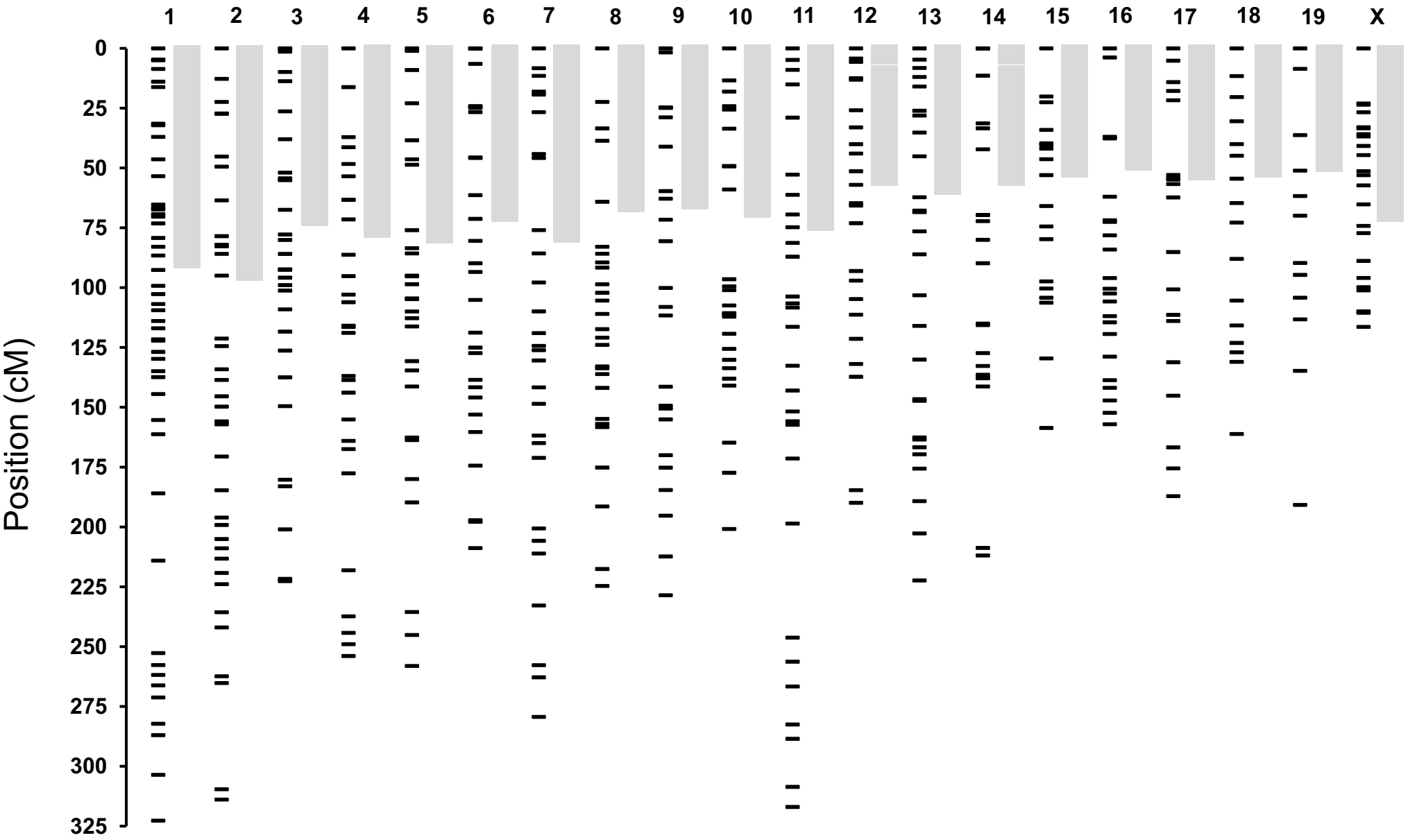


# Chromosome



1 **SUPPLEMENTAL MATERIAL**

2

3 **SUPPLEMENTAL FIGURE LEGENDS**

4 Supplemental Fig.1. Genetic linkage map depicting locations (cM) of markers ( $n = 530$ ) in the  
5  $G_4$  population. The production of the  $G_4$  advanced intercross line increased the genetic length of  
6 the entire genome by generating higher levels of recombination relative to a  $F_2$  (see 14). For  
7 comparison, we have added chromosome lengths from a new standard genetic map for the  
8 laboratory mouse (gray shaded area) (11). All positions (including those from 11) were based on  
9 a sex-averaged map, with the exception of the X chromosome, which was based on the female  
10 map only.

11

12 **SUPPLEMENTAL TABLES**

13 Supplemental Table 1. *SNPs (n = 530) used in the final analyses of the G<sub>4</sub> population of mice*  
 14 *with known physical (Mb) locations*

SNP	MMU	Position (Mb)	SNP	MMU	Position (Mb)
JAX00240652	1	3.46	JAX00009797	1	136.28
JAX00000321	1	7.30	JAX00268776	1	139.51
JAX00241694	1	9.99	JAX00269922	1	145.97
JAX00000760	1	13.23	JAX00010715	1	148.55
JAX00001021	1	16.68	JAX00010980	1	152.08
JAX00243650	1	20.14	JAX00011133	1	154.11
JAX00244717	1	24.81	JAX00275074	1	169.61
JAX00002001	1	29.77	JAX00012316	1	170.02
JAX00188707	1	33.66	JAX00275695	1	171.81
JAX00247128	1	36.76	JAX00276519	1	175.07
JAX00002741	1	39.61	JAX00277411	1	178.74
JAX00003014	1	43.27	JAX00278821	1	185.33
JAX00249585	1	46.33	JAX00013696	1	188.78
JAX00250156	1	50.06	JAX00280187	1	191.76
JAX00003704	1	52.50	JAX00280986	1	195.62
JAX00251429	1	55.40	JAX00090971	2	7.61
JAX00004537	1	63.62	JAX00483290	2	10.81
JAX00253602	1	66.22	JAX00091402	2	13.35
JAX00004954	1	69.19	JAX00484496	2	19.39
JAX00254795	1	72.80	JAX00484539	2	19.57
JAX00005495	1	76.41	JAX00091876	2	19.68
JAX00005735	1	79.62	JAX00092635	2	29.85
JAX00257356	1	82.62	JAX00092666	2	30.26
JAX00258190	1	89.77	JAX00092942	2	33.94
JAX00259020	1	93.04	JAX00093554	2	42.23
JAX00260131	1	98.83	JAX00093881	2	46.59
JAX00261568	1	106.63	JAX00094170	2	50.47
JAX00008045	1	112.67	JAX00094385	2	53.29
JAX00263199	1	115.56	JAX00094639	2	56.70
JAX00008766	1	122.52	JAX00094839	2	59.40
JAX00265393	1	126.39	JAX00095470	2	67.85
JAX00009649	1	134.31	JAX00095583	2	69.34

15

16

## 17 Supplemental Table 1...continued

18

SNP	MMU	Position (Mb)	SNP	MMU	Position (Mb)
JAX00493169	2	73.87	JAX00109931	3	86.29
JAX00493664	2	76.35	JAX00110107	3	88.65
JAX00096391	2	80.17	JAX00110808	3	98.33
JAX00096585	2	82.78	JAX00110851	3	99.01
JAX00097085	2	89.55	JAX00111276	3	104.69
JAX00496243	2	91.83	JAX00111864	3	112.60
JAX00097778	2	99.04	JAX00189283	3	119.29
JAX00498192	2	102.76	JAX00189293	3	125.60
JAX00098514	2	109.20	JAX00113499	3	134.56
JAX00098814	2	113.18	JAX00538751	3	136.05
JAX00500486	2	115.58	JAX00114351	3	145.92
JAX00099246	2	118.98	JAX00542768	3	154.45
JAX00501779	2	122.68	JAX00543027	3	156.02
JAX00099979	2	128.74	JAX00115604	4	6.06
JAX00100245	2	132.30	JAX00544225	4	7.08
JAX00100567	2	136.58	JAX00116659	4	20.38
JAX00100848	2	140.35	JAX00116950	4	24.42
JAX00508265	2	155.71	JAX00117341	4	29.71
JAX00509136	2	159.30	JAX00117573	4	33.02
JAX00511966	2	172.51	JAX00117972	4	38.40
JAX00103392	2	174.30	JAX00548707	4	39.69
JAX00103973	3	6.19	JAX00549337	4	44.04
JAX00104028	3	6.94	JAX00119104	4	54.22
JAX00104180	3	8.97	JAX00119212	4	55.65
JAX00515950	3	18.57	JAX00189438	4	58.47
JAX00105078	3	21.37	JAX00552983	4	64.17
JAX00105505	3	27.12	JAX00554143	4	71.10
JAX00189155	3	33.46	JAX00120481	4	73.52
JAX00520666	3	40.32	JAX00554899	4	76.13
JAX00106771	3	44.02	JAX00557140	4	88.28
JAX00107199	3	49.78	JAX00121671	4	89.43
JAX00107680	3	56.18	JAX00121710	4	89.94
JAX00524422	3	60.23	JAX00121898	4	92.50
JAX00524828	3	63.25	JAX00122676	4	102.85
JAX00108421	3	66.14	JAX00561847	4	109.15
JAX00526713	3	73.72	JAX00123647	4	116.30
JAX00109133	3	75.68	JAX00563495	4	118.55
JAX00109693	3	83.13	JAX00567938	4	135.79

## 19 Supplemental Table 1...continued

20

SNP	MMU	Position (Mb)	SNP	MMU	Position (Mb)
JAX00568742	4	139.34	JAX00139789	6	36.30
JAX00569432	4	142.03	JAX00140451	6	45.15
JAX00570195	4	147.27	JAX00608826	6	46.81
JAX00126017	4	149.26	JAX00141073	6	53.58
JAX00573023	5	7.19	JAX00612506	6	67.44
JAX00127022	5	10.64	JAX00142749	6	76.13
JAX00127317	5	15.41	JAX00615985	6	83.23
JAX00127722	5	20.81	JAX00143736	6	89.31
JAX00128228	5	28.49	JAX00617746	6	92.62
JAX00128632	5	33.91	JAX00618398	6	94.98
JAX00128815	5	36.39	JAX00619072	6	97.99
JAX00581045	5	46.89	JAX00144705	6	102.24
JAX00581735	5	49.99	JAX00621926	6	109.87
JAX00582506	5	52.91	JAX00622369	6	112.22
JAX00584541	5	65.04	JAX00623316	6	115.91
JAX00131070	5	66.45	JAX00189941	6	118.94
JAX00131182	5	67.96	JAX00624709	6	122.61
JAX00586379	5	75.10	JAX00626640	6	132.92
JAX00131790	5	76.06	JAX00189987	6	139.28
JAX00131820	5	77.23	JAX00629129	6	142.21
JAX00131888	5	78.14	JAX00630018	6	145.23
JAX00132785	5	90.09	JAX00148257	7	3.77
JAX00133006	5	93.05	JAX00148474	7	6.72
JAX00133202	5	96.86	JAX00190016	7	13.48
JAX00133397	5	99.48	JAX00149076	7	17.09
JAX00592675	5	113.20	JAX00633165	7	19.09
JAX00593521	5	116.34	JAX00149554	7	26.95
JAX00594409	5	119.65	JAX00635190	7	34.29
JAX00135190	5	123.43	JAX00635952	7	36.42
JAX00599257	5	139.84	JAX00638745	7	50.07
JAX00599877	5	142.39	JAX00641805	7	65.96
JAX00137098	5	149.15	JAX00152597	7	69.87
JAX00602977	6	10.24	JAX00643377	7	73.22
JAX00603343	6	13.27	JAX00153077	7	76.26
JAX00138460	6	18.56	JAX00190133	7	79.92
JAX00139228	6	28.82	JAX00645408	7	82.64
JAX00139316	6	29.99	JAX00645933	7	85.85
JAX00139528	6	32.81	JAX00154099	7	89.95

21 Supplemental Table 1...*continued*

22

SNP	MMU	Position (Mb)	SNP	MMU	Position (Mb)
JAX00154329	7	93.00	JAX00167703	9	4.54
JAX00155508	7	108.92	JAX00167904	9	7.24
JAX00155743	7	112.05	JAX00687899	9	25.32
JAX00155961	7	114.94	JAX00169293	9	25.85
JAX00156517	7	122.38	JAX00169301	9	25.94
JAX00156769	7	125.73	JAX00688081	9	26.77
JAX00655512	7	128.31	JAX00190451	9	29.69
JAX00157304	7	132.85	JAX00169834	9	33.05
JAX00657603	7	137.70	JAX00170132	9	37.11
JAX00658030	7	139.06	JAX00170532	9	42.46
JAX00659205	7	145.07	JAX00170819	9	46.31
JAX00190231	8	3.43	JAX00171082	9	49.80
JAX00158713	8	9.53	JAX00695061	9	56.92
JAX00190239	8	14.53	JAX00696373	9	63.51
JAX00159268	8	16.95	JAX00696900	9	66.11
JAX00159808	8	26.43	JAX00698952	9	76.24
JAX00160567	8	36.56	JAX00700236	9	83.38
JAX00666793	8	42.98	JAX00173791	9	86.06
JAX00161163	8	44.56	JAX00701802	9	92.42
JAX00667095	8	44.88	JAX00704097	9	103.02
JAX00190302	8	53.24	JAX00704581	9	105.81
JAX00162173	8	59.70	JAX00175541	9	109.55
JAX00162404	8	62.80	JAX00705853	9	112.65
JAX00190312	8	66.73	JAX00176095	9	116.96
JAX00163022	8	71.06	JAX00707462	9	118.91
JAX00163156	8	72.86	JAX00282080	10	7.51
JAX00163548	8	78.06	JAX00014851	10	10.13
JAX00673875	8	83.88	JAX00283234	10	13.52
JAX00674224	8	86.04	JAX00284586	10	20.60
JAX00190351	8	89.28	JAX00015834	10	23.31
JAX00675742	8	92.99	JAX00016105	10	26.93
JAX00165121	8	99.05	JAX00285956	10	27.00
JAX00165438	8	103.29	JAX00016116	10	27.07
JAX00678797	8	105.63	JAX00286536	10	30.62
JAX00166114	8	112.30	JAX00016388	10	30.72
JAX00166553	8	118.14	JAX00187308	10	43.69
JAX00167128	8	125.82	JAX00019034	10	66.30
JAX00683747	8	129.11	JAX00019069	10	66.76

23 Supplemental Table 1...*continued*

24

SNP	MMU	Position (Mb)	SNP	MMU	Position (Mb)
JAX00019076	10	66.86	JAX00030022	11	87.22
JAX00019077	10	66.86	JAX00318408	11	92.79
JAX00019082	10	66.95	JAX00030707	11	96.35
JAX00019083	10	66.96	JAX00031155	11	102.35
JAX00019619	10	74.11	JAX00031382	11	105.37
JAX00293914	10	81.49	JAX00031628	11	108.69
JAX00020328	10	83.79	JAX00031943	11	112.89
JAX00020403	10	84.77	JAX00032145	11	115.59
JAX00020562	10	86.91	JAX00187607	12	7.48
JAX00295678	10	89.83	JAX00325423	12	10.64
JAX00020986	10	92.59	JAX00033353	12	12.94
JAX00021324	10	97.08	JAX00327082	12	17.18
JAX00021724	10	102.46	JAX00327523	12	21.46
JAX00022058	10	106.89	JAX00329004	12	30.00
JAX00299310	10	113.81	JAX00331009	12	39.06
JAX00300375	10	119.47	JAX00035416	12	43.82
JAX00023249	10	122.82	JAX00332546	12	46.52
JAX00023839	11	3.78	JAX00036158	12	53.72
JAX00024084	11	7.05	JAX00036460	12	57.89
JAX00024300	11	9.94	JAX00335079	12	60.29
JAX00304396	11	13.51	JAX00187705	12	62.99
JAX00304853	11	16.81	JAX00037350	12	69.77
JAX00025338	11	23.97	JAX00037863	12	76.62
JAX00306858	11	30.08	JAX00339139	12	80.08
JAX00026075	11	33.90	JAX00038348	12	83.10
JAX00026291	11	36.87	JAX00340356	12	86.54
JAX00026765	11	43.20	JAX00038836	12	89.61
JAX00187495	11	46.24	JAX00341779	12	92.91
JAX00311223	11	53.24	JAX00342543	12	97.57
JAX00312699	11	56.50	JAX00345486	12	109.06
JAX00311892	11	56.50	JAX00346570	12	112.79
JAX00313044	11	61.81	JAX00348827	13	3.77
JAX00314044	11	66.20	JAX00041702	13	10.55
JAX00314703	11	69.63	JAX00350930	13	15.74
JAX00315275	11	72.94	JAX00351843	13	19.82
JAX00029177	11	75.94	JAX00352599	13	23.79
JAX00029428	11	79.30	JAX00043166	13	30.85
JAX00316531	11	82.08	JAX00353952	13	31.13

25 Supplemental Table 1...*continued*

26

SNP	MMU	Position (Mb)	SNP	MMU	Position (Mb)
JAX00354948	13	36.43	JAX00385628	14	82.64
JAX00043830	13	39.77	JAX00055542	14	86.00
JAX00356785	13	45.37	JAX00387018	14	92.60
JAX00357304	13	47.75	JAX00057997	14	119.28
JAX00044483	13	48.47	JAX00391461	14	120.36
JAX00358182	13	52.92	JAX00058152	14	121.35
JAX00358965	13	56.25	JAX00392026	15	3.52
JAX00361017	13	63.68	JAX00395686	15	23.96
JAX00045772	13	67.39	JAX00396199	15	26.49
JAX00361784	13	69.58	JAX00396735	15	30.15
JAX00046473	13	76.89	JAX00397321	15	32.39
JAX00363824	13	77.78	JAX00398163	15	37.07
JAX00047202	13	86.64	JAX00061061	15	39.43
JAX00047414	13	89.55	JAX00399798	15	45.76
JAX00366239	13	93.31	JAX00062446	15	57.94
JAX00047888	13	96.52	JAX00403855	15	66.01
JAX00048133	13	99.78	JAX00063060	15	66.11
JAX00048392	13	103.23	JAX00063396	15	70.59
JAX00048913	13	110.19	JAX00405318	15	72.18
JAX00371280	13	116.19	JAX00063956	15	78.07
JAX00372896	14	10.05	JAX00407012	15	80.08
JAX00372971	14	10.46	JAX00064382	15	83.77
JAX00373057	14	10.89	JAX00408215	15	85.97
JAX00050520	14	16.28	JAX00410365	15	94.59
JAX00050720	14	19.02	JAX00065772	15	102.33
JAX00050905	14	21.51	JAX00413022	16	6.77
JAX00051084	14	23.95	JAX00413176	16	7.55
JAX00375557	14	24.69	JAX00415862	16	24.34
JAX00052010	14	36.75	JAX00415942	16	24.89
JAX00052052	14	37.29	JAX00068044	16	32.34
JAX00378576	14	39.70	JAX00417972	16	35.48
JAX00378943	14	44.50	JAX00068339	16	36.27
JAX00052649	14	46.67	JAX00418604	16	39.65
JAX00381940	14	63.19	JAX00068876	16	43.43
JAX00382398	14	66.14	JAX00069480	16	51.50
JAX00383174	14	69.46	JAX00069872	16	56.73
JAX00054877	14	76.86	JAX00422529	16	59.78
JAX00385288	14	79.90	JAX00070376	16	63.50



27 Supplemental Table 1...*continued*

28

SNP	MMU	Position (Mb)	SNP	MMU	Position (Mb)
JAX00070865	16	70.08	JAX00084511	18	66.75
JAX00424604	16	72.92	JAX00463762	18	69.45
JAX00071217	16	74.77	JAX00464605	18	72.79
JAX00071562	16	79.36	JAX00085156	18	75.39
JAX00071974	16	84.88	JAX00465946	18	77.85
JAX00072088	16	86.42	JAX00468254	18	86.57
JAX00072361	16	90.07	JAX00086324	19	3.46
JAX00428434	16	92.97	JAX00470125	19	10.06
JAX00429186	16	96.43	JAX00087311	19	16.98
JAX00429799	17	3.97	JAX00472935	19	20.61
JAX00073232	17	6.70	JAX00473727	19	23.78
JAX00431384	17	10.41	JAX00474575	19	26.68
JAX00073820	17	14.66	JAX00088467	19	32.43
JAX00432525	17	15.50	JAX00476173	19	34.36
JAX00436582	17	33.15	JAX00089065	19	40.46
JAX00075442	17	36.68	JAX00478815	19	46.43
JAX00438327	17	40.61	JAX00479657	19	50.54
JAX00439027	17	43.15	JAX00480903	19	56.40
JAX00440286	17	47.28	JAX00709351	X	11.55
JAX00441944	17	53.15	JAX00711215	X	44.34
JAX00077328	17	62.24	JAX00711221	X	44.34
JAX00443940	17	66.24	JAX00711351	X	45.56
JAX00444142	17	67.00	JAX00179013	X	46.96
JAX00078196	17	74.18	JAX00711759	X	49.41
JAX00447544	17	79.37	JAX00712291	X	55.80
JAX00078883	17	83.33	JAX00179551	X	55.82
JAX00449090	17	86.04	JAX00179671	X	57.42
JAX00188476	17	89.63	JAX00239349	X	70.12
JAX00452266	18	13.21	JAX00180633	X	70.40
JAX00080770	18	16.70	JAX00180639	X	70.46
JAX00081229	18	22.89	JAX00180648	X	70.59
JAX00081764	18	30.02	JAX00714006	X	72.22
JAX00455751	18	33.67	JAX00715098	X	83.17
JAX00082288	18	37.04	JAX00182389	X	94.50
JAX00458347	18	46.99	JAX00182535	X	96.43
JAX00458892	18	50.23	JAX00182562	X	96.80
JAX00460030	18	56.66	JAX00182899	X	101.40
JAX00460887	18	59.82	JAX00183346	X	107.51

29 Supplemental Table 1...*continued*

30

SNP	MMU	Position (Mb)
JAX00717956	X	112.23
JAX00184535	X	126.02
JAX00718909	X	126.04
JAX00185465	X	138.78
JAX00185820	X	145.90
JAX00186043	X	148.89
JAX00240371	X	154.49
JAX00722634	X	159.44
JAX00186887	X	160.42
JAX00187170	X	164.22

31 Supplemental Table 2. *QTL detected and respective statistics for body mass and voluntary wheel-running traits. Values represent*  
 32 *LOD scores from simple mapping output that were significant at the genome-wide level ( $P \leq 0.05$ ,  $LOD \geq 3.9$ ), but did not remain*  
 33 *significant or suggestive ( $P \leq 0.1$ ,  $LOD \geq 3.5$ ) following the GRAIP procedure (and hence are not depicted in Table 3 of the primary*  
 34 *text).*

35

Trait <sup>a</sup>	Nearest Marker	MMU	Peak Position (Mb)	Naive LOD	GRAIP LOD	CI (Mb) <sup>d</sup>	% Var <sup>e</sup>	Additive <sup>f</sup> ±SE	Dominance <sup>f</sup> ±SE
Body Mass	JAX00511966	2	172.3	4.0	1.8	168-	1.2	-0.4±0.2	-0.8±0.3
	JAX00645408	7	82.6	6.7	3.2	80-84	1.4	0.4±0.2	0.9±0.3
	JAX00700236	9	83.4	4.4	2.1	79-90	0.6	0.3±0.2	0.6±0.3
<b><i>Distance</i></b>									
Day 1	JAX00081229	18	22.9	4.4	2.8	-31	3.0	504.5±180.2	-937.0±232.9 <sup>†</sup>
Slope (Days1-6) <sup>c</sup>	JAX00008766	1	122.5	3.9	3.2	116-135	3.0	139.6±35.87	-75.1±53.1
Intercept (Days1-6) <sup>c</sup>	JAX00023249	10	122.8	4.5	2.9	121-	2.5	265.8±192.1	-985.1±253.6
<b><i>Time</i></b>									
Day 1	JAX00608826	6	46.8	5.7	3.4	26-50	2.6	-38.0±8.8 <sup>†</sup>	-17.6±13.5
	JAX00025338	11	24.0	5.4	2.9	21-35	3.0	-34.3±10.0	-37.4±13.5
	JAX00081229	18	22.9	4.9	2.8	-28	2.6	15.7±10.7	-59.5±13.8 <sup>†</sup>
Day 2	JAX00072088	16	86.4	4.1	2.7	82-91	3.2	-34.5±8.4 <sup>†</sup>	-18.2±11.0
Day 3	JAX00582506	5	52.9	4.1	3.4	50-59	2.5	20.6±7.5	37.0±10.2
(Days 5+6)/2 <sup>b</sup>	JAX00478815	19	46.4	4.2	3.0	40-49	1.3	-18.7±6.8	10.1±8.9
Slope (Days1-6) <sup>c</sup>	JAX00081229	18	22.9	4.2	2.8	20-28	2.3	-2.2±1.9	8.7±2.4
Intercept (Days1-6) <sup>c</sup>	JAX00645408	7	82.6	5.5	3.2	75-86	3.5	23.5±9.6	-55.7±13.7 <sup>†</sup>

	JAX00026075	11	33.9	4.9	3.0	29-39	2.8	-28.4±9.7	-37.3±13.9
	JAX00081229	18	22.9	4.2	2.5	19-27	1.9	9.8±11.0	-47.7±14.2
<b>Average speed</b>									
Day 2	JAX00131182	5	68.0	4.1	3.3	66-78	2.8	0.1±0.1	0.9±0.2 <sup>†</sup>
Day 3	JAX00131182	5	68.0	3.9	3.0	66-78	2.3	-0.03±0.16	0.9±0.2 <sup>†</sup>
Slope (Days1-6) <sup>c</sup>	JAX00050520	14	16.3	4.3	3.4	14-18	2.8	0.09±0.03	0.17±0.05
<b>Maximum Speed</b>									
Day 6	JAX00131790	5	76.1	4.0	3.4	47-89	2.1	-0.8±0.2	0.8±0.3
Slope (Days1-6) <sup>c</sup>	JAX00025338	11	24.0	4.2	3.2	21-30	2.5	0.20±0.05	-0.01±0.07

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37 <sup>a</sup>Traits measured from a 6-day exposure to running wheels: body mass (g) prior to exposure to running wheels, running  
38 distance (revolutions / day), time spent running (i.e., cumulative 1-minute intervals in which at least one revolution was recorded),  
39 average speed (total revolutions / time spent running), and maximum speed (highest number of revolutions in any 1-minute interval  
40 within a 24 hour period). <sup>b</sup>Mean of days 5 and 6 of a 6-day exposure to running wheels. This is the criterion for which one strain  
41 (HR) was selectively bred (63). <sup>c</sup>Slope and intercept values from across the 6-day test. Slopes and intercepts were not calculated for  
42 individuals missing one or more days of wheel-running data. <sup>d</sup>Confidence intervals (CIs) for QTL positions were obtained using a 1.0  
43 LOD drop in Mb (relative to the Naive LOD score). <sup>e</sup>Percentage of phenotypic variance accounted for by the QTL effect. <sup>f</sup>For  
44 additive and dominance effects: positive values indicate increasing effect of the HR allele or increasing effect of the heterozygote,  
45 respectively. <sup>†</sup>Indicates additive and dominance effects were statistically significant at  $P < 0.05$ .