Fischer ARH, Berezowska A, vanderLans IA, Ronteltap A, Rankin A, Kuznesof S, Poinhois R, Stewart-Knox B, Frewer LJ.

Willingness to pay for personalised nutrition across Europe.

***European Journal of Public Health* (2016)**

DOI: 10.1093/eurpub/ckw045

Willingness to pay for personalised nutrition across Europe

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Source of support: This research was carried out within the context of Food4Me, which is the acronym of the EU FP7 project "Personalised nutrition: an integrated analysis of opportunities and challenges" (Contract no. KBBE.2010.2.3-02, Project no.265494), http://www.food4me.org/.

Disclaimer: Authors know of no conflict of interest. All procedures were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards). Informed consent was obtained from all individual participants for being included in the study

Abstract

Background: Personalised nutrition (PN) may promote public health. PN involves dietary advice based on individual characteristics of end users and can for example be based on lifestyle, blood and/or DNA profiling. Currently PN is not refunded by most health insurance or health care plans. Improved public health is contingent on individual consumers being willing to pay for the service.

Methods: A survey with a representative sample from the general population was conducted in eight European countries (N=8233). Participants reported their willingness to pay (WTP) for PN based on lifestyle information, lifestyle and blood information, and lifestyle and DNA information. WTP was elicited by contingent valuation with the price of a standard, non-personalised nutrition advice used as reference.

Results: About 30% of participants reported being willing to pay more for personalised nutrition than for non-personalised nutrition advice. They were on average prepared to pay about 150% of the reference price of a standard, non-personalised advice, with some differences related to socio-demographic factors.

Conclusion: There is a potential market for PN compared to non-PN advice, particularly among men on higher incomes. These findings raise questions to what extent personalized nutrition can be left to the market or should be incorporated into public health programs.

Keywords: Personalised nutrition, Willingness to pay, Nutrition services, Preventive medicine; Food4Me

Key points:

- There is a potential market for personalised-nutrition advice in the EU
- The majority of people is not willing to pay for personalised- nutrition advice
- Willingness to pay for personalisation based on DNA sampling is not higher than for personalisation based on lifestyle or blood data.
- Large scale adoption of personalised nutrition is likely to require inclusion in national health services

Introduction

Current advances in nutrition science and more specifically in nutrigenomics indicate that more specific information about an individual could be used to develop personalised nutrition (PN) advice that is tailored to individual needs(1). Increased personalisation requires more information about an individual e.g. a blood sample to assess cholesterol levels, in order to suggest specific dietary recommendations. Genetic analysis can be applied to predict potential future nutritional needs, or to investigate how specific nutrients contribute to the healthiness of an individual's diet.

Currently, most health insurance companies or health service providers, such as the NHS, or health care insurances do not refund the cost of PN advice. Therefore, adoption depends on consumers' willingness to pay (WTP) for commercial PN advice. Although various businesses have marketed PN as a viable opportunity(2), there is no clear idea about *how much* consumers are willing to spend on PN advice(3).

This paper presents results from a survey that assessed people's WTP for PN based on three different levels of personal information: i) lifestyle (food consumption and physical exercise pattern); ii) lifestyle and phenotype (from analysis of a blood sample); lifestyle and genotype (from DNA testing using a saliva sample). Comparisons regarding WTP were made between countries, gender, age groups, and income and education levels.

Methods

A survey was conducted in November and December 2012 in representative samples from the general population in eight EU countries[1] as part of a larger study on PN(4). Data reported here have not been published previously.

WTP was measured as a two-step contingent valuation. Participants were first asked whether they would be willing to pay a price equal to that of standard, non-PN advice provided by a qualified dietitian. Those who reported a WTP of at least this reference price were provided with a continuous scale of which the lower-end represented the reference price, and the higher end being five times the reference price. Participants who reported to be not willing to pay the reference price were provided with a scale that ranged from 0 to the reference price.

[1] Greece, Spain, Germany, Ireland, Netherlands, UK. Poland and Norway

Based on the price of general dietary advice in the Netherlands (about 100€), reference prices were calculated for all participating countries using the Eurostat Comparative Price Level index of 2011(5). To check whether the calculated reference prices resembled dietary advice prices of the participating countries, the reference price of each country was compared to the price of a national Weight Watchers[2] dietary service. To allow comparability across countries, the reported WTPs were expressed as percentages of the reference prices. Each participant scored WTP for three levels of personal information: lifestyle (about daily diets and exercise); lifestyle and phenotype (with additional information from blood chemistry information); and, lifestyle and genotype (with additional information from DNA testing using a saliva sample). The order of WTP scoring was randomized.

WTP data were coded into three classes: (1) Nothing: WTP=0; (2) Low: 0.< WTP < reference price; (3) High: WTP ≥ reference price. In addition, age, gender, income (compared to the modal income of country of residence[3]), education (Low: 12 or fewer years of schooling, including kindergarten; Medium: 12-16 years education; High: degree level) were recorded.Of the 8233 participants, 919 did not disclose income. These participants were omitted from analyses that included income as determinant.. Distributions of participants across the WTP classes were cross-tabulated with these demographics and tested using χ^2. In addition, factorial ANOVAs were conducted testing the main effects of the sociodemographic on WTP, for the Lower and Higher WTP class[4] and each level of personal information.

Results

A total of 8233 participants from the representative survey completed the questionnaire. Gender distribution was about equal (50.6% male). Twenty-two percent of participants were aged between 18 and 29 years; 23% between 30 and 39 years; 35% between 40 and 54 years; and 20% between 55 and 65 years. Twenty-nine percent reported low education level; 39% had completed medium level education; and, 32% had completed higher education. Income distribution peaked (as expected) around the modal income of each country, with 49.3% (3605) of those willing to disclose income information, earning between 0.5 and 1.5 times modal income.

[2] Weight Watchers is an international company that offers various products and services to assist weight loss and maintenance

[3] Modal incomes at the time of data collection were: Germany: 25,000€ ; Spain: 22,000€; Greece: 20,000€; Ireland: 24,000 €; Netherlands: 30,000€; United Kingdom: 22,000£; Poland: 50,000 Złoty; Norway: 322,000 kroner, Portuguese participants did not fill out this question.

[4] For the Nothing WTP class, an ANOVA would be meaningless since all participants in this class scored a WTP equal to 0.

Average WTP as percentage of the reference price provided is reported in Table 1.

TABLE 1 ABOUT HERE

A minority of the participants (about 30% see Table 2) showed a higher WTP for PN advice than the reference price of standard, non-PN. About half showed a WTP less than the reference price. The remaining participants (about 20%; Table 2) reported not being willing to pay anything for PN advice. WTP-class percentages differed between the three levels of information (Friedman $X^2(2)=106.98$, N=8233, $p<0.001$). For lifestyle-based nutrition advice, relatively fewer participants had a WTP above the reference price and more a WTP below the reference price. For lifestyle and phenotype information, more participants were willing to pay more, and fewer did not want to pay anything. For lifestyle and phenotype analysis and lifestyle and genotype analysis, more than expected were willing to pay nothing, while fewer than expected were willing to pay a lower price (Table 2).

The effects of gender, age, income, education level and country on WTP class membership and mean WTP per WTP class were tested. Figure 1 gives an overview of the percentages, means, standard deviations, and medians. Tests statistics are provided in Table 3.

TABLE 2 ABOUT HERE

TABLE 3 ABOUT HERE

FIGURE 1 ABOUT HERE

Discussion

Only about a third of the participants showed WTP PN higher than the reference price of standard, non-PN advice. They were on average willing to pay a price of 40% and 50% of higher than the reference price. The additional amount people were willing to pay for the more advanced forms of personalisation (based on phenotype or genotype) was very small compared to what participants were willing to pay for lifestyle-only based PN advice. This aligns with previous research(6), where it was reported that people did not perceive additional benefits accruing from more medicalised personal data.

A sizable minority (20%) indicated that they are willing to pay nothing for PN. While this may imply these participants and those with a WTP considerably lower than the price of standard, non-PN advice, reject the idea of PN altogether this is not necessarily the case. Current concerns about data privacy, lack of confidence in the efficacy of PN, or distrust in the motivations of the service providers(6) may have, reduced their current WTP. It is also impossible to rule out that there was a group of people not willing to pay the reference price for the non-PN service, which may have reduced WTP for PN services.[5] Another group may have consisted of people who were potentially interested in adopting a PN advice but were opposed to paying for healthcare(8). Finally there may have been a group of people for whom the personalized nutrition remained abstract and hypothetical and therefore indicated a low WTP.

There were some differences in WTP between countries. For example, participants from the Netherlands and the UK were most often in the nothing and lower class and those in the lower class wanted to pay less than the reference scored among those with the lowest WTP, while those with WTP more than the reference price were among those with the highest WTP. This may have to do with the availability of relatively inexpensive basic healthcare (Netherlands), or free of direct charge basic healthcare (UK), while non-standard care is something for which they have to pay.

There were more males than females reporting a WTP of nothing. Whereas males with WTP lower than the reference value showed means lower than female participants, males with a WTP higher than the reference value had a higher WTP than females. This suggests that male participants, once committed to PN, have a higher WTP than females.

Participants in the highest income classes reported the highest WTP for PN. This suggests that commercial introduction of personalized nutrition services would benefit higher

[5] A much larger proportion (about 60%) of participants in a proof of principle trial in the same countries completed the same survey (7) and were willing to pay a higher price for a PN service than for a non-PN service (data not shown), indicating that motivation to engage with nutrition advice may be a central driver for adoption.

socio-economic classes most, while it is generally accepted that these groups in the population already have better health(9). The higher WTP may in part be related to higher income classes having more awareness of health issues, but it may also relate to the availability of resources (money) to engage in nutrition services. This raises important ethical questions to whether personalised nutrition should also be accessible to lower income classes that may need it more than those with high income. Considering the low WTP of these income classes other ways could be explored, for example, through employers or insurance companies, or whether its availability should be regulated by commercial market which may explicitly target the higher social classes and incomes to maximize profit. Alternatively, the use of basic PN services may refundable, while specific implementations such as comprehensive lifestyle advice(3) may be left to the market. The answer to this issue is beyond the scope of the current paper, and should be taken up at the level of policy discussion.

A potential limitation to the current study is the adopted contingent valuation method for WTP where participants did not make any actual sacrifice of money(10).

The proportion of the population and the size of the WTP suggests that there may be a market for PN if it can be offered at no more than one and a half time the price of current dietary advice services. This suggest that PN may find a place among a minority of the European population if it is made available at limited additional cost compared to non-PN services, but would be much more likely to be adopted if it is offered through existing health care systems at no or very limited extra charge beyond charges in the local health care system.

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Table 1: Average WTP per country per type of required personal information

Country	N	Reference price (local currency)	Average in % reference		
			Lifestyle	Lifestyle + Phenotype	Lifestyle + Genotype
Greece	1020	90€	70.24	75.81	76.64
Spain	1025	90€	65.84	68.77	71.21
Germany	1020	100€	53.38	54.32	54.62
Ireland	1020	110€	68.42	69.64	68.44
Netherlands	1020	100€	42.35	41.70	41.26
UK	1061	£80	44.24	47.53	46.65
Poland	1045	230 Złoty	64.50	68.67	70.99
Norway	1022	1100 Norse kroner	52.15	57.23	54.90

Table 2: Distribution of WTP ((as percentage of reference price) per personalisation level

	Lifestyle	Lifestyle + Phenotype	Lifestyle + Genotype
N	8233	8233	8233
Nothing	19.6%	19.1%	20.8%
Lower	51.5%	49.9%	48.4 %
Mean (SD)	30.10 (21.40)	30.44 (21.66)	30.68 (21.83)
Median	25.56	26.10	27.27
Higher	29.0%	31.0%	30.7%
Mean (SD)	143.84 (62.53)	143.27 (61.14)	146.73 (63.64)
Median	120.00	119.00	122.23

Table 3: Test statistics for effect of sociodemographics on WTP-class membership and mean WTP within the Low and the High WTP class

N=8233[1]	Lifestyle		Lifestyle and Blood		Lifestyle and DNA	
Country (df=14)	χ^2=358.82, p<.001,V=.15		χ^2=408.11, p<.001,V=.16		χ^2=439.02, p<.001,V=.16	
Gender (df=2)	χ^2=29.23 ,p<.001,V=.06		χ^2=29.18, p<.001,V=.06		χ^2=28.31 ,p<.001,V=.06	
Age class (df=6)	χ^2=163.34 ,p<.001,V=.10		χ^2=173.65, p<.001,V=.10		χ^2=159.35 ,p<.001,V=.10	
Education level (df=4)	χ^2=61.81 ,p<.001,V=.06		χ^2=75.02, p<.001,V=.07		χ^2=51.54 ,p<.001,V=.06	
Income level (df=10)[1]	χ^2=90.00 ,p<.001,V=.08		χ^2=88.96, p<.001,V=.08		χ^2=86.65 ,p<.001,V=.08	
	Lower (N=3609) (df_e=3590)	Higher (N=2269) (df_e=2250)	Lower (N=3485) (df_e=3466)	Higher (N=2443) (df_e=2424)	Lower (N=3393) (df_e=3374)	Higher (N=2415) (df_e=2396)
Country (df_m=7)	F=14.02; p<.01	F=5.86; p<.01	F=11.32; p<.01	F=3.92; p<.01	F=2.46; p=.02	F=1.56; p=.14
Gender (df_m=1)	F=6.95; p<.01	F=25.03; p<.01	F=9.97; p<.01	F=15.78; p<.01	F=4.68; p=.03	F=25.85; p<.01
Age class (df_m=3)	F=36.54; p<.01	F=1.01; p=.35	F=41.41; p<.01	F=1.80; p=.12	F=34.07; p<.01	F=0.77; p=.51
Education level (df_m=2)	F=0.63; p=.53	F=0.17; p=.84	F=0.55; p=.58	F=0.33; p=.72	F=0.16; p=.86	F=1.81; p=.17
Income level (df_m=5)	F=5.97; p<.01	F=5.77; p<.01	F=5.94; p<.01	F=7.04; p<.01	F=4.66; p<.01	F=7.66; p<.01

[1] Except for income N=7314. Participants not willing or able to disclose income were not included

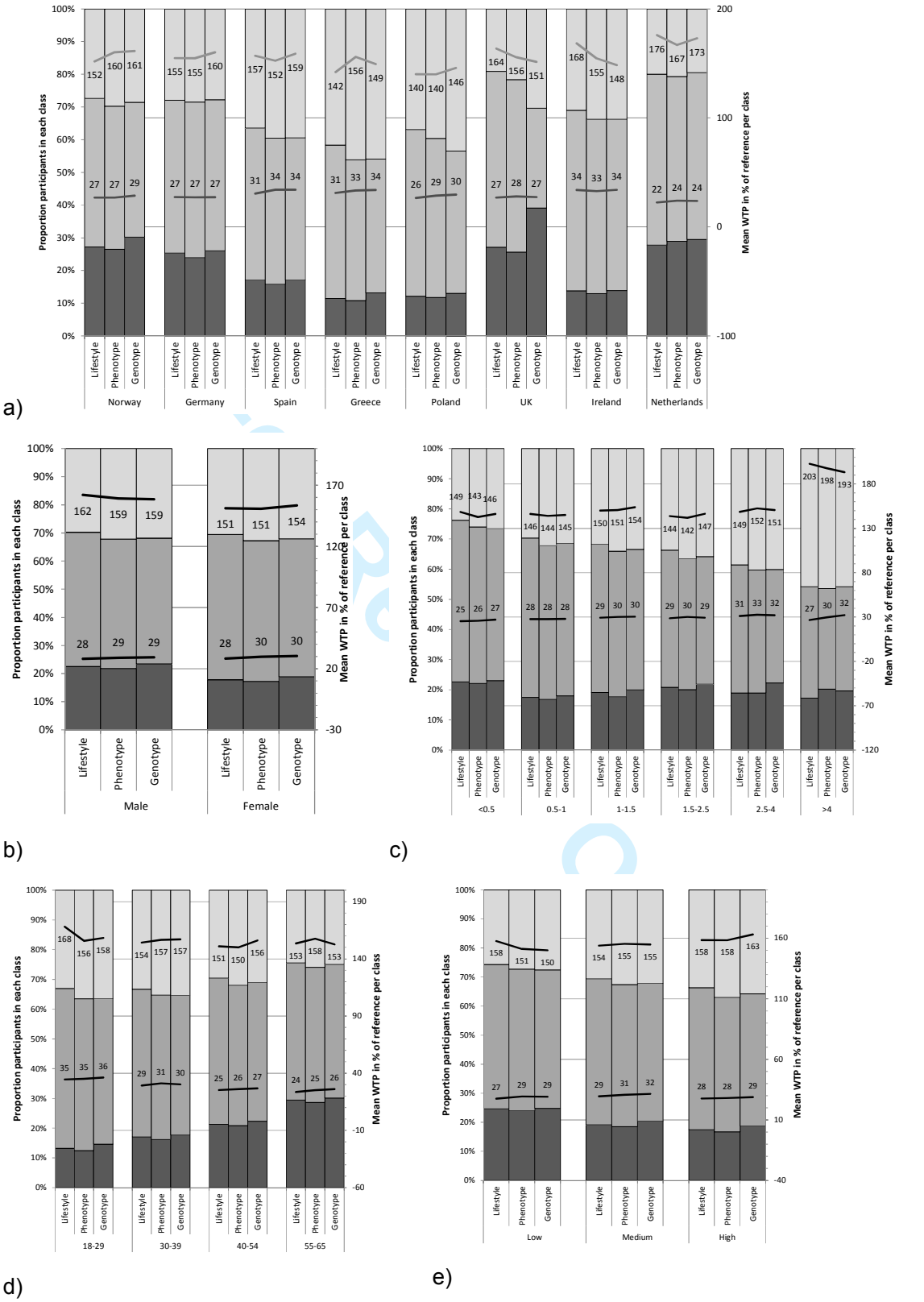

Figure 1: WTP for different levels of PN by (a) Country (b) Gender (c) Income (d) Age and (e) Education. Bars indicate proportion of participants willing to pay: Nothing (dark grey), Lower than reference (mid grey) and Higher than reference (light grey). Lines and numbers indicate mean WTP in percentage of the reference.