

Original Research

Opportunities for training for nutritional professionals in nutritional genomics: What's out there?

Running head: Nutritional genomics professional development

Date accepted: November 2017

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This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: [10.1111/1747-0080.12398](https://doi.org/10.1111/1747-0080.12398)

Abstract

Aim: To identify and profile training courses available to dietitians and nutritionists in the area of nutritional genomics. Genetic technology is progressing quickly leading to increased public interest and requests from the public for personalised nutrition advice based on genetic background. Tertiary courses often lack specific curriculum in nutritional genomics preventing graduates from discussing confidently with their clients the relationships between genetics, nutrition and health. This has increased the demand for professional development in this field.

Methods: The search strategy was intended to replicate real life practice. Google and snowball searches were conducted using terms related to education and nutritional genomics. Results included online or face to face courses in any country providing content on nutritional genomics. One-off courses and those no longer accessible were excluded. A descriptive analysis of characteristics of courses was undertaken, reporting on: mode of delivery, cost, duration, content, qualification awarded, target audience and affiliations.

Results: 37 courses varying in duration, content and cost were identified: 4 post-graduate university degrees, 5 university course units, 4 recurring face to face workshops, 15 online short courses, 8 pre-recorded presentations and 1 service offering regular live webinars. Affiliations with food and pharmaceutical industry (e.g. genetic testing companies), professional organisations and research/education institutes were observed.

Conclusions: Training courses identified were predominantly delivered online, enabling nutrition professionals worldwide to upskill in nutritional genomics and personalised nutrition. Additional courses exist. Those seeking training should scrutinise and compare cost, duration, mode, content, and affiliations of course providers to ensure learning needs are met.

Key words: education, nutrigenetics/nutrigenomics, nutritional genomics, professional competence, personalised nutrition.

Introduction

In the last 15 years the technology to sequence DNA and subsequent genotyping has progressed quickly. This has led to a drop in the cost of testing and therefore an increase in the number of companies now offering genetic tests to both healthcare professionals and the general public. With the public having greater access to a variety of genetic tests, healthcare professionals (including nutritionists and dietitians), may experience a growing demand to provide advice and recommendations based on the relationship between genetics, nutrition and health. Sequencing the human genome at the beginning of this century came with great expectation that genetics would infiltrate nutrition and dietetic practice. It was suggested that nutritional genomics, which includes nutrigenetics and nutrigenomics, was going to become a core component to inform personalised dietary advice.¹ The reality has proven to be more complex than expected, and nearly 20 years after the publication of the human genome sequence, using genetic testing to inform nutrition requirements is far from standard dietary practice.²

Nutrigenetics and nutrigenomics training are not traditional components of nutrition and dietetics course curricula; only over the last few years has this science been included in some courses.³ For dietitians and nutritionists trained prior to the development of this area of science (and subsequent inclusion in some dietetic and nutrition courses), the complexity of the topic may be confusing and unclear, and access to appropriate training and information may be difficult.⁴ International surveys,^{5,6} indicated that dietitians in Australia, US and UK have low knowledge and confidence in applying nutritional genomics in their practice. Further to this, the recent visioning report for The Academy of Nutrition and Dietetics (2017) identified nutritional genomics as a priority area for the nutrition and dietetics profession.⁷ To ensure dietitians and nutritionists are equipped with knowledge in this area and skills in application there is a need to i) implement detailed genetic, molecular biology and genomic education and application aspects in all nutrition and dietetics courses, and ii) ensure easily accessible, independent training opportunities for nutritionists and dietitians to enable post-graduation professional development. Training and education serve to improve knowledge, confidence and attitudes towards nutritional genomics, as well as critical analysis skills, which are associated with integration into practice.⁶

There have been repeated calls over the last decade for greater training and education on the topic of nutritional genomics for qualified nutrition professionals,⁸ and over the years a number of courses have become available through tertiary institutions, industry and scientific organisations. While this has increased opportunities to access post-graduate and continuing professional education and training, the question now arises whether these courses are appropriate for the task of training nutrition professionals to ensure they are appropriately

placed to advise on genetic based nutrition recommendations. The first step in understanding this is to identify current courses and their content.

With this in mind, the aim of this research was to identify and profile education and training courses relating to nutritional genomics that are currently advertised online and directed to dietitians and nutritionists. The purpose of collating information on this topic was twofold. Firstly, it provides a single resource of courses that can be identified through a simple online search approach. This enables nutrition professionals to compare, contrast and critique current training and education options, making it easier to make informed decisions about the suitability of courses for education purposes. Furthermore, it identifies potential gaps or limitations in the education space to enable recommendations to be made to improve the accessibility, online visibility, transparency and quality of training courses.

Methods

Data were collected via an online search, designed to replicate the process a nutrition professional would likely undertake when seeking training on this topic. Ethical approval by an Institutional Review Board was not required as this research was not involving human subjects and relies on information freely available on the internet. A series of electronic searches were conducted in January 2017 using a combination of terms relating to education and nutrition (Table 1). “Google” (www.google.com) was chosen, as it is the most popular search engine globally. To minimise the effect of previous browsing activity the searches were repeated in “Incognito mode” (Chrome browser), no further courses were identified through this mode.^{9,10} Google trend was explored to establish the more frequent search terms

used for this topic. Most of our chosen terms did not have enough data to display trends. Most people tend to use keywords when using search engines to locate information, as opposed to a scientific search strategy which involves functions such as “AND”, “OR” or quotation marks.¹¹ To replicate the experience of nutrition professionals seeking training or education opportunities, a basic search strategy using multiple combinations of search terms was used. Snowball searching was also conducted by clicking through from the websites identified in the Google search. For example, exploring links between different providers’ webpages or multiple courses offered by one provider. A maximum of 100 hits were screened for each combination of search terms. If the primary website did not contain all required information, relevant web links or pages were opened until all available information was sourced.

Eligible courses were delivered online or face to face, were delivered or conducted in any country, were described in English and contained content related to nutritional genomics. One-off courses that were not recurring (e.g. conference workshop) or courses which did not primarily focus on content related to nutritional genomics were excluded.

The following data were extracted: name of the course, website (URL), provider, location of provider (country), mode of course delivery, cost, duration, course content as described on the website, qualification awarded, target audience and affiliations of providers. Cost reported on webpages were converted to US dollars as of February 2017 using a currency converter (www.oanda.com/currency/converter/). Theoretical or practical content covered in each course was classified as relating to basic theory on both genetics, molecular biology and nutritional genomics (e.g. DNA structure, what is gene, how a gene is expressed)

and/or the application and use of these concepts in a client consultation (e.g. how to interpret genetic test results, how to critique evidence). An 'affiliation' was any observed link or relationship between the course and other groups (e.g. professional bodies, commercial companies). Data extraction was undertaken independently by two researchers, and any disagreement was discussed. Data extracted was based on the information presented on the webpages and links within, no information was sought through additional means (e.g. contacting course providers). Data were synthesised narratively.

Results

The results of the search strategy are described in Figure 1. In total, 17 courses were identified with a basic Google search using 8 different combinations, and 20 courses were identified by snowball search. In total 37 courses relating to nutritional genomics and their characteristics are reported in Table 2. All courses were available for trained dietitians and nutritionists, but not exclusively targeted to them. Other potential participants included non-nutrition professionals (e.g. health coach, culinary experts, medical doctors) who consult to patients or clients. Courses were offered by a range of providers including: universities, learning institutes, professional associations and commercial companies (e.g. genetic testing /biotechnology companies).

There were four post-graduate university degrees; these were the most expensive and longest in duration (~ 1 year). Five course units specifically relating to nutritional genomics were offered at universities, these appeared to be restricted to students enrolled in a tertiary education degree. Face to face delivery was the preferred mode for the degrees and course

units offered by universities. Four recurring workshops (duration ranging from 1-4 days) delivered face to face were also identified; one from a university provider and three from private organisations. The majority of all courses (68%) were in online format, enabling access to participants worldwide. This included 15 online short courses running for a few weeks or months, eight pre-recorded presentations of 1-3 hours in duration, and one service offering regular live webinars on a regular basis to subscribers. The face to face workshops and online short courses generally included a number of modules or topics participants progressed through, and many included practical activities and assessment of learning (e.g. quiz). Online presentations were non-interactive. The cost of online presentations (free - \$US100) was lower than the cost of workshops (~\$US100-800) or online short courses (~\$US100-1000).

The scope of content addressed by courses appeared to vary. All post-graduate courses appeared to focus on developing research skills (e.g. laboratory skills, systems biology, big data analysis) of individuals with existing qualifications in health science or nutrition. Some online courses, workshops and presentations claimed to provide only basic theory on genetics and nutritional genomics, likely suitable for continuing professional development to qualified professionals with limited knowledge in this area. Other online short courses focused only on applications and use of knowledge in nutrition practice, or included both basic theory and practical aspects, or in separate courses designed to be conducted in sequence (e.g. Foundation in Culinary Nutrition and Applied Culinary Nutrition: Advanced Course). Where practical skills (e.g. conducting a genetic test and interpreting the result) were taught, these often utilised products or were linked to services offered by the provider. Niche areas of

personalised nutrition were addressed in some courses including: culinary genomics, sports genomics, methylation, carbohydrate metabolism and detoxification.

Formal university qualifications were awarded for the four university courses within tertiary degrees. Recognition of learning was available for the majority of online short courses and workshops through the provision of a certificate of completion or continuing education credit points for particular health professions/associations. Two courses provided by commercial companies (Smart Practitioner certification training, Fitgenes Accredited Practitioner workshop course) were specifically designed to train professionals to deliver their services to clients/patients. Courses and course providers were affiliated with a variety of organisations and industries. This included: professional associations (e.g. national dietetic association) or research or educational institutes (e.g. university) (n=12 courses); food industry (n=2 courses); genetic testing companies (n=8 courses) and; other pharmaceutical or biotechnology industry (n=1 course) (Table 3).

Discussion

The online search identified 37 courses, including university degrees, single university course units, online short courses, face to face workshops and online presentations relating to nutritional genomics. Most courses were in an online format, enabling worldwide access and participation. This research illustrates that a substantial number of varied training and education options exist for nutrition professionals to undertake to upskill in nutritional genomics and personalised nutrition. These courses serve a number of important purposes: filling a knowledge gap for those who trained before genomics was included in healthcare

and science qualifications; updating knowledge through providing continuing professional development and; crafting specialist skills for advanced practitioners.

We present a compilation of training options available through an online search approach at January 2017 for consideration by dietitians and nutritionists seeking to upskill in the area of nutrigenetics and nutrigenomics. Additional courses do exist currently, and more will become available into the future. Nutrition professionals could consult national professional nutrition or dietetic associations, university course guides and nutritional genomics associations (e.g. International Society of Nutrigenetics and Nutrigenomics (ISNN) or NuGO) to identify other course not profiled here.

Despite a large number of courses identified, they appeared very different from each other. Given the range of options available, and the time and money invested into training, nutrition professionals are encouraged to scrutinise courses to ensure they select a high quality, reputable course that meets their educational and practice needs. In addition to practicality (e.g. mode and duration) and affordability, the following aspects should be taken into account:

- Accreditation or endorsement of courses by professional organisations.
- The aims and objectives of the training
- The type of qualification achieved and the translational value of this.
- Affiliations between courses or course providers and genetic testing companies, pharmaceutical industry and food industry.
- The professional background and qualifications of the educators.

- Whether the content is appropriate for their existing level of knowledge and intended purpose.

To enable nutrition professionals and other learners to make informed decisions, course providers should ensure that sufficient, comprehensive and accurate information about the training they offer is available online. As indicated in Table 1, information was unclear for 14 courses. We identified the following priorities: i) courses should be named appropriately (e.g. ‘introduction’, ‘essential basics’ or ‘foundations’ for courses covering basic scientific theory), ii) describe the content covered, iii) correspondent websites should specify the learning outcomes (i.e. what the learner can expect to be able to know or do upon completion), iv) specify the intended target audience including pre-requisite knowledge, v) provide contact information for further information to be sought if required. Importantly, course providers must take responsibility for the integrity of the education provided. The content delivered needs to reflect the current evidence available on the utility of genetic testing and the effectiveness of personalised nutrition intervention and the limitation that their application present.² Endorsement or accreditation from professional associations, by appropriately educated individuals, would provide an opportunity for content to be independently reviewed and ensure it is in-line with best practice guidelines for that healthcare profession. The omission of some relevant courses from the results also suggests there is a need for providers to employ search engine optimisation and other advertising techniques to ensure their course is easily visible online.

The provision of education related to nutritional genomics by companies that also sell genetic tests or nutrition supplements presents a particular challenge. While it is preferred

that nutrition professionals receive education from independent non-conflicted providers, universities and professional associations have failed to deliver this in a timely and easily accessible fashion. In addition, most university courses that we identified focus on developing high level research skills rather than providing the practical information that healthcare professionals seek for translation in practice. Commercial companies have identified this gap with many seeking to upskill professionals to deliver practical nutritional genomics services to patients. It is important to consider there is a potential conflict of interest when the application of personalised nutrition in practice is taught by commercial companies who stand to benefit from the selling of genetic tests. On the other hand, these companies are more likely to have first-hand experience of the challenges associated with providing dietary advice that incorporates genetic information, and hence be well placed to teach practical, how-to skills.

A basic understanding of genetics and genomics is a prerequisite to being able to critically evaluate genetic tests, moreover a good understanding of research methods (e.g. study design, statistical analysis) is essential to develop skills in critical analysis of genetic tests and personalised nutrition. This will also assist nutrition professionals to evaluate courses where potential conflicts of interest exist and to be able to discern whether a genetic test is founded on solid science. From our analysis we were unable to determine whether courses teaching practical nutritional genomics skills provided sufficient training in these areas. Often the course appeared too short to allow the foundation of genetics and genomics to be taught with enough depth, and most probably it was beyond their scope to teach research methods. There is a need for nutrigenomics (basic knowledge to practical

application) and research methods to be required as part of undergraduate nutrition and dietetics curriculum, to ensure graduates are equipped to navigate the translation of the science of nutritional genomics to nutrition practice.

While the search strategy combined multiple rounds of Google searching and a snowball search, we are aware the results are not exhaustive. It was not the purpose of this research to provide a complete list of all existing courses, but to identify those courses that are retrieved through an online search that mimics real-life behaviour. Webpages retrieved in an online Google search are influenced by the location of the search (Australia) and previous searches undertaken (due to Google's 'memory' of search terms).¹² This is likely to reflect the reproducibility of the search. Despite this, the large number of hits from a range of countries demonstrate wide reach of the search. This research did not formally assess the quality of each course, as it was not the intention to promote or demote particular courses, but rather to develop a compilation of courses retrieved in a search for nutrition professionals to then consider on their own accord. Only information about courses available on webpages was considered and is presented here; no further data were collected by contacting course providers, for example.

A variety of courses were identified for nutrition professionals seeking professional development in the space of nutritional genomics. Not all the courses provided the same level of education and detailed information around learning objectives. Learners need to analyse each course to make sure that match with their learning needs.

Funding source

This research was financially supported by the Department of Nutrition, Dietetics and Food Monash University.

Conflict of interest

CM and MA were involved in the development of one of the courses included in the study.

Authorship

CM and JC defined the project; JC, CT and MA defined the search strategy and performed the searches; CM, JC and MA analysed the results; CM, JC and MA wrote the manuscript; All authors reviewed and approved the manuscript. All authors are in agreement with the manuscript and declare that the content has not been published elsewhere.

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Figure Legends

Figure 1 Process of identification of nutritional genomics training courses

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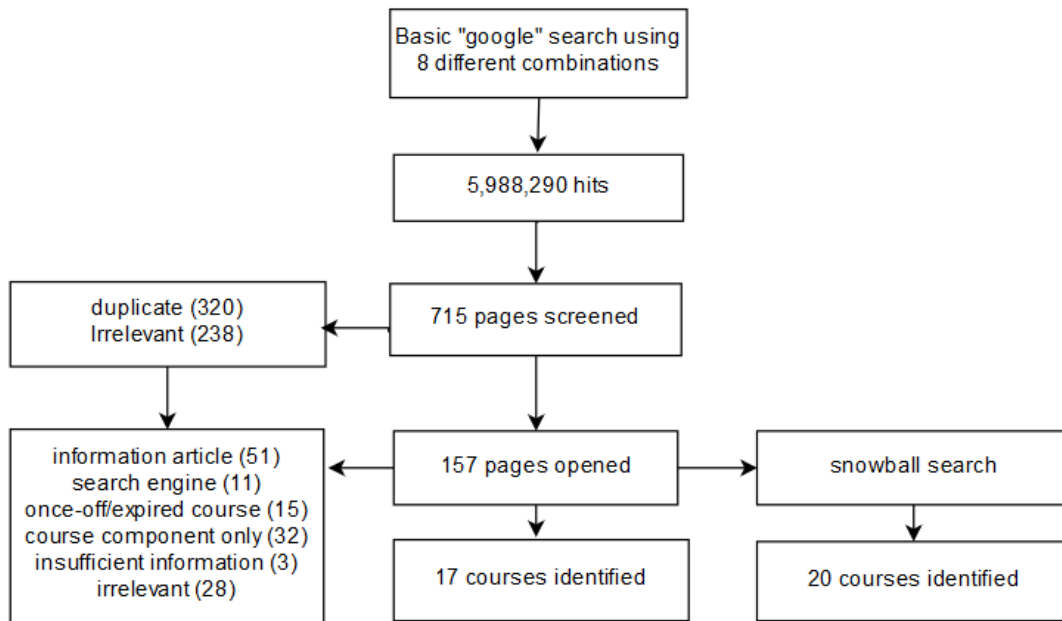


Table 1. Search Terms Used In Google Search For Nutritional Genomics Training Courses.

Search 1	nutritional genomics, nutrigenetics, nutrigenomics, training, education, course, qualification, degree, certificate, post graduate, professional development, short course, nutrition, genetic testing, health professional
Search 2	nutritional genomics, short course, professional
Search 3	Nutrigenetics, short course, professional
Search 4	degree certificate, diploma, qualification, nutritional genomic, nutrigenetic, nutrigenomic,
Search 5	Accreditation, "professional development", nutritional genomic, nutrigenetic, nutrigenomic
Search 6	functional nutrition course, nutrigenomics, genetic
Search 7	nutrition course, training, genomics, personalized nutrition
Search 8	nutritional genomics, nutrigenetics, nutrigenomics, counsellor

Table 2 Characteristics of nutritional genomics training courses.

	Course name, link	Provider, Location	Qualification awarded	Cost (US\$)	Duration	Target audience	Information about the course content available on the website.	
							Basic theory	Application and use
Tertiary Degree	Doctoral Degree (PhD) in Nutrigenomics and Personalized Nutrition http://www.uib.eu/study/doctorat/TNUT/	University of the Balearic Islands, Spain (face to face)	PhD	Unclear	Unclear	Professionals with qualification in health sciences	No	No
	Masters in Nutrigenomics and Personalised Nutrition http://cepnet.uib.es/doc/descriptors/POP_master_nutrigenomica_0910_eng.html	University of the Balearic Islands, Spain (face to face)	Master degree	\$1273-1697	1 year	Professionals with qualification in health sciences	Yes	No
	Master of Science (Nutrition and Genetics) http://www.stmarys.ac.uk/postgraduate-courses-london/msc-nutrition-and-genetics/content.php	St Mary's University Twickenham, UK (online/face to face)	Master degree	\$7,934	1 year	Professionals with qualification in nutrition and dietetics	Yes	Yes
	Higher University Course in Master Nutrigenomics and Nutrigenetics http://www.ub.edu/web/ub/	University of Barcelona IL3-UB, Spain (online)	Degree IL3-UB	\$58,362	1 year	Professionals with qualification in health sciences	Yes	No

	en/estudis/oferta_formativa/masters_propis/fitxa/N/201511875/index.html							
Tertiary unit	Applied Nutrigenomics (HNE-34806) https://ssc.wur.nl/Handbook/Course/HNE-34806	Wageningen University, Netherlands (face to face)	Credit points towards degree	\$18,039	1 semester (62 contact hours)	Students enrolled in Master of Nutrition and Health or Master of Biotechnology	Yes	No
	Nutrigenomics for Disease Prevention and Intervention (475) https://www.nutrigenomics.arizona.edu/#Outline	University of Arizona, US (face to face)	None reported	Unclear	1 semester	Students enrolled in Nutritional Science	Yes	No
	Nutrigenomics and Personalized Nutrition (NFS487H1) http://nutrisci.med.utoronto.ca/undergraduate-courses	University of Toronto, Canada (face to face)	Credit points towards degree	Unclear	1 semester (3 hours/week)	Students enrolled in Nutrition Sciences	Yes	No
	Introduction to Nutritional Genomic Counseling http://www.muoh.edu/introduction-nutritional-genomic-counseling-1	Maryland University of Integrative Health, US (online/face to face)	Credit points towards degree	\$310	12 hours	Students enrolled in Master of Science in Nutrition and Integrative Health	Unclear	Unclear

	Certificate in Nutritional Genomics https://www.newhaven.edu/arts-sciences/graduate-programs/nutrition/nutritional-genomics.php	University of New Haven, US	Credit points towards degree	Unclear	1 semester	Professionals with qualifications in Biology, Biotechnology, or Nutrition	Yes	No
Online short course	Introduction to Nutritional genomics http://www.med.monash.edu.au/base/short-courses/nutritional-genomics.html	Monash University, Australia	None reported	\$345	5 weeks (4-6 hours/week) (runs 2/year)	Dietitians	Yes	No
	CarbChoice AMY1 Gene http://www.fitgenes.com/about_fitgenes/practitioners/online-learning-courses	Fitgenes, Australia	None reported	\$169	Unclear	Health professionals who see patients/clients	No	Yes
	Foundations in nutrigenomics http://ctgeducation.com/	Centre for Translational Genomics	Certificate issued by provider	\$595	2-3 weeks full time or 2 months part time (runs continuously)	Health professionals who see patients/clients and/or professionals with qualifications in food or nutrition sciences	No	Yes
	Translational	Manuka	Diploma	\$950	5-10 hours	Health	Yes	Yes

	Nutrigenomics http://www.manukascience.co.za/Our-course-Translational-Nutrigenomics	Science, South Africa	issued by provider		per week for 4-9 months (commences any time)	professionals who see patients/clients		
	Methylation and Clinical Nutrigenomics – Part 1 https://seekinghealth.org/product/methylation-and-clinical-nutrigenomics-part-1-video-course/	Seeking Health Education Institute	Certificate of completion issued by provider, continuing education credits	\$95 (general public) \$349 (health professional)	12 hours (commence anytime)	Health professionals who see patients/clients, general public	No	Yes
	Methylation and Clinical Nutrigenomics – Part 2 https://seekinghealth.org/product/methylation-clinical-nutrigenomics-part-2/	Seeking Health Education Institute	Certificate of completion issued by provider, continuing education credits	\$95 - \$349	11 hours (commence any time)	Health professionals who see patients/clients, general public	No	Yes
	Culinary genomics https://www.learnitlive.com/class/7695/Culinary-Genomics	Learn it live, unclear	None reported	\$149	1-2 hours per week for 5 weeks	Professionals with a qualification, licence or expertise in nutrition, health science or cooking	No	No
	Smart practitioner	Smart DNA	Certification	Not	Unclear	Health	No	Yes

certification training course http://www.smartdna.com.au/smart-training-certification/		to be a practitioner with provider	reported		professionals who see patients/clients		
Nutrigenomics (INMD 610) http://www.theifim.com/inmd-610-nutrigenomics-2	The Institute for Integrative Medicine, US	None reported	\$295	Not reported, self paced	Health professionals who see patients/clients	Yes	No
Sports genomics https://www.ncghealthsolutions.com/p/sports-genomics	NCG Health Solutions, US	Continuing education credits	\$449	12 hours	Health professionals who see athletes or clients who exercise	No	Yes
Basic Certification Course Foundations in Genomics and Culinary Genomics https://www.ncghealthsolutions.com/p/basic-certification-course	NCG Health Solutions, US	Continuing education credits	\$1,995	70 hours, must be completed over 2 year	Health professionals who see patients/clients	Unclear	No
Culinary Genomics: An Introductory Primer https://www.ncghealthsolutions.com/store/i8GBqoDx	NCG Health Solutions, US	Continuing education credit application pending	\$149.95	5 hours	Health professionals who see patients/clients	No	Yes

	The MTHFR, Methylation, & Biochemistry https://metabolichealing.com/mastercourse-2/	Metabolic Healing	Certificate of completion issued by provide, continuing education credits	\$1,197	14 hours plus bi-monthly webinars	Health professionals who see patients/clients	No	Yes
	Foundation of Culinary Nutrition http://www.fieldtoplate.com/applied-culinary-nutrition/	Field to Plate	Continuing education credits	\$299	Unclear	Professionals with a qualification, licence or expertise in nutrition, health science or cooking	No	Unclear
	Applied Culinary Nutrition: Advanced Course http://www.fieldtoplate.com/the-genomic-kitchen/	Field to Plate	None reported	\$299	Unclear	Professionals with a qualification, licence or expertise in nutrition, health science or cooking	No	Yes
Face to face workshop	Workshop on Nutrigenetics, Nutrigenomics and Precision Nutrition http://www.uncnri.org/index.php/nutrigenetics-nutrigenomics-and-	University of North Carolina Nutrition Research Institute, US	None reported	\$400-800 (travel, accommodation food)	3 days (runs 1/year)	Professionals with qualifications in nutritor health science	Yes	Yes

	precision-nutrition-2017/	(North Carolina)		included)				
	4 day Nutrigenomics course http://www.genesnippers.org.uk/4-day-nutrigenomics-course/	Gene Snippers, UK (various locations)	Continuing education credits	\$744	4 days (runs multiple times per year)	Health professionals who see patients/clients	Yes	Yes
	Using Nutrigenomic Testing in Practice http://www.genesnippers.org.uk/view-book-courses/	Gene Snippers, UK (various locations)	None reported	\$93	1 day (runs multiple times per year)	Health professionals who see patients/clients	No	Yes
	Fitgenes Accredited Practitioner workshop http://www.fitgenes.com/workshop-booking-form	Fitgenes Australia, (Melbourne) and New Zealand (Auckland)	Certification to be a practitioner with provider	Not reported	2 days	Health professionals who see patients/clients	No	Yes
Presentati on – online recording	Obesity, Nutrition, Nutrigenomics - OH MY! http://depts.washington.edu/cgph/Nutrigenomics.htm	University of Washington, US	None reported	Free	1 hour	Health professionals	No	No
	Nutritional Genomics- Essential Basics for Nutrition Professionals https://www.bda.uk.com/calendar/event/view?id=425%20 ,	Pomegranate Nutrition Consulting	None reported	\$105	1.5 hours	Nutrition professionals	No	Yes

Advanced Detox-seminar module cpw4 http://www.biopractica.com.au/online-education/advanced-detox.html#Exposome	Bio-Practica, Australia	None reported	\$50	Not reported	Health professionals who see patients/clients	No	Unclear
Nutrigenetics: The Interplay of Genes, Diet and Health https://ce.nurse.com/course/ce729/nutrigenetics/	Nurse.com, UK	Continuing education credits	\$12	1 hour	Health professionals	Yes	No
Genomics for Nutrition Professionals https://www.ncghealthsolutions.com/store/jczgtAe9	NCG health solutions, US	None reported	Free	3 hours	Health professionals who see patients/clients	Unclear	No
Nutrigenomics and Culinary Genomics: Strategies for Depression and Cardiovascular Disease https://www.ncghealthsolutions.com/store/S5sVqu6B	NCG health solutions, US	Continuing education credit application pending	\$49.95	1.5 hours	Health professionals who see patients/clients	Unclear	Unclear
Genomics for Nutrition Professionals https://www.gsnuniversity.com/store/tzXeEKGQ	GSN University and Genomic Solutions, US	None reported	Free	3 hours	Health professionals who see patients/clients	Unclear	Unclear
Nutrigenomics and personalized nutrition http://www.dietitians.ca/Lea	Dietitians of Canada	None reported	\$14-25	1.5 hours	Dietitians	Unclear	Unclear

rn/Distance-Learning/LODStoreProduct.aspx?guid=0f2e2eca-402b-41a3-a5e6-e2469b8de1fe								
Seminars in Nutritional Genomics for Practitioners http://snppros.com/upcoming-webinars-and-events/	SnPED	None reported	\$550 yearly subscription, \$50 monthly subscription	30-60 minute presentations, biweekly	Nutrition professionals	Unclear	Unclear	

Table 3. Affiliations of nutritional genomics training courses

Type	Course	Comment
Affiliation with professional association, research or educational institute*	Methylation and Clinical Nutrigenomics – Part 1, Seeking Health Education Institute	Credits through Bastyr University
	Methylation and Clinical Nutrigenomics – Part 2, Seeking Health Education Institute	Credits through Bastyr University
	Nutrigenomics (INMD 610)	Credits through Chiropractors' Association of Australia and awaiting approval for credits through American Academy of Family Physicians
	Sports genomics	Credits through University of Virginia School of Medicine and the Commission on Dietetic Registration
	Basic Certification Course Foundations in Genomics and Culinary Genomics	Credits through University of Virginia School of Medicine and the Commission on Dietetic Registration
	The MTHFR, Methylation, & Biochemistry	Credits through the Corrective High Performance Exercise Kinesiology Institute and Functional Diagnostic Nutrition
	4 day Nutrigenomics course	Credits through British Association for Applied Nutrition & Nutritional Therapy, accredited by Nutritional Therapy Education Council
	Using Nutrigenomic Testing in Practice	Credits through British Association for Applied Nutrition & Nutritional Therapy
Nutrigenetics: The Interplay of Genes, Diet and Health	Credits through American Nurses Credentialing Center, the Accreditation Council for Pharmacy Education and the Accreditation Council for Continuing Medical Education	

	Nutritional Genomics- Essential Basics for Nutrition Professionals	Endorsed by the British Dietetic Association
	Masters in Nutrigenomics and Personalised Nutrition, University of the Balearic Islands	Supported by European Nutrigenomics Organization (NuGO), Biomedical Research Networking Centres consortia (CIBER)
	Workshop on Nutrigenetics, Nutrigenomics and Precision Nutrition	Receives funding from the National Institute of Diabetes and Digestive and Kidney Diseases
Affiliation with genetic testing service	Nutrigenomics and Personalized Nutrition (NFS487H1), University of Toronto	Option to undergo nutrigenetic testing using Nutrigenomix®
	CarbChoice AMY1 Gene, Fitgenes Australia	Training provider is a genetic testing company, enrolment requires completion of genetic test
	Foundations in nutrigenomics, Centre for Translational Genomics	Option to undergo nutrigenetic testing (no service provider prescribed)
	Translational Nutrigenomics, Manuka Science	Requirement to undergo nutrigenetic testing (no service provider prescribed)
	Smart practitioner certification training course	Training provider is a genetic testing company
	The MTHFR, Methylation, & Biochemistry	Participants are eligible for a wholesale testing account with Direct Healthcare Labs
	4 day Nutrigenomics course	Encourages undergoing genetic testing using 23andme
	Fitgenes Accredited Practitioner workshop	Training provider is a genetic testing company, enrolment requires completion of genetic test through Fitgenes.

Affiliation with food industry	Workshop on Nutrigenetics, Nutrigenomics and Precision Nutrition	Sponsored by Coca Cola and Dole Food Company
	Masters in Nutrigenomics and Personalised Nutrition, University of the Balearic Islands	Supported by Unilever, CAPSA Food, Puleva Biotech, Calidad Pascual, Grupo Siro
Affiliation with pharmaceutical or biotechnology industry	Masters in Nutrigenomics and Personalised Nutrition, University of the Balearic Islands	Supported by Natraceutical Group, Biopolis
* Continuing education credits		



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Title:

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Date:

2018-04-01

Citation:

Collins, J., Adamski, M. M., Twohig, C. & Murgia, C. (2018). Opportunities for training for nutritional professionals in nutritional genomics: What is out there?. *NUTRITION & DIETETICS*, 75 (2), pp.206-218. <https://doi.org/10.1111/1747-0080.12398>.

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