

Distribution of East Eurasian Y-Chromosome and Mitochondrial DNA Haplogroups across Eurasia: Insights into the Genetic Ancestry of Bulgarians

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Abstract

The modern Bulgarian mitochondrial DNA (mtDNA) and Y-chromosome gene pools predominantly consist of Western Eurasian haplogroups. In contrast, the Eastern Eurasian lineages are found at very low frequencies in Bulgarians, being represented only by mtDNA haplogroups C (0.2%), D (0.4%) and Z (0.1%) (Karachanak et al., 2012) and Y-chromosome haplogroups C, N and Q (each 0.5%) (Karachanak et al., 2013). A similar pattern is observed in ancient mtDNA samples of proto-Bulgarian human remains, which belong exclusively to Western Eurasian mtDNA haplogroups (Nesheva et al., 2015). In order to investigate Bulgarian ancestry from the perspective of Eastern Eurasian haplogroups, we have analyzed the distribution of Y-chromosome haplogroups C, N and Q and mtDNA haplogroups C, D and Z across Eurasia. The survey was performed using literature data for more than 15,000 individuals from different Eurasian (sub-) populations for each of these haplogroups. The collected data were used to construct Eurasian frequency maps of the considered haplogroups and to test the significance of their incidence between Bulgarians and Europeans, European neighboring populations of Bulgaria and populations, which according to some historical conceptions could have common ancestry with proto-Bulgarians, namely: Altaian, Caucasus, Siberian and Central Asian populations. The spatial distribution of mtDNA haplogroups C, D and Z and Y-chromosome haplogroups C, N and Q contrasts their high frequency among Altaic populations and their occasional appearance in Bulgarians. Furthermore, the comparison of the occurrence of these haplogroups shows no link between Bulgarians and Altaic and Caucasus populations. Based on the substantial genetic input of proto-Bulgarians to the modern Bulgarian gene

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pool, the present study confirms the nonexistence of a close Y-chromosomal or mtDNA link between proto-Bulgarians on the one hand and Altaic and Caucasus populations on the other.

Keywords

Bulgarians, Y-Chromosome, mtDNA, Haplogroup

1. Introduction

The territory of Bulgaria has been involved in different migration routes ever since the modern human settlement of Europe in the Upper Paleolithic. Later, it has served as a refugium and fuelled different expansion routes of postglacial re-colonization. The area of present-day Bulgaria also played a significant role in the Neolithic spread (Calafell et al., 1996; Nitecki & Nitecki, 2013; Ray & Adams, 2001). This prehistorical population background was overlaid by the inhabitation of the Thracians, and later by the invasions of Slavs and proto-Bulgarians, which were considered as populations playing important role in the modern Bulgarian ethnogenesis (Dobrev, 1994, 2005; Haefs, 2009).

The most disputable issue of the Bulgarian past is the origin of proto-Bulgarians. Their ancestry has been widely debated, as there are even theories describing them as Altaic and Turko-Mongolic people (Zlatarski, 1970). According to novel archeological, historical and linguistic evidence, the ancient (proto-) Bulgarians made a substantial contribution to the modern Bulgarian gene pool (Dimitrov, 2005; Rashev, 1993).

The previously performed phylogenetic analysis of 13 ancient mtDNA samples retrieved from proto-Bulgarian human remains and discovered in three necropolises in Bulgaria dating to VIII-X century AD identified mtDNA haplogroups, which were found in present-day European and Western Eurasian populations. These results pointed to a Western Eurasian matrilineal origin for proto-Bulgarians as well as to a genetic similarity between them and modern Bulgarians (Nesheva et al., 2015).

The high-resolution phylogenetic analyses of Y-chromosome and mitochondrial DNA (mtDNA) diversity of modern Bulgarians in samples comprising 808 and 855 subjects, respectively, showed that their gene pool was predominantly composed by Western Eurasian haplogroups. On the other hand, Eastern Eurasian haplogroups are represented at negligible frequencies. Thus, mtDNA haplogroups C, D and Z account for 0.2%, 0.4% and 0.1% of the modern Bulgarian gene pool, respectively and Y-chromosome haplogroups C, N and Q are each at frequency of 0.5%. The interpopulational comparisons of Y-chromosome and mtDNA haplogroup frequencies locate modern Bulgarians among European populations in both cases (Karachanak et al., 2012, 2013).

In order to further test the reliability of the theories of Bulgarian, and in particular of proto-Bulgarian origin, we have depicted the frequency gradients of Y-chromosome haplogroups C, N and Q and mtDNA haplogroups C, D and Z across Eurasia and we have tested the significance of their incidence between Bulgarians and Europeans, European neighboring populations of Bulgaria and populations, which according to some historical conceptions could have common ancestry with proto-Bulgarians, namely: Altaian, Caucasus, Siberian and Central Asian populations.

2. Materials and Methods

We have collected literature data for the frequencies of Y-chromosome haplogroups C, N and Q and mtDNA haplogroups C, D and Z in Eurasian populations. The gathered data for the Y-chromosome haplogroups comprise 19856 samples from 186 (sub-) populations for Hg C, 16418 from 173 (sub-) populations for Hg N and 15652 samples from 160 (sub-) populations for Hg Q (supplementary **Tables S1(a)-(c)**, respectively). For the mtDNA haplogroups we have collected data for 35083 samples representing 226 (sub-) populations for Hg C, 38039 from 242 (sub-) populations for haplogroup D and 17716 samples from 160 (sub-) populations for Hg Z (supplementary **Tables S2(a)-(c)**, respectively). These data were used to construct frequency maps by using the Surfer Golden software following the Kriging procedure.

The occurrences of the aforementioned haplogroups were compared between modern Bulgarians and: Europeans, European neighboring populations of Bulgaria, Altaian, Caucasus, Siberian and Central Asian populations. The comparison was performed through a chi-square test using XLSTAT.

3. Results

The frequency maps of Y-chromosome haplogroups C, N and Q are given in **Figure 1**.

Haplogroup C, one of the earliest Out-of-Africa founder types, has highest frequencies in the middle latitudes of Asia. It has overwhelming presence among: Oroqens (90.9%), Evens (74.2%), Evenks (68.4%) (Hammer et al., 2005), Buryats (68.2%), Mongols (65.2%) and Kalmyks (62.6%) (Malyarchuk et al., 2010). The frequency of haplogroup C decreases in South Asia and diminishes in Europe with only few representatives in the south of the continent.

The frequency map of Hg N, which is considered of Southern East Asia origin (Shi et al., 2013), depicts the prevalence of this haplogroup mainly in Northern Eurasia. Thus, it is most numerous in European Russia, in particular in: Kursk (92.5%) (Mirabal et al., 2009), Tver (78.9%), Mezen (53.7%), Krasnoborsk (39.6%), Pinega (39.5%) and Vologda (38.8%); in Siberia, among Yakuts (84.2%) (Derenko et al., 2007a; Sengupta et al., 2006) and Khanty (81.5%) (Mirabal et al., 2009); and among Swedish Saami (44.7%) (Karlsson et al., 2006). Haplogroup N abruptly dissipates in lower latitudes, being virtually absent in southern Eurasia, with the exception of certain southwest Chinese ethnic groups such as Sichuan (13.2%) and Yunnan (10.7%) (Zhong et al., 2011). Unlike the other considered haplogroups, Hg N has quite uneven distribution among European populations which is summarized in **Table 1**. It is apparent that Hg N is most prominent in East Slavic populations (Russians, Belarusians and Ukrainians) (Battaglia et al., 2009; Kushniarevich et al., 2013; Mirabal et al., 2009) and Swedish Saami (Karlsson et al., 2006), but is almost lacking among other Europeans.

Despite its Asian origin (Sharma et al., 2007), Hg Q is a minor Y-chromosome haplogroup in Eurasia having two occasional frequency peaks in Northwest Siberia among Kets and Selkups (93.8% and 66.4%, respectively) (Karafet et al., 2002) and in Altai people (17.4%) (Hammer et al., 2005), as its frequency steeply declines outside these regions.

The spatial frequency maps of mtDNA haplogroups C, D and Z are presented in **Figure 2**.

Haplogroups C and D, which have evolved in Eastern Asia and expanded after the Last Glacial Maximum, comprise almost half of the northern and eastern Asian mtDNA gene pool (Derenko et al., 2007b; Derenko et al., 2010).

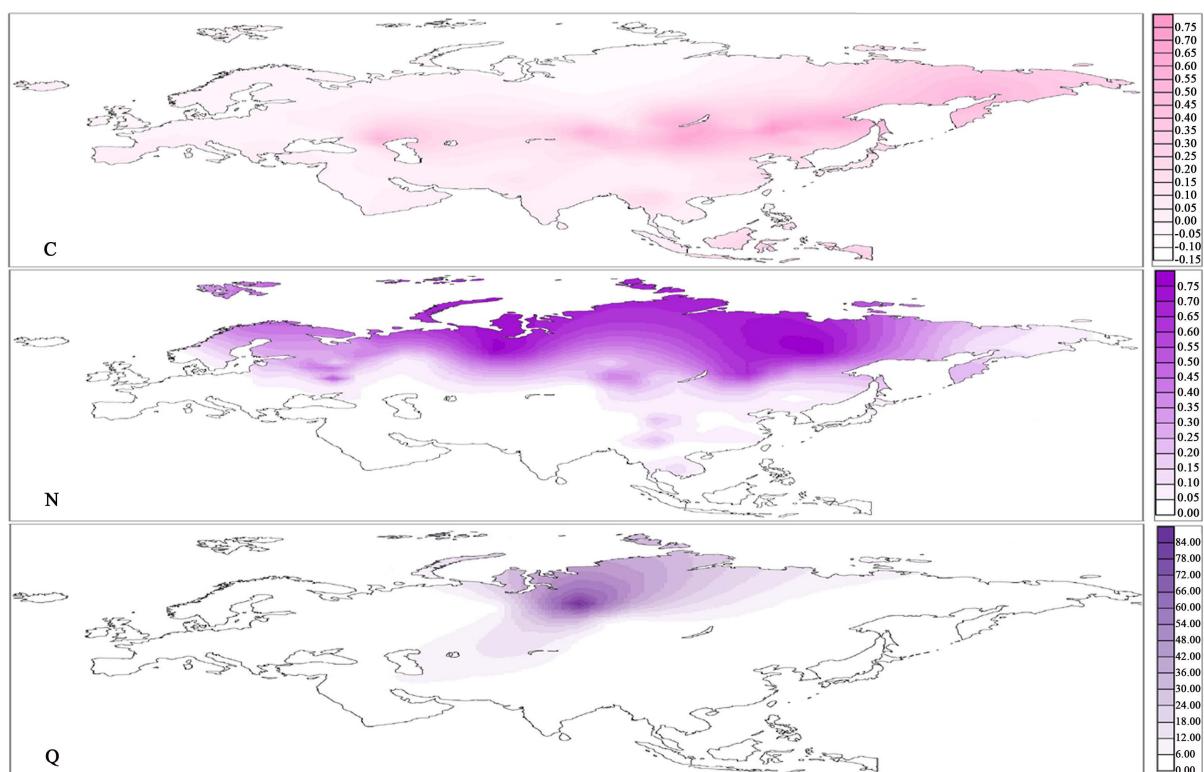


Figure 1. Eurasian frequency distributions of Y-chromosome haplogroups C, N and Q.

Table 1. Percent frequency of Y-chromosome haplogroup N in European populations. N-number of analyzed individuals.

Populations	N	Hg N %	Reference
European Russia, Belorussia and Ukraine			
• Belarussian-East Polesie	96	8.3	Kushniarevich et al., 2013
• Belarussian-West Polesie	121	8.3	Kushniarevich et al., 2013
• Belarussian-Centre	88	8	Kushniarevich et al., 2013
• Belarussian-East	86	7	Kushniarevich et al., 2013
• Belarussian-North	101	15.8	Kushniarevich et al., 2013
• Belarussian-West	73	13.7	Kushniarevich et al., 2013
• Russia-Arkhangelski	28	28.6	Mirabal et al., 2009
• Russia-Belgorod	143	12.6	Battaglia et al., 2009
• Russia-Belgorod	143	12.6	Battaglia et al., 2009
• Russia-Kashin	73	11	Battaglia et al., 2009
• Russia-Krasnoborsk	91	39.6	Battaglia et al., 2009
• Russia-Kuban Cossacs	90	7.8	Battaglia et al., 2009
• Russia-Kursk	40	92.5	Mirabal et al., 2009
• Russia-Livni	110	5.5	Battaglia et al., 2009
• Russia-Livni	110	5.5	Battaglia et al., 2009
• Russia-Mezen	54	53.7	Battaglia et al., 2009
• Russia-Ostrov	75	28	Battaglia et al., 2009
• Russia-Pinega	114	39.5	Battaglia et al., 2009
• Russia-Porhov	57	19.3	Battaglia et al., 2009
• Russia-Pristen	45	13.3	Battaglia et al., 2009
• Russia-Pskov	132	24.2	Battaglia et al., 2009
• Russia-Repilevka	96	6.3	Battaglia et al., 2009
• Russia-Roslavl	107	14	Battaglia et al., 2009
• Russia-Tver	38	78.9	Mirabal et al., 2009
• Russia-Unzha	52	13.5	Battaglia et al., 2009
• Russia-Unzha	52	13.5	Battaglia et al., 2009
• Russia-Vologda	121	38.8	Battaglia et al., 2009
• Ukraine	92	6.5	Battaglia et al., 2009
Central Europe			
• Czechs	75	2.7	Battaglia et al., 2009
• Germany	16	0	Battaglia et al., 2009
• Hungary	53	0	Battaglia et al., 2009
• Poland	99	1	Battaglia et al., 2009
Western Europe			
• Ac,ores	121	0	Capelli et al., 2007
• Antwerpen	72	0	Capelli et al., 2007
• Corsica	34	0	Derenko et al., 2007a
• France	23	0	Battaglia et al., 2009
• Gipuzkoa Basques	74	0	Kushniarevich et al., 2013
• Italy-Central Marche	59	0	Larmuseau et al., 2011
• Italy-Elba Island Tuscany	95	0	Larmuseau et al., 2011

Continued

• Italy-West Calabria	57	0	Larmuseau et al., 2011
• Kempen Belgium	77	1.3	Capelli et al., 2003
• Madeira	129	2.3	Gonçalves et al., 2005
• Mechelen Belgium	63	3.2	Capelli et al., 2003
• Noord-Brabant Netherlands	130	0	Capelli et al., 2003
• Norway	201	1	Semino et al., 2000
• Portugal-Central	102	0	Capelli et al., 2007
• Portugal-North	101	0	Capelli et al., 2007
• Portugal-South	100	0	Capelli et al., 2007
• Sardinia	78	0	Francalacci et al., 2003
• Sicily	51	0	Francalacci et al., 2003
• Spain-Alto Urgel	34	0	López-Parra et al., 2009
• Spain-Cerdána	37	0	López-Parra et al., 2009
• Spain-Cinco Villas	42	0	López-Parra et al., 2009
• Spain-Jacetania	31	0	López-Parra et al., 2009
• Spain-Valle de Arán	25	0	López-Parra et al., 2009
• Swedish Saami	38	44.7	Karlsson et al., 2006
• Vlaams and Waals Brabant Belgium	135	0.7	Larmuseau et al., 2011
Southeastern Europe			
• Albania	55	0	Battaglia et al., 2009
• Bosniacs	84	0	Battaglia et al., 2009
• Bosnian Croats	90	0	Battaglia et al., 2009
• Bosnian Serbs	81	6.2	Battaglia et al., 2009
• Bulgaria	808	0.5	Karachanak et al., 2013
• Crete-Heraklion Prefecture	104	0	Martinez et al., 2007
• Crete-Lasithi Plateau	41	0	Martinez et al., 2007
• Crete-Lasithi Prefecture	23	0	Martinez et al., 2007
• Croats	89	2.2	Battaglia et al., 2009
• Croats-Osijek	29	0	Battaglia et al., 2009
• FYROM	211	0.5	Noveski et al., 2010
• Greece	92	0	Battaglia et al., 2009
• Greece-Crete	193	0	King et al., 2008
• Greece-Nea Nikomedeia	57	0	King et al., 2008
• Greece-Sesklo	57	0	King et al., 2008
• Macedonian Greeks	57	0	Battaglia et al., 2009
• Moldavia	125	1.6	Varzari et al., 2013
• Romania	149	0.7	Martinez-Cruz et al., 2012
• Serbia	103	1.9	Regueiro et al., 2012
• Slovenia	75	0	Battaglia et al., 2009

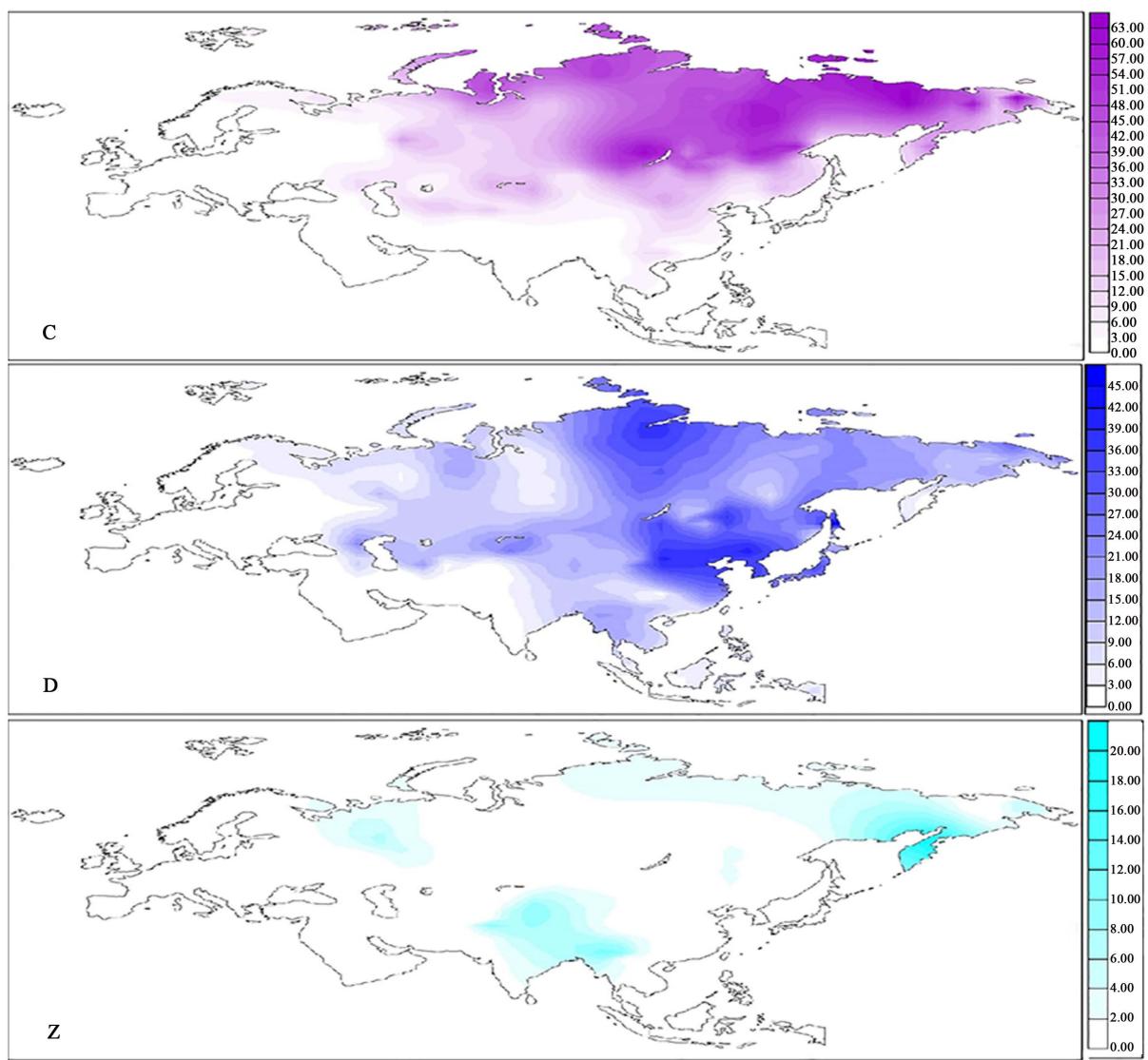


Figure 2. Eurasian frequency distributions of mtDNA haplogroups C, D and Z.

Haplogroup C is prevalent in Siberia. It has highest frequencies in regions inhabited by Yukaghirs (up to 72.2%) (Volodko et al., 2008), Evenks (up to 71.8%) and Tofalars (up to 62.1%) (Derenko et al., 2010). The occurrence of haplogroup C decreases to 5% towards the Volga-Ural region, Central Asia and the Indian sub-continent; which together delineate the diminishing border of the haplogroup.

The distributions of haplogroups C and D are almost overlapping. They slightly differ in haplogroup D frequency maximums which are found in: Oroks of Sakhalin (68.9%), Sojots from the Baikal region (46.7%), Orochens (43.2%), Manchus (42.6%) (Zhao et al., 2011) and Dolgans in North Siberia (39.5%) (Derenko et al., 2010). Furthermore, the frequency of Hg D drops below 5% more westward and southward than Hg C, but it is also nearly nonexistent in Europe and West Asia.

The minor mtDNA haplogroup Z, which is of Central Asian origin, has only a few frequency foci in Eurasia. They are scattered in: Northeastern Asia in Koryaks (21.7%); in the Volga-Ural region in Udmurts (16.7%) (Grosheva et al., 2014) and in parts of Central South Asia among Nu (16.7%) (Liu et al., 2011), Hazara (13%) (Quintana-Murci et al., 2004), and Kazakhs (11.3%) (Yao et al., 2004).

The results of the chi-square test of the occurrence of Y-chromosome haplogroups C, N and Q (supplementary **Table S3**) and mtDNA haplogroups C and D (supplementary **Table S4**) are presented in **Table 2** and **Table 3**, respectively.

Table 2. Comparison of the incidence of Y-chromosome haplogroups C, N and Q between Bulgarians and different population groups.

Population group*	N	Hg C	Hg N	Hg Q	p**
Altaian populations	465	122	45	68	<0.0001
Siberian populations	842	257	478	9	<0.00001
Central Asian populations	700	67	111	49	<0.00001
European populations	2617	4	77	3	0.000035
Bulgarians' European neighbouring populations	520	0	4	1	0.289988
Bulgarians	808	4	4	4	

N-number of samples analyzed; *The populations consisting the population groups and their references are given in supplementary **Table S3**; **p-value population group vs Bulgarians.

Table 3. Comparison of the incidence of mtDNA haplogroups C and D between Bulgarians and different population groups.

Population group*	N	Hg C	Hg D	p**
Altaian populations	1058	252	223	<0.0001
Siberian populations	2892	911	570	<0.0001
Central Asian populations	3078	314	444	<0.0001
Caucasus populations	829	92	54	<0.00001
European populations	8229	20	21	0.896
Bulgarians' European neighbouring populations	658	1	1	0.873002
Bulgarians	855	2	3	

N-number of samples analyzed; *The populations consisting the population groups and their references are given in supplementary **Table S4**; **p-value population group vs Bulgarians.

The occurrence of Y-chromosome haplogroups C, N and Q shows that there is statistically significant difference between Bulgarians and: Altaian, Siberian, Central Asian and European populations ($p < 0.0001$, $p < 0.00001$, $p < 0.00001$ and $p = 0.000035$, respectively). Furthermore, the chi-square test shows a Y-chromosome relation between Bulgarians and their European neighboring populations ($p = 0.289988$).

The absolute frequencies of mtDNA haplogroups C and D (Hg Z was excluded due to lack of data for part of the populations) point that there is significant difference between Bulgarians and: Altaian, Siberian, Central Asian and Caucasus populations ($p < 0.0001$, $p < 0.0001$, $p < 0.0001$ and $p < 0.0001$, respectively) and that Bulgarians do not statistically differ from Europeans and their European neighboring populations ($p = 0.896$ and $p = 0.873002$, respectively).

4. Discussion

The modern Bulgarian gene pool has been gradually formed from a succession of populations with different genetic impacts. According to novel historical, linguistic and archeological data, one of the strongest genetic signals in the modern Bulgarian gene pool should derive from proto-Bulgarians (Dimitrov, 2005; Rashev, 1993).

It has been established that the modern Bulgarian mtDNA and Y-chromosome gene pools are overwhelmingly represented by Western Eurasian haplogroups. On the other hand, the Eastern Eurasian lineages among Bulgarians are represented by very low frequencies of mtDNA haplogroups C (0.2%), D (0.4%) and Z (0.1%) and Y-chromosome haplogroups C, N and Q (each 0.5%) (Karachanak et al., 2012, 2013). Similar to these findings, ancient mtDNA analysis of proto-Bulgarian human remains has revealed the presence of only Western Eurasian haplogroups (Nesheva et al., 2015).

In order to further genetically test the hypotheses about the origin of modern-and proto-Bulgarians, in the present study we have analyzed the distribution of Y-chromosome haplogroups C, N and Q and mtDNA haplogroups C, D and Z across Eurasia and between modern Bulgarians and different population groups.

The frequency distributions of mtDNA haplogroups C, D and Z and Y-chromosome haplogroups C, N and Q clearly depict their predominance in territories including those inhabited by Altaic (Turkic and Mongolic) populations. All of these haplogroups are underrepresented in Europe, with the exception of Y-chromosome haplogroup N, which is frequent only among East Slavic (Battaglia et al., 2009; Kushniarevich et al., 2013; Mirabal et al., 2009) populations and Swedish Saami (Karlsson et al., 2006) and is one of the features which genetically distinguish them from the remainder of the European populations.

The comparison of the incidence of Y-chromosome haplogroups C, N and Q points to a statistically significant difference between Bulgarians and Altaian, Siberian and Central Asian populations. Conversely, the chi-square test reveals a Y-chromosome link between Bulgarians and their European neighboring populations. The occurrence of mtDNA haplogroups C and D shows a similar pattern, with no association between Bulgarians and Altaian, Siberian, Central Asian and Caucasus populations and with similarity between Bulgarians and their European neighboring populations and European populations as a whole. The discrepancy in the statistical significance of the distribution of Y-chromosome and mtDNA haplogroups in Bulgarians and Europeans is probably due to the mtDNA uniformity of Europe.

The Eurasian distribution of mtDNA haplogroups C, D and Z and Y-chromosome haplogroups C, N and Q contrasts their high frequency among Altaic populations and their occasional appearance in Bulgarians. Furthermore, the comparison of the occurrence of these haplogroups shows no link between Altaic populations and Bulgarians. Based on the substantial genetic input of proto-Bulgarians to the modern Bulgarian gene pool, our findings confirm the nonexistence of a close Y-chromosomal or mtDNA link between proto-Bulgarians on one hand and Altaic and Caucasus populations on the other.

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Supplementary

Table S1. Absolute and percent frequencies of Y-chromosome haplogroups C (a), N (b) and Q (c) used to construct spatial frequency maps. N-number of analyzed individuals.

(a)				
Country	Reference	N	Hg C	Hg C %
Afghanistan-North	Lacau et al., 2012	44	0	0
Afghanistan-South	Lacau et al., 2012	146	5	3.42
Albania	Battaglia et al., 2009	55	0	0
Altai	Hammer et al., 2005	98	22	22.45
Altaian Kazakhs	Malyarchuk et al., 2010	36	21	58.33
Altaian Kazakhs (Southeastern)	Dulik et al., 2011	89	54	60.67
Altaian Kazakhs (Southwestern)	Dulik et al., 2011	30	17	56.67
Altaians	Malyarchuk et al., 2010	89	14	15.73
Anhui	Zhong et al., 2011	52	7	13.46
Antwerpen	Larmuseau et al., 2011	72	0	0
Balkarians	Battaglia et al., 2009	38	0	0
Belarussian-East Polesie	Kushniarevich et al., 2013	96	0	0
Belarussian-West Polesie	Kushniarevich et al., 2013	121	0	0
Belarussian-Centre	Kushniarevich et al., 2013	88	0	0
Belarussian-East	Kushniarevich et al., 2013	86	0	0
Belarussian-North	Kushniarevich et al., 2013	101	0	0
Belarussian-West	Kushniarevich et al., 2013	73	0	0
Bosniacs	Battaglia et al., 2009	84	0	0
Bosnian Croats	Battaglia et al., 2009	90	0	0
Bosnian Serbs	Battaglia et al., 2009	81	0	0
British Isles	Capelli et al., 2003	1772	0	0
Bulgaria	Karachanak et al., 2013	808	4	0.50
Buryat	Hammer et al., 2005	81	49	60.49
Buryats	Malyarchuk et al., 2010	217	148	68.20
Cambodia	Sengupta et al., 2006	6	0	0
China-Dai	Sengupta et al., 2006	7	2	28.57
China-Daur	Sengupta et al., 2006	7	2	28.57
China-Hezhen	Sengupta et al., 2006	6	3	50.00
China-Lahu	Sengupta et al., 2006	7	0	0
China-Naxi	Sengupta et al., 2006	8	0	0
China-Oroqen	Sengupta et al., 2006	7	5	71.43

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China-Tu	Sengupta et al., 2006	7	0	0
China-Tujia	Sengupta et al., 2006	9	1	11.11
China-Uygur	Sengupta et al., 2006	8	1	12.50
China-Xibo	Sengupta et al., 2006	8	3	37.50
China-Yi	Sengupta et al., 2006	9	0	0
Chongqing	Zhong et al., 2011	43	2	4.65
Corsica	Francalacci et al., 2003	34	0	0
Crete	King et al., 2008; Martinez et al., 2007	361	0	0
Croats	Battaglia et al., 2009	118	0	0
Even	Hammer et al., 2005	31	23	74.19
Evenk	Hammer et al., 2005	95	65	68.42
Evenks	Malyarchuk et al., 2010	41	20	48.78
Evenks	Malyarchuk et al., 2010	41	20	48.78
Evenks	Malyarchuk et al., 2010	41	20	48.78
Evens	Malyarchuk et al., 2010	63	34	53.97
France	Semino et al., 2000	23	0	0
Fujian	Zhong et al., 2011	112	9	8.04
FYROM	Noveski et al., 2010	211	0	0
Gansu	Zhong et al., 2011	221	33	14.93
Georgians	Battaglia et al., 2009	66	0	0
Germany	Semino et al., 2000	16	0	0
Gipuzkoa Basques	Alonso et al., 2005	74	0	0
Greece	Battaglia et al., 2009	92	1	1.09
Greece-Nea Nikomedea	King et al., 2008	57	0	0
Greece-Sesklo	King et al., 2008	57	0	0
Guangdong	Zhong et al., 2011	91	6	6.59
Guangxi	Zhong et al., 2011	272	17	6.25
Guizhou	Zhong et al., 2011	533	40	7.50
Hainan	Zhong et al., 2011	110	0	0
Heilongjiang	Zhong et al., 2011	171	34	19.88
Henan	Zhong et al., 2011	66	8	12.12
Hubei	Zhong et al., 2011	83	12	14.46
Hunan	Zhong et al., 2011	133	19	14.29
Hungary	Battaglia et al., 2009	53	0	0
India-East	Sengupta et al., 2006	128	2	1.56
India North	Sengupta et al., 2006	80	2	2.50
India-Northeast	Sengupta et al., 2006	87	1	1.15

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India-Central	Sengupta et al., 2006	71	0	0
India-South	Sengupta et al., 2006	303	6	1.98
India-West	Sengupta et al., 2006	59	2	3.39
Indonesia-East	Hammer et al., 2005	55	18	32.73
Indonesia-West	Hammer et al., 2005	25	1	4.00
Inner Mongolia	Zhong et al., 2011	53	16	30.19
Iran	Grugni et al., 2012	827	9	1.09
Iran North	Regueiro et al., 2006	33	1	3.03
Iran South	Regueiro et al., 2006	117	0	0
Iraq (Marsh Arab)	Al-Zahery et al., 2011	143	0	0
Ireland	Moore et al., 2006	796	0	0
Italy-Apennine Marche	Capelli et al., 2007	27	0	0
Italy-Central Marche	Capelli et al., 2007	59	0	0
Italy-Central Tuscany	Capelli et al., 2007	41	0	0
Italy-Elba Island (Tuscany)	Capelli et al., 2007	95	0	0
Italy-North-East Latium	Capelli et al., 2007	55	0	0
Italy-North-West Apulia	Capelli et al., 2007	46	0	0
Italy-South Apulia	Capelli et al., 2007	71	0	0
Italy-South Latium	Capelli et al., 2007	51	0	0
Italy-Tuscany-Latium border	Capelli et al., 2007	79	0	0
Italy-Val Badia (Alto Adige)	Capelli et al., 2007	34	0	0
Italy-West Calabria	Capelli et al., 2007	57	0	0
Italy-West Campania	Capelli et al., 2007	84	0	0
Japan	Hammer et al., 2005	255	21	8.24
Jiangsu	Zhong et al., 2011	39	6	15.38
Jiangxi	Zhong et al., 2011	26	0	0
Jilin	Zhong et al., 2011	118	16	13.56
Jordan/Amman	Flores et al., 2005	101	0	0
Jordan/Dead Sea	Flores et al., 2005	45	0	0
Kalmyks	Malyarchuk et al., 2010	91	57	62.64
Kempen (Belgium)	Larmuseau et al., 2011	77	0	0
Khakassians	Malyarchuk et al., 2010	64	1	1.56
Khamnigans	Malyarchuk et al., 2010	51	28	54.90
Koreans	Malyarchuk et al., 2010	52	5	9.62
Koryaks	Malyarchuk et al., 2010	39	15	38.46
Liaoning	Zhong et al., 2011	149	34	22.82
Macedonian Greeks	Battaglia et al., 2009	57	0	0

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Madeira	Goncalves et al., 2005	129	0	0
Malay	Hammer et al., 2005	32	1	3.13
Manchurian	Hammer et al., 2005	41	18	43.90
Mechelen (Belgium)	Larmuseau et al., 2011	63	0	0
Moldavia	Varzari et al., 2013	125	0	0
Mongolia-Outer	Hammer et al., 2005	149	78	52.35
Mongols	Malyarchuk et al., 2010	46	30	65.22
Ningxia	Zhong et al., 2011	62	11	17.74
Noord-Brabant (Netherlands)	Larmuseau et al., 2011	130	0	0
North Korea	Zhong et al., 2011	19	5	26.32
Norway	Capelli et al., 2003	201	0	0
Oman	Luis et al., 2004	121	4	3.31
Oroqen	Hammer et al., 2005	22	20	90.91
Pakistan-North	Sengupta et al., 2006	86	12	13.95
Pakistan-South	Sengupta et al., 2006	91	1	1.10
Philippines	Hammer et al., 2005	48	1	2.08
Poland	Battaglia et al., 2009	99	0	0
Portugal-Central	Goncalves et al., 2005	102	0	0
Portugal-North	Goncalves et al., 2005	101	1	0.99
Portugal-South	Goncalves et al., 2005	100	1	1.00
Qinghai	Zhong et al., 2011	40	3	7.50
Romania	Martinez-Cruz et al., 2012	149	0	0
Russia-Arkhangelski	Mirabal et al., 2009	28	0	0
Russia-Belgorod	Balanovsky et al., 2008	143	1	0.70
Russia-Izhemski Komi	Mirabal et al., 2009	54	0	0
Russia-Kashin	Balanovsky et al., 2008	73	0	0
Russia-Krasnoborsk	Balanovsky et al., 2008	91	0	0
Russia-Kuban Cossacs	Balanovsky et al., 2008	90	0	0
Russia-Kursk	Mirabal et al., 2009	40	0	0
Russia-Livni	Balanovsky et al., 2008	110	0	0
Russia-Mezen	Balanovsky et al., 2008	54	0	0
Russians	Malyarchuk et al., 2010	406	3	0.74
Russia-Ostrov	Balanovsky et al., 2008	75	0	0
Russia-Pinega	Balanovsky et al., 2008	114	0	0
Russia-Porhov	Balanovsky et al., 2008	57	0	0
Russia-Priluzski Komi	Mirabal et al., 2009	49	0	0
Russia-Pristen	Balanovsky et al., 2008	45	0	0

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Russia-Pskov	Balanovsky et al., 2008	132	0	0
Russia-Repievka	Balanovsky et al., 2008	96	0	0
Russia-Roslavl	Balanovsky et al., 2008	107	1	0.93
Russia-Siberia (Khanty)	Mirabal et al., 2009	27	0	0
Russia-Tver	Mirabal et al., 2009	38	0	0
Russia-Unzha	Balanovsky et al., 2008	52	0	0
Russia-Vologda	Balanovsky et al., 2008	121	0	0
Sardinia	Francalacci et al., 2003	78	1	1.28
Serbia	Regueiro et al., 2012	103	0	0
Shandong	Zhong et al., 2011	115	13	11.30
Shanghai	Zhong et al., 2011	17	4	23.53
Shannxi	Zhong et al., 2011	56	6	10.71
Shanxi	Zhong et al., 2011	56	11	19.64
Shors	Malyarchuk et al., 2010	38	1	2.63
Sichuan	Zhong et al., 2011	113	7	6.19
Sicily	Francalacci et al., 2003	51	0	0
Slovenia	Battaglia et al., 2009	75	0	0
Sojots	Malyarchuk et al., 2010	28	15	53.57
South Korea	Hammer et al., 2005	75	7	9.33
Spain-Alto Urgel	Lopez-Parra et al., 2009	34	1	2.94
Spain-Cerdaña	Lopez-Parra et al., 2009	37	1	2.70
Spain-Cinco Villas	Lopez-Parra et al., 2009	42	0	0
Spain-Jacetania	Lopez-Parra et al., 2009	31	0	0
Spain-Vallede Ar'an	Lopez-Parra et al., 2009	25	0	0
Swedish Saami	Karlsson et al., 2006	38	0	0
Taiwan	Hammer et al., 2005	132	7	5.30
Teleuts	Malyarchuk et al., 2010	44	5	11.36
Tibet	Hammer et al., 2005	105	2	1.90
Tibetans	Zhong et al., 2011	222	7	3.15
Todjins	Malyarchuk et al., 2010	26	2	7.69
Turkey-central	Cinnioglu et al., 2004	152	2	1.32
Turkey-east	Cinnioglu et al., 2004	208	1	0.48
Turkey-west	Cinnioglu et al., 2004	163	4	2.45
Tuvinians	Malyarchuk et al., 2010	108	12	11.11
Ukraine	Battaglia et al., 2009	92	0	0
Vietnam	Hammer et al., 2005	70	3	4.29
Vlaams and Waals Brabant (Belgium)	Larmuseau et al., 2011	135	0	0

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Xingjiang	Zhong et al., 2011	244	54	22.13
Xinjiang	Zhong et al., 2011	61	22	36.07
Yakut	Sengupta et al., 2006	18	2	11.11
Yakuts	Malyarchuk et al., 2010	10	2	20.00
Yemen	Cadenas et al., 2008	62	0	0
Yunnan	Zhong et al., 2011	447	41	9.17
Zhejiang	Zhong et al., 2011	102	5	4.90

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(b)

Country	Reference	N	Hg N	Hg N %
Afghanistan-North	Lacau et al., 2012	44	0	0
Afghanistan-South	Lacau et al., 2012	146	0	0
Albania	Battaglia et al., 2009	55	0	0
Altai	Hammer et al., 2005	98	4	4.08
Altaian Kazakhs (Southeastern)	Dulik et al., 2011	89	0	0
Altaian Kazakhs (Southwestern)	Dulik et al., 2011	30	0	0
Altaians	Derenko et al., 2007	142	13	9.15
Anhui	Zhong et al., 2011	52	4	7.69
Antwerpen	Larmuseau et al., 2011	72	0	0
Balkarians	Battaglia et al., 2009	38	0	0
Belarussian-East Polesie	Kushniarevich et al., 2013	96	8	8.33
Belarussian-West Polesie	Kushniarevich et al., 2013	121	10	8.26
Belarussian-Centre	Kushniarevich et al., 2013	88	7	7.95
Belarussian-East	Kushniarevich et al., 2013	86	6	6.98
Belarussian-North	Kushniarevich et al., 2013	101	16	15.84
Belarussian-West	Kushniarevich et al., 2013	73	10	13.70
Bosniacs	Battaglia et al., 2009	84	0	0
Bosnian Croats	Battaglia et al., 2009	90	0	0
Bosnian Serbs	Battaglia et al., 2009	81	5	6.17
Bulgaria	Karachanak et al., 2013	808	4	0.50
Buryat	Hammer et al., 2005	81	25	30.86
Buryats	Derenko et al., 2007	217	41	18.89
Cambodia	Sengupta et al., 2006	6	1	16.67
China-Dai	Sengupta et al., 2006	7	0	0
China-Daur	Sengupta et al., 2006	7	1	14.29
China-Hezhen	Sengupta et al., 2006	6	0	0
China-Lahu	Sengupta et al., 2006	7	0	0
China-Naxi	Sengupta et al., 2006	8	2	25.00
China-Oroqen	Sengupta et al., 2006	7	2	28.57
China-Tu	Sengupta et al., 2006	7	2	28.57
China-Tujia	Sengupta et al., 2006	9	1	11.11
China-Uygur	Sengupta et al., 2006	8	0	0
China-Xibo	Sengupta et al., 2006	8	1	12.50
China-Yi	Sengupta et al., 2006	9	1	11.11
Chongqing	Zhong et al., 2011	43	1	2.33
Corsica	Francalacci et al., 2003	34	0	0
Crete	Martinez et al., 2007; King et al., 2008	361	0	0
Croats	Battaglia et al., 2009	118	2	1.69

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Czechs	Battaglia et al., 2009	75	2	2.67
Even	Hammer et al., 2005	31	4	12.90
Evenk	Hammer et al., 2005	95	18	18.95
Evenks	Derenko et al., 2007	41	12	29.27
Evenks	Derenko et al., 2007	41	12	29.27
Evenks	Derenko et al., 2007	41	12	29.27
Evens	Derenko et al., 2007	11	1	9.09
France	Semino et al., 2000	23	0	0
Fujian	Zhong et al., 2011	112	6	5.36
FYROM	Noveski et al., 2010	211	1	0.47
Gansu	Zhong et al., 2011	221	15	6.79
Georgians	Battaglia et al., 2009	66	0	0
Germany	Semino et al., 2000	16	0	0
Gipuzkoa Basques	Alonso et al., 2004	74	0	0
Greece	Battaglia et al., 2009	92	0	0
Greece-Nea Nikomedesia	King et al., 2008	57	0	0
Greece-Sesklo	King et al., 2008	57	0	0
Guangdong	Zhong et al., 2011	91	4	4.40
Guangxi	Zhong et al., 2011	272	6	2.21
Guizhou	Zhong et al., 2011	533	27	5.07
Hainan	Zhong et al., 2011	110	2	1.82
Heilongjiang	Zhong et al., 2011	171	10	5.85
Henan	Zhong et al., 2011	66	3	4.55
Hubei	Zhong et al., 2011	83	7	8.43
Hunan	Zhong et al., 2011	133	12	9.02
Hungary	Battaglia et al., 2009	53	0	0
India-East	Sengupta et al., 2006	128	0	0
India North	Sengupta et al., 2006	80	0	0
India-Northeast	Sengupta et al., 2006	87	0	0
India-Central	Sengupta et al., 2006	71	0	0
India-South	Sengupta et al., 2006	303	0	0
India-West	Sengupta et al., 2006	59	0	0
Indonesia-East	Hammer et al., 2005	55	0	0
Indonesia-West	Hammer et al., 2005	25	0	0
Inner Mongolia	Zhong et al., 2011	53	5	9.43
Iran	Grugni et al., 2012	827	3	0.36
Iran North	Regueiro et al., 2006	33	2	6.06

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Iran South	Regueiro et al., 2006	117	1	0.85
Iraq (Marsh Arab)	Al-Zahery et al., 2011	143	0	0
Italy-Central Marche	Capelli et al., 2007	59	0	0
Italy-Elba Island (Tuscany)	Capelli et al., 2007	95	0	0
Italy-West Calabria	Capelli et al., 2007	57	0	0
Japan	Hammer et al., 2005	255	10	3.92
Jiangsu	Zhong et al., 2011	39	0	0
Jiangxi	Zhong et al., 2011	26	0	0
Jilin	Zhong et al., 2011	118	9	7.63
Jordan/Amman	Flores et al., 2005	101	0	0
Jordan/Dead Sea	Flores et al., 2005	45	0	0
Kalmyks	Derenko et al., 2007	60	2	3.33
Kempen (Belgium)	Larmuseau et al., 2011	77	1	1.30
Khakassians	Derenko et al., 2007	64	32	50.00
Koreans	Derenko et al., 2007	52	0	0
Koryaks	Derenko et al., 2007	16	4	25.00
Liaoning	Zhong et al., 2011	149	13	8.72
Macedonian Greeks	Battaglia et al., 2009	57	0	0
Madeira	Gonçalves et al., 2005	129	3	2.33
Malay	Hammer et al., 2005	32	1	3.13
Manchurian	Hammer et al., 2005	41	2	4.88
Mechelen (Belgium)	Larmuseau et al., 2011	63	2	3.17
Moldavia	Varzari et al., 2013	125	2	1.60
Mongolians	Derenko et al., 2007	46	4	8.70
Mongolia-Outer	Hammer et al., 2005	149	13	8.72
Ningxia	Zhong et al., 2011	62	5	8.06
Noord-Brabant (Netherlands)	Larmuseau et al., 2011	130	0	0
North Korea	Zhong et al., 2011	19	1	5.26
Norway	Capelli et al., 2003	201	2	1.00
Oman	Luis et al., 2004	121	0	0
Oroqen	Hammer et al., 2005	22	1	4.55
Pakistan-North	Sengupta et al., 2006	86	0	0
Pakistan-South	Sengupta et al., 2006	91	0	0
Philippines	Hammer et al., 2005	48	0	0
Poland	Battaglia et al., 2009	99	1	1.01
Portugal-Central	Gonçalves et al., 2005	102	0	0
Portugal-North	Gonçalves et al., 2005	101	0	0
Portugal-South	Gonçalves et al., 2005	100	0	0
Qinghai	Zhong et al., 2011	40	0	0
Romania	Martinez-Cruz et al., 2012	149	1	0.67
Russia-Arkhangelski	Mirabal et al., 2009	28	8	28.57
Russia-Belgorod	Balanovsky et al., 2008	143	18	12.59
Russia-Izhemski Komi	Mirabal et al., 2009	54	5	9.26

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Russia-Kashin	Balanovsky et al., 2008	73	8	10.96
Russia-Krasnoborsk	Balanovsky et al., 2008	91	36	39.56
Russia-Kuban Cossacs	Balanovsky et al., 2008	90	7	7.78
Russia-Kursk	Mirabal et al., 2009	40	37	92.50
Russia-Livni	Balanovsky et al., 2008	110	6	5.45
Russia-Mezen	Balanovsky et al., 2008	54	29	53.70
Russia-Ostrov	Balanovsky et al., 2008	75	21	28.00
Russia-Pinega	Balanovsky et al., 2008	114	45	39.47
Russia-Porhov	Balanovsky et al., 2008	57	11	19.30
Russia-Priluzski Komi	Mirabal et al., 2009	49	5	10.20
Russia-Pristen	Balanovsky et al., 2008	45	6	13.33
Russia-Pskov	Balanovsky et al., 2008	132	32	24.24
Russia-Repievka	Balanovsky et al., 2008	96	6	6.25
Russia-Roslavl	Balanovsky et al., 2008	107	15	14.02
Russia-Siberia (Khanty)	Mirabal et al., 2009	27	22	81.48
Russia-Tver	Mirabal et al., 2009	38	30	78.95
Russia-Unzha	Balanovsky et al., 2008	52	7	13.46
Russia-Vologda	Balanovsky et al., 2008	121	47	38.84
Sardinia	Francalacci et al., 2003	78	0	0
Serbia	Regueiro et al., 2012	103	2	1.94
Shandong	Zhong et al., 2011	115	10	8.70
Shanghai	Zhong et al., 2011	17	0	0
Shannxi	Zhong et al., 2011	56	0	0
Shanxi	Zhong et al., 2011	56	12	21.43
Shors	Derenko et al., 2007	38	7	18.42
Sichuan	Zhong et al., 2011	113	15	13.27
Sicily	Francalacci et al., 2003	51	0	0
Slovenia	Battaglia et al., 2009	75	0	0
Sojots	Derenko et al., 2007	28	3	10.71
South Korea	Hammer et al., 2005	75	2	2.67
Spain-Alto Urgel	Lopez-Parra et al., 2009	34	0	0
Spain-Cerdána	Lopez-Parra et al., 2009	37	0	0
Spain-Cinco Villas	Lopez-Parra et al., 2009	42	0	0
Spain-Jacetania	Lopez-Parra et al., 2009	31	0	0
Spain-Vallede Arán	Lopez-Parra et al., 2009	25	0	0
Swedish Saami	Karlsson et al., 2006	38	17	44.74
Taiwan	Hammer et al., 2005	132	5	3.79
Tajiks	Derenko et al., 2007	103	0	0
Tibet	Hammer et al., 2005	105	3	2.86
Tibetans	Zhong et al., 2011	222	4	1.80
Tofalars	Derenko et al., 2007	30	21	70.00
Turkey-central	Cinnioglu et al., 2004	152	7	4.61
Turkey-east	Cinnioglu et al., 2004	208	8	3.85

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Turkey-west	Cinnioglu et al., 2004	163	5	3.07
Tuvinians	Derenko et al., 2007	134	39	29.10
Ukraine	Battaglia et al., 2009	92	6	6.52
Vietnam	Hammer et al., 2005	70	2	2.86
Vlaams and Waals Brabant (Belgium)	Larmuseau et al., 2011	135	1	0.74
Xingjiang	Zhong et al., 2011	244	9	3.69
Xinjiang	Zhong et al., 2011	61	11	18.03
Yakuts	Derenko et al., 2007; Sengupta et al., 2006	28	24	84.21
Yemen	Cadenas et al., 2008	62	0	0
Yunnan	Zhong et al., 2011	447	48	10.74
Zhejiang	Zhong et al., 2011	102	9	8.82

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Country	Reference	N	Hg Q	Hg Q %
Afghanistan-North	Lacau et al., 2012	44	2	4.55
Afghanistan-South	Lacau et al., 2012	146	4	2.74
Albania	Battaglia et al., 2009	55	0	0
Altai	Hammer et al., 2005	98	17	17.35
Altaian Kazakhs (Southeastern)	Dulik et al., 2011	89	0	0
Altaian Kazakhs (Southwestern)	Dulik et al., 2011	30	1	3.33
Anhui	Zhong et al., 2011	52	4	7.69
Antwerpen	Larmuseau et al., 2011	72	0	0
Balkarians	Battaglia et al., 2009	38	0	0
Belarussian-East Polesie	Kushniarevich et al., 2013	96	0	0
Belarussian-West Polesie	Kushniarevich et al., 2013	121	1	0.83
Belarussian-Centre	Kushniarevich et al., 2013	88	0	0
Belarussian-East	Kushniarevich et al., 2013	86	0	0
Belarussian-North	Kushniarevich et al., 2013	101	0	0
Belarussian-West	Kushniarevich et al., 2013	73	0	0
Bosniacs	Battaglia et al., 2009	84	0	0
Bosnian Croats	Battaglia et al., 2009	90	0	0
Bosnian Serbs	Battaglia et al., 2009	81	0	0
Bulgaria	Karachanak et al., 2013	808	4	0.50
Buryat	Hammer et al., 2005	81	0	0
Cambodia	Sengupta et al., 2006	6	0	0
Chechen (Chechnya)	Balanovsky et al., 2011	112	4	3.57
Chechen (Dagestan)	Balanovsky et al., 2011	118	0	0
Chechen (Ingushetia)	Balanovsky et al., 2011	100	7	7.00
China-Dai	Sengupta et al., 2006	7	0	0
China-Daur	Sengupta et al., 2006	7	0	0
China-Hezhen	Sengupta et al., 2006	6	0	0
China-Lahu	Sengupta et al., 2006	7	0	0
China-Naxi	Sengupta et al., 2006	8	0	0
China-Oroqen	Sengupta et al., 2006	7	0	0
China-Tu	Sengupta et al., 2006	7	0	0
China-Tujia	Sengupta et al., 2006	9	0	0
China-Uygur	Sengupta et al., 2006	8	0	0
China-Xibo	Sengupta et al., 2006	8	0	0
China-Yi	Sengupta et al., 2006	9	0	0
Chongqing	Zhong et al., 2011	43	3	6.98

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Corsica	Francalacci et al., 2003	34	0	0
Crete	Martinez et al., 2007; King et al., 2008	361	2	0.55
Croats	Battaglia et al., 2009	118	0	0
Czechs	Battaglia et al., 2009	75	0	0
Even	Hammer et al., 2005	31	1	3.23
Evenk	Hammer et al., 2005	95	4	4.21
France	Semino et al., 2000	23	0	0
Fujian	Zhong et al., 2011	112	0	0
FYROM	Noveski et al., 2010	211	0	0
Gansu	Zhong et al., 2011	221	12	5.43
Georgians	Battaglia et al., 2009	66	0	0
Germany	Semino et al., 2000	16	0	0
Gipuzkoa Basques	Alonso et al., 2005	74	0	0
Greece	Battaglia et al., 2009	92	0	0
Greece-Nea Nikomedea	King et al., 2008	57	0	0
Greece-Sesklo	King et al., 2008	57	0	0
Guangdong	Zhong et al., 2011	91	0	0
Guangxi	Zhong et al., 2011	272	2	0.74
Guizhou	Zhong et al., 2011	533	5	0.94
Hainan	Zhong et al., 2011	110	0	0
Heilongjiang	Zhong et al., 2011	171	3	1.75
Henan	Zhong et al., 2011	66	3	4.55
Hubei	Zhong et al., 2011	83	0	0
Hunan	Zhong et al., 2011	133	4	3.01
Hungary	Battaglia et al., 2009	53	0	0
India North	Sengupta et al., 2006	80	1	1.25
India-Northeast	Sengupta et al., 2006	87	0	0
India-Central	Sengupta et al., 2006	71	1	1.41
India-East	Sengupta et al., 2006	128	0	0
India-South	Sengupta et al., 2006	303	1	0.33
India-West	Sengupta et al., 2006	59	0	0
Indonesia-East	Hammer et al., 2005	55	0	0
Indonesia-West	Hammer et al., 2005	25	0	0
Inner Mongolia	Zhong et al., 2011	53	1	1.89
Iran	Grugni et al., 2012	827	47	5.68
Iran North	Regueiro et al., 2006	33	3	9.09
Iran South	Regueiro et al., 2006	117	3	2.56

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Iraq (Marsh Arab)	Al-Zahery et al., 2011	143	4	2.80
Italy-Central Marche	Capelli et al., 2007	59	0	0
Italy-Elba Island (Tuscany)	Capelli et al., 2007	95	0	0
Italy-West Calabria	Capelli et al., 2007	57	0	0
Japan	Hammer et al., 2005	255	1	0.39
Jiangsu	Zhong et al., 2011	39	3	7.69
Jiangxi	Zhong et al., 2011	26	0	0
Jilin	Zhong et al., 2011	118	3	2.54
Jordan/Amman	Flores et al., 2005	101	0	0
Jordan/Dead Sea	Flores et al., 2005	45	0	0
Kempen (Belgium)	Larmuseau et al., 2011	77	0	0
Kets	Karafet et al., 2002	48	45	93.75
Liaoning	Zhong et al., 2011	149	2	1.34
Macedonian Greeks	Battaglia et al., 2009	57	0	0
Madeira	Goncalves et al., 2005	129	0	0
Malay	Hammer et al., 2005	32	0	0
Manchurian	Hammer et al., 2005	41	4	9.76
Mechelen (Belgium)	Larmuseau et al., 2011	63	0	0
Moldavia	Varzari et al., 2013	125	1	0.80
Mongolia-Outer	Hammer et al., 2005	149	4	2.68
Ningxia	Zhong et al., 2011	62	2	3.23
Noord-Brabant (Netherlands)	Larmuseau et al., 2011	130	0	0
North Korea	Zhong et al., 2011	19	0	0
Oman	Luis et al., 2004	121	0	0
Oroqen	Hammer et al., 2005	22	0	0
Pakistan-North	Sengupta et al., 2006	86	4	4.65
Pakistan-South	Sengupta et al., 2006	91	2	2.20
Philippines	Hammer et al., 2005	48	0	0
Poland	Battaglia et al., 2009	99	0	0
Portugal-Central	Goncalves et al., 2005	102	0	0
Portugal-North	Goncalves et al., 2005	101	0	0
Portugal-South	Goncalves et al., 2005	100	1	1.00
Qinghai	Zhong et al., 2011	40	1	2.50
Romania	Martinez-Cruz et al., 2012	149	1	0.67
Russia-Arkhangelski	Mirabal et al., 2009	28	0	0
Russia-Belgorod	Balanovsky et al., 2008	143	0	0
Russia-Izhemski Komi	Mirabal et al., 2009	54	0	0
Russia-Kashin	Balanovsky et al., 2008	73	1	1.37
Russia-Krasnoborsk	Balanovsky et al., 2008	91	0	0
Russia-Kuban Cossacs	Balanovsky et al., 2008	90	1	1.11

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Russia-Kursk	Mirabal et al., 2009	40	0	0
Russia-Livni	Balanovsky et al., 2008	110	1	0.91
Russia-Mezen	Balanovsky et al., 2008	54	0	0
Russia-Ostrov	Balanovsky et al., 2008	75	0	0
Russia-Pinega	Balanovsky et al., 2008	114	1	0.88
Russia-Porhov	Balanovsky et al., 2008	57	0	0
Russia-Priluzski Komi	Mirabal et al., 2009	49	0	0
Russia-Pristen	Balanovsky et al., 2008	45	0	0
Russia-Pskov	Balanovsky et al., 2008	132	0	0
Russia-Repievka	Balanovsky et al., 2008	96	0	0
Russia-Roslavl	Balanovsky et al., 2008	107	0	0
Russia-Siberia (Khanty)	Mirabal et al., 2009	27	1	3.70
Russia-Tver	Mirabal et al., 2009	38	0	0
Russia-Unzha	Balanovsky et al., 2008	52	0	0
Russia-Vologda	Balanovsky et al., 2008	121	2	1.65
Sardinia	Francalacci et al., 2003	78	0	0
Selkups	Karafet et al., 2002	131	87	66.41
Serbia	Regueiro et al., 2012	103	0	0
Shandong	Zhong et al., 2011	115	2	1.74
Shanghai	Zhong et al., 2011	17	0	0
Shannxi	Zhong et al., 2011	56	1	1.79
Shanxi	Zhong et al., 2011	56	3	5.36
Sichuan	Zhong et al., 2011	113	1	0.88
Sicily	Francalacci et al., 2003	51	0	0
Slovenia	Battaglia et al., 2009	75	0	0
South Korea	Hammer et al., 2005	75	0	0
Spain-Alto Urgel	Lopez-Parra et al., 2009	34	0	0
Spain-Cerda~na	Lopez-Parra et al., 2009	37	0	0
Spain-Cinco Villas	Lopez-Parra et al., 2009	42	0	0
Spain-Jacetania	Lopez-Parra et al., 2009	31	0	0
Spain-Vallede Ar'an	Lopez-Parra et al., 2009	25	0	0
Swedish Saami	Karlsson et al., 2006	38	0	0
Taiwan	Hammer et al., 2005	132	0	0
Tibet	Hammer et al., 2005	105	0	0
Tibetans	Zhong et al., 2011	222	1	0.45
Turkey-central	Cinnioglu et al., 2004	152	3	1.97
Turkey-east	Cinnioglu et al., 2004	208	6	2.88
Turkey-west	Cinnioglu et al., 2004	163	1	0.61
Ukraine	Battaglia et al., 2009	92	1	1.09
Vietnam	Hammer et al., 2005	70	5	7.14

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Vlaams and Waals Brabant (Belgium)	Larmuseau et al., 2011	135	0	0
Xingjiang	Zhong et al., 2011	244	11	4.51
Xinjiang	Zhong et al., 2011	61	0	0
Yakut	Sengupta et al., 2006	18	0	0
Yemen	Cadenas et al., 2008	62	0	0
Yunnan	Zhong et al., 2011	447	7	1.57
Zhejiang	Zhong et al., 2011	102	2	1.96

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Table S2. Absolute and percent frequencies of mtDNA haplogroup C (a), D (b) and Z (c) used to construct spatial frequency maps. N-number of analyzed individuals.

(a)				
Country	Reference	N	Hg C	Hg C (%)
Adam	Grosheva et al., 2014	54	2	3.70
Afghanistan	Irwin et al., 2010	98	2	2.04
Ainu	Derenko et al., 2010	51	0	0
Altaian Kazakhs	Derenko et al., 2012	98	8	8.16
Altaians	Derenko et al., 2010	110	21	19.09
Ambon	Simonson et al., 2011	43	0	0
Asian Eskimos	Gubina et al., 2013	40	0	0
Austrians	Brandstaetter et al., 2007	273	1	0.37
Azerbaijanians	Derenko et al., 2010	89	3	3.37
Azeris	Derenko et al., 2013	22	1	5
Bai	Liu et al., 2011	68	2	3
Bali	Simonson et al., 2011	82	0	0
Baluch	Quintana-Murci et al., 2004	39	0	0
Barghuts	Derenko et al., 2012	149	30	20
Bashkirs	Derenko et al., 2010	207	25	12
Basque Country	Prieto et al., 2011	29	0	0
Basques from Northern Navarre	Cardoso et al., 2011	110	0	0
Belarusians	Kushniarevich et al., 2013	267	3	1
Borneo	Simonson et al., 2011	157	2	1
Bosnians	Malyarchuk et al., 2003	144	0	0
Brahui	Quintana-Murci et al., 2004	38	0	0
British people	Zheng et al., 2012	94	0	0
Bukharan Arabs	Comas et al., 2004	20	4	20.00
Bulgarians	Karachanak et al., 2012	855	2	0.23
Buryats	Derenko et al., 2010	419	89	21
Cantabria	Álvarez-Iglesias et al., 2009	135	0	0
Catalonia	Álvarez-Iglesias et al., 2009	101	0	0
Central Portugal	Prieto et al., 2011	53	0	0
Chaplin	Volodko et al., 2008	50	0	0
Chechens	Derenko et al., 2010	67	3	4

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Chinese	Derenko et al., 2010	1930	87	4.51
Chukchi	Derenko et al., 2010	417	55	13
Chukchi	Gubina et al., 2013	159	22	13.84
Chukchi	Volodko et al., 2008	182	34	18.80
Chutyr'	Grosheva et al., 2014	63	3	4.76
Chuvantsi	Derenko et al., 2010	32	10	31
Chuvashis	Derenko et al., 2010	142	2	1.41
Crimean Tatars	Comas et al., 2004	20	0	0
Cypriots	Irwin et al., 2008	91	0	0
Czech	Mielnik-Sikorska et al., 2013	85	0	0
Czechs (Western Bohemia)	Malyarchuk et al., 2006	179	0	0
Dai	Liu et al., 2011	41	5	12.20
Danes	Mikkelsen et al., 2010	201	0	0
Darginians	Derenko et al., 2010	37	1	2.70
Daurs, China	Derenko et al., 2010	45	3	6.67
Dolgans	Derenko et al., 2010	157	61	38.85
Dong	Liu et al., 2011	28	0	0
Dungan	Comas et al., 2004	16	1	6.25
East Evenks	Derenko et al., 2010	45	29	64
Eskimos	Derenko et al., 2010	254	2	0.79
European Russia (Novgorod oblast)	Grzybowski et al., 2007	157	0	0
Evenks	Derenko et al., 2010	71	51	72
Evenks	Gubina et al., 2013	38	20	53
Evenks, China	Derenko et al., 2010	47	9	19.15
Evens	Derenko et al., 2010	191	72	38
Ezhevo	Grosheva et al., 2014	39	11	28
Finns	Hedman et al., 2007	200	0	0
Fins	Zheng et al., 2012	97	0	0
French people	Richard et al., 2007	868	0	0
Gelao	Liu et al., 2011	177	14	8
Georgians	Derenko et al., 2010	57	1	1.75
Gilaki	Quintana-Murci et al., 2004	37	0	0
Gujarati	Quintana-Murci et al., 2004	34	0	0

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Han Chinese	Yao et al., 2002	263	8	3.04
Hazara	Quintana-Murci et al., 2004	23	0	0
Hui	Yao et al., 2004	45	1	2.22
Hui, China	Derenko et al., 2010	45	1	2.22
Hungarians	Derenko et al., 2010	344	2	0.58
Hunza Burusho	Quintana-Murci et al., 2004	44	1	2
Hungarians (Budapest)	Irwin et al., 2007	211	0	0
Iranians	Derenko et al., 2013	352	5	1.42
Iranians	Comas et al., 2004	20	2	10.00
Iraqis	Al-Zahery et al., 2003	216	0	0
India	Derenko et al., 2010	2544	31	1.22
Itelmens	Derenko et al., 2010	46	6	13.04
Japanese	Derenko et al., 2010	1312	7	0.53
Java	Simonson et al., 2011	46	1	2
Kabachigurt	Grosheva et al., 2014	57	3	5
Kabardinians	Derenko et al., 2010	51	1	2
Kalash	Quintana-Murci et al., 2004	44	0	0
Kalmyks	Derenko et al., 2010	110	12	11
Karakalpaks	Derenko et al., 2010	108	16	15
Kazak	Comas et al., 2004	20	1	5
Kazak	Yao et al., 2004	53	7	13
Kazakhs	Derenko et al., 2010	511	44	9
Kazakhs, China	Derenko et al., 2010	53	7	13
Kazakhstan	Irwin et al., 2010	256	20	8
Kazan Tatars (Azmakaev)	Malyarchuk et al., 2010	71	4	6
Kets	Derenko et al., 2010	104	13	13
Khakassians	Derenko et al., 2010	110	30	27
Khakassians	Derenko et al., 2007	57	11	19
Khamnigans	Derenko et al., 2010	99	16	16.16
Khants	Derenko et al., 2010	106	11	10.38
Khanty	Pimenoff et al., 2008	106	11	10
Khoremian Uzbek	Comas et al., 2004	20	0	0
Kirghiz	Derenko et al., 2010	200	28	14

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Komis	Derenko et al., 2010	121	6	5
Koreans	Derenko et al., 2010	1297	26	2.00
Koreans, China	Derenko et al., 2010	48	0	0
Koryaks	Derenko et al., 2010	182	67	36.81
Koryaks	Gubina et al., 2013	69	16	23.19
Kurdish	Derenko et al., 2010	135	1	0.74
Kurdish-Western Iran	Quintana-Murci et al., 2004	20	0	0
Kurdish-Turkmenistan	Quintana-Murci et al., 2004	32	3	9.38
Kuzyumovo	Grosheva et al., 2014	72	1	1
Kyrgyz	Comas et al., 2004	20	6	30
Kyrgyzstan	Irwin et al., 2010	249	32	12.85
Lahu	Liu et al., 2011	35	0	0
Lesagurt	Grosheva et al., 2014	63	7	11
Lombok	Simonson et al., 2011	44	1	2
Lower Kolyma-Indigirka	Volodko et al., 2008	82	54,038	65.90
Lur	Quintana-Murci et al., 2004	17	0	0
Macedonians (FYROM)	Zimmermann et al., 2007	200	0	0
Makrani	Quintana-Murci et al., 2004	33	0	0
Manchu	Zhao et al., 2011	47	2	4.26
Mansi	Derenko et al., 2010	161	30	19
Mansi	Pimenoff et al., 2008	63	13	20.63
Maris	Derenko et al., 2010	234	2	0.85
Mazandarian	Quintana-Murci et al., 2004	21	0	0
Miao	Liu et al., 2011	103	10	9.71
Mongolian	Yao et al., 2004	49	5	10.20
Mongolians	Derenko et al., 2010	150	23	15
Mongolians, China	Derenko et al., 2010	97	8	8
Mordvins	Derenko et al., 2010	120	2	1.67
Mulam	Liu et al., 2011	39	0	0
Nanaians	Gubina et al., 2013	86	8	9.30
Nanais	Derenko et al., 2010	85	8	9
Naukan	Volodko et al., 2008	39	0	0
Naxi	Liu et al., 2011	45	4	8.89
Negidals	Derenko et al., 2010	33	5	15

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Nenets	Derenko et al., 2010	58	18	31
Nenets Tundra	Derenko et al., 2010	70	34	49
Nganasan	Volodko et al., 2008	39	20,007	51
Nganasans	Derenko et al., 2010	78	26	33
Nivkhs	Derenko et al., 2010	56	0	0
Nivkhs	Gubina et al., 2013	17	0	0
Nogays	Derenko et al., 2010	206	25	12.14
North and Central Italians	Turchi et al., 2008	395	0	0
North Portugal	Prieto et al., 2011	187	0	0
Northern Caucasians	Derenko et al., 2010	199	8	4
Northern Greeks	Irwin et al., 2008	319	1	0
Nu	Liu et al., 2011	30	0	0
Orochens, China	Derenko et al., 2010	44	13	30
Oroks	Derenko et al., 2010	61	7	11
Osettins	Derenko et al., 2010	123	4	3.25
Pakistani	Derenko et al., 2010	189	4	2
Parsis	Quintana-Murci et al., 2004	44	0	0
Pathan	Quintana-Murci et al., 2004	44	0	0
Persian	Quintana-Murci et al., 2004	42	0	0
Persians	Derenko et al., 2010	518	4	0.77
Persians	Derenko et al., 2013	181	1	1
Phillipines	Simonson et al., 2011	61	0	0
Poland (Kashubians)	Mielnik-Sikorska et al., 2013	203	1	0.49
Poland (Podhale)	Mielnik-Sikorska et al., 2013	201	0	0
Poland Northeastern	Grzybowski et al., 2007	73	0	0
Poland Northern	Grzybowski et al., 2007	253	0	0
Poland Southern	Grzybowski et al., 2007	87	1	1.15
Poles	Derenko et al., 2010	947	5	1
Qashqais	Derenko et al., 2013	112	2	2
Romanians	Derenko et al., 2010	360	10	2.78
Saudi Arabs	Abu-Amero et al., 2008, 2007	553	0	0
Selkups	Derenko et al., 2010	120	26	21.67
Serbia-Vojvodina Province	Zgonjanin et al., 2010	104	0	0
Shors	Derenko et al., 2010	82	10	12
Shugnan	Quintana-Murci et al., 2004	44	8	18
Shugnan, Tajikistan	Derenko et al., 2010	44	8	18
Shui	Liu et al., 2011	30	0	0

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Sindhi	Quintana-Murci et al., 2004	23	0	0
Sireniki	Volodko et al., 2008	37	0	0
Slovaks	Lehocký et al., 2008	374	4	1.07
Slovenians	Malyarchuk et al., 2003	104	0	0
Sojots	Derenko et al., 2010	30	6	20.00
Southern Germany (Ulm)	Brandstaetter et al., 2006	100	0	0
Spain	Prieto et al., 2011	403	0	0
Staraya Salya	Grosheva et al., 2014	54	4	7.41
Sulawesi	Simonson et al., 2011	237	1	0.42
Sumatra	Simonson et al., 2011	180	0	0
Sumba	Simonson et al., 2011	50	0	0
Svetozarevo	Grosheva et al., 2014	45	1	2
Taiwan	Simonson et al., 2011	78	0	0
Tajikistan	Irwin et al., 2010	244	36	14.75
Tajiks	Derenko et al., 2010	82	6	7.32
Tatars	Derenko et al., 2010	310	7	2.26
Tatars from Buinsk (Mishars)	Malyarchuk et al., 2010	126	0	0
Telenghits	Derenko et al., 2010	71	12	16.90
Teleuts	Derenko et al., 2010	53	15	28.30
Thai	Derenko et al., 2010	552	19	3.44
Tibetan	Liu et al., 2011	40	0	0
Todjins	Derenko et al., 2010	48	23	47.92
Tofalars	Derenko et al., 2010	58	36	62.07
Tsipya	Grosheva et al., 2014	53	1	1.89
Tubalars	Derenko et al., 2010	72	14	19.44
Tujia	Liu et al., 2011	29	2	6.90
Turkish	Quintana-Murci et al., 2004	40	0	0
Turkmen	Comas et al., 2004	20	1	5.00
Turkmen	Quintana-Murci et al., 2004	41	3	7.32
Turkmenistan	Irwin et al., 2010	249	17	6.83
Turkmens	Derenko et al., 2010	178	24	13.48
Turks	Derenko et al., 2010	218	4	1.83
Tuscans	Zheng et al., 2012	105	0	0
Tuscans	Achilli et al., 2007	322	0	0
Tuvinians	Derenko et al., 2010	231	109	47.19
Tuvinians	Derenko et al., 2007	105	53	50.48

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Udegeys	Derenko et al., 2010	46	8	17.39
Udmurts	Derenko et al., 2010	189	5	2.65
Uighurs	Derenko et al., 2010	177	13	7.34
Uighurs, China	Derenko et al., 2010	47	3	6.38
Ukraine	Mielnik-Sikorska et al., 2013	159	2	1.26
Ulchi	Derenko et al., 2010	87	12	13.79
Upper Anadyr (Chuvantsi)	Volodko et al., 2008	32	10,016	31.30
Upper Kolyma (Yukaghirs)	Volodko et al., 2008	18	12,996	72.20
Uygur	Yao et al., 2004	47	3	6.38
Uzbek	Comas et al., 2004	20	2	10.00
Uzbek	Yao et al., 2004	58	3	5.17
Uzbek	Quintana-Murci et al., 2004	42	1	2.38
Uzbekistan	Irwin et al., 2010	328	27	8.23
Uzbeks	Derenko et al., 2010	130	8	6.15
Va	Liu et al., 2011	36	0	0
West Evenks	Derenko et al., 2010	73	34	46.58
Yakuts	Derenko et al., 2010	254	119	46.85
Yao	Liu et al., 2011	40	4	10.00
Yi	Liu et al., 2011	20	0	0
Yugdon	Grosheva et al., 2014	58	7	12.07
Yukaghirs	Derenko et al., 2010	100	67	67.00
Yukaghirs	Gubina et al., 2013	66	41	62.12
Zhulang	Liu et al., 2011	83	4	4.82

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(b)

Country	Reference	N	Hg D	Hg D (%)
Adam	Grosheva et al., 2014	54	1	1.85
Afghanistan	Irwin et al., 2010	98	2	2.04
Ainu	Derenko et al., 2010	51	9	17.65
Altaian Kazakhs	Derenko et al., 2012	98	26	26.53
Altaians-Kizhi	Derenko et al., 2007	90	8	8.89
Altaians	Derenko et al., 2010	110	17	15.45
Ambon	Simonson et al., 2011	43	2	4.65
Asian Eskimos	Gubina et al., 2013	40	6	15.00
Austrians	Brandsta�tter et al., 2007	273	0	0
Azeris	Derenko et al., 2013	22	0	0
Bai	Liu et al., 2011	68	13	19.12
Bali	Simonson et al., 2011	82	2	2.44
Baluch	Quintana-Murci et al., 2004	39	0	0
Barghuts	Derenko et al., 2012	149	53	35.57
Bashkirs	Derenko et al., 2010	207	20	9.66
Basque Country	Prieto et al., 2011	29	0	0
Basques from Northern Navarre	Cardoso et al., 2011	110	0	0
Belarusians	Kushniarevich et al., 2013	267	1	0.37
Borneo	Simonson et al., 2011	157	5	3.18
Bosnians	Malyarchuk et al., 2003	144	0	0
Brahui	Quintana-Murci et al., 2004	38	1	2.63
British people	Zheng et al., 2012	94	0	0
Bukharan Arabs	Comas et al., 2004	20	0	0
Bulgarians	Karachanak et al., 2012	855	3	0.35
Buryats	Derenko et al., 2010	419	146	34.84
Buryats	Derenko et al., 2007	295	103	34.92
Cantabria	�lvarez-Iglesias et al., 2009	135	0	0
Catalonia	�lvarez-Iglesias et al., 2009	101	2	1.98
Central Portugal	Prieto et al., 2011	53	0	0
Chaplin	Volodko et al., 2008	50	5	10.00
Chinese	Derenko et al., 2010	1930	317	16.42
Chukchi	Derenko et al., 2010	417	64	15.35
Chukchi	Gubina et al., 2013	159	31	19.50

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Chukchi	Derenko et al., 2007	15	2	13.33
Chukchi	Volodko et al., 2008	182	13	7.14
Chutyr'	Grosheva et al., 2014	63	5	7.94
Chuvantsi	Derenko et al., 2010	32	3	9.38
Chuvashis	Derenko et al., 2010	142	4	2.82
Crimean Tatars	Comas et al., 2004	20	0	0
Croats	Derenko et al., 2010	407	2	0.49
Cypriots	Irwin et al., 2008	91	0	0
Czech	Mielnik-Sikorska et al., 2013	85	0	0
Czechs	Derenko et al., 2010	354	1	0.28
Czechs (Western Bohemia)	Malyarchuk et al., 2006	179	1	0.56
Dai	Liu et al., 2011	41	4	9.76
Danes	Mikkelsen et al., 2010	201	0	0
Daurs, China	Derenko et al., 2010	45	11	24.44
Dolgans	Derenko et al., 2010	157	62	39.49
Dong	Liu et al., 2011	28	0	0
Dungan	Comas et al., 2004	16	1	6.25
East Evenks	Derenko et al., 2010	45	11	24.44
East Evenks	Derenko et al., 2007	45	11	24.44
European Russia (Novgorod oblast)	Grzybowski et al., 2007	157	2	1.27
Evenks	Derenko et al., 2010	71	15	21.13
Evenks	Gubina et al., 2013	38	11	28.95
Evenks, China	Derenko et al., 2010	47	15	31.91
Evens	Derenko et al., 2010	191	41	21.47
Eskimos	Derenko et al., 2010	254	49	19.29
Ezhevo	Grosheva et al., 2014	39	3	7.69
Finns	Hedman et al., 2007	200	0	0
Fins	Zheng et al., 2012	97	0	0
French people	Richard et al., 2007	868	0	0
Gelao	Liu et al., 2011	177	27	15.25
Georgians	Derenko et al., 2010	57	3	5.26
Germans	Derenko et al., 2010	554	1	0.18
Gilaki	Quintana-Murci et al., 2004	37	1	2.70
Gujarati	Quintana-Murci et al., 2004	34	0	0

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Han Chinese	Yao et al., 2002	263	57	21.67
Hazara	Quintana-Murci et al., 2004	23	0	0
Hui	Yao et al., 2004	45	7	15.56
Hui, China	Derenko et al., 2010	45	7	15.56
Hungarians	Derenko et al., 2010	344	2	0.58
Hunza Burusho	Quintana-Murci et al., 2004	44	0	0
Hungarians (Budapest)	Irwin et al., 2007	211	2	0.95
Iranians	Derenko et al., 2013	352	4	1.14
Iranians	Comas et al., 2004	20	1	5.00
Iraqis	Al-Zahery et al., 2003	216	0	0
India	Derenko et al., 2010	2544	46	1.81
Itelmens	Derenko et al., 2010	46	0	0
Japanese	Derenko et al., 2010	1312	492	37.50
Java	Simonson et al., 2011	46	1	2.17
Kabachigurt	Grosheva et al., 2014	57	5	8.77
Kalash	Quintana-Murci et al., 2004	44	0	0
Kalmyks	Derenko et al., 2010	110	32	29.09
Kalmyks	Derenko et al., 2007	110	32	29.09
Karakalpaks	Derenko et al., 2010	108	19	17.59
Karelians	Derenko et al., 2010	512	19	3.71
Kazak	Comas et al., 2004	20	2	10.00
Kazak	Yao et al., 2004	53	7	13.21
Kazakhs	Derenko et al., 2010	511	102	19.96
Kazakhs, China	Derenko et al., 2010	53	7	13.21
Kazakhstan	Irwin et al., 2010	256	44	17.19
Kazan Tatars (Azmakaev)	Malyarchuk et al., 2010	71	7	9.86
Kets	Derenko et al., 2010	104	3	2.88
Khakassians	Derenko et al., 2010	110	16	14.55
Khakassians	Derenko et al., 2007	57	9	15.79
Khamnigans	Derenko et al., 2010	99	31	31.31
Khamnigans	Derenko et al., 2007	99	33	33.33
Khants	Derenko et al., 2010	106	17	16.04
Khanty	Pimenoff et al., 2008	106	17	16.04
Khoremian Uzbek	Comas et al., 2004	20	2	10.00

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Kirghiz	Derenko et al., 2010	200	34	17.00
Komis	Derenko et al., 2010	121	2	1.65
Koreans	Derenko et al., 2010	1297	432	33.31
Koreans, China	Derenko et al., 2010	48	16	33.33
Koreans	Derenko et al., 2007	103	41	39.81
Koryaks	Derenko et al., 2010	182	2	1.10
Koryaks	Gubina et al., 2013	69	2	2.90
Kurdish	Derenko et al., 2010	135	6	4.44
Kurdish-Western Iran	Quintana-Murci et al., 2004	20	0	0
Kurdish-Turkmenistan	Quintana-Murci et al., 2004	32	0	0
Kurds	Derenko et al., 2007	25	3	12.00
Kuzyumovo	Grosheva et al., 2014	72	9	12.50
Kyrgyz	Comas et al., 2004	20	4	20.00
Kyrgyzstan	Irwin et al., 2010	249	52	20.88
Lahu	Liu et al., 2011	35	5	14.29
Lesagurt	Grosheva et al., 2014	63	5	7.94
Lombok	Simonson et al., 2011	44	3	6.82
Lower Kolyma-Indigirka	Volodko et al., 2008	82	14	17.07
Lur	Quintana-Murci et al., 2004	17	0	0
Macedonians (FYROM)	Zimmermann et al., 2007	200	0	0
Makrani	Quintana-Murci et al., 2004	33	0	0
Manchu	Zhao et al., 2011	47	20	42.55
Mansi	Derenko et al., 2010	161	20	12.42
Mansi	Pimenoff et al., 2008	63	12	19.05
Maris	Derenko et al., 2010	234	3	1.28
Mazandarian	Quintana-Murci et al., 2004	21	0	0
Miao	Liu et al., 2011	103	18	17.48
Mongolian	Yao et al., 2004	49	10	20.41
Mongolians	Derenko et al., 2010	150	34	22.67
Mongolians	Derenko et al., 2007	47	5	10.64
Mongolians, China	Derenko et al., 2010	97	29	29.90
Mordvins	Derenko et al., 2010	120	1	0.83
Mulam	Liu et al., 2011	39	6	15.38
Nanaians	Gubina et al., 2013	86	24	27.91

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Nanais	Derenko et al., 2010	85	22	25.88
Naukan	Volodko et al., 2008	39	10	25.64
Naxi	Liu et al., 2011	45	2	4.44
Negidals	Derenko et al., 2010	33	8	24.24
Nenets	Derenko et al., 2010	58	13	22.41
Nenets Tundra	Derenko et al., 2010	70	4	5.71
Nganasan	Volodko et al., 2008	39	10	25.64
Nganasans	Derenko et al., 2010	78	22	28.21
Nivkhs	Derenko et al., 2010	56	16	28.57
Nivkhs	Gubina et al., 2013	17	3	17.65
Nogays	Derenko et al., 2010	206	16	7.77
North and Central Italians	Turchi et al., 2008	395	3	0.76
North Portugal	Prieto et al., 2011	187	1	0.53
Northern Caucasians	Derenko et al., 2010	199	8	4.02
Northern Greeks	Irwin et al., 2008	319	0	0
Nu	Liu et al., 2011	30	6	20.00
Orochens, China	Derenko et al., 2010	44	19	43.18
Oroks	Derenko et al., 2010	61	42	68.85
Pakistani	Derenko et al., 2010	189	2	1.06
Parsis	Quintana-Murci et al., 2004	44	0	0
Pathan	Quintana-Murci et al., 2004	44	0	0
Persian	Quintana-Murci et al., 2004	42	0	0
Persians	Derenko et al., 2010	518	7	1.35
Persians	Derenko et al., 2013	181	1	0.55
Phillipines	Simonson et al., 2011	61	5	8.20
Poland (Kashubians)	Mielnik-Sikorska et al., 2013	203	0	0
Poland (Podhale)	Mielnik-Sikorska et al., 2013	201	1	0.50
Poland Northeastern	Grzybowski et al., 2007	73	0	0
Poland Northern	Grzybowski et al., 2007	253	0	0
Poland Southern	Grzybowski et al., 2007	87	0	0
Poles	Derenko et al., 2010	947	3	0.32
Qashqais	Derenko et al., 2013	112	2	1.79
Romanians	Derenko et al., 2010	360	0	0
Saudi Arabs	Abu-Amero et al., 2008, 2007	553	0	0
Scandinavians	Derenko et al., 2010	316	1	0.32
Selkups	Derenko et al., 2010	120	4	3.33
Serbia-Vojvodina Province	Zgonjanin et al., 2010	104	0	0
Shors	Derenko et al., 2010	82	10	12.20
Shors	Derenko et al., 2007	82	10	12.20
Shugnan	Quintana-Murci et al., 2004	44	0	0

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Shui	Liu et al., 2011	30	1	3.33
Sindhi	Quintana-Murci et al., 2004	23	0	0
Sireniki	Volodko et al., 2008	37	11	29.73
Slovaks	Lehocký et al., 2008	374	0	0
Slovenians	Malyarchuk et al., 2003	104	0	0
Sojots	Derenko et al., 2010	30	14	46.67
Southern Germany (Ulm)	Brandsta�tter et al., 2006	100	0	0
Spain	Prieto et al., 2011	403	0	0
Staraya Salya	Grosheva et al., 2014	54	12	22.22
Sulawesi	Simonson et al., 2011	237	19	8.02
Sumatra	Simonson et al., 2011	180	0	0
Sumba	Simonson et al., 2011	50	1	2.00
Svetozarevo	Grosheva et al., 2014	45	6	13.33
Taiwan	Simonson et al., 2011	78	1	1.28
Tajik	Comas et al., 2004	20	3	15.00
Tajikistan	Irwin et al., 2010	244	24	9.84
Tajiks	Derenko et al., 2010	82	4	4.88
Tajiks	Derenko et al., 2007	44	3	6.82
Tatars	Derenko et al., 2010	310	9	2.90
Tatars from Buinsk (Mishars)	Malyarchuk et al., 2010	126	6	4.76
Telenghits	Derenko et al., 2010	71	15	21.13
Telenghits	Derenko et al., 2007	71	15	21.13
Teleuts	Derenko et al., 2010	53	13	24.53
Teleuts	Derenko et al., 2007	53	13	24.53
Thai	Derenko et al., 2010	552	93	16.85
Tibetan	Liu et al., 2011	40	2	5.00
Todjins	Derenko et al., 2010	48	2	4.17
Tofalars	Derenko et al., 2010	58	0	0
Tsipyra	Grosheva et al., 2014	53	7	13.21
Tubalars	Derenko et al., 2010	72	14	19.44
Tujia	Liu et al., 2011	29	0	0
Turkish	Quintana-Murci et al., 2004	40	0	0
Turkmen	Comas et al., 2004	20	6	30.00
Turkmen	Quintana-Murci et al., 2004	41	9	21.95
Turkmenistan	Irwin et al., 2010	249	26	10.44
Turkmens	Derenko et al., 2010	178	29	16.29
Turks	Derenko et al., 2010	218	5	2.29
Tuscans	Zheng et al., 2012	105	1	0.95
Tuscans	Achilli et al., 2007	322	1	0.31

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Tuvinians	Derenko et al., 2010	231	36	15.58
Tuvinians	Derenko et al., 2007	105	16	15.24
Udegeys	Derenko et al., 2010	46	0	0
Udmurts	Derenko et al., 2010	189	24	12.70
Uighur	Comas et al., 2004	16	7	43.75
Uighurs	Derenko et al., 2010	177	24	13.56
Uighurs, China	Derenko et al., 2010	47	5	10.64
Ukraine	Mielnik-Sikorska et al., 2013	159	0	0
Ulchi	Derenko et al., 2010	87	19	21.84
Upper Anadyr (Chuvantsi)	Volodko et al., 2008	32	3	9.38
Upper Kolyma (Yukaghirs)	Volodko et al., 2008	18	4	22
Uygur	Yao et al., 2004	47	5	11
Uzbek	Comas et al., 2004	20	1	5
Uzbek	Yao et al., 2004	58	5	9
Uzbek	Quintana-Murci et al., 2004	42	4	10
Uzbekistan	Irwin et al., 2010	328	36	11
Uzbeks	Derenko et al., 2010	130	18	14
Va	Liu et al., 2011	36	9	25
West Evenks	Derenko et al., 2010	73	22	30
West Evenks	Derenko et al., 2007	73	22	30
Yakuts	Derenko et al., 2010	254	15	6
Yakuts	Derenko et al., 2007	36	8	22
Yao	Liu et al., 2011	40	6	15
Yi	Liu et al., 2011	20	0	0
Yugdon	Grosheva et al., 2014	58	6	10
Yukaghirs	Derenko et al., 2010	100	19	19
Yukaghirs	Gubina et al., 2013	66	8	12
Zhulang	Liu et al., 2011	83	5	6

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Country	Reference	N	Hg Z	Hg Z (%)
Adam	Grosheva et al., 2014	54	3	5.56
Afghanistan	Irwin et al., 2010	98	2	2.04
Altaian Kazakhs	Derenko et al., 2012	98	2	2.04
Altaians-Kizhi	Derenko et al., 2007	90	2	2.22
Ambon	Simonson et al., 2011	43	0	0
Asian Eskimos	Gubina et al., 2013	40	0	0
Austrians	Brandstaetter et al., 2007	273	0	0
Azeris	Derenko et al., 2013	22	0	0
Bai	Liu et al., 2011	68	0	0
Bali	Simonson et al., 2011	82	0	0
Baluch	Quintana-Murci et al., 2004	39	0	0
Barghuts	Derenko et al., 2012	149	4	2.68
Basque Country	Prieto et al., 2011	29	0	0
Basques from Northern Navarre	Cardoso et al., 2011	110	0	0
Belarusians	Kushniarevich et al., 2013	267	0	0
Borneo	Simonson et al., 2011	157	0	0
Bosnians	Malyarchuk et al., 2003	144	1	1
Brahui	Quintana-Murci et al., 2004	38	0	0
British people	Zheng et al., 2012	94	0	0
Bukharan Arabs	Comas et al., 2004	20	0	0
Bulgarians	Karachanak et al., 2012	855	1	0.12
Buryats	Derenko et al., 2007	295	4	1
Cantabria	Álvarez-Iglesias et al., 2010	135	0	0
Catalonia	Álvarez-Iglesias et al., 2010	101	0	0
Central Portugal	Prieto et al., 2011	53	0	0
Chaplin	Volodko et al., 2008	50	0	0
Chukchi	Gubina et al., 2013	159	0	0
Chukchi	Derenko et al., 2007	15	0	0
Chukchi	Volodko et al., 2008	182	0	0
Chutyr'	Grosheva et al., 2014	63	6	9.52
Crimean Tatars	Comas et al., 2004	20	0	0
Cypriots	Irwin et al., 2008	91	0	0
Czech	Mielnik-Sikorska et al., 2013	85	0	0

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Czechs (Western Bohemia)	Malyarchuk et al., 2006	179	0	0
Dai	Liu et al., 2011	41	0	0
Danes	Mikkelsen et al., 2010	201	0	0
Dong	Liu et al., 2011	28	1	3.57
Dungan	Comas et al., 2004	16	0	0
East Evenks	Derenko et al., 2007	45	0	0
European Russia (Novgorod oblast)	Grzybowski et al., 2007	157	1	0.64
Evenks	Gubina et al., 2013	38	1	3
Ezhevo	Grosheva et al., 2014	39	1	3
Finns	Hedman et al., 2007	200	0	0
Fins	Zheng et al., 2012	97	0	0
French people	Richard et al., 2007	868	0	0
Gelao	Liu et al., 2011	177	4	2
Gilaki	Quintana-Murci et al., 2004	37	0	0
Gujarati	Quintana-Murci et al., 2004	34	0	0
Han Chinese	Yao et al., 2002	263	5	2
Hazara	Quintana-Murci et al., 2004	23	3	13.04
Hui	Yao et al., 2004	45	2	4.44
Hunza Burusho	Quintana-Murci et al., 2004	44	0	0
Hungarians (Budapest)	Irwin et al., 2007	211	0	0
Iranians	Derenko et al., 2013	352	0	0
Iranians	Comas et al., 2004	20	0	0
Iraqis	Al-Zahery et al., 2003	216	0	0
Java	Simonson et al., 2011	46	0	0
Kabachigurt	Grosheva et al., 2014	57	1	1.75
Kalash	Quintana-Murci et al., 2004	44	0	0
Kalmyks	Derenko et al., 2007	110	2	2
Kazak	Comas et al., 2004	20	1	5
Kazak	Yao et al., 2004	53	6	11
Kazakhstan	Irwin et al., 2010	256	3	1.17
Kazan Tatars (Azmakaev)	Malyarchuk et al., 2010	71	2	2.82
Khakassians	Derenko et al., 2007	57	0	0
Khamnigans	Derenko et al., 2010	99	0	0
Khanty	Pimenoff et al., 2008	106	0	0

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Khoremian Uzbek	Comas et al., 2004	20	0	0
Koreans	Derenko et al., 2007	103	0	0
Koryaks	Gubina et al., 2013	69	15	21.74
Kurdish-Western Iran	Quintana-Murci et al., 2004	20	0	0
Kurdish-Turkmenistan	Quintana-Murci et al., 2004	32	0	0
Kurds	Derenko et al., 2007	25	0	0
Kuzyumovo	Grosheva et al., 2014	72	12	16.67
Kyrgyz	Comas et al., 2004	20	0	0
Kyrgyzstan	Irwin et al., 2010	249	3	1.20
Lahu	Liu et al., 2011	35	1	3
Lesagurt	Grosheva et al., 2014	63	6	9.52
Lombok	Simonson et al., 2011	44	0	0
Lower Kolyma-Indigirka	Volodko et al., 2008	82	2	2.44
Lur	Quintana-Murci et al., 2004	17	0	0
Macedonians (FYROM)	Zimmermann et al., 2007	200	0	0
Makrani	Quintana-Murci et al., 2004	33	0	0
Manchu	Zhao et al., 2011	47	1	2.13
Mansi	Pimenoff et al., 2008	63	0	0
Mazandarian	Quintana-Murci et al., 2004	21	0	0
Miao	Liu et al., 2011	103	1	0.97
Mongolian	Yao et al., 2004	49	0	0
Mongolians	Derenko et al., 2007	47	1	2.13
Mulam	Liu et al., 2011	39	1	2.56
Nanaians	Gubina et al., 2013	86	0	0
Naukan	Volodko et al., 2008	39	0	0
Naxi	Liu et al., 2011	45	1	2.22
Nganasan	Volodko et al., 2008	39	1	2.56
Nivkhs	Gubina et al., 2013	17	0	0
North and Central Italians	Turchi et al., 2008	395	0	0
North Portugal	Prieto et al., 2011	187	0	0
Northern Greeks	Irwin et al., 2008	319	0	0
Nu	Liu et al., 2011	30	5	16.67
Parsis	Quintana-Murci et al., 2004	44	0	0
Pathan	Quintana-Murci et al., 2004	44	0	0

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Persian	Quintana-Murci et al., 2004	42	0	0
Persians	Derenko et al., 2013	181	0	0
Phillipines	Simonson et al., 2011	61	0	0
Poland (Kashubians)	Mielnik-Sikorska et al., 2013	203	0	0
Poland (Podhale)	Mielnik-Sikorska et al., 2013	201	0	0
Poland Northeastern	Grzybowski et al., 2007	73	0	0
Poland Northern	Grzybowski et al., 2007	253	0	0
Poland Southern	Grzybowski et al., 2007	87	0	0
Qashqais	Derenko et al., 2013	112	0	0
Saudi Arabs	Abu-Amro et al., 2008, 2007	553	0	0
Serbia-Vojvodina Province	Zgonjanin et al., 2010	104	0	0
Shors	Derenko et al., 2007	82	1	1.22
Shugnan	Quintana-Murci et al., 2004	44	0	0
Shui	Liu et al., 2011	30	0	0
Sindhi	Quintana-Murci et al., 2004	23	0	0
Sireniki	Volodko et al., 2008	37	0	0
Slovaks	Lehocký et al., 2008	374	0	0
Slovenians	Malyarchuk et al., 2003	104	0	0
Southern Germany (Ulm)	Brandstaetter et al., 2006	100	0	0
Spain	Prieto et al., 2011	403	0	0
Staraya Salya	Grosheva et al., 2014	54	2	4
Sulawesi	Simonson et al., 2011	237	0	0
Sumatra	Simonson et al., 2011	180	1	0.56
Sumba	Simonson et al., 2011	50	0	0
Svetozarevo	Grosheva et al., 2014	45	4	8.89
Taiwan	Simonson et al., 2011	78	0	0
Tajik	Comas et al., 2004	20	0	0
Tajikistan	Irwin et al., 2010	244	0	0
Tajiks	Derenko et al., 2007	44	1	2.27
Tatars from Buinsk (Mishars)	Malyarchuk et al., 2010	126	0	0
Telenghits	Derenko et al., 2007	71	0	0
Teleuts	Derenko et al., 2007	53	3	5.66
Tibetan	Liu et al., 2011	40	0	0
Tsipyta	Grosheva et al., 2014	53	4	7.55
Tujia	Liu et al., 2011	29	0	0
Turkish	Quintana-Murci et al., 2004	40	0	0

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Turkmen	Comas et al., 2004	20	0	0
Turkmen	Quintana-Murci et al., 2004	41	0	0
Turkmenistan	Irwin et al., 2010	249	0	0
Tuscans	Zheng et al., 2012	105	0	0
Tuscans	Achilli et al., 2007	322	0	0
Tuvinians	Derenko et al., 2010	231	1	0.43
Uighur	Comas et al., 2004	16	0	0
Ukraine	Mielnik-Sikorska et al., 2013	159	0	0
Upper Anadyr (Chuvantsi)	Volodko et al., 2008	32	2	6.25
Upper Kolyma (Yukaghirs)	Volodko et al., 2008	18	1	5.56
Uygur	Yao et al., 2004	47	0	0
Uzbek	Comas et al., 2004	20	0	0
Uzbek	Yao et al., 2004	58	0	0
Uzbek	Quintana-Murci et al., 2004	42	0	0
Uzbekistan	Irwin et al., 2010	328	2	0.61
Va	Liu et al., 2011	36	0	0
West Evenks	Derenko et al., 2007	73	1	1.37
Yakuts	Derenko et al., 2010	254	0	0
Yao	Liu et al., 2011	40	1	3
Yi	Liu et al., 2011	20	0	0
Yugdon	Grosheva et al., 2014	58	1	1.72
Yukaghirs	Gubina et al., 2013	66	1	1.52
Zhulang	Liu et al., 2011	83	0	0

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Table S3. Absolute frequencies of Y-chromosome haplogroups C, N and Q in the population groups used in the chi-square test comparison. N-number of analyzed individuals; p^* -value population group vs Bulgarians.

Population group	N	Hg C	Hg N	Hg Q	Reference	p^*
<u>Altai populations</u>						
Altaian Kazakhs (Southeastern)	89	54	0	0	Dulik et al., 2012	
Altai	98	22	4	17	Hammer et al., 2006	
Altaian Kazakhs (Southwestern)	30	17	0	1	Dulik et al., 2012	
Altaians	59	5	19	5	Gubina et al., 2013	
Altai-Kizhi	120	24	5	20	Dulik et al., 2012	
Chelkan	25	0	5	15	Dulik et al., 2012	
Kumandin	17	0	9	0	Dulik et al., 2012	
Tubalar	27	0	3	10	Dulik et al., 2012	
Total	465	122	45	68		<0.0001
<u>Siberian populations</u>						
Evenks	152	83	52	4	Hammer et al., 2006; Fedorova et al., 2013	
Buryats	298	119	143	0	Kharkov et al., 2014	
Evens	24	10	12	0	Fedorova et al., 2013	
Shorians	21	0	17	0	Gubina et al., 2013	
Tuvinians	102	27	46	5	Gubina et al., 2013	
Yakuts	234	14	205	0	Sengupta et al., 2006; Fedorova et al., 2013	
Yukaghirs	11	4	3	0	Fedorova et al., 2013	
Total	842	257	478	9		<0.00001
<u>Central Asian populations</u>						
Khakassians	176	2	88	7	Gubina et al., 2013	
Kazakhs	49	20	2	0	Gubina et al., 2013	
Kyrgyz	132	26	6	1	Di Cristofaro et al., 2013	
Tajik	142	13	5	5	Di Cristofaro et al., 2013	
Turkmen-Jawzjan	74	1	5	25	Di Cristofaro et al., 2013	
Uzbek	127	5	5	11	Di Cristofaro et al., 2013	
Total	700	67	111	49		<0.00001
<u>Europeans</u>						
Belarussian-East Polesie	96	0	8	0	Kushniarevich et al., 2013	
Belarussian-West Polesie	121	0	10	1	Kushniarevich et al., 2013	
Belarussian-Centre	88	0	7	0	Kushniarevich et al., 2013	
Belarussian-East	86	0	6	0	Kushniarevich et al., 2013	
Belarussian-North	101	0	16	0	Kushniarevich et al., 2013	
Belarussian-West	73	0	10	0	Kushniarevich et al., 2013	
Bosniacs	84	0	0	0	Battaglia et al., 2009	
Bosnian Croats	90	0	0	0	Battaglia et al., 2009	
Bosnian Serbs	81	0	5	0	Battaglia et al., 2009	
Corsica	34	0	0	0	Francalacci et al., 2003	

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Croats	89	0	2	0	Battaglia et al., 2009
Croats-Osijek	29	0	0	0	Battaglia et al., 2009
Czechs	75	0	2	0	Battaglia et al., 2009
France	23	0	0	0	Semino et al., 2000
FYROM	211	0	1	0	Noveski et al., 2010
Germany	16	0	0	0	Semino et al., 2000
Gipuzkoan Basques	74	0	0	0	Alonso et al., 2005
Greece	92	1	0	0	Battaglia et al., 2009
Hungary	53	0	0	0	Battaglia et al., 2009
Italy-Central Marche	59	0	0	0	Capelli et al., 2007
Italy-Elba Island (Tuscany)	95	0	0	0	Capelli et al., 2007
Macedonian Greeks	57	0	0	0	Battaglia et al., 2009
Poland	99	0	1	0	Battaglia et al., 2009
Portugal-Central	102	0	0	0	Goncalves et al., 2005
Portugal-North	101	1	0	0	Goncalves et al., 2005
Romania	149	0	1	1	Martinez-Cruz et al., 2012
Serbia	103	0	2	0	Regueiro et al., 2012
Slovenia	75	0	0	0	Battaglia et al., 2009
Spain-Cinco Villas	42	0	0	0	Lopez-Parra et al., 2009
Spain-Jacetania	31	0	0	0	Lopez-Parra et al., 2009
Spain-Valle de Arán	25	0	0	0	Lopez-Parra et al., 2009
Spain-Alto Urgel	34	1	0	0	Lopez-Parra et al., 2009
Spain-Cerdanya	37	1	0	0	Lopez-Parra et al., 2009
Ukraine	92	0	6	1	Battaglia et al., 2009
Total	2617	4	77	3	0.000035
<u>European neighbouring countries of Bulgaria</u>					
FYROM	211	0	1	0	Noveski et al., 2010
Macedonian Greeks	57	0	0	0	Battaglia et al., 2009
Serbia	103	0	2	0	Regueiro et al., 2012
Romanians	149	0	1	1	Martinez-Cruz et al., 2012
Total	520	0	4	1	0.289988
Bulgarians	808	4	4	4	Karachanak et al., 2013

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Table S4. Absolute frequencies of mtDNA haplogroups C and D in the population groups used in the chi-square test comparison. N-number of analyzed individuals; p^* -value population group vs Bulgarians

Population group	N	Hg C	Hg D	Reference	p^*
<u>Altai populations</u>					
Altaian Kazakhs	98	8	26	Derenko et al., 2012	
Altaians	110	21	17	Derenko et al., 2010	
Altai-Kizhi	324	98	58	Dulik et al., 2012	
Chelkan	91	14	21	Dulik et al., 2012	
Kumandin	52	22	10	Dulik et al., 2012	
Shor	28	5	8	Dulik et al., 2012	
Telenghits	71	12	15	Derenko et al., 2010	
Telengit	55	8	10	Dulik et al., 2012	
Teleuts	53	15	13	Derenko et al., 2010	
Teleuts	33	8	9	Dulik et al., 2012	
Tubalar	143	41	36	Dulik et al., 2012	
Total	1058	252	223		<0.0001
<u>Siberian populations</u>					
Buryats	419	89	146	Derenko et al., 2010	
Dolgans	157	61	62	Derenko et al., 2010	
East Evenks	45	29	11	Derenko et al., 2010	
Evenks	109	71	26	Derenko et al., 2010; Gubina et al., 2013	
Kalmyks	110	12	32	Derenko et al., 2010	
Kets	104	13	3	Derenko et al., 2010	
Khakassians	110	30	16	Derenko et al., 2010	
Khamnigans	99	16	31	Derenko et al., 2010	
Khants	106	11	17	Derenko et al., 2010	
Mansi	161	30	20	Derenko et al., 2010	
Nenets	58	18	13	Derenko et al., 2010	
Nenets Tundra	70	34	4	Derenko et al., 2010	
Nganasans	78	26	22	Derenko et al., 2010	
Nganasans	78	26	22	Derenko et al., 2010	
Selkups	120	26	4	Derenko et al., 2010	
Shors	82	10	10	Derenko et al., 2010	
Sojots	30	6	14	Derenko et al., 2010	
Todjins	48	23	2	Derenko et al., 2010	
Tofalars	58	36	0	Derenko et al., 2010	
Tuvinians	231	109	36	Derenko et al., 2010	

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West Evenks	73	34	22	Derenko et al., 2010
Yakuts	254	119	15	Derenko et al., 2010
Total	2600	829	528	<0.00001
<u>Central Asian populations</u>				
Bukharan Arabs	20	4	0	Comas et al., 2004
Karakalpaks	108	16	19	Derenko et al., 2010
Kazak	840	72	155	Derenko et al., 2010; Irwin et al., 2010; Comas et al., 2004; Yao et al., 2004
Kyrgyz	469	66	90	Derenko et al., 2010; Irwin et al., 2010; Comas et al., 2004
Tajiks	414	58	28	Derenko et al., 2010; Irwin et al., 2010; Quintana-Murci et al., 2004
Turkmens	447	42	61	Derenko et al., 2010; Irwin et al., 2010; Comas et al., 2004
Uighurs	224	16	29	Derenko et al., 2010; Yao et al. 2004
Uzbeks	556	40	62	Derenko et al., 2010; Irwin et al., 2010; Comas et al., 2004; Yao et al. 2004
Total	3078	314	444	<0.0001
Caucasus				
Azerbaijanians	89	6	0	Derenko et al., 2010
Chechens	67	6	0	Derenko et al., 2010
Darginians	37	2	0	Derenko et al., 2010
Georgians	57	2	6	Derenko et al., 2010
Kabardinians	51	2	0	Derenko et al., 2010
Nogays	206	50	32	Derenko et al., 2010
Northern Caucasians	199	16	16	Derenko et al., 2010
Osettins	123	8	0	Derenko et al., 2010
Total	829	92	54	<0.00001
Austrians	273	1	0	Brandstaetter et al., 2007
Basque Country	29	0	0	Prieto et al., 2011
Basques from Northern Navarre	110	0	0	Cardoso et al., 2011
Belarusians	267	3	1	Kushniarevich et al., 2013
Bosnians	144	0	0	Malyarchuk et al., 2003
British people	94	0	0	Zheng et al., 2012
Cantabria	135	0	0	Álvarez-Iglesias et al., 2009
Catalonia	101	0	2	Álvarez-Iglesias et al., 2009
Central Portugal	53	0	0	Prieto et al., 2011
Cypriots	91	0	0	Irwin et al., 2008
Czech	85	0	0	Mielnik-Sikorska et al., 2013
Czechs (Western Bohemia)	179	0	1	Malyarchuk et al., 2006

Continued

Danes	201	0	0	Mikkelsen et al., 2010
European Russia (Novgorod oblast)	157	0	2	Grzybowski et al., 2007
Fins	297	0	0	Zheng et al., 2012; Hedman et al., 2007
French people	868	0	0	Richard et al., 2007
Hungarians	344	2	2	Derenko et al., 2010
Hungarians (Budapest)	211	0	2	Irwin et al., 2007
Macedonians (FYROM)	200	0	0	Zimmermann et al., 2007
North and Central Italians	395	0	3	Turchi et al., 2008
North Portugal	187	0	1	Prieto et al., 2011
Northern Greeks	319	1	0	Irwin et al., 2008
Poland (Kashubians)	203	1	0	Mielnik-Sikorska et al., 2013
Poland (Podhale)	201	0	1	Mielnik-Sikorska et al., 2013
Poland Northeastern	73	0	0	Grzybowski et al., 2007
Poland Northern	253	0	0	Grzybowski et al., 2007
Poland Southern	87	1	0	Grzybowski et al., 2007
Poles	947	5	3	Derenko et al., 2010
Serbia	139	0	1	Davidovic et al., 2014
Serbia-Vojvodina Province	104	0	0	Zgonjanin et al., 2010
Slovaks	374	4	0	Lehocký et al., 2008
Slovenians	104	0	0	Malyarchuk et al., 2003
Southern Germany (Ulm)	100	0	0	Brandsta�tter et al., 2006
Spain	403	0	0	Prieto et al., 2011
Tuscans	105	0	1	Zheng et al., 2012
Tuscans	322	0	1	Achilli et al., 2007
Ukraine	159	2	0	Mielnik-Sikorska et al., 2013
Total	8229	20	21	0.873
<u>European neighbouring countries of Bulgaria</u>				
FYROM	200	0	0	Zimmermann et al., 2007
Northern Greeks	319	1	0	Irwin et al., 2008
Serbia	139	0	1	Davidovic et al., 2014
Total	658	1	1	0.710
Bulgarians	2	3	850	Karachanak et al., 2012

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