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Article

# Counting Oceanians of Non-European, Non-Asian Descent (ONENA) in the South Pacific to Make Them Count in Global Health

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**Abstract:** Several diseases and vulnerabilities associated with genetic or microbial factors are more frequent among populations of Oceanian, Non-European, Non-Asian descent (ONENA). ONENA are specific and have long been isolated geographically. To our knowledge, there are no published official, quantitative, aggregated data on the populations impacted by these excess vulnerabilities in Oceania. We searched official census reports for updated estimates of the total population for each of the Pacific Island Countries and Territories (including Australia) and the US State of Hawaii, privileging local official statistical or censal sources. We multiplied the most recent total population estimate by the cumulative percentage of the ONENA population as determined in official reports. Including Australia and the US State of Hawaii, Oceania counts 27 countries and territories, populated in 2016 by approximately 41 M inhabitants (17 M not counting Australia) among which approximately 12.5 M (11.6 M not counting Australia) consider themselves of entire or partial ONENA ancestry. Specific genetic and microbiome traits of ONENA may be unique and need further investigation to adjust risk estimates, risk prevention, diagnostic and therapeutic strategies, to the benefit of populations in the Pacific and beyond.

**Keywords:** medical genetics; diabetes mellitus; type 2; non-communicable diseases; global health; ethnic groups; indigenous health; infectious diseases; nutritional and metabolic diseases; epidemiology; pacific islands

## 1. Introduction

Some gene polymorphisms are found more frequently in certain human groups compared to other populations [1,2]. This is particularly true among ethnic groups or populations that have lived long in isolation for geographic, cultural or other historical reasons [3,4]. In most instances, these polymorphisms are simply normal-functioning variants of genes [5]. Although the influence of lifestyle and dietary habits seems dominant, ethnic origin and corresponding gene polymorphisms may also influence the microbiome [6–8]. Microbiome studies have evidenced associations with inflammation and certain diseases or vulnerabilities [9,10].

For the purpose of this paper, we define Oceania as all countries, commonwealths and territories located in the South Pacific, including Australia, New Zealand and the U.S. State of Hawaii. Archaeological and genetic data suggest that the Oceania region was settled in two main historical waves of migration: 1) the Australo-Papuan (Indigenous Australian and Melanesian) people settled in the region possibly more than 60,000 years ago, shortly after the first 'out-of-Africa' migration; 2) Austronesian (Polynesian and Micronesian) people settled in the region less than 4000 years ago, probably originating from East Asia [11]. Indigenous Australians (Aboriginal and Torres Strait Islander people of Australia) and other Pacific islanders (Melanesians, Micronesians and Polynesians) seem to constitute very specific human populations both in terms of genetic traits [11,12] and microbiome [13]. Some of these genetic traits may have selected to confer a comparative advantage during perilous transoceanic migrations or in an often-challenging environment.

Several diseases known to be associated with genetic risk factors, however, are more frequent among populations of Oceanian, Non-European, Non-Asian (ONENA) ancestry [14–17]. In various territories in the region (Australia, New Zealand and Hawaii), ONENA are disproportionately affected by infectious, as well as non-communicable diseases, when compared to their non-ONENA compatriots [18, 19]. Although social and cultural factors are major contributors, these vulnerabilities may be exacerbated in some instances by genetic or microbial risk factors. This disproportionate health burden is well documented by public health studies [20].

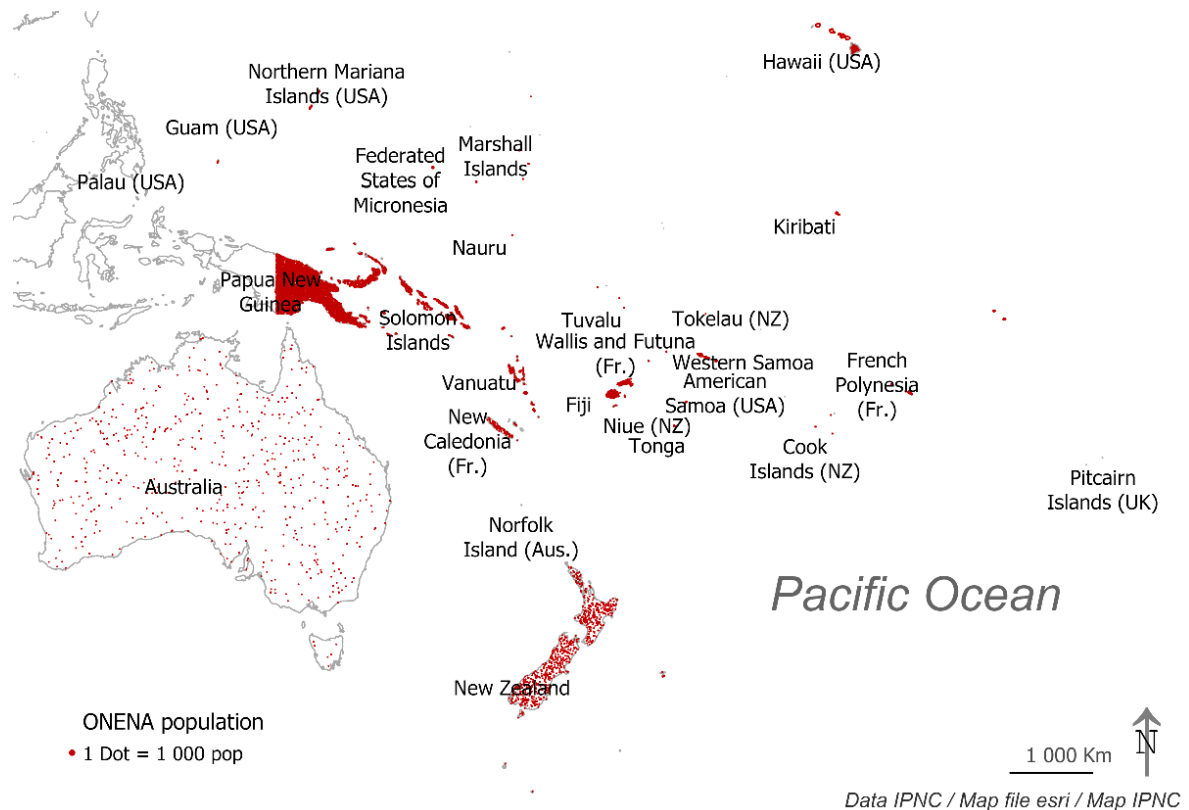
Surprisingly, we could find no official aggregated quantitative data on the number of people which may be impacted by these vulnerabilities in Oceania. As a preliminary step to further research we, therefore, sought to estimate the 2016 total population of ONENA in Oceania (including Hawaiians and Aboriginal and Torres Strait Islander Australians) to whom these estimated excess health risks may apply.

## 2. Materials and Methods

We listed all countries, commonwealths and territories in Oceania: The Pacific Islands, Australia and Torres Straits Islands, and the US State of Hawaii. We then searched official census reports available for updated estimates of the total population of each of these countries or territories, privileging local official statistical or censal sources. When local estimates were dated prior to 2016 then the United Nations population projections for 2016 [21] were used. We also searched these reports to find the most recent official estimates of population distribution by ethnic group for each Oceanian country or territory. In order not to underestimate potential vulnerabilities, the percentage of populations of self-declared mixed ancestry including ONENA were added to that of persons entirely of self-declared ONENA ancestry. We then multiplied the 2016 total population estimate by the cumulative percentage of ONENA population to obtain an absolute number. Although correct and reliable, the resulting current ONENA population estimates were rounded off to the nearest hundred so as not to give a misleading idea of precision. Data were entered, percentages computed and added and multiplied by population totals using a spreadsheet (Microsoft Excel<sup>®</sup>, Redmond, WA, USA) and results were mapped using ArcGIS 10.6.1 (ESRI. Redlands, CA, USA).

### 3. Results

Including Australia and the US State of Hawaii, Oceania counts 27 countries and territories, populated by approximately 41 M inhabitants including 24 M in Australia and 17 in other countries and territories. Among these, approximately 12.5 M (11.6 M not counting Australia) consider themselves or are considered entirely or partly of ONENA ancestry (Table 1 and Figure 1).



**Figure 1.** Oceania and relative estimates of population subgroups considered/self-declared as descending entirely or in part of Oceanian of Non-European, Non-Asian descent (ONENA) populations, Pacific region and US State of Hawaii, 2016. Points represent 1 000 pop and are randomly distributed, not georeferenced.

These populations are very diverse: ONENA were reported as being entirely or partly descending from more than 30 different population subgroups. When these subgroups are considered as a whole, the cumulated population of ONENA is in the range of countries such as Rwanda, Tunisia, Cuba or Belgium and would be situated in the 68th percentile of populations of countries or inhabited areas listed in a 2015 United Nations report [22]. Most ONENA live in Papua New Guinea, New Zealand or Australia, but—with the notable exception of Papua New Guinea—the territories in which ONENA people constitute the majority of the population are small. Depending on the territory considered, ONENA accounted for 3% to 100% of the territory's population. Most territories were home to several distinct ONENA groups. In some territories, populations were categorized as “Pacific Islanders”. In some others such as New Caledonia, censuses proposed an “undetermined” or otherwise culturally/politically important but ethnically imprecise category (“New Caledonian”).

**Table 1.** Estimates of total populations and of population subgroups considered/self-declared as descending entirely or in part of ONENA populations, Oceania, 2016.

Territory (Country or Commonwealth)	Most Recent Population Estimate	Year of Census or Estimate	Census or Best Estimate in 2016 *	Ethnic Groups (Adapted from Cited Sources)	Estimated** and Rounded-off 2016 ONENA Population		Ref.
					N	%	
American Samoa (USA)	55,519	2010	54,196	Native Pacific islander or mixed 94.4%; Asian or mixed 4.4%; White 0.9%; Other 0.1%	51,500	95%	[21,23,24]
Australia	24,051,000	2016	24,051,000	European/mixed European and other 91%; Asian/mixed Asian and other 6%; Indigenous Australian/mixed Indigenous Australian and Torres Straits Islanders and other 3%; Pacific Islanders 0.7%	890,000	4%	[25–28]
Cook Islands (NZ)	17,459	2016	17,459	Cook Island Maori 81.3%; part Cook Island Maori 6.7%; other 11.9%	15,400	88%	[29,30]
Easter Island (Chile)	6370	2015	6370	Rapa Nui 59.9%; Andean Chilean 39.3%; Other 0.9%	3800	60%	[31]
Federated States of Micronesia	102,843	2010	105,000	Chuukese or mixed 46.8%; Pohnpeian or mixed 28.3%; Kosraean or mixed 6.3%; Yapese or mixed 6.1%; Other Pacific Islanders or mixed 10.4%; Asian 1.3%; White 0.3%; Other 0.6%	102,600	98%	[21,32]
Fiji	869,458	2015	898,000	Chinese 0.6%; European 0.4%; iTaukei 56.8%; Part European 1.3%; Indian 37.5%; Rotuman 1.2%; Other Pacific Islanders 0.8%; Other 1.5%	529,000	59%	[21,33,34]
French Polynesia (Fr.)	272,800	2015	272,800	Polynesian 82.7%; Asian 4.7%; European 11.9%	226,400	83%	[35,36]
Guam (United States)	162,742	2016	162,742	Chamorro (or mixed) 43.4%; other Pacific Islander (or mixed) 13.3%; Asian 34.3%; white 7.1%; other 2.1%	92,300	57%	[37,38]
Hawaii (USA)	1,431,603	2015	1,428,557	Asian 37.3%; Multiethnic 23.0%; White 26.7%, Native Hawaiian and Pacific Islander 9.9%; Black 2.6%; Native American 0.5%	138,800	10%	[39–41]
Kiribati	110,110	2015	114,000	I-Kiribati & mixed 98.0%; Tuvalu 0.2%; Fiji 0.1%; Australia 0.04%; New Zealand 0.6%; European 0.1%; Chinese 0.1%; Other 0.9%	108,200	98%	[42,43]
Marshall Islands	55,158	2011	56,400	Pacific Islanders 92.7%; Asian 3.6%; Mixed 2.7%; Other 1.2%	49,300	98%	[21,44–46]
Nauru	10,084	2011	10,000	Nauruan 90.8%; other Pacific Islander 6.1%; Asian 2.1; Other 1.0%	8400	84%	[47–51]
New Caledonia (Fr.)	268,767	2014	268,767	Kanak (Melanesian) 39.0%; European 27.1%, Wallisian & Futunian 8.2%, Tahitian 2.1%; Indonesian 1.4%; Vietnamese 0.9%; Ni-Vanuatu 1%; “Caledonian”/other/undeclared 22.7%	135,000	50%	[52,53]

Table 1. Cont.

Territory (Country or Commonwealth)	Most Recent Population Estimate	Year of Census or Estimate	Census or Best Estimate in 2016 *	Ethnic Groups (Adapted from Cited Sources)	Estimated** and Rounded-off 2016 ONENA Population		Ref.
					N	%	
New Zealand	4,693,000	2016	4,693,000	European 66.7%; Maori 13.4%; Asian 10.6%; Pacific Islander 6.7%; other 2.6%	1,126,300	24%	[54,55]
Niue (NZ)	1611	2011	1600	Niuean 66.5%; Part Niuean 13.4%; Pacific Islander 8%; Asian and European 12%	1800	88%	[21,56]
Norfolk Island (Aus.)	1796	2011	2210	European ancestry 88%; Polynesian ancestry 12%	66	3%	[57–59]
Northern Mariana Islands (USA)	53,883	2010	55,700	Asian 49.9%; Pacific islander 34.8%; Mixed 12.7%; Other 2.5%	19,100	35%	[21,60,61]
Palau	17,501	2012	17,800	Palauan 72.5%; Filipino 16.3%; Chinese 1.6%; other Asian 5.0%; white 0.9%; Carolinian 1%; other Micronesian 2.4%; other 0.3%	13,000	76%	[21,62]
Papua New Guinea	7,620,000	2015	7,776,000	New Guinea Papuan 84%; New Guinea Melanesian 15%; other (Negrito; Polynesian; Melanesian; other) 1%	7,776,000	100%	[21,63–65]
Pitcairn Islands (UK)	57	2012	54	European; Tahitian	0	0%	[49,66]
Samoa	187,820	2011	194,899	Samoan or part-Samoan 98.5%; other/missing/don't know: 1.5%	191,800	99%	[67,68]
Solomon Islands	642,000	2015	639,418	Melanesian 95.3%; Polynesian 3.1%; Micronesian 1.2%; other 0.3%	637,500	100%	[69]
Tokelau (NZ)	1499	2016	1499	Tokelauan 69.3%; Samoan 14.1%; Tuvaluan 9.2%; Other Pacific Islander 3.5%; European 2.8%; Other ethnic group or not stated 1.1%	1400	96%	[51,70,71]
Tonga	103,252	2011	107,000	Tongan (or mixed) 97.5%; Pacific islanders or mixed (0.7%); European 0.6%; Asian 1.0%; Other/not stated: 0.3%	105,000	98%	[21,72]
Tuvalu	10,782	2012	10,000	Tuvaluan or mixed Tuvaluan 99.1%; Other 0.9%	9,900	99%	[21,73]
Vanuatu	234,023	2009	271,000	Ni-Vanuatu 97.6%; part Ni-Vanuatu 1.1%; 1.3% other	268,500	99%	[21,74,75]
Wallis & Futuna (Fr.)	12,197	2013	13,000	Polynesian	13,000	100%	[21,76]
<b>Total</b>	<b>40,988,967</b>				<b>12,514,066</b>	<b>30%</b>	
<b>Total minus Australia</b>	<b>16,937,967</b>				<b>11,624,066</b>	<b>69%</b>	

\* Projected 2016 estimates from the United Nations World Statistics Pocketbook 2016 [21] unless otherwise indicated; \*\* Rounded-off estimates obtained by multiplying the cumulative percentages of ethnic groups found in various cited sources by the total population estimated in 2014–2016 found in various sources (not shown), also cited. In practice, this sometimes means applying percentages documented in 2002 to documented or projected populations in 2015. These data, and especially their apparent precision, must be considered with caution.

#### 4. Discussion

However approximate, this is to our knowledge, the first published and detailed estimate of the number of Oceanians of Non-European, Non-Asian ancestry (Micronesians, Melanesians and Polynesians and Aboriginal and Torres Strait Islander Australians) living in countries or territories composed of the predominantly South Pacific islands, New Zealand, Australia and Torres Islands and the US State of Hawaii.

Oceania's population is youthful [77] and on the rise, overall. According to United Nations estimates, the total population in Oceania should reach approximately 47 M by 2030 and 57 M by 2050 [22]. The absolute number of the ONENA population, however, is on the rise in some territories, but decreasing in others due to migration [51] or due in part to the consequences of climate change [78]. Following European colonization, ONENA populations suffered tremendous mortality due to the introduction of infectious diseases such as influenza [19,79], dysentery or measles [80]. Successive measles outbreaks, for example, led to population collapses in some Pacific Island communities by 80%–90% within 1–2 generations following first contact with Europeans [81]. Although much of this mortality may be explained by the lack of lifetime immunity in previously unexposed island populations [17], population genetic and perhaps microbiotic homogeneity likely also contributed to the exceptionally high mortality rates due to influenza [19] and other infections.

Today, the morbidity and mortality burden remains higher among ONENA compared to non-ONENA people in the South Pacific, whether from infectious diseases (influenza [82], leptospirosis [83] or rheumatic heart disease [84], etc.) or especially, from non-communicable diseases (diabetes, obesity [85], etc.), which in Oceania present some of the highest incidence and/or prevalence worldwide [20]. These diseases also incur high direct or indirect health costs, especially for Oceanian countries or territories already facing significant economic, demographic and climate-driven challenges [86,87].

Many of these diseases are now known to be associated with genetic risk factors [20]. The latter have been identified thanks to many studies conducted on diseases and genetic or microbiotic risk factors in industrialized countries, among populations of overwhelmingly European or Asian descent [88,89]. Despite the high cost paid to these diseases, ONENA, however, are usually not represented in these large-scale genetics or microbiome studies as they represent a small proportion of the population and study cohorts, especially in Europe or the Continental United States [90].

##### 4.1. Bias and Limitations

Our study may suffer from bias and limitations. First, mixed ancestry may not reflect allele distribution—even in Mendelian inheritance—and census reports cannot provide information as to whether individuals with mixed ancestry inherited ONENA or European alleles, for example. The default allocation of individuals of mixed ancestry to ONENA may, therefore, have overestimated vulnerabilities' allele frequency. The role of mitochondrial genomes in ONENA also remains unclear. Census reports from Oceania, however, show that persons declaring mixed ancestry are in much smaller proportions than those declaring single-ONENA ancestry (Table 1). Second, ancestry is usually self-declared by census participants, which also may have overrepresented certain population subgroups. Studies, however, have shown that self-declared ancestry is well correlated with gene markers, at least those predictive of origin at the “continental” scale [88,91]. Third, 39% of the population of Easter Island are of Andean ancestry. Although these qualify as non-European and non-Asian and likely have specific vulnerabilities, they were not included in the ONENA totals which focus on long-residing populations of Oceania. This, however, was applicable only to a small population of a few thousand. Fourth, some census participants declared themselves as “undeclared”, “not stated”, etc., or were declared as “other”. The ancestry of these participants, therefore, cannot be accurately determined. We report census data as published; therefore, these were not removed from the population denominators. As opposed to the first and second points, this may somewhat underestimate the proportion of ONENA in the entire population in some countries or territories.

Finally, documented ethnicity may sometimes be purposefully misrepresented due to social/political agendas. Most Oceanian countries and territories, however, are stable democracies and in most ONENA represent the overwhelming majority, with little interest to misestimate populations of European or Asian ancestry. We, therefore, conclude that our review provides the most reliable estimate possible of the true number of ONENA.

#### 4.2. Public Health Implications

We considered ethnic origin only to quantitatively estimate populations that could ultimately benefit from targeted allelic or microbiotic vulnerabilities research, potentially leading to improved, adjusted—even “precision”—prevention or therapeutic programs. Albeit debated, the consequences—in a given environment—of host genetics, of the gut microbiome, of their effects on immune function [10], on obesity [92], type 2 diabetes [93,94], metabolic, inflammatory, allergic or other diseases such as colorectal cancer are the subject of increasing research [95–97]. Although translating research into tangible results is always a challenge [98], a clearer picture of the number of ONENA people and their health vulnerabilities is needed to meet the health challenges they face. This can also help document human genetic diversity, ultimately contributing to improved prevention and care of infectious and non-communicable diseases [17], response to certain drugs [99] or to toxins [100] in the Pacific and beyond. Several institutions or organizations—especially in New Zealand, Australia or the US State of Hawaii—are already mandated and strive to meet this objective of adjusting the public health response to varying ethnic burdens and vulnerabilities.

### 5. Conclusions

Authorities and legal frameworks are tasked with protecting and promoting the rights of all citizens of all origins equally, without distinction, including in providing access to health and timely and adequate healthcare. Alongside other determinants of health, genetic and microbiome traits of the ONENA population need to be considered to equitably adjust risk estimates, risk prevention, diagnostic and therapeutic strategies, perhaps leading even to adjusted individual medical care [101,102], “precision medicine” or even “precision public health” initiatives [103]. Furthermore, studies which include ONENA participants in research may be important for the global community as a whole, as certain genetic polymorphisms or epigenetic profiles may be more frequent among ONENA, who may shed light, for example, on genetic factors contributing to severe influenza [17] or diabetes [91] in any human population subgroup. Although these fields of research are quickly developing, much remains to be discovered or explained. As a member of the International Network of Pasteur Institutes, the Institut Pasteur in New Caledonia will strive to contribute with other stakeholders to the improvement of health and healthcare for all in New Caledonia, in the rest of Oceania and beyond.

**Author Contributions:** A.T. and P.H. conceived the study; A.T., P.H., C.G., B.B. and E.K.-F. collected the data; A.T. and C.G. completed the analyses; B.B., S.B., O.E.A.M., E.K.-F. and V.R. assisted with the study; A.T., P.H. and C.G. wrote the manuscript; B.B., S.B., O.E.A.M., T.P., E.K.-F., P.S., L.Q.-M. and V.R. reviewed and edited the manuscript.

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### References

1. Rosenberg, N.A. Genetic Structure of Human Populations. *Science* **2002**, *298*, 2381–2385. [[CrossRef](#)] [[PubMed](#)]
2. Stephens, J.C.; Herbert, T.D.; Schuffert, J.D.; Andreasen, D.; Heusser, L.; Lyle, M.; Mix, A.; Ravelo, A.C.; Stott, L.D.; Herguera, J.C. Haplotype Variation and Linkage Disequilibrium in 313 Human Genes. *Science* **2001**, *293*, 489–493. [[CrossRef](#)] [[PubMed](#)]



3. Liu, H.; Prugnolle, F.; Manica, A.; Balloux, F. A Geographically Explicit Genetic Model of Worldwide Human-Settlement History. *Am. J. Hum. Genet.* **2006**, *79*, 230–237. [[CrossRef](#)] [[PubMed](#)]
4. Barbujani, G.; Colonna, V. Human genome diversity: Frequently asked questions. *Trends Genet.* **2010**, *26*, 285–295. [[CrossRef](#)] [[PubMed](#)]
5. Marian, A.J. Causality in Genetics. *Circ. Res.* **2014**, *114*, e18–e21. [[CrossRef](#)] [[PubMed](#)]
6. Ley, R.E.; Hamady, M.; Lozupone, C.; Turnbaugh, P.J.; Ramey, R.R.; Bircher, J.S.; Schlegel, M.L.; Tucker, T.A.; Schrenzel, M.D.; Knight, R.; et al. Evolution of mammals and their gut microbes. *Science* **2008**, *320*, 1647–1651. [[CrossRef](#)]
7. Goodrich, J.K.; Waters, J.L.; Poole, A.C.; Sutter, J.L.; Koren, O.; Blekhman, R.; Beaumont, M.; Van Treuren, W.; Knight, R.; Bell, J.T.; et al. Human genetics shape the gut microbiome. *Cell* **2014**, *159*, 789–799. [[CrossRef](#)]
8. Dabrowska, K.; Witkiewicz, W. Correlations of Host Genetics and Gut Microbiome Composition. *Front. Microbiol.* **2016**, *7*, 1357. [[CrossRef](#)]
9. Karlsson, F.H.; Tremaroli, V.; Nookaew, I.; Bergström, G.; Behre, C.J.; Fagerberg, B.; Nielsen, J.; Bäckhed, F. Gut metagenome in European women with normal, impaired and diabetic glucose control. *Nature* **2013**, *498*, 99–103. [[CrossRef](#)]
10. Belkaid, Y.; Hand, T.W. Role of the Microbiota in Immunity and inflammation. *Cell* **2014**, *157*, 121–141. [[CrossRef](#)]
11. Duggan, A.T.; Stoneking, M. Recent developments in the genetic history of East Asia and Oceania. *Curr. Opin. Genet. Dev.* **2014**, *29*, 9–14. [[CrossRef](#)] [[PubMed](#)]
12. Shriner, D.; Tekola-Ayele, F.; Adeyemo, A.; Rotimi, C.N. Genome-wide genotype and sequence-based reconstruction of the 140,000 year history of modern human ancestry. *Sci. Rep.* **2014**, *4*, 6055. [[CrossRef](#)] [[PubMed](#)]
13. Greenhill, A.R.; Tsuji, H.; Ogata, K.; Natsuhara, K.; Morita, A.; Soli, K.; Larkins, J.-A.; Tadokoro, K.; Odani, S.; Baba, J.; et al. Characterization of the Gut Microbiota of Papua New Guineans Using Reverse Transcription Quantitative PCR. *PLoS ONE* **2015**, *10*, e0117427. [[CrossRef](#)] [[PubMed](#)]
14. Finucane, M.M.; Stevens, G.A.; Cowan, M.J.; Danaei, G.; Lin, J.K.; Paciorek, C.J.; Singh, G.M.; Gutierrez, H.R.; Lu, Y.; Bahalim, A.N.; et al. National, regional, and global trends in body mass index since 1980: Systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 9.1 million participants. *Lancet* **2011**, *377*, 557–567. [[CrossRef](#)]
15. Collaborators, T.G. Health Effects of Overweight and Obesity in 195 Countries over 25 Years. *N. Engl. J. Med.* **2017**, *377*, 13–27. [[CrossRef](#)] [[PubMed](#)]
16. Gosling, A.L.; Buckley, H.R.; Matisoo-Smith, E.; Merriman, T.R.; Matisoo-Smith, E. Pacific Populations, Metabolic Disease and ‘Just-So Stories’: A Critique of the ‘Thrifty Genotype’ Hypothesis in Oceania. *Ann. Hum. Genet.* **2015**, *79*, 470–480. [[CrossRef](#)] [[PubMed](#)]
17. Tarantola, A.; Horwood, P.; Richard, V.; Quintana-Murci, L. Host and viral genetic diversity can help explain mortality during the 1918–21 influenza pandemic in the Pacific region. *Lancet Infect. Dis.* **2018**, *18*, 833–834. [[CrossRef](#)]
18. Anderson, I.; Crengle, S.; Kamaka, M.L.; Chen, T.-H.; Palafox, N.; Jackson-Pulver, L. Indigenous health in Australia, New Zealand, and the Pacific. *Lancet* **2006**, *367*, 1775–1785. [[CrossRef](#)]
19. Shanks, G.D.; Wilson, N.; Kippen, R.; Brundage, J.F. The unusually diverse mortality patterns in the Pacific region during the 1918–21 influenza pandemic: Reflections at the pandemic’s centenary. *Lancet Infect. Dis.* **2018**, *18*, e323–e332. [[CrossRef](#)]
20. Dicker, D. Global, regional, and national age-sex-specific mortality and life expectancy, 1950–2017: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet* **2018**, *392*, 1684–1735. [[CrossRef](#)]
21. United Nations Department of Economic and Social Affairs Statistics Division. *World Statistics Pocketbook*, 2016 ed.; United Nations: New York, NY, USA, 2016; p. 264.
22. United Nations Department of Economic and Social Affairs, Population Division. *World Population Prospects: The 2015 Revision, Key Findings and Advance Tables*; Working Paper No. ESA/P/WP.241; United Nations Department of Economic and Social Affairs, Population Division: New York, NY, USA, 2015.
23. US Census Bureau 2010 American Samoa Demographic Profile Data. Available online: <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk> (accessed on 17 October 2016).

24. United States Census Bureau. *American Samoa—2010 Census Results Total Population by County*; United States Census Bureau: Suitland, MD, USA, 2010. Available online: [https://www.census.gov/2010census/news/pdf/cb11cn177\\_ia\\_as\\_totalpop\\_2010map\\_revised.pdf](https://www.census.gov/2010census/news/pdf/cb11cn177_ia_as_totalpop_2010map_revised.pdf) (accessed on 17 October 2016).
25. Australian Bureau of Statistics 2071.0—Reflecting a Nation: Stories from the 2011 Census, 2012–2013. Available online: <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/2071.0main+features902012-2013> (accessed on 12 December 2016).
26. Australian Bureau of Statistics 3101.0—Australian Demographic Statistics, March 2016. Available online: <http://www.abs.gov.au/ausstats/abs@.nsf/mf/3101.0> (accessed on 12 December 2016).
27. *Australian Indigenous HealthInfoNet Summary of Aboriginal and Torres Strait Islander Health Status 2015*; Edith Cowan University: Mount Lawley, Australia, 2015; p. 27. Available online: <https://healthinonet.ecu.edu.au/uploads/docs/2015-overview.pdf> (accessed on 17 October 2016).
28. Pryke, J. Pacific Islanders in Australia: Where are the Melanesians? *Devpolicy Blog Dev. Policy Cent.* **2014**. Available online: <https://www.devpolicy.org/pacific-islanders-in-australia-where-are-the-melanesians-20140828/> (accessed on 12 December 2016).
29. Ministry of Finance and Economic Management. *Statistics Office Cook Islands 2011 Census of Population and Dwellings—Main Report*; Ministry of Finance and Economic Management: Rarotonga, Cook Islands; p. 184. Available online: <https://cookislands-data.sprep.org/dataset/census-population-and-dwellings-cook-islands/resource/f48c7a7f-580f-4f1c-a130-e4d05f9ac786> (accessed on 12 December 2016).
30. UNdata Country Profile Cook Islands. Available online: <http://data.un.org/CountryProfile.aspx?crName=Cook%20Islands> (accessed on 12 December 2016).
31. Isla de Pascua/Población—Reportes Estadísticos Comunes. Available online: [http://reportescomunales.bcn.cl/2015/index.php/Isla\\_de\\_Pascua/Poblaci%C3%B3n](http://reportescomunales.bcn.cl/2015/index.php/Isla_de_Pascua/Poblaci%C3%B3n) (accessed on 17 October 2016).
32. Government of the Federated States of Micronesia Office of Statistics. *2010 Census of Population and Housing—National and State basic Tables*; Government of the Federated States of Micronesia, 2012; p. 405. Available online: [http://prism.spc.int/images/census\\_reports/FSM\\_2010\\_Census\\_Indicators\\_Final.pdf](http://prism.spc.int/images/census_reports/FSM_2010_Census_Indicators_Final.pdf) (accessed on 12 December 2016).
33. Fiji Bureau of Statistics—*Fiji Statistics at a Glance*. Available online: <http://www.statsfiji.gov.fj/> (accessed on 13 October 2016).
34. Population and Demographic Indicators—Fiji Bureau of Statistics. Available online: <http://www.statsfiji.gov.fj/statistics/social-statistics/population-and-demographic-indicators> (accessed on 12 December 2016).
35. *Points Forts de la Polynésie Française: Bilan Démographique 2015*; Institut de la Statistique de la Polynésie Française: Papeete, French Polynesia, 2016. Available online: <http://www.ispf.pf/docs/default-source/public-pf-bilans-et-etudes/pf-bilan-02-2016-demographie-2015.pdf> (accessed on 12 December 2016).
36. Celentano, A.B. Frontières ethniques et redéfinition du cadre politique à Tahiti. *Hermès* **2002**, *32*, 367. [[CrossRef](#)]
37. Guam. Available online: <https://www.doi.gov/oia/islands/guam> (accessed on 17 October 2016).
38. U.S. Census Bureau. *Guam Demographic Profile Summary File*; U.S. Census Bureau: Suitland-Silver Hill, MD, USA, 2012; p. 380. Available online: [https://cnas-re.uog.edu/wp-content/uploads/2015/10/KGI\\_2010-Guam-Demographic-Profile-Study.pdf](https://cnas-re.uog.edu/wp-content/uploads/2015/10/KGI_2010-Guam-Demographic-Profile-Study.pdf) (accessed on 12 December 2016).
39. Census American Community Survey 2015. Available online: <http://census.hawaii.gov/acs/acs-2015/> (accessed on 13 October 2016).
40. Department of Business, Economic Development & Tourism, State of Hawaii Office of Planning. *Hawaii 2015 Population Estimate Summary Data, by County*; Department of Business, Economic Development & Tourism, State of Hawaii Office of Planning: Honolulu, HI, USA, 2016.
41. Native Hawaiian and other Pacific Islander Alone by Selected Groups. Available online: <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk> (accessed on 18 July 2017).
42. National Statistics Office, MFED. *2015 Population and Housing Census—Preliminary Report*; National Statistics Office, MFED: Bairiki/Tarawa, Kiribati, 2016. Available online: [http://www.mfed.gov.ki/statistics/documents/2015\\_Population\\_Census\\_Report\\_Volume\\_1final\\_211016.pdf](http://www.mfed.gov.ki/statistics/documents/2015_Population_Census_Report_Volume_1final_211016.pdf) (accessed on 12 December 2016).
43. National Statistics Office Report on the Kiribati 2010 Census of Population and Housing. *Volume 1: Basic Information and Tables*; Ministry of Finance, Government of Kiribati: Bairiki/Tarawa, Kiribati, 2012; p. 229. Available online: [http://www.mfed.gov.ki/sites/default/files/Census-Report-2010-Volume-1\\_3.pdf](http://www.mfed.gov.ki/sites/default/files/Census-Report-2010-Volume-1_3.pdf) (accessed on 12 December 2016).

44. Australia-Oceania: Marshall Islands. Available online: <https://www.cia.gov/library/publications/the-world-factbook/geos/rm.html> (accessed on 17 October 2016).
45. Government of the Republic of the Marshall Islands. *Economic Policy, Planning and Statistics Office The RMI 2011 Census of Population and Housing—Summary and Highlights Only*; Government of the Republic of the Marshall Islands: Majuro, 2012; p. 23. Available online: <https://www.doi.gov/sites/doi.gov/files/migrated/oia/reports/upload/RMI-2011-Census-Summary-Report-on-Population-and-Housing.pdf>. (accessed on 12 December 2016).
46. Economic Policy, Planning and Statistics Office. Republic of the Marshall Islands Population Statistics. Available online: <http://rmi.prism.spc.int/index.php/social> (accessed on 12 December 2016).
47. National Report on Population and Housing—Census 2011; Republic of Nauru, 2011; p. 2017. Available online: [http://www.spc.int/nmdi/nmdi\\_documents/2011\\_NAURU\\_CENSUS\\_REPORT.pdf](http://www.spc.int/nmdi/nmdi_documents/2011_NAURU_CENSUS_REPORT.pdf). (accessed on 12 December 2016).
48. Nauru Statistics. Available online: <http://nauru.prism.spc.int/> (accessed on 17 October 2016).
49. Pacific Community / Communauté du Pacifique Pacific Island Populations—Estimates and Projections of Demographic Indicators for Selected Years/Les Populations du Pacifique—Estimations d’Indicateurs Démographiques pour Certaines Années. Available online: <http://prism.spc.int/> (accessed on 12 December 2016).
50. Social Statistics. Available online: <http://rmi.prism.spc.int/index.php/social> (accessed on 12 December 2016).
51. United Nations Population Fund, Pacific Sub-Regional Office. *Population and Development Profiles: Pacific Island Countries*; United Nations Population Fund, Pacific Sub-Regional Office: Suva, Fiji, 2014; p. 128. Available online: [https://pacific.unfpa.org/sites/default/files/pub-pdf/web\\_\\_140414\\_UNFPA\\_PopulationandDevelopmentProfiles-PacificSub-RegionExtendedv1LRv2\\_0.pdf](https://pacific.unfpa.org/sites/default/files/pub-pdf/web__140414_UNFPA_PopulationandDevelopmentProfiles-PacificSub-RegionExtendedv1LRv2_0.pdf). (accessed on 12 December 2016).
52. Broustet, D. *Projections de Population Pour la Nouvelle-Calédonie à L’horizon 2030: Une Evolution Entre Croissance et Vieillesse*; ISEE: Nouméa, New Caledonia, 2015; p. 6. Available online: <http://www.isee.nc/component/phocadownload/category/197-analyse?download=772:projections-demographiques-2030>. (accessed on 12 December 2016).
53. ISEE—Structure de la Population et Evolutions. Available online: <http://www.isee.nc/population/recensement/structure-de-la-population-et-evolutions> (accessed on 5 October 2016).
54. 2013 Census—Major Ethnic Groups in New Zealand. Available online: <http://www.stats.govt.nz/Census/2013-census/profile-and-summary-reports/infographic-culture-identity.aspx> (accessed on 18 July 2017).
55. National Population Estimates: at 30 June 2016. Available online: [http://www.stats.govt.nz/browse\\_for\\_stats/population/estimates\\_and\\_projections/NationalPopulationEstimates\\_HOTPA30Jun16.aspx](http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/NationalPopulationEstimates_HOTPA30Jun16.aspx) (accessed on 13 October 2016).
56. Statistics Niue. *Niue Census of Population and Households 2011*; Planning and Statistics, Government of Niue, 2012. Available online: [prism.spc.int/images/census\\_reports/Niue\\_2011\\_Population\\_Households\\_Census.pdf](http://prism.spc.int/images/census_reports/Niue_2011_Population_Households_Census.pdf). (accessed on 12 December 2016).
57. *Report on the 2011 Census of Population and Housing: Census Description, Analysis and Basic Tables*; Census and Statistics: Norfolk Island, 2011; p. 110. Available online: [https://unstats.un.org/unsd/demographic-social/census/documents/Norfolk\\_Island/report.pdf](https://unstats.un.org/unsd/demographic-social/census/documents/Norfolk_Island/report.pdf) (accessed on 12 December 2016).
58. Territories and Local Government Norfolk Island. Available online: [http://regional.gov.au/territories/norfolk\\_island/](http://regional.gov.au/territories/norfolk_island/) (accessed on 13 October 2016).
59. McEvoy, B.P.; Zhao, Z.Z.; Macgregor, S.; Bellis, C.; Lea, R.A.; Cox, H.; Montgomery, G.W.; Griffiths, L.R.; Visscher, P.M. European and Polynesian admixture in the Norfolk Island population. *Heredity* **2010**, *105*, 229–234. [CrossRef] [PubMed]
60. United States Census Bureau. *Northern Mariana Islands—2010 Census Results. Total population by election district*; United States Census Bureau: Hillcrest Heights, MD, USA, 2010. Available online: [https://www.census.gov/2010census/news/pdf/cb11cn178\\_ia\\_cnmi\\_totalpop\\_2010map.pdf](https://www.census.gov/2010census/news/pdf/cb11cn178_ia_cnmi_totalpop_2010map.pdf) (accessed on 12 December 2016).
61. Australia—Oceania: Northern Mariana Islands. Available online: <https://www.cia.gov/library/publications/the-world-factbook/geos/cq.html> (accessed on 7 July 2017).
62. Australia—Oceania: Palau. Available online: <https://www.cia.gov/library/publications/the-world-factbook/geos/ps.html> (accessed on 7 July 2017).

63. World Health Organization. Papua New Guinea. Available online: <http://www.who.int/countries/png/en/> (accessed on 12 December 2016).
64. Population, Total Data. Available online: <http://data.worldbank.org/indicator/SP.POP.TOTL?locations=PG> (accessed on 12 December 2016).
65. Papua New Guinea. Available online: [http://www.worldstatesmen.org/Papua\\_New\\_Guinea.htm](http://www.worldstatesmen.org/Papua_New_Guinea.htm) (accessed on 18 July 2017).
66. Pitcairn Islands. Available online: <http://www.government.pn/> (accessed on 17 October 2016).
67. Samoa Bureau of Statistics—Population & Demography. Available online: <http://www.sbs.gov.ws/library/> (accessed on 13 October 2016).
68. Samoa Bureau of Statistics, Government of Samoa. *Census-Surveys and Demography Division Samoa Demographic and Health Survey 2014*; Samoa Bureau of Statistics, Government of Samoa: Apia, Samoa, 2016; ISBN 978-982-98096-4-3. Available online: <http://www.sbs.gov.ws/digi/Samoa%20DHS%202014.pdf> (accessed on 12 December 2016).
69. Solomon Islands Stats Website—Solomon Islands National Statistics Office. Available online: <http://www.statistics.gov.sb/> (accessed on 17 October 2016).
70. 2011 Tokelau Census of Population and Dwellings. Available online: [http://www.stats.govt.nz/browse\\_for\\_stats/people\\_and\\_communities/pacific\\_peoples/2011-tokelau-census-landing-page.aspx](http://www.stats.govt.nz/browse_for_stats/people_and_communities/pacific_peoples/2011-tokelau-census-landing-page.aspx) (accessed on 17 October 2016).
71. Tokelau National Statistics Office. Available online: <https://www.tokelau.org.nz/Tokelau+Government/Government+Departments/Office+of+the+Council+for+the+Ongoing+Government+OCOG/Tokelau+National+Statistics+Office.html> (accessed on 12 December 2016).
72. Tonga Department of Statistics, and the Secretariat of the Pacific Community. *Tonga 2011 Census of Population and Housing, Volume 2: Analytical Report*; Tonga Department of Statistics, and the Secretariat of the Pacific Community: Noumea, New Caledonia, 2014; p. 173.
73. Tuvalu Government. *2012 Population and Housing Census of Tuvalu*; Tuvalu Government, 2012; p. 11. Available online: <https://microdata.pacificdata.org/index.php/ddibrowser/50/export/?format=pdf&generate=yes>. (accessed on 12 December 2016).
74. Vanuatu National Statistics Office. *2009 National Population and Housing Census—Analytical Report Volume 2*; Vanuatu National Statistics Office: Port Vila, Oceania, 2011; p. 252.
75. Wikipedia. *Demographics of Vanuatu*. Wikipedia. 2016. Available online: [https://en.wikipedia.org/wiki/Demographics\\_of\\_Vanuatu](https://en.wikipedia.org/wiki/Demographics_of_Vanuatu). (accessed on 12 December 2016).
76. Wallis et Futuna a Perdu Près du Cinquième de sa Population en dix ans Insee. Available online: <https://www.insee.fr/fr/statistiques/1281314> (accessed on 12 December 2016).
77. Pacific Community/Communauté du Pacifique Population Distribution by Age and Sex—2016 and 2050/Distribution de la Population par Age et par Sexe—2016 et 2050. 2017. Available online: [https://spccfpstore1.blob.core.windows.net/digitalibrary-docs/files/f6/f68c2b69b946e38f82175e40416f2c55.pdf?sv=2015-12-11&sr=b&sig=J%2Ff0tTZxjS1ma3dWf5TFQDH4bPnR44x8WAKM1KEg2wY%3D&se=2020-02-03T23%3A49%3A31Z&sp=r&rsc=public%2C%20max-age%3D864000%2C%20max-stale%3D864000&rsc=application%2Fpdf&rscd=inline%3B%20filename%3D%22Pacific\\_Islands\\_2016\\_Populations\\_poster.pdf%22](https://spccfpstore1.blob.core.windows.net/digitalibrary-docs/files/f6/f68c2b69b946e38f82175e40416f2c55.pdf?sv=2015-12-11&sr=b&sig=J%2Ff0tTZxjS1ma3dWf5TFQDH4bPnR44x8WAKM1KEg2wY%3D&se=2020-02-03T23%3A49%3A31Z&sp=r&rsc=public%2C%20max-age%3D864000%2C%20max-stale%3D864000&rsc=application%2Fpdf&rscd=inline%3B%20filename%3D%22Pacific_Islands_2016_Populations_poster.pdf%22). (accessed on 12 December 2016).
78. Oakes, R.; Milan, A.; Campbell, J. *Kiribati: Climate Change and Migration—Relationships Between Household Vulnerability, Human Mobility and Climate Change*; United Nations University—Institute for Environment and Human Security: Bonn, Germany, 2016; p. 80.
79. Wilson, N.; Mansoor, O.; Lush, D.; Kiedrzyński, T. Modeling the Impact of Pandemic Influenza on Pacific Islands. *Emerg. Infect. Dis.* **2005**, *11*, 347–349. [[CrossRef](#)] [[PubMed](#)]
80. Shanks, G.D. Lethality of First Contact Dysentery Epidemics on Pacific Islands. *Am. J. Trop. Med. Hyg.* **2016**, *95*, 273–277. [[CrossRef](#)] [[PubMed](#)]
81. Spriggs, M. Population in a Vegetable Kingdom Aneityum Island (Vanuatu) at European Contact in 1830. In *The Growth and Collapse of Pacific Island Societies: Archaeological and Demographic Perspectives*; Kirch, P.V., Rallu, J.L., Eds.; University of Hawai'i Press: Honolulu, HI, USA, 2007; pp. 278–305. ISBN 978-0-8248-3134-9.
82. La Roche, G.; Tarantola, A.; Barboza, P.; Vaillant, L.; Gueguen, J.; Gastellu-Etchegorry, M. The 2009 pandemic H1N1 influenza and indigenous populations of the Americas and the Pacific. *Eurosurveillance* **2009**, *14*, 19366. [[CrossRef](#)]

83. Lau, C.L.; Watson, C.H.; Lowry, J.H.; David, M.C.; Craig, S.B.; Wynwood, S.J.; Kama, M.; Nilles, E.J. Human Leptospirosis Infection in Fiji: An Eco-epidemiological Approach to Identifying Risk Factors and Environmental Drivers for Transmission. *PLoS Negl. Trop. Dis.* **2016**, *10*, e0004405. [[CrossRef](#)]
84. Mirabel, M.; Fauchier, T.; Bacquelin, R.; Tafflet, M.; Germain, A.; Robillard, C.; Rouchon, B.; Marijon, E.; Jouven, X. Echocardiography screening to detect rheumatic heart disease: A cohort study of schoolchildren in French Pacific Islands. *Int. J. Cardiol.* **2015**, *188*, 89–95. [[CrossRef](#)]
85. Forouzanfar, M.H.; Afshin, A.; Alexander, L.T.; Anderson, H.R.; Bhutta, Z.A.; Biryukov, S.; Brauer, M.; Burnett, R.; Cercy, K.; Charlson, F.J. GBD 2015 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990–2015: A systematic analysis for the Global Burden of Disease Study 2015. *Lancet* **2016**, *388*, 1659–1724.
86. WHO Regional Office for the Western Pacific Health Systems Development in the Pacific. Available online: [http://www.wpro.who.int/southpacific/programmes/health\\_sector/health\\_systems/page/en/](http://www.wpro.who.int/southpacific/programmes/health_sector/health_systems/page/en/) (accessed on 19 July 2017).
87. Rob, S. An economic survey of developing countries in the Pacific region. *Econ. Roundup Treasury Aust. Gov.* **2006**, *4*, 91–115.
88. Burchard, E.G.; Ziv, E.; Coyle, N.; Gomez, S.L.; Tang, H.; Karter, A.J.; Mountain, J.L.; Pérez-Stable, E.J.; Sheppard, D.; Risch, N. The Importance of Race and Ethnic Background in Biomedical Research and Clinical Practice. *N. Engl. J. Med.* **2003**, *348*, 1170–1175. [[CrossRef](#)]
89. Bustamante, C.D.; Burchard, E.G.; De La Vega, F.M. Genomics for the world. *Nature* **2011**, *475*, 163–165. [[CrossRef](#)] [[PubMed](#)]
90. Fesinmeyer, M.D.; North, K.E.; Ritchie, M.D.; Lim, U.; Franceschini, N.; Wilkens, L.R.; Gross, M.D.; Bůžková, P.; Glenn, K.; Quibrera, P.M.; et al. Genetic risk factors for BMI and obesity in an ethnically diverse population: Results from the population architecture using genomics and epidemiology (PAGE) study. *Obes. Silver Spring Md.* **2013**, *21*, 835–846. [[CrossRef](#)] [[PubMed](#)]
91. Risch, N.; Burchard, E.; Ziv, E.; Tang, H. Categorization of humans in biomedical research: Genes, race and disease. *Genome Biol.* **2002**, *3*, 2007.1. [[CrossRef](#)] [[PubMed](#)]
92. Dugas, L.R.; Fuller, M.; Gilbert, J.; Layden, B.T. The obese gut microbiome across the epidemiologic transition. *Emerg. Themes Epidemiol.* **2016**, *13*, 2. [[CrossRef](#)] [[PubMed](#)]
93. Qin, J.; Li, Y.; Cai, Z.; Li, S.; Zhu, J.; Zhang, F.; Liang, S.; Zhang, W.; Guan, Y.; Shen, D.; et al. A metagenome-wide association study of gut microbiota in type 2 diabetes. *Nature* **2012**, *490*, 55–60. [[CrossRef](#)] [[PubMed](#)]
94. Larsen, N.; Vogensen, F.K.; Berg, F.W.J.V.D.; Nielsen, D.S.; Andreasen, A.S.; Pedersen, B.K.; Abu Al-Soud, W.; Sørensen, S.J.; Hansen, L.H.; Jakobsen, M. Gut Microbiota in Human Adults with Type 2 Diabetes Differs from Non-Diabetic Adults. *PLoS ONE* **2010**, *5*, e9085. [[CrossRef](#)] [[PubMed](#)]
95. Clemente, J.C.; Ursell, L.K.; Parfrey, L.W.; Knight, R. The Impact of the Gut Microbiota on Human Health: An Integrative View. *Cell* **2012**, *148*, 1258–1270. [[CrossRef](#)]
96. Harley, I.T.; Karp, C.L. Obesity and the gut microbiome: Striving for causality. *Mol. Metab.* **2012**, *1*, 21–31. [[CrossRef](#)]
97. McKenney, P.T.; Pamer, E.G. From hype to hope: The gut microbiota in enteric infectious disease. *Cell* **2015**, *163*, 1326–1332. [[CrossRef](#)]
98. Bainbridge, R.; Tsey, K.; McCalman, J.; Kinchin, I.; Saunders, V.; Lui, F.W.; Cadet-James, Y.; Miller, A.; Lawson, K. No one’s discussing the elephant in the room: Contemplating questions of research impact and benefit in Aboriginal and Torres Strait Islander Australian health research. *BMC Public Health* **2015**, *15*, 696. [[CrossRef](#)]
99. Wilson, J.F.; Weale, M.E.; Smith, A.C.; Gratrix, F.; Fletcher, B.; Thomas, M.G.; Bradman, N.; Goldstein, D.B. Population genetic structure of variable drug response. *Nat. Genet.* **2001**, *29*, 265–269. [[CrossRef](#)] [[PubMed](#)]
100. Bosron, W.; Lumeng, L.; Li, T. Genetic polymorphism of enzymes of alcohol metabolism and susceptibility to alcoholic liver disease. *Mol. Asp. Med.* **1988**, *10*, 147–158. [[CrossRef](#)]
101. Van Ness, B. Applications and limitations in translating genomics to clinical practice. *Transl. Res.* **2016**, *168*, 1–5. [[CrossRef](#)] [[PubMed](#)]

102. Sade, R.M. What's right (and wrong) with racially stratified research and therapies. *J. Natl. Med. Assoc.* **2007**, *99*, 693–696. [[PubMed](#)]
103. Bertier, G.; Carrot-Zhang, J.; Ragoussis, V.; Joly, Y. Integrating precision cancer medicine into healthcare—policy, practice, and research challenges. *Genome Med.* **2016**, *8*, 108. [[CrossRef](#)] [[PubMed](#)]



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