



# Who killed the Somerton Man?

## Background

In 1948, a man was found mysteriously dead on Somerton Beach, Adelaide, South Australia. His identity remains unknown until this day, and the case has been classified as one of Australia's biggest unsolved mysteries. There was no ID or anything on him that shows a clue on who he actually was.

This project analyses Somerton Man's DNA file extracted from his hair which has been corrupted. The project aims to investigate the Somerton Man's DNA with other sample DNA files via computer techniques and biological engineering methods.



Figure 1: The Somerton Man

## Aim and Motivation

- To find possibilities of who the Somerton Man was - taking a step forward to solving the unsolved mystery
- To evaluate the robustness of the Somerton Man's DNA
- To evaluate the ethnicity of Somerton Man
- To identify any possible diseases or physical characteristics of the Somerton Man

## Task 1: Counting DNA

Firstly, the Somerton man's DNA file was examined and the available SNPs to be used for analysis were counted.

There are more than 0.6 million SNPs in Somerton man's DNA file, but only about 2% of them have determined base pairs.

#chr	chromosome	position	genotype
r153861929	1	8869	...
r23328864	2	29732	...
r50383159	3	50508	...
r73428	3	73982	...
r13804790	3	72982	...
r3321972	3	73272	...
r11218235	3	74655	...
r11292618	3	75368	...
r11892517	3	79956	...
r11218889	3	77946	...
r112127425	3	79432	...
r17979718	3	81316	...
r17888803	3	81513	...
r1758185	3	82488	...
r10844609	3	83081	...
r731449	3	83073	...
r13051758	3	83836	...
r17285887	3	85092	...
r12079053	3	83000	...
r4979482	3	86079	...
r4847491	3	85808	CT
r1793889	3	81636	...
r5257756	3	85426	AG
r1130242	3	86368	...
r18047792	3	89136	...
r1281928	3	86893	TC
r1332954	3	86864	...
r17472341	3	87282	...

Figure 2: A screenshot of Somerton Man's DNA file

Chromosome	Total amount	Base amount	Percentage
1	49150	1034	2.09%
2	21771	978	4.49%
3	43023	628	1.45%
4	34773	621	1.79%
5	37028	661	1.79%
6	44021	880	2.00%
7	34356	655	1.91%
8	31881	621	1.95%
9	28445	513	1.80%
10	35222	705	2.00%
11	39432	705	1.79%
12	29432	596	2.03%
13	22891	393	1.70%
14	39951	441	1.10%
15	19006	440	2.32%
16	20796	558	2.70%
17	19461	519	2.68%
18	17874	372	2.07%
19	14879	518	3.48%
20	14781	375	2.54%
21	8677	285	3.29%
22	8151	323	3.96%
Total	613905	12751	2.08%

Figure 3: SNPs counting results of Somerton Man's DNA

## Task 2: Ethnicity

Ethnicity check via GEDmatch shows that he was North Atlantic for a proportion of more than a quarter of the chart. The second largest section shows that he was Baltic, which does not stray too much from North Atlantic region.

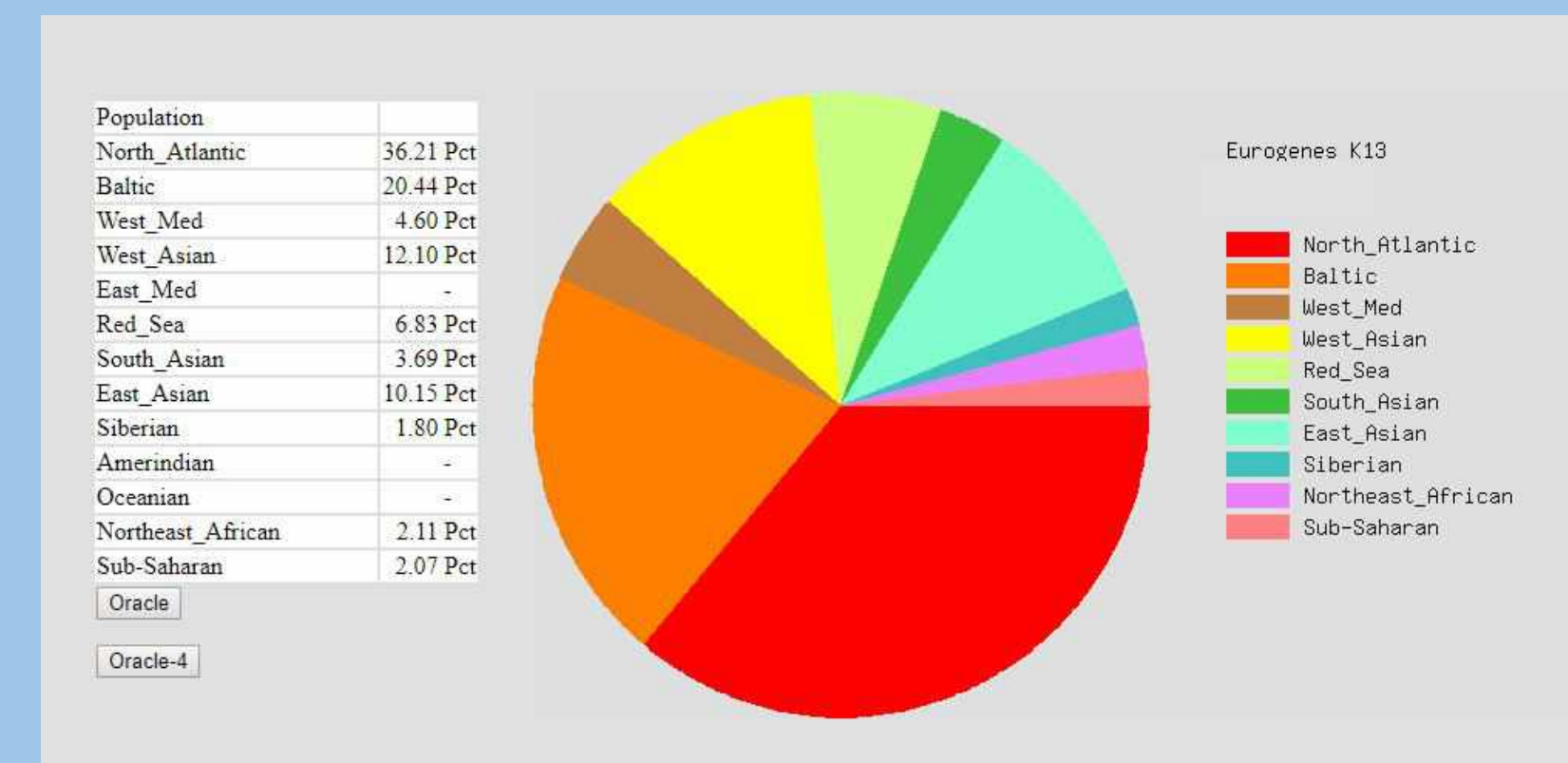


Figure 4: Ethnicity check of Somerton Man's DNA file

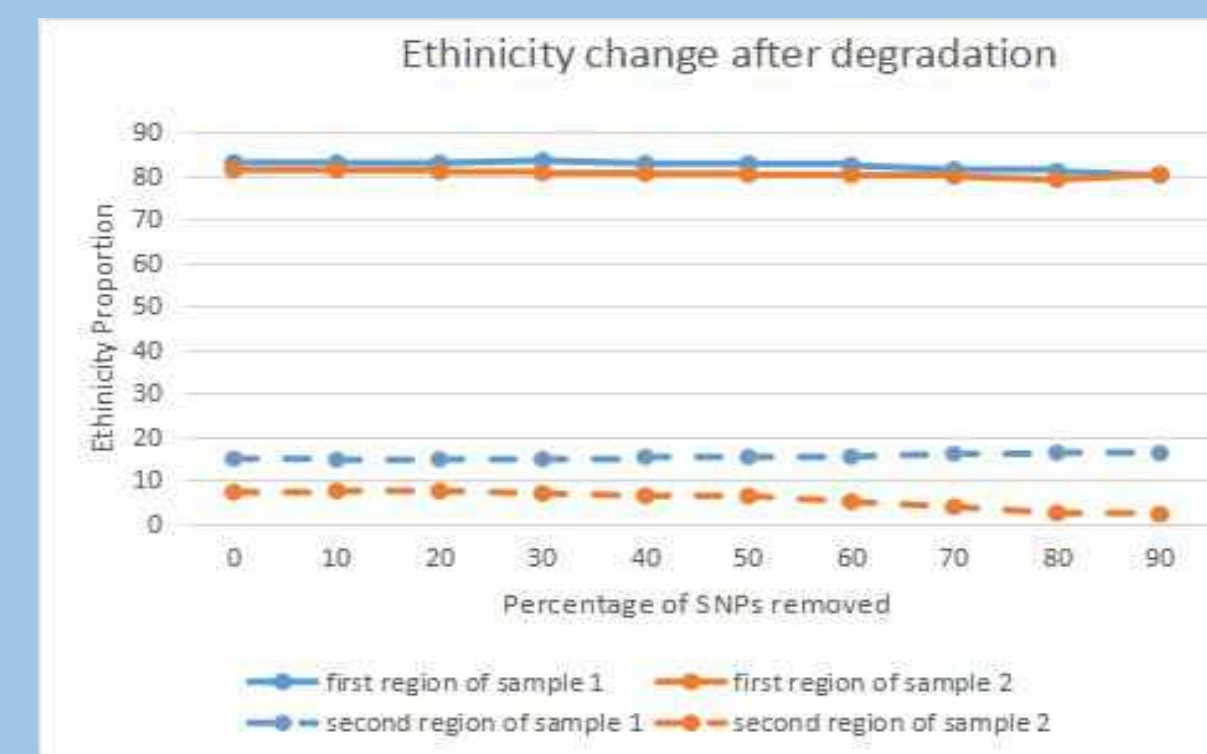


Figure 5: Change of ethnicity percentage after degrading to certain amount

There is only slight change on the ethnicity regions during the degradation process. It is shown in Figure 5 that the ethnicity does not intersect with one another for two sample DNA files, thus concludes that the degradation of DNA does not affect the proportion of ethnicity.

This then concludes that the Somerton Man's origin is around North Atlantic countries and Baltic region based on Figure 4. The countries that are associated with these regions are shown in Figure 6.

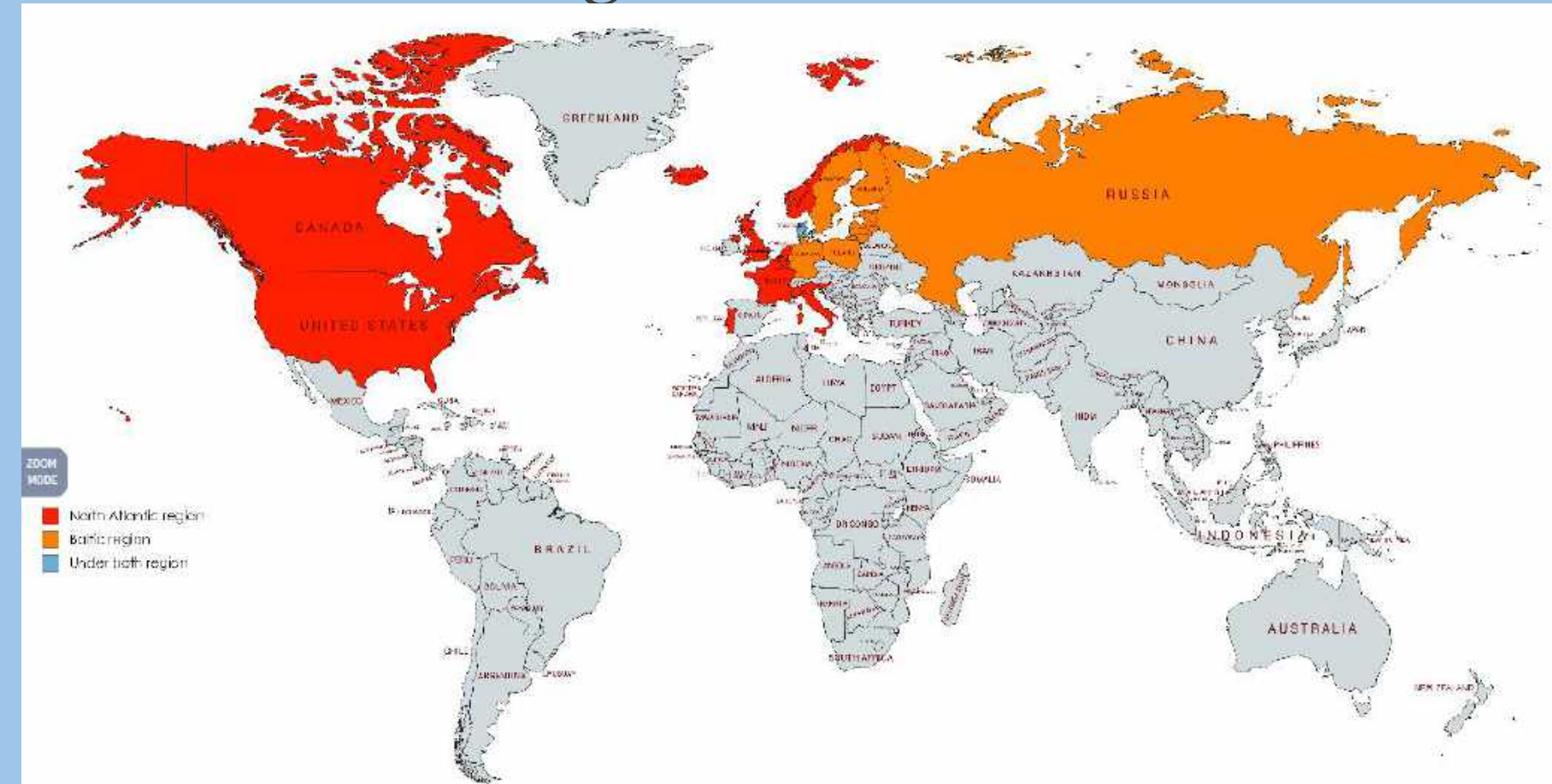


Figure 6: North Atlantic and Baltic regions

## Task 3: Genetic Disease

Somerton Man's DNA was analysed with dbSNP 575 potential genetic diseases were found associated to Somerton Man's DNA.

There is no result strongly support Somerton Man's known physical appearance such as hair colour, teeth structure or eye colour. But several interesting characteristics were discovered.

One of the diseases found in his DNA is Skin fragility woolly hair syndrome which indicates that Somerton Man might have woolly hair abnormality.

rsid	#alleles	#ClinVar Accession	#disease name
r5217	(A>A)	(A>G)	RCV00017857.2 not specified
r171414	(G>G)	(G>A)	RCV00044651.1 not specified
r375434	(G>G)	(G>A)	RCV00024343.1 Age-related cortical cataract
r1049675	(G>G)	(G>A)	RCV000290348.1 Schwartz-Jampel syndrome type 1
r1049675	(G>G)	(G>A)	RCV00017751.1 Dyssegmental Dysplasia
r35669711	(C>C)	(C>T)	RCV00030625.1 Schwartz-Jampel syndrome type 1
r35669711	(C>C)	(C>T)	RCV00059521.1 Dyssegmental Dysplasia
r2229475	(C>C)	(C>T)	RCV00039647.1 Dyssegmental Dysplasia
r2229475	(C>C)	(C>T)	RCV000175538.1 Schwartz-Jampel syndrome type 1
r2229475	(C>C)	(C>A)	RCV00026958.1 Schwartz-Jampel syndrome type 1
r2224353	(C>C)	(C>A)	RCV000374875.1 Dyssegmental Dysplasia
r2712644	(C>C)	(C>T)	RCV00047739.1 not specified
r11577358	(C>C)	(C>A)	RCV000430131.1 not specified
r11285	(A>A)	(A>G)	RCV00026910.1 Demoscoliosis
r544796	(A>A)	(A>C)	RCV00015743.1 not specified
r544796	(A>A)	(A>C)	RCV00025294.6 Familial hypercholesterolemia
r544796	(A>A)	(A>C)	RCV00017130.1 Familial hypercholesterolemia
r544796	(A>A)	(A>C)	RCV00060317.1 Hypercholesterolemia, autosomal dominant, 3
r562556	(G>G)	(G>A)	RCV00018272.3 not specified
r562556	(G>G)	(G>A)	RCV00016295.6 Familial hypercholesterolemia
r562556	(G>G)	(G>A)	RCV00030942.1 Familial hypercholesterolemia
r562556	(G>G)	(G>A)	RCV00052011.1 Hypercholesterolemia, autosomal dominant, 3
r505151	(G>G)	(G>A)	RCV00018049.7 Familial hypercholesterolemia
r505151	(G>G)	(G>A)	RCV00022352.2 not specified
r505151	(G>G)	(G>A)	RCV00016485.1 Familial hypercholesterolemia
r505151	(G>G)	(G>A)	RCV00012647.1 Hypercholesterolemia, autosomal dominant, 3
r144508	(G>G)	(G>A)	RCV00050521.1 Corneal Ectopy/Dysmatur/Raccoose
r1127101	(A>A)	(A>G)	RCV00009047.3 LEPTIN RECEPTOR POLYMORPHISM

Figure 7: Part of potential genetic diseases

rsid	#alleles	#ClinVar Accession	#disease name
r5217	(A>A)	(A>G)	RCV00017857.2 not specified
r171414	(G>G)	(G>A)	RCV00044651.1 not specified
r375434	(G>G)	(G>A)	RCV00024343.1 Age-related cortical cataract
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r1049675	(G>G)	(G>A)	RCV00017751.1 Dyssegmental Dysplasia
r35669711	(C>C)	(C>T)	RCV00030625.1 Schwartz-Jampel syndrome type 1
r35669711	(C>C)	(C>T)	RCV00059521.1 Dyssegmental Dysplasia
r2229475	(C>C)	(C>T)	RCV00039647.1 Dyssegmental Dysplasia
r2229475	(C>C)	(C>T)	RCV000175538.1 Schwartz-Jampel syndrome type 1
r2229475	(C>C)	(C>A)	RCV00026958.1 Schwartz-Jampel syndrome type 1
r2224353	(C>C)	(C>A)	RCV000374875.1 Dyssegmental Dysplasia
r2712644	(C>C)	(C>T)	RCV00047739.1 not specified
r11577358	(C>C)	(C>A)	RCV000430131.1 not specified
r11285	(A>A)	(A>G)	RCV00026910.1 Demoscoliosis
r544796	(A>A)	(A>C)	RCV00015743.1 not specified
r544796	(A>A)	(A>C)	RCV00025294.6 Familial hypercholesterolemia
r544796	(A>A)	(A>C)	RCV00017130.1 Familial hypercholesterolemia
r544796	(A>A)	(A>C)	RCV00060317.1 Hypercholesterolemia, autosomal dominant, 3
r562556	(G>G)	(G>A)	RCV00018272.3 not specified
r562556	(G>G)	(G>A)	RCV00016295.6 Familial hypercholesterolemia
r562556	(G>G)	(G>A)	RCV00030942.1 Familial hypercholesterolemia
r562556	(G>G)	(G>A)	RCV00052011.1 Hypercholesterolemia, autosomal dominant, 3
r505151	(G>G)	(G>A)	RCV00018049.7 Familial hypercholesterolemia
r505151	(G>G)	(G>A)	RCV00022352.2 not specified
r505151	(G>G)	(G>A)	RCV00016485.1 Familial hypercholesterolemia
r505151	(G>G)	(G>A)	RCV00012647.1 Hypercholesterolemia, autosomal dominant, 3
r144508	(G>G)	(G>A)	RCV00050521.1 Corneal Ectopy/Dysmatur/Raccoose
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Figure 8: Screenshot of SNP related to Skin fragility woolly hair syndrom

## Conclusion

Task 1: The proportion of Somerton Man's DNA is quite low to conduct most DNA analysis services. But there still are some techniques can be tested with it.

Task 2: The Somerton Man might be North Atlantic according to the ethnicity check on GEDmatch

Task 3: No strong evidences to confirm his physical characteristics and genetic diseases. But several interesting results were discovered.

## Reference

Figure 1: J. Bineth, "How the Somerton Man played cupid from the grave," ABC News. [Online]. Available: <https://www.abc.net.au/news/2017-12-14/somerton-man-cold-case-could-be-one-step-closer-to-solved/9245512>.

Figure 6: "World Map - Simple," MapChart. [Online]. Available: <https://mapchart.net/world.html>.