	30	15	9	27	11	11	10	14	25	21	23	10	11	12	13	15	13	19	12	14
May		J	Eur	1		21	14	20	31	13	10	25	13	11	11	14	18	21	24	12	14	10	13	15	16	17	12	17
May		J	Eur	1		16	13	20	31	14	10	24	11	11	12	15	17	22	24	12	14	10	13	17	13	16	11	15
May		J2a1	Eur	1		16	13	21	29	14.2	10	22	12	11	9	14	17	21	23	12	11	10	12	16	14	15	12	16
May		J2a1	Eur	1		17	13	21	29	14.2	10	22	12	11	9	15	17	21	23	12	11	10	12	16	14	15	12	15
May		J2a1	Eur	1		16	13	21	29	15	9	23	11	11	9	15	18	21	23	11	11	10	12	14	11	15	11	17
May		O-W		1		17	12	21	29	16	10	25	11	11	11	14	18	21	21	11	11	12	14	17	16	16	11	18
May		G2a		1		19	14	21	31	15	10	21	12	9	10	16	17	20	22	12	11	11	15	18	13	15	11	15
May		O-W		1		18	13	21	31	15	10	24	11	10	16	16	17	21	22	13	11	11	13	18	13	15	12	15

Total 118 *= (probably)

*Capital letter only in this work.

Supplementary Table 2a.
Amerindian Y chromosome Haplotypes (Q).

Group	N	Equal 18-23 Y-STR	N Equal 23 Y-STR	DYS576	DYS389I	DYS448	DYS389II	DYS19	DYS391	DYS481	DYS549	DYS533	DYS438	DYS437	DYS570	DYS635	DYS390	DYS439	DYS392	DYS643	DYS393	DYS458	DYS385a	DYS456	DYSYGATAH4	DYS385b
Tar	26	Q2		19	13	19	30	15	10	24	13	11	11	14	17	22	23	11	14	9	13	15	14	17	12	15
Tar		Q2		19	13	19	31	15	10	24	13	11	11	14	17	22	23	11	14	9	13	15	14	17	12	15
Tar		Q3		19	13	19	30	15	10	24	11	11	11	14	18	22	23	11	14	9	13	16	14	15	12	0
Tar		Q3		18	13	19	30	15	10	24	12	11	11	14	18	22	23	11	14	9	13	16	14	15	12	0
Tar		Q4		20	13	20	30	13	10	25	13	12	11	14	18	22	24	11	14	10	12	17	13	16	13	18
Tar		Q4		20	13	20	30	13	10	25	13	12	11	14	18	22	24	11	14	10	12	17	13	15	13	18
Tar		1		19	13	19	30	15	10	24	12	11	11	14	16	22	22	11	14	10	13	16	14	17	11	15
Tar		Q5	2	17	12	19	28	13	10	23	12	11	13	14	15	22	23	12	14	10	13	15	14	18	11	0
Tar		Q5		18	12	19	28	13	10	23	12	11	13	14	15	22	23	12	14	10	13	15	14	18	11	0
Tar		Q5		17	12	19	28	13	10	20	12	11	13	14	15	22	23	13	14	10	13	15	14	18	11	15
Tar		1		16	12	19	28	13	11	23	11	12	12	14	15	22	23	11	14	11	13	18	14	15	11	16
Tar		1		19	12	19	28	13	11	23	12	11	14	14	15	22	23	12	14	11	13	15	14	18	12	16
Tar		1		19	13	18	30	14	10	23	13	11	11	14	19	23	24	12	15	10	13	15	14	16	13	16
Tar		Q6		17	13	20	29	13	11	26	12	11	11	14	17	22	24	12	15	11	12	17	15	18	11	17
Tar		Q6		17	14	20	30	13	11	26	12	11	11	14	17	22	24	12	15	11	12	16	15	18	11	17

Group	N	Equal 18-23 Y-STR	N Equal 23 Y-STR	DYS576	DYS389I	DYS448	DYS389II	DYS19	DYS391	DYS481	DYS549	DYS533	DYS438	DYS437	DYS570	DYS635	DYS390	DYS439	DYS392	DYS643	DYS393	DYS458	DYS385a	DYS456	DYSYGATAH4	DYS385b
Tar		Q32		17	14	20	31	13	10	26	12	11	11	14	16	22	24	12	15	11	13	18	16	17	12	17
Tar		Q7		16	14	20	32	13	10	25	12	11	11	14	16	22	25	12	15	11	13	12	15	16	12	18
Tar		Q7		16	14	20	31	13	10	25	12	11	12	14	16	22	25	12	15	11	13	16	15	16	12	18
Tar		1		18	14	20	31	13	10	25	12	11	11	14	15	22	24	13	15	11	13	16	16	16	12	0
Tar		Q8		17	14	19	31	12	10	24	12	11	12	14	15	22	23	12	16	9	13	17	14	16	12	16
Tar		Q8		17	14	19	31	12	10	24	12	11	12	14	15	22	23	13	16	9	13	16	14	15	12	16
Tar		Q8		17	14	19	31	12	10	24	12	11	12	14	15	22	23	13	16	9	13	16	14	16	12	16
Tar		Q9		18	14	19	30	13	10	25	12	11	12	14	15	22	24	13	16	9	13	15	13	16	12	17
Tar		Q9		18	13	19	30	13	10	25	12	11	12	14	15	22	24	14	16	9	13	15	14	16	12	17
Tar		1		18	14	18	31	13	10	24	12	10	11	14	16	22	24	11	16	11	13	16	16	17	12	0
Tep	35	Q10		15	13	20	30	13	10	24	12	12	11	14	17	22	26	13	13	9	13	16	13	17	13	20
Tep		Q10		15	13	20	30	13	10	24	12	12	11	14	17	22	26	13	14	10	13	17	14	17	13	19
Tep		Q11		16	12	20	29	13	9	26	13	11	11	14	18	22	25	11	13	10	12	17	15	12	12	18
Tep		Q11		17	12	20	28	13	9	26	12	11	11	14	18	22	23	11	13	10	12	17	15	12	12	19
Tep		Q11		16	12	20	29	13	9	26	12	11	11	14	18	22	24	11	13	10	12	17	15	12	12	19
Tep		Q11		17	12	20	28	13	9	26	12	11	11	14	18	22	23	11	13	10	12	18	15	12	12	19
Tep		Q12	5	20	12	20	29	13	9	25	11	11	11	15	18	22	24	12	13	10	13	18	14	15	12	19
Tep		1		17	12	21	29	13	10	25	12	11	11	14	17	22	25	14	13	10	13	15	14	15	12	0
Tep		1		18	14	20	32	13	10	25	12	12	11	14	17	22	24	11	14	10	12	16	15	15	12	17
Tep		Q81		17	12	19	28	13	10	24	11	12	12	14	16	22	24	12	14	10	13	19	14	17	11	0
Tep		1		17	14	21	31	13	10	25	12	12	11	14	18	22	23	11	15	10	13	16	14	15	12	15
Tep		1		19	14	20	31	13	10	25	12	11	11	14	16	22	24	15	15	10	13	16	16	17	12	17
Tep		Q13		20	13	19	30	15	10	24	12	11	11	14	16	22	23	12	15	10	13	15	14	16	12	0
Tep		Q13		20	13	19	30	15	10	24	12	11	11	14	16	22	23	12	15	10	13	16	15	16	12	0
Tep		Q13	2	20	13	19	30	15	10	24	12	11	11	14	16	22	23	12	15	10	13	15	14	16	12	0
Tep		Q14		18	13	20	30	13	10	24	12	11	11	14	16	22	24	11	15	11	13	15	15	16	12	17
Tep		Q14		17	13	20	30	13	10	24	12	11	11	14	16	22	24	11	15	11	13	15	15	16	12	17
Tep		Q14		17	13	20	30	13	10	24	12	11	11	14	16	22	24	11	15	11	13	16	15	16	12	17
Tep		Q14		18	13	20	30	13	10	24	12	11	11	14	16	22	23	11	15	11	13	16	15	16	12	17
Tep		Q15		18	14	21	31	13	10	24	13	11	11	14	16	22	25	13	16	11	13	16	15	15	12	19
Tep		Q15	2	18	14	21	31	13	10	24	13	11	11	14	16	22	25	13	16	12	13	16	15	15	12	19
Tep		Q16	3	18	13	19	30	13	10	24	12	11	11	14	18	23	24	11	16	12	13	16	14	16	12	17
Tep		Q16	3	17	13	19	30	13	10	24	12	11	11	14	18	23	24	11	16	12	13	16	14	16	12	17
Tep		Q84		19	13	19	30	13	10	22	12	11	11	14	18	23	24	11	16	12	13	16	14	16	12	17
Tep		Q84		19	13	19	30	13	10	23	12	11	11	14	18	23	24	11	16	12	13	15	14	16	12	17
Cor	52	Q11		16	12	20	28	13	9	24	12	11	11	14	18	22	25	11	13	10	12	17	15	12	12	19
Cor		Q11		17	12	20	29	13	9	26	12	11	11	14	18	22	24	11	13	10	12	16	15	12	12	19
Cor		Q11		17	12	14	29	13	9	26	12	11	11	14	18	22	24	11	13	10	12	15	15	12	12	19
Cor		1		16	12	20	28	13	9	26	12	11	11	14	19	22	24	12	13	10	12	16	15	12	12	19
Cor		Q18		17	12	20	25	13	9	25	12	11	11	14	18	22	23	11	13	10	13	18	14	14	11	17
Cor		Q18		17	12	20	25	13	9	25	12	11	11	14	18	22	23	11	13	10	13	17	14	14	11	17
Cor		Q19*6		19	12	20	29	13	10	24	11	11	11	14	16	22	24	12	13	11	13	17	14	16	12	18
Cor		1		15	13	20	30	13	10	24	12	12	11	14	17	22	25	13	14	10	13	17	14	15	13	21
Cor		1		15	14	20	31	13	10	25	12	12	11	14	18	22	25	13	14	10	13	18	14	15	14	21
Cor		Q20		15	13	20	30	13	10	24	12	12	11	14	19	22	24	13	14	10	13	18	14	15	13	19
Cor		Q20		15	13	20	30	13	10	24	12	12	11	14	18	22	25	13	14	10	13	17	14	15	13	21
Cor		Q20	2	15	13	20	30	13	10	24	12	12	11	14	17	22	25	14	14	10	13	17	14	16	12	20
Cor		Q20		15	13	20	30	13	10	24	12	12	11	14	18	22	25	13	14	10	13	17	14	15	13	21
Cor		Q20		15	13	20	30	13	10	24	12	12	11	14	17	22	25	14	14	10	13	17	14	16	12	20
Cor		Q20		15	13	20	30	13	10	24	12	12	11	14	18	22	25	12	14	10	13	17	14	15	13	21
Cor		Q20		15	13	20	30	13	10	24	12	12	11	14	18	22	25	13	14	10	13	17	14	15	13	21

Group	N	Equal 18-23 Y-STR	N Equal 23 Y-STR	DYS576	DYS389I	DYS448	DYS389II	DYS19	DYS391	DYS481	DYS549	DYS533	DYS438	DYS437	DYS570	DYS635	DYS390	DYS439	DYS392	DYS643	DYS393	DYS458	DYS385a	DYS456	DYSYGATAH4	DYS385b
Cor		Q20		15	13	20	30	13	10	24	12	12	11	14	18	22	24	13	14	10	13	17	14	15	13	21
Cor		Q81		17	12	19	28	13	11	23	11	12	12	14	16	22	24	12	14	10	13	17	14	18	11	15
Cor		Q21		15	13	20	30	13	10	24	12	11	11	14	17	22	25	14	14	10	13	17	14	15	12	20
Cor		Q21		15	13	20	30	13	10	24	12	12	11	14	17	22	25	14	14	10	13	17	14	16	12	20
Cor		Q22		17	14	21	31	13	11	27	13	11	11	14	16	22	24	12	14	11	13	16	15	17	12	17
Cor		Q22		17	14	21	31	13	11	27	13	11	11	14	16	23	24	12	14	11	13	15	15	17	12	18
Cor		Q22		17	14	21	31	13	11	27	13	11	11	14	16	22	24	12	14	11	13	15	15	17	12	18
Cor		Q23	2	16	13	20	31	13	10	24	12	12	11	14	18	23	25	13	14	11	13	15	14	16	12	21
Cor		Q23		16	13	20	31	13	10	24	12	12	11	14	18	23	25	13	14	11	13	18	14	16	12	21
Cor		Q24	3	17	14	21	31	13	11	27	13	11	11	14	16	22	24	12	14	11	13	16	15	17	12	18
Cor		1		17	14	20	30	13	10	25	12	11	11	14	16	22	24	12	15	11	13	16	15	17	12	17
Cor		1		16	14	21	31	13	10	26	11	11	11	14	16	22	24	12	15	11	13	15	15	15	11	19
Cor		Q25		17	14	20	31	13	12	25	12	11	11	14	16	22	24	12	15	11	13	17	15	17	12	17
Cor		Q25		19	14	20	31	13	10	25	12	11	11	14	16	22	24	11	15	11	13	16	15	17	12	18
Cor		1		19	13	20	31	13	10	24	12	11	11	14	18	22	24	11	15	12	13	16	14	17	12	19
Cor		Q26		16	13	20	30	13	10	25	13	11	11	14	18	22	23	11	16	11	13	16	13	17	11	18
Cor		Q26		16	13	20	30	13	10	25	13	11	11	14	19	22	23	11	16	11	13	16	13	11	16	18
Cor		Q26		16	13	20	30	13	10	25	13	11	11	14	19	22	23	11	16	11	13	15	13	11	16	18
Cor		Q38		17	14	20	31	14	9	25	12	11	11	14	18	22	23	11	16	11	13	15	14	15	12	18
Cor		Q16	2	18	13	19	30	13	10	25	12	11	11	14	18	23	24	11	16	12	13	16	14	15	12	17
Cor		Q16		18	13	19	30	13	10	25	12	11	11	14	18	23	24	11	16	12	13	16	15	15	12	17
Cor		Q16		18	13	19	30	13	10	25	12	11	11	14	18	23	24	11	16	12	13	16	14	15	12	17
Cor		Q28	4	16	13	19	30	13	10	27	12	11	11	14	18	23	24	12	16	12	14	16	13	16	11	17
Hui	41	Q19*		19	12	20	29	13	10	24	11	11	11	14	16	22	24	12	13	11	13	17	14	16	12	18
Hui		Q19		19	13	20	30	13	10	24	11	11	11	14	15	22	24	12	13	11	13	17	14	15	12	18
Hui		Q19		19	12	20	29	13	10	24	11	11	11	14	16	22	24	12	13	11	13	17	14	16	12	18
Hui		Q30		16	13	20	29	14	10	24	12	13	11	16	20	21	24	11	14	10	13	18	13	15	11	16
Hui		Q30		16	13	20	29	14	10	24	12	13	11	16	19	21	24	11	14	10	13	17	13	15	11	16
Hui		1		18	13	20	30	13	10	24	12	11	11	14	19	22	24	11	14	10	13	16	15	15	12	16
Hui		1		16	13	20	29	14	11	24	12	13	11	15	19	21	24	11	14	10	13	17	13	15	11	16
Hui		Q31		16	13	20	30	13	10	25	12	9	11	14	19	24	25	13	14	11	13	17	14	15	12	21
Hui		Q31	3	16	13	20	30	13	10	24	12	9	11	14	19	24	25	13	14	11	13	17	14	15	12	21
Hui		Q31		16	13	20	30	13	10	24	12	9	11	14	19	23	25	13	14	11	13	17	0	15	12	0
Hui		Q32		16	14	20	31	13	10	26	13	11	11	14	15	22	24	12	15	11	13	16	15	17	12	17
Hui		Q32		16	14	20	31	13	10	26	13	11	11	14	15	22	24	12	15	11	13	17	15	17	12	17
Hui		Q32	2	16	14	20	31	13	10	26	12	11	11	14	15	22	24	12	15	11	13	16	15	17	12	17
Hui		Q32	2	16	14	20	31	13	10	26	12	11	11	14	15	22	24	12	15	11	13	16	15	17	12	18
Hui		Q33	6	18	13	20	30	13	10	25	12	11	11	14	16	22	24	12	15	11	13	16	15	18	12	17
Hui		Q33	4	17	13	20	30	13	11	25	12	11	11	14	16	22	24	12	15	11	13	17	15	17	12	17
Hui		Q33	4	17	14	20	31	13	12	25	12	11	11	14	16	22	24	12	15	11	13	17	15	16	12	17
Hui		Q33		17	13	20	30	13	11	25	12	11	11	14	16	22	24	12	15	11	13	17	15	17	12	17
Hui		Q33		17	13	20	30	13	12	25	12	11	11	14	16	22	24	12	15	11	13	18	15	17	12	18
Hui		Q33		17	13	20	30	13	11	25	12	11	11	14	16	22	24	12	15	11	13	17	15	17	12	17
Hui		Q33		18	13	20	30	13	10	26	12	11	11	14	16	22	24	12	15	11	13	16	15	18	12	17
Hui		Q37		16	13	20	30	11	11	24	11	11	11	14	18	22	24	12	16	10	13	16	15	15	11	17
Hui		Q37		16	13	20	30	11	11	24	11	11	11	14	18	22	24	12	16	10	13	18	15	15	11	17
Hui		Q37		16	13	20	30	11	11	24	11	11	11	14	16	22	24	12	16	10	13	16	15	15	11	17
Hui		Q38		17	14	20	31	13	9	25	12	11	11	14	17	22	23	11	16	11	13	15	14	15	12	18
Hui		Q38		17	14	20	31	13	9	25	12	11	9	14	17	22	23	12	16	11	14	17	14	15	12	18
Yaq	13	1		19	14	19	30	17	11	23	13	12	12	14	16	23	23	13	13	10	13	16	10	15	12	14
Yaq		1		19	12	19	28	13	10	23	12	11	13	14	14	22	23	13	14	10	13	16	14	17	11	18

Group	N	Equal 18-23 Y-STR	N Equal 23 Y-STR	DYS576	DYS389I	DYS448	DYS389II	DYS19	DYS391	DYS481	DYS549	DYS533	DYS438	DYS437	DYS570	DYS635	DYS390	DYS439	DYS392	DYS643	DYS393	DYS458	DYS385a	DYS456	DYSYGATAH4	DYS385b
Yaq		1		20	12	19	28	13	10	23	11	11	12	14	15	22	23	11	14	10	13	15	14	17	11	18
Yaq		Q39		18	14	19	32	13	10	25	13	11	11	14	16	22	24	11	15	11	13	17	15	17	12	17
Yaq		Q39		18	14	20	32	13	10	25	13	11	11	14	17	22	24	13	15	11	13	17	15	17	12	17
Yaq		1		17	13	21	29	13	10	27	11	11	11	14	19	22	24	11	16	11	13	17	14	16	12	16
Yaq		1		18	12	20	28	13	10	25	12	12	11	14	18	24	24	12	16	11	13	18	15	17	13	16
Yaq		1		18	13	20	30	13	9	25	12	11	11	14	18	22	24	12	16	11	13	19	15	17	12	16
Yaq		1		20	12	20	28	13	10	25	12	12	11	14	17	23	24	12	16	11	13	17	15	16	12	16
Yaq		Q40		18	14	20	31	13	10	25	12	11	11	14	17	22	23	11	16	12	13	16	14	17	11	15
Yaq		Q40		18	14	19	32	13	10	25	12	11	11	14	17	22	25	11	16	12	13	16	14	15	11	17
Yaq		Q40		18	13	19	31	13	10	26	11	11	11	14	17	22	24	11	16	12	13	16	14	15	11	17
Yaq		Q40		18	13	19	31	13	10	25	11	11	11	14	17	22	24	11	16	12	13	16	14	15	11	17
Hua	15	1		19	12	20	28	13	9	23	10	11	11	14	18	23	24	13	13	10	13	18	14	16	11	19
Hua		1		18	12	19	28	13	10	24	12	12	11	14	20	22	24	12	13	11	13	17	14	15	12	18
Hua		1		17	12	21	29	13	10	23	13	11	11	14	16	22	24	13	13	11	13	18	14	16	13	18
Hua		Q5		18	12	19	28	13	10	23	12	11	12	14	16	22	23	12	14	10	12	15	14	16	11	16
Hua		1		18	13	19	30	13	10	25	12	11	11	14	18	22	25	13	14	10	13	16	15	17	11	16
Hua		Q41	2	17	14	20	30	13	10	22	11	11	11	14	17	22	24	12	14	10	13	19	14	15	12	18
Hua		1		19	13	19	31	13	10	24	12	11	11	14	17	23	24	12	15	11	14	18	14	16	12	19
Hua		1		17	13	19	30	14	11	25	12	11	11	14	18	22	24	13	16	8	13	16	14	18	12	21
Hua		1		17	13	21	29	13	10	25	13	13	11	14	20	22	23	12	16	10	13	15	15	15	12	?
Hua		Q42		19	14	20	30	13	10	24	13	11	11	14	16	22	24	12	16	10	13	18	13	15	12	21
Hua		Q42		19	14	20	30	13	10	24	13	11	11	14	16	22	24	12	16	10	13	18	13	15	12	20
Hua		Q42		18	14	20	30	13	10	24	13	11	11	14	16	22	24	12	16	10	13	18	13	15	12	20
Hua		Q42		19	14	21	30	13	10	24	13	11	11	14	16	22	24	12	16	10	13	18	13	15	12	20
Hua		1		18	14	20	31	13	10	25	12	11	11	14	15	22	24	12	16	11	13	16	15	15	12	0
Chnt	36	1		17	12	20	29	13	10	25	13	11	11	14	20	22	24	11	18	11	13	17	13	15	12	17
Chnt		Q43		16	13	19	30	13	10	25	11	11	11	14	16	22	25	12	14	10	12	16	13	16	12	16
Chnt		Q43		16	13	19	30	13	10	25	11	11	11	14	16	22	25	12	14	10	12	17	13	16	12	16
Chnt		1		17	13	19	32	13	10	25	12	11	11	14	17	22	27	12	14	10	13	17	13	17	11	0
Chnt		1		18	14	20	32	13	11	25	13	11	11	14	19	22	24	13	16	10	13	18	13	17	13	17
Chnt		1		19	13	20	29	13	10	25	11	13	12	14	17	22	24	12	14	11	13	15	14	15	11	17
Chnt		Q80		17	12	20	29	13	10	25	13	11	11	14	20	22	24	11	16	11	13	16	14	15	12	17
Chnt		Q83		18	13	19	29	13	9	23	12	10	11	14	18	22	24	11	14	10	14	17	14	15	13	17
Chnt		Q44		18	12	20	29	13	9	24	12	11	11	14	19	22	25	12	13	10	13	19	14	15	11	19
Chnt		Q44		18	12	20	29	13	9	24	12	11	11	14	21	22	25	12	15	10	13	19	14	15	11	19
Chnt		1		18	12	20	29	13	11	23	12	11	11	14	17	22	24	12	14	10	13	16	14	16	12	0
Chnt		1		18	13	19	31	13	10	25	12	11	11	14	18	22	24	11	17	11	13	16	14	16	12	17
Chnt		1		18	14	20	32	13	11	25	13	11	11	14	19	22	24	13	16	10	13	18	14	17	13	16
Chnt		Q85		18	14	20	30	13	9	25	12	12	11	14	19	22	24	11	14	11	13	16	14	17	11	17
Chnt		Q45		18	14	20	31	13	11	25	13	11	11	14	19	22	24	13	16	10	13	18	14	17	13	17
Chnt		Q45	2	18	14	20	32	13	11	25	13	11	11	14	19	22	24	13	16	10	13	18	14	17	13	17
Chnt		Q45		18	14	20	31	13	11	25	13	11	11	14	19	22	24	13	16	10	13	18	14	17	13	17
Chnt		1		18	12	19	29	13	10	24	12	11	11	14	16	23	24	10	15	10	13	16	15	14	11	18
Chnt		1		18	13	19	30	13	11	25	13	11	11	15	18	23	24	12	14	11	13	15	15	15	12	16
Chnt		Q46	2	19	12	20	28	13	9	25	13	11	11	14	18	22	24	13	13	10	13	20	15	15	12	18
Chnt		1		17	13	19	29	13	10	26	14	12	11	14	19	22	24	11	17	11	13	17	15	16	12	17
Chnt		Q47	4	19	14	20	30	14	10	23	11	11	11	14	17	23	22	13	14	10	13	16	15.215		12	17
Chnt		Q47		19	14	20	30	13	10	23	11	11	11	14	17	23	22	13	14	10	13	16	15.215		12	17
Chnt		Q47		19	14	20	30	14	10	23	11	11	11	14	18	23	22	13	14	10	13	16	15.215		12	17
Chnt		Q47		19	14	20	30	14	10	23	11	11	11	14	17	23	22	13	14	10	13	17	15.215		12	17
Chnt		Q47		20	14	20	30	14	10	23	11	11	11	14	17	23	22	13	14	10	13	16	15.215		12	18

Group	N	Equal 18-23 Y-STR	N Equal 23 Y-STR	DYS576	DYS389I	DYS448	DYS389II	DYS19	DYS391	DYS481	DYS549	DYS533	DYS438	DYS437	DYS570	DYS635	DYS390	DYS439	DYS392	DYS643	DYS393	DYS458	DYS385a	DYS456	DYSYGATAH4	DYS385b
Chnt		1		18	14	20	31	14	10	25	10	11	11	14	17	22	24	12	14	10	13	15	15.2	16	12	17
Chnt		1		18	14	20	30	13	10	23	12	11	11	14	17	22	24	13	14	10	13	16	15.2	16	11	17
Chnt		Q48	2	17	13	19	30	13	10	25	12	12	11	14	16	22	24	13	14	10	14	16	16	15	11	17
Chnt		1		19	14	21	31	13	10	24	12	12	12	14	17	22	25	12	14	10	13	17	16	15	13	17
Mxt	44	Q49		18	12	21	29	13	9	26	12	11	11	14	17	22	25	12	12	10	13	18	15	15	12	19
Mxt		Q49		18	12	21	29	19	9	26	12	11	11	14	18	22	25	12	12	10	13	18	15	15	12	19
Mxt		1		17	12	19	28	14	10	26	12	11	11	14	18	23	26	12	13	10	12	18	14	15	12	18
Mxt		Q50		18	12	20	29	13	10	28	12	11	11	14	18	22	24	11	13	10	13	20	15	15	12	19
Mxt		Q50		18	12	20	29	13	10	28	12	11	11	14	18	22	24	11	13	10	13	19	15	15	12	19
Mxt		Q50	2	18	12	20	29	13	10	28	12	11	11	14	18	22	24	11	13	10	13	20	15	16	12	19
Mxt		Q50		18	12	20	29	13	10	28	12	11	11	14	18	22	24	11	13	10	13	20	15	15	12	19
Mxt		Q50		18	12	20	29	13	10	28	12	11	11	14	18	22	24	11	13	10	13	20	15	16	12	18
Mxt		1		18	13	19	29	13	10	24	13	11	11	14	16	22	25	11	14	8	12	18	14	19	12	16
Mxt		1		19	13	20	32	13	11	27	13	11	12	14	19	22	22	13	14	9	13	15	14	16	12	17
Mxt		1		18	13	19	30	13	10	24	12	11	11	14	18	22	23	12	14	10	12	17	15	14	11	18
Mxt		1		18	14	21	32	13	10	25	14	11	11	14	17	22	24	11	14	10	12	15	13	16	11	14
Mxt		1		18	14	20	31	15	10	24	12	11	11	14	19	22	24	12	14	10	13	16	15.2	16	12	16
Mxt		1		19	13	20	31	13	11	24	12	12	11	14	18	22	25	11	14	10	13	17	15	15	12	16
Mxt		1		17	13	19	31	14	10	20	12	12	11	14	18	23	24	13	14	10	13	18	14.2	15	11	17
Mxt		Q51		18	14	19	31	14	10	25	11	11	11	15	18	22	24	12	14	10	13	15	15	17	12	15.2
Mxt		Q51		19	14	19	31	14	10	26	11	11	11	15	18	22	24	11	14	10	13	15	15	17	12	15.2
Mxt		Q86		19	14	19	31	14	10	25	13	12	11	14	15	22	23	12	14	10	14	17	15	16	12	16
Mxt		1		18	14	19	31	14	10	25	11	11	11	14	17	22	24	11	14	10	13	17	14	15	10	18
Mxt		1		18	13	20	31	14	10	24	11	11	11	14	18	22	24	12	14	10	13	16	15.2	16	11	16
Mxt		1		18	13	19	31	13	9	24	13	11	11	14	18	22	23	11	14	10	13	17	15	15	12	16
Mxt		1		17	13	20	31	13	10	23	13	12	11	14	18	23	25	11	14	10	13	17	15	15	12	0
Mxt		1		18	14	20	26	15	10	24	12	11	11	14	19	22	24	12	14	10	13	16	15.2	16	12	16
Mxt		1		18	14	19	31	14	10	25	11	11	11	14	18	22	24	12	14	10	13	15	15	17	12	15.2
Mxt		1		20	13	21	29	13	10	25	12	12	11	14	18	22	22	12	14	10	13	17	17	15	11	?
Mxt		1		18	13	21	30	13	9	24	12	11	11	14	17	20	23	11	14	10	13	15	13	15	12	15
Mxt		1		19	13	19	29	13	11	26	12	13	11	14	17	22	24	11	14	10	14	18	15	18	11	0
Mxt		Q83		18	13	19	29	13	9	24	12	10	11	14	19	22	24	11	14	10	14	16	15	15	13	17
Mxt		1		18	13	21	31	13	11	25	12	11	11	14	18	22	24	11	14	11	11	16	14	15	12	17
Mxt		1		20	12	19	28	13	11	23	12	12	12	14	17	23	23	13	14	11	12	15	13	14	12	15
Mxt		Q52		20	13	19	30	13	10	26	12	12	11	14	16	23	24	12	14	11	12	16	13	16	11	15
Mxt		Q52		21	13	19	30	13	10	26	12	12	11	14	16	23	25	12	14	11	12	16	13	16	11	15
Mxt		Q52		21	13	19	30	13	10	26	12	12	11	14	16	24	25	12	14	11	12	16	13	16	11	15
Mxt		Q53	2	16	13	20	30	13	10	24	12	12	11	14	17	22	25	12	14	11	13	19	14	16	12	23
Mxt		Q53		16	13	20	30	13	10	24	12	12	11	14	17	22	25	12	14	11	13	16	14	16	12	24
Mxt		1		18	13	21	31	13	10	25	13	11	11	14	20	22	24	11	14	11	13	15	15	15	12	17
Mxt		Q54	2	18	13	19	30	13	10	24	13	11	11	14	17	22	24	11	15	9	15	16	15	17	11	16
Mxt		1		18	13	20	31	13	10	25	14	11	11	14	17	22	24	12	16	11	12	17	14	16	11	16
Mxt		Q55		18	14	20	30	13	10	25	13	11	11	14	17	22	25	11	16	11	13	17	14	15	11	15.2
Mxt		Q55		18	14	20	30	13	10	25	13	11	11	14	17	22	25	11	16	11	13	17	14	15	11	17
Mxt		Q55		18	14	20	30	13	10	25	13	11	11	14	18	22	25	11	16	11	13	17	14	15	11	0
Mxe	31	Q56		15	14	20	31	13	9	25	12	11	11	14	17	22	24	13	13	10	12	18	14	16	13	18
Mxe		Q56		15	14	20	31	13	9	25	12	11	11	14	17	22	24	12	13	10	13	19	14	16	13	19
Mxe		Q56		16	14	20	31	13	9	25	12	11	11	14	17	22	24	12	13	10	13	18	14	16	13	18
Mxe		Q56		15	14	20	31	13	9	25	13	11	11	14	17	22	24	12	13	10	13	17	14	16	12	18
Mxe		1		16	13	20	31	14	10	25	14	11	11	14	17	22	24	13	13	10	13	16	14	16	12	18
Mxe		1		18	12	20	30	14	10	25	15	11	11	14	17	22	24	13	13	10	13	17	13	16	12	18

Group	N	Equal 18-23 Y-STR	N Equal 23 Y-STR	DYS576	DYS389I	DYS448	DYS389II	DYS19	DYS391	DYS481	DYS549	DYS533	DYS438	DYS437	DYS570	DYS635	DYS390	DYS439	DYS392	DYS643	DYS393	DYS458	DYS385a	DYS456	DYSYGATAH4	DYS385b
Mxe		Q57		17	13	20	29	13	11	26	12	12	11	14	17	24	24	11	13	11	13	18	15	16	12	19
Mxe		Q57		17	13	20	30	13	11	26	12	12	11	14	17	24	24	11	13	11	13	18	15	16	12	19
Mxe		1		17	13	19	29	13	10	24	12	11	11	14	17	22	24	11	14	9	13	17	13	15	12	15
Mxe		1		17	13	19	30	14	10	23	13	11	11	14	15	22	24	12	14	9	13	15	14	16	12	15
Mxe		Q58		17	13	19	30	14	10	24	12	10	11	14	15	22	25	10	14	10	13	16	15	18	11	16
Mxe		Q58		17	13	19	29	14	10	24	12	11	11	14	15	22	25	10	14	10	13	17	15	18	11	16
Mxe		Q59		18	13	20	30	14	9	25	13	11	11	14	15	22	24	12	14	10	13	15	16	15	12	19
Mxe		Q59		18	13	20	30	14	9	25	13	11	11	14	15	22	24	12	14	10	13	15	16	15	12	18
Mxe		Q59		18	13	20	30	14	9	25	13	11	11	14	15	22	24	12	14	10	13	15	16	15	12	19
Mxe		Q59		18	13	20	30	14	9	25	13	11	11	14	15	22	24	12	14	10	13	15	16	15	12	18
Mxe		1		18	13	19	30	13	10	24	12	11	11	15	16	22	24	12	14	10	13	15	13	16	12	15
Mxe		1		21	14	20	30	14	11	24	11	11	11	14	17	22	24	12	14	10	13	18	15.2	16	12	17
Mxe		1		19	14	21	31	13	10	24	12	12	12	14	17	23	24	12	14	10	13	17	16	15	13	18
Mxe		Q60		15	15	20	32	13	9	25	12	11	11	14	17	22	24	13	14	10	13	17	14	16	13	18
Mxe		Q60		15	15	20	32	13	9	25	12	11	11	14	17	22	24	13	14	10	13	18	14	16	13	18
Mxe		Q61		20	14	19	32	13	10	24	13	11	11	14	19	22	25	13	14	10	13	15	16	15	12	17
Mxe		Q61		19	14	20	32	13	10	25	13	11	11	14	21	22	25	13	14	10	13	15	16	15	12	17
Mxe		1		19	14	19	30	15	10	23	12	11	11	14	16	22	25	11	14	10	15	17	15	16	12	17
Mxe		1		16	14	19	31	14	10	25	13	12	11	14	16	22	26	12	14	11	12	16	15	15	12	16
Mxe		1		19	13	21	31	15	10	25	13	12	11	14	18	22	24	10	14	11	13	16	14	15	13	18
Mxe		1		20	13	20	30	13	10	24	13	11	11	14	19	22	24	11	14	11	13	16	14	16	12	18
Mxe		Q62	2	19	13	19	30	13.2	11	24	11	12	11	14	14	24	23	11	15	9	13	16	14	15	13	16
Mxe		1		18	14	20	32	14	10	24	11	11	12	14	16	22	26	13	15	10	13	16	15.2	15	12	16
Mxe		Q80		17	12	20	29	13	10	24	13	11	11	14	22	22	24	11	16	11	13	16	13	15	12	18
May	45	1		19	12	19	28	13	10	23	13	11	11	14	16	22	24	12	13	10	12	16	14	15	12	16
May		1		17	13	20	29	13	9	25	12	11	11	14	19	22	24	12	13	10	13	17	15	15	12	0
May		1		20	13	19	29	13	10	25	12	12	11	14	17	22	24	11	13	10	13	16	14	15	13	16
May		1		20	13	21	28	13	10	23	12	11	11	14	15	22	24	11	13	10	14	15	15	16	11	18
May		Q63		17	14	19	30	13	10	25	12	11	11	14	16	22	24	11	14	9	13	17	14	17	12	17
May		Q63		17	14	19	30	13	10	25	12	11	11	14	16	22	24	12	14	9	13	17	14	16	12	17
May		Q64		20	13	19	30	13	10	23	11	11	11	14	16	26	23	11	14	9	13	16	15	17	12	0
May		Q64		21	13	19	30	13	10	23	11	11	11	14	16	26	23	11	14	9	13	16	15	17	12	0
May		1		17	13	19	29	13	10	25	11	11	11	14	17	22	25	13	14	10	12	18	12	15	12	16
May		1		18	13	18	30	13	11	23	12	11	11	14	18	22	23	12	14	10	12	16	14	16	11	18
May		1		17	14	19	32	13	10	24	13	11	11	14	18.1	22	24	12	14	10	13	16	16	17	12	18
May		1		19	13	19	29	13	10	25	12	12	11	14	16	23	24	11	14	10	13	17	14	15	13	16
May		1		19	14	18	31	15	11	23	11	11	11	14	18	22	24	12	14	10	13	17	14	16	12	17
May		1		20	13	19	30	13	10	26	12	11	11	15	17	22	24	12	14	10	13	16	14	15	12	17
May		1		17	13	19	30	13	10	23	12	12	11	14	18	26	23	11	14	10	13	16	14	17	13	15
May		1		20	14	22	31	15	10	23	11	11	11	14	16	22	24	12	14	10	13	18	15	18	11	17
May		Q65		19	14	20	30	13	10	24	13	11	11	14	18	22	23	12	14	10	13	17	16	15	11	17
May		Q65		18	14	20	30	13	10	24	13	11	11	14	18	22	23	12	14	10	13	17	16	15	11	17
May		1		17	14	19	32	13	10	24	13	11	11	14	18	22	24	12	14	10	13	16	16	17	12	18
May		Q66		19	13	19	30	13	10	24	12	11	12	14	20	23	24	12	14	10	13	15	14	17	13	16
May		Q66		20	13	19	30	13	10	24	12	11	12	14	19	23	24	12	14	10	13	15	15	17	12	16
May		Q66		18	13	19	30	13	10	24	11	11	12	14	19	23	24	12	14	10	13	15	14	17	13	16
May		Q67	2	20	13	19	30	13	10	26	12	11	11	15	17	22	24	12	14	10	13	16	14	15	12	17
May		1		18	13	20	30	13	10	25	12	11	11	14	17	23	23	11	14	10	13	17	15	16	12	16
May		1		21	13	21	30	13	10	22	12	12	11	14	18	22	24	13	14	10	13	19	16	16	12	0
May		1		19	14	21	31	15	10	23	13	11	11	14	17	22	24	12	14	10	13	19	15	16	12	19

Group	N	Equal 18-23 Y-STR	N Equal 23 Y-STR	DYS576	DYS389I	DYS448	DYS389II	DYS19	DYS391	DYS481	DYS549	DYS533	DYS438	DYS437	DYS570	DYS635	DYS390	DYS439	DYS392	DYS643	DYS393	DYS458	DYS385a	DYS456	DYSYGATAH4	DYS385b
May		1		18	13	19	30	13	10	25	12	11	11	14	17	22	24	12	14	10	13	16	14	15	13	16
May		1		17	13	20	30	13	11	23	11	11	12	14	15	22	25	14	14	10	13	17	15	15	11	19
May		1		20	13	19	30	15	10	25	13	11	11	14	16	22	24	12	14	10	13	16	15	15	13	17
May		1		17	13	19	30	13	11	23	12	12	11	14	16	23	24	11	14	10	13	16	14	16	12	0
May		1		17	13	20	30	13	11	23	11	11	12	14	15	22	25	14	14	10	13	17	15	15	11	19
May		1		21	13	19	31	13	10	25	13	10	11	14	19	22	24	14	14	10	13	17	15	15	12	0
May		Q68	2	17	13	19	30	13	11	23	12	12	11	14	16	23	24	11	14	10	13	16	14	16	12	15
May		1		18	14	20	30	13	11	24	12	11	11	14	16	22	24	12	14	10	13	16	14	18	11	16
May		1		19	13	17	29	14	10	25	12	10	11	14	16	22	24	11	14	10	13	17	14	16	12	16
May		1		20	13	20	31	13	10	26	12	11	11	14	17	22	25	11	14	11	12	19	15	16	12	17
May		Q85		18	14	20	30	13	11	24	12	11	11	14	16	22	24	11	14	11	13	16	14	17	11	16
May		1		18	14	20	31	13	10	24	12	13	11	14	17	22	25	12	14	11	13	16	13	16	12	15
May		1		18	13	19	32	14	10	25	13	11	11	14	17	22	24	11	14	12	14	17	15	15	13	16
May		1		18	13	19	30	13	10	25	11	11	11	14	17	22	23	11	15	8	13	15	17	15	13	16
May		1		19	12	21	31	13	10	23	11	11	11	15	16	22	24	12	15	12	12	17	14	15	13	16
May		Q69		17	12	19	28	13	10	25	12	11	11	14	18	22	24	12	16	13	13	15	14	14	13	17
May		Q69		17	12	19	29	13	10	25	12	11	11	14	18	22	24	12	16	13	13	18	14	14	13	17
Zap	47	1		20	12	20	28	13	9	25	13	11	11	14	19	22	24	13	13	10	13	20	14	15	12	17
Zap		Q46		19	12	20	28	13	9	25	12	11	11	14	17	22	24	13	13	10	13	19	15	15	12	18
Zap		Q46		20	12	20	28	13	9	25	13	11	11	14	19	22	24	13	13	10	13	20	14	15	12	18
Zap		Q71	2	18	12	20	28	13	9	24	12	11	11	14	17	22	24	13	13	10	13	17	17	15	12	18
Zap		Q72		20	12	20	28	13	9	25	13	11	11	14	19	22	24	12	13	10	13	20	14	15	12	18
Zap		Q72		20	12	20	28	13	9	25	13	11	11	14	19	22	24	13	13	10	13	20	14	15	12	18
Zap		Q73	5	18	12	20	28	13	9	24	12	11	11	14	17	22	24	13	13	10	13	17	17	15	12	18
Zap		1		17	13	21	30	13	10	22	14	11	11	14	18	22	24	12	13	10	13	18	16	16	11	17
Zap		Q74		18	13	19	31	13	11	23	13	11	11	14	18	22	24	13	14	9	13	18	15	18	12	17
Zap		Q74	11	18	13	19	31	13	11	24	13	11	11	14	18	22	24	13	14	9	13	17	15	18	12	17
Zap		Q74		18	13	19	30	13	10	24	13	11	11	14	18	22	24	13	14	9	13	17	15	18	12	17
Zap		Q74		18	13	19	31	13	10	24	13	11	11	14	18	22	24	12	14	9	13	17	15	18	12	17
Zap		Q74		18	13	19	31	13	11	23	13	11	11	14	18	22	24	13	14	9	13	17	15	18	12	17
Zap		Q74		18	13	19	31	13	11	24	13	11	11	14	18	22	24	13	14	9	13	17	15	18	12	17
Zap		Q74		18	13	19	31	13	11	24	14	11	11	14	18	22	24	13	14	9	13	17	15	18	12	17
Zap		Q74		18	13	18	31	13	11	24	13	11	11	14	18	22	24	13	14	9	13	15	15	18	12	17
Zap		Q74		18	13	19	31	13	11	24	13	11	11	14	18	22	24	13	14	9	13	17	15	18	12	17
Zap		1		19	13	19	30	13	11	25	12	12	11	14	17	22	24	12	14	10	13	19	15	16	13	19
Zap		1		19	14	20	30	14	10	24	11	11	11	14	18	22	24	12	14	10	13	16	15.2	16	11	18
Zap		Q75		18	15	20	31	13	10	24	12	12	11	14	19	22	24	12	14	10	13	16	14	17	12	17
Zap		Q75		18	15	20	31	13	11	24	12	12	11	14	19	22	24	12	14	10	13	16	14	17	12	17
Zap		Q75	2	18	15	20	31	13	10	24	12	12	11	14	19	22	24	12	14	10	13	16	14	17	12	17
Zap		Q75		18	15	20	31	13	11	24	12	12	11	14	19	22	24	12	14	10	13	16	14	17	12	17
Zap		1		18	13	19	32	13	10	24	13	11	12	14	20	22	25	12	14	10	13	17	14	17	12	19
Zap		1		18	14	19	31	13	10	25	12	12	11	14	16	22	24	12	15	10	13	15	14	17	11	17
Zap		1		17	13	19	30	13	10	24	12	12	11	14	19	22	24	11	15	12	13	16	13	15	12	19
Zap		1		?	13	20	31	13	10	26	12	11	11	14	18	23	24	11	16	10	13	17	16	15	11	0
Zap		Q76	2	19	13	21	30	13	11	21	12	12	11	14	19	22	24	12	16	10	13	16	14	15	12	16
Zap		1		17	13	20	31	13	10	26	12	11	11	14	18	23	24	11	16	10	13	17	16	15	11	0
Zap		1		19	13	21	30	13	11	21	12	12	11	14	19	22	24	12	16	10	13	16	14	15	12	16
Total	385	103																								