Supplementary Tables for the paper:
LINADMIX: Evaluating the effect of ancient admixture events on modern populations

Lily Agranat-Tamir *et al*.

	Jordanian	English	Iranian	Spanish	Russian	Iran_ChL	Iran_N	Levant_N	German	French	Palestinian	Syrian	Somali
Jordanian	0	0.013	0.004	0.009	0.017	0.013	0.046	0.025	0.013	0.011	0.003	0.002	0.049
English	0.013	0	0.013	0.003	0.005	0.027	0.061	0.042	0.001	0.001	0.016	0.014	0.075
Iranian	0.004	0.013	0	0.011	0.015	0.007	0.032	0.037	0.012	0.011	0.007	0.004	0.062
Spanish	0.009	0.003	0.011	0	0.008	0.022	0.06	0.034	0.003	0.001	0.012	0.01	0.068
Russian	0.017	0.005	0.015	0.008	0	0.028	0.06	0.048	0.003	0.005	0.021	0.017	0.075
Iran_ChL	0.013	0.027	0.007	0.022	0.028	0	0.022	0.034	0.025	0.023	0.015	0.012	0.07
Iran_N	0.046	0.061	0.032	0.06	0.06	0.022	0	0.078	0.06	0.06	0.048	0.044	0.092
Levant_N	0.025	0.042	0.037	0.034	0.048	0.034	0.078	0	0.041	0.039	0.027	0.027	0.075
German	0.013	0.001	0.012	0.003	0.003	0.025	0.06	0.041	0	0.001	0.016	0.013	0.074
French	0.011	0.001	0.011	0.001	0.005	0.023	0.06	0.039	0.001	0	0.014	0.012	0.072
Palestinian	0.003	0.016	0.007	0.012	0.021	0.015	0.048	0.027	0.016	0.014	0	0.004	0.052
Syrian	0.002	0.014	0.004	0.01	0.017	0.012	0.044	0.027	0.013	0.012	0.004	0	0.052
Somali	0.049	0.075	0.062	0.068	0.075	0.07	0.092	0.075	0.074	0.072	0.052	0.052	0

Table S1. *F_{ST} values.*

model 1: target: Jordanian 20% English 80%; sources: Jordanian, English

model 2: target: Jordanian 50% English 50%; sources: Jordanian, English

model 3: target: Jordanian 80% English 20%; sources: Jordanian, English

Proportion of missing SNPs	average error (percentage points)	maximum error (percentage points)	average standard error (percentage points)	p-value (model 1)	p-value (model 2)	p-value (model 3)
0.4	2.25	5.05	5.05	0.0233	0.1501	0.2415
0.6	2.80	4.21	5.17	0.7779	1.0000	0.6017
0.8	4.24	7.95	6.67	0.0054	0.0098	0.0013
0.9	10.44	14.04	7.74	0.0003	0.0011	0.0002

model 4: target: Spanish 20% Russian 80%; sources: Spanish and Russian

model 5: target: Spanish 50% Russian 50%; sources: Spanish and Russian

model 6: target: Spanish 80% Russian 20%; sources: Spanish and Russian

Proportion of missing SNPs	average error (percentage points)	maximum error (percentage points)	average standard error (percentage points)	p-value (model 4)	p-value (model 5)	p-value (model 6)
0.4	1.97	4.37	8.83	0.4651	0.7338	0.3936
0.6	4.18	6.34	8.31	0.3857	0.7720	0.1858
0.8	1.88	4.26	11.08	0.0139	0.1514	0.3293
0.9	4.15	6.63	14.62	0.0009	0.0414	0.3674

***Table S2**. Admixture models used in the simulations with different proportions of missing SNPs. P-values below 0.05 are shaded.*

model 1: target: Jordanian 20% Iranian 80%; sources: Jordanian, Iranian

model 2: target: Jordanian 50% Iranian 50%; sources: Jordanian, Iranian

model 3: target: Jordanian 80% Iranian 20%; sources: Jordanian, Iranian

set	average error (percentage points)	maximum error (percentage points)	average standard error (percentage points)	p-value (model 1)	p-value (model 2)	p-value (model 3)
1	1.18	2.70	17.44	0.0011	0.0019	0.0005
2	4.94	8.11	15.47	0.2571	0.1294	0.0693

***Table S3**. Admixture of two closely related populations. P-values below 0.05 are shaded.*

target 1: Jordanian 20% English 80%
target 2: Jordanian 50% English 50%
target 3: Jordanian 80% English 20%
target 4: Jordanian 20% Iranian 80%
target 5: Jordanian 50% Iranian 50%
target 6: Jordanian 80% Iranian 20%

	sources provided to LINADMIX	F_{ST} of alternative and original populations	average error (percentage points)	maximum error (percentage points)	average standard error (percentage points)	p-value (target 1)	p-value (target 2)	p-value (target 3)
A	Jordanian and English		2.89	4.41	5.43	0.8012	0.9999	0.7063
	Jordanian and German	0.001	2.89	4.22	5.02	0.0389	0.8039	0.9452
	Jordanian and merged English and German		2.89	4.33	4.83	0.1231	0.9760	0.8408
	Jordanian and French	0.001	6.78	7.60	5.13	0.6420	0.8385	0.5417
	Syrian and English	0.002	1.75	2.99	5.42	0.9802	0.5213	0.0493
	Palestinian and English	0.003	3.85	6.58	4.74	0.9382	0.4569	0.1375
	Iranian and English	0.004	3.27	4.81	5.73	0.0238	0.0262	0.0481
	Syrian and German	0.002;0.001	1.63	3.50	5.06	0.0724	0.4623	0.1030
	Syrian and French	0.002;0.001	4.97	5.89	4.91	0.4152	0.3321	0.0285
	Palestinian and German	0.003;0.001	3.91	6.46	4.35	0.0805	0.5533	0.2025
	Palestinian and French	0.003;0.001	8.20	8.99	4.28	0.2535	0.1658	0.0801
						p-value (target 4)	**p-value (target 5)**	**p-value (target 6)**
B	Jordanian and Iranian		5.08	8.59	15.56	0.2757	0.1003	0.0573
	Syrian and Iranian	0.002	6.82	16.78	17.79	0.2896	0.1734	0.0039
	Palestinian and Iranian	0.003	12.49	17.25	12.45	0.2029	0.0546	0.0027
	Jordanian and Iran_ChL	0.007	13.55	18.77	17.35	0.0001	0.0001	0.0081

***Table S2**. Replacing Jordanian and English sources with proxy populations. **A**. Targets are mixtures of Jordanians and English. **B**. Targets are mixtures of Jordanians and Iranians. P-values below 0.05 are shaded.*

target 1: French 20% Palestinian 80%
target 2: French 50% Palestinian 50%
target 3: French 80% Palestinian 20%

	sample size provided to LINADMIX	average error (percentage points)	maximum error (percentage points)	average standard error (percentage points)	p-value (target 1)	p-value (target 2)	p-value (target 3)
set 1	2	5.66	7.11	5.28	0.5218	0.9153	0.5717
	4	2.62	4.59	7.56	0.8276	0.6858	0.3687
	8	2.21	3.76	7.30	0.8766	0.9612	0.5298
	12	2.67	3.48	6.71	0.9868	0.9261	0.4122
	16	3.58	6.12	7.32	0.9956	0.8040	0.3066
	20	3.28	5.47	7.06	0.9804	0.8296	0.3584
set 2	*2*	*2.95*	*4.00*	*9.13*	*0.1193*	*0.0326*	*0.0340*
	4	*2.80*	*3.97*	*6.95*	*0.4086*	*0.2407*	*0.2768*
	8	*3.89*	*6.12*	*7.10*	*0.5147*	*0.3579*	*0.3413*
	12	*4.26*	*7.41*	*6.79*	*0.6940*	*0.4773*	*0.3697*
	16	*4.09*	*6.88*	*7.28*	*0.6914*	*0.5004*	*0.3595*
	20	*3.29*	*5.53*	*7.31*	*0.9788*	*0.8125*	*0.3688*
set 3	*2*	*6.03*	*10.71*	*8.73*	*0.7666*	*0.1500*	*0.0027*
	4	*4.80*	*8.46*	*6.46*	*0.3725*	*0.3126*	*0.0271*
	8	*4.68*	*8.29*	*5.64*	*0.9244*	*0.6941*	*0.2082*
	12	*4.05*	*7.08*	*6.18*	*0.9767*	*0.7090*	*0.2525*
	16	*3.45*	*5.82*	*6.54*	*0.9928*	*0.7246*	*0.3307*
	20	*3.27*	*5.29*	*6.70*	*0.9224*	*0.7552*	*0.3218*

Table S5*. Effect of sample size on LINADMIX performance across three sets of runs of increasing sample size. P-values below 0.05 are shaded.*

A.

sources: Jordanian, English, 3rd population

target: Jordanian 20% English 80%

third population	estimate of third population	standard error	p-value
Somali	2E-09	0.0125	0.8038
Iran_ChL	0.0582	0.1048	0.9887
Russian	1E-06	0.1295	0.8550

target: Jordanian 50% English 50%

third population	estimate of third population	standard error	p-value
Somali	1E-05	0.0169	1
Iran_ChL	0.0003	0.1050	0.9999
Russian	3E-05	0.1414	1

target: Jordanian 80% English 20%

third population	estimate of third population	standard error	p-value
Somali	0.0111	0.0200	0.7870
Iran_ChL	0.0003	0.1050	0.7151
Russian	0.0405	0.1060	0.8260

***Table S6A**. Target population of Jordanian and English admixture, modeled by the original source populations with the addition of a third population.*

B.

sources: Jordanian, English, 3rd poplation

target: Jordanian 20% English 80%

third population	estimate of third population	standard error	standard error of related population	standard error of non-related population	p-value
Syrian	0.2250	0.1178	0.0984	0.0667	0.9228
Palestinian	2E-05	0.1066	0.1138	0.0629	0.8007
German	0.2282	0.2974	0.3089	0.0479	0.8022
French	3E-07	0.3213	0.3019	0.0634	0.7945

target: Jordanian 50% English 50%

third population	estimate of third population	standard error	standard error of related population	standard error of non-related population	p-value
Syrian	5E-05	0.1930	0.1843	0.0533	1
Palestinian	0.0372	0.1887	0.1942	0.0520	1
German	0.0022	0.2298	0.2375	0.0461	1
French	0.0179	0.2460	0.2343	0.0552	0.9999

target: Jordanian 80% English 20%

third population	estimate of third population	standard error	standard error of related population	standard error of non-related population	p-value
Syrian	1E-06	0.2773	0.2759	0.0387	0.7132
Palestinian	0.0051	0.2821	0.2800	0.0422	0.7129
German	0.0121	0.1253	0.1287	0.0434	0.7135
French	4E-06	0.1356	0.1296	0.0486	0.7084

***Table S6B**. Target population of Jordanian and English admixture, modeled by the original source populations with the addition of a third population that is similar to one of the sources.*

sources: Jordanian, Iranian, 3rd poplation

target: Jordanian 20% Iranian 80%

third population	estimate of third population	standard error third population	standard error Jordanian	standard error Iranian	p-value
Somali	0.0243	0.0161	0.1326	0.1327	0.2718
Iran_ChL	6E-10	0.0493	0.1433	0.1491	0.2787
Russian	0.0544	0.0366	0.1568	0.1552	0.9448
Palestinian	2E-08	0.0990	0.1243	0.1324	0.2749
Syrian	2E-06	0.0965	0.1367	0.1413	0.2815

target: Jordanian 50% Iranian 50%

third population	estimate of third population	standard error third population	standard error Jordanian	standard error Iranian	p-value
Somali	0.0198	0.0222	0.1660	0.1624	0.0876
Iran_ChL	2E-06	0.0546	0.1622	0.1679	0.1010
Russian	0.0680	0.0422	0.1825	0.2047	0.9678
Palestinian	5E-07	0.1730	0.1946	0.1417	0.1052
Syrian	0.0175	0.1842	0.1956	0.1562	0.1021

target: Jordanian 80% Iranian 20%

third population	estimate of third population	standard error third population	standard error Jordanian	standard error Iranian	p-value
Somali	3E-05	0.0255	0.1799	0.1748	0.0604
Iran_ChL	1E-06	0.0872	0.1657	0.1628	0.0614
Russian	0.0538	0.0420	0.1483	0.1635	0.5312
Palestinian	1E-06	0.2697	0.2886	0.1430	0.0961
Syrian	0.0786	0.2845	0.2894	0.1518	0.0600

***Table S6C**. Target population of Jordanian and Iranian admixture, modeled by the original source populations with the addition of a third population.*

sources: Somali, English, 3rd poplation

target: Somali 20% English 80%

third population	estimate of third population	standard error third population	standard error Somali	standard error English	p-value
Levant_N	0.0149	0.0241	0.0180	0.0307	0.2429
Iran_ChL	0.0474	0.0617	0.0192	0.0563	0.2814
Russian	5E-09	0.0989	0.0207	0.1049	0.2223
French	0.1833	0.2875	0.0183	0.2886	0.2478
German	0.0297	0.2980	0.0192	0.3009	0.2230

target: Somali 50% English 50%

third population	estimate of third population	standard error third population	standard error Somali	standard error English	p-value
Levant_N	0.0217	0.0340	0.0223	0.0466	0.2468
Iran_ChL	0.0661	0.0503	0.0214	0.0485	0.5463
Russian	6E-08	0.1051	0.0235	0.1180	0.3384
French	0.2815	0.2204	0.0240	0.2140	0.3554
German	0.0589	0.2201	0.0229	0.2271	0.3376

target: Somali 80% English 20%

third population	estimate of third population	standard error third population	standard error Somali	standard error English	p-value
Levant_N	0.0298	0.0431	0.0209	0.0493	0.1235
Iran_ChL	0.0859	0.0439	0.0258	0.0309	0.6489
Russian	4E-07	0.0770	0.0209	0.0840	0.1009
French	0.2057	0.1013	0.0224	0.0954	0.1151
German	0.0488	0.0973	0.0208	0.1018	0.1063

***Table S6D**. Target population of Somali and English admixture, modeled by the original source populations with the addition of a third population.*

Composition of target population	Source populations provided to LINADMIX	estimation error (percentage points)	standard error (percentage points)	p-value
Jordanian 90% English 10%	Jordanian and English	5.62	4.77	0.4435
Jordanian 95% English 5%	Jordanian and English	4.94	5.10	0.3029
Jordanian 90% Iranian 10%	Jordanian and Iranian	0.17	14.07	0.2369
Jordanian 95% Iranian 5%	Jordanian and Iranian	5.00	12.34	0.0548

Table S7. *Simulations of a mixture where one source has a low contribution to a target population.*

model 1: target: Jordanian 10% Iranian 60% English 30%; sources: Jordanian Iranian and English
model 2: target: Jordanian 30% Iranian 10% English 60%; sources: Jordanian Iranian and English
model 3: target: Jordanian 60% Iranian 30% English 10%; sources: Jordanian Iranian and English
model 4: target: Jordanian 25% Iranian 25% English 25% Russian 25%; sources: Jordanian Iranian English and Russian

calculation across	average error (percentage points)	maximum error (percentage points)	average standard error (percentage points)	p-value
models 1-3, all sources	4.13	9.92	7.66	
model1, all sources	1.19	1.79	6.95	0.9997
model 2, all sources	4.58	6.87	8.60	0.8632
model 3, all sources	6.61	9.92	7.42	0.4669
model 4, all sources	5.41	10.81	12.78	0.9881

***Table S8**. Admixture of three or four populations.*

target: Jordanian 25% Iranian 25% English 80% Russian 25%

Sources in the model	p-value	Estimates (Standard errors)
Jordanian Iranian and English	0.4205	0.01;0.43;0.56 (0.09;0.14;0.07)
Jordanian English and Russian	0.2752	0.46;0;0.54 (0.05;0.20;0.16)
Jordanian Iranian and Russian	0.2291	0.28;0.22;0.50 (0.12;0.13;0.04)
Iranian English and Russian	0.4297	0.45;0.46;0.09 (0.15;0.06;0.12)
English and Russian	0.0006	1;0 (0.24;0.24)
Jordanian and Iranian	0.0001	0.03;0.97 (0.13;0.13)
Jordanian and English	0.0054	0.38;0.62 (0.07;0.07)
Jordanian and Russian	0.1764	0.46;0.54 (0.03;0.03)
Iranian and Russian	0.0248	0.52;0.48 (0.03;0.03)
Iranian and English	0.3812	0.44;0.56 (0.07;0.07)

***Table S9**. Model fit when at least one of the source populations is missing in a target that is an admixture of four populations. P-values below 0.05 are shaded.*

A	E	1	2	3	4	5	6	7	8	9	10	11
Jordanian	10	10.75 7.69	11.87 8.48	10.74 9.85	8.69 8.89	1.89 5.88	1.64 5.26	-	-	-	-	-
Syrian	-	-	-	-	-	-	1.77 12.76	4.62 13.31	-	1.68 13.37	-	14.40 14.73
Palestinian	-	-	-	-	-	3.67 9.53	1.75 7.05	1.64 7.82	9.26 10.22	3.55 8.99	9.26 10.24	-
Iranian	60	60.53 9.90	59.69 11.00	60.57 11.70	62.08 10.17	64.14 11.42	64.31 14.64	63.19 14.99	61.16 17.45	64.04 14.90	61.17 11.65	56.46 15.84
English	30	28.72 5.26	25.06 10.10	23.86 10.75	23.28 11.42	18.43 12.24	12.52 10.28	-	-	-	-	-
German	-	-	-	-	-	3.66 10.43	5.49 8.98	15.57 10.87	27.14 11.74	13.33 11.12	27.15 11.09	24.62 11.20
French	-	-	-	-	-	-	5.44 8.60	10.17 9.97	-	14.97 10.62	-	-
Spanish	-	-	-	1.40 9.16	3.06 9.38	5.40 7.26	4.35 6.17	1.92 6.66	0.00 8.24	-	-	-
Russian	-	-	3.37 10.77	3.43 10.49	2.68 8.80	2.19 9.76	2.05 10.68	2.23 10.84	2.07 10.29	1.63 11.34	2.06 11.25	4.41 11.10
Somali	-	-	-	-	0.22 1.85	0.62 1.82	0.68 1.72	0.65 1.71	0.36 1.76	0.79 1.69	0.36 1.73	0.12 1.73

B	E	1	2	3	4	5	6	7	8	9	10	11
Jordanian	30	29.06 11.14	29.06 11.01	29.06 11.88	28.95 13.07	7.14 9.81	3.73 8.72	-	-	-	-	-
Syrian	-	-	-	-	-	-	13.93 12.65	24.05 14.20	-	21.36 14.12	-	37.90 11.96
Palestinian	-	-	-	-	-	17.68 14.15	5.01 11.69	2.45 12.13	24.45 14.23	3.49 14.36	24.45 12.46	-
Iranian	10	15.43 9.34	15.43 9.45	15.43 10.93	15.49 10.91	17.17 10.10	18.01 9.84	14.36 11.25	17.45 11.89	15.69 11.01	17.44 10.05	4.97 9.51
English	60	55.52 5.98	55.52 8.14	55.52 14.45	55.51 15.66	50.53 22.37	27.82 21.40	-	-	-	-	-
German	-	-	-	-	-	4.08 21.38	12.77 19.01	38.29 22.83	57.19 20.47	34.53 22.55	57.19 14.30	52.04 11.12
French	-	-	-	-	-	-	12.44 17.09	16.48 19.37	-	22.80 19.86	-	-
Spanish	-	-	-	0.00 13.41	0.00 15.10	2.09 10.86	4.55 9.87	1.68 1.74	0.00 15.28	-	-	-
Russian	-	-	0.00 7.52	0.00 7.52	0.00 5.67	0.22 8.16	0.40 8.37	1.60 10.06	0.00 12.38	0.86 9.80	0.00 12.36	4.80 9.01
Somali	-	-	-	-	0.05 1.64	1.08 1.58	1.33 1.60	1.09 1.74	0.91 1.62	1.28 1.69	0.91 1.47	0.30 1.93

C	E	1	2	3	4	5	6	7	8	9	10	11
Jordanian	60	50.49 7.68	50.49 7.65	50.49 8.18	45.90 12.27	0.00 18.55	22.28 17.20	-	-	-	-	-
Syrian	-	-	-	-	-	-	31.15 22.26	31.24 23.51	-	14.93 23.50	-	56.31 16.94
Palestinian	-	-	-	-	-	41.32 19.13	0.00 14.97	9.32 16.89	41.08 11.87	30.69 17.61	41.09 11.24	-
Iranian	30	40.61 9.59	40.61 10.14	40.61 10.36	43.30 11.18	43.31 11.01	33.92 15.63	42.67 16.27	43.64 11.48	39.27 15.63	43.64 11.02	29.05 18.02
English	10	8.89 5.59	8.89 5.43	8.89 5.47	8.50 5.73	10.98 6.14	0.15 5.23	-	-	-	-	-
German	-	-	-	-	-	0.00 5.23	9.56 4.27	0.00 5.14	10.97 6.07	10.95 5.52	10.98 5.50	10.62 5.70
French	-	-	-	-	-	-	0.00 3.87	0.00 4.77	-	0.00 5.51	-	-
Spanish	-	-	-	0.00 2.87	0.00 3.86	0.00 3.47	0.02 3.98	12.32 5.68	0.00 5.52	-	-	-
Russian	-	-	0.00 5.68	0.00 5.66	0.00 3.02	0.00 3.49	0.00 3.72	0.00 3.87	0.00 4.16	0.00 4.34	0.00 4.70	0.00 4.24
Somali	-	-	-	-	2.30 3.04	4.39 3.09	2.91 3.24	4.44 3.35	4.29 3.13	4.14 3.27	4.29 3.07	4.00 4.05

***Table S10**. Estimated contribution when multiple sources are given to LINADMIX. The 'E' column represents the expected contribution. '-' indicates that the population was not given as a source in that model.*