

# Dairy intake-related intentions, attitudes, subjective norms and perceived behavioural control of South African nutrition professionals

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**Background:** Intake of dairy-related nutrients of South Africans is low. Nutrition professionals may influence dietary behaviour. Their own disposition related to dairy is unknown, yet important in promoting the “have milk, maas or yoghurt every day” guideline. **Aim:** Guided by the Theory of Planned Behaviour (TPB), this study aimed to describe determinants of target behaviour of consumption of 2–3 servings of dairy daily among nutrition professionals. **Methods:** An electronic survey (Qualtrics Online Survey Software) of conveniently sampled Association for Dietetics in South Africa (ADSA) and Nutrition Society of South Africa (NSSA) members determined their dairy-related behaviour, intentions, attitudes, subjective norms and perceived behavioural control regarding dairy in general, and of milk, maas, yoghurt and cheese. **Results:** Three hundred and six (306) responses (aged  $36.4 \pm 10.5$  years) were received. A third of nutrition professionals reported that their daily dairy intake was 2–3 servings 4–6 times per week, yet over 40% met the target once per week or less often. Intake differed across products. Intention to consume the target was high ( $5.2 \pm 0.12$ ; scale 1–7). Attitudinal evaluations revealed highest belief scores related to nutritional quality and bone health. Associations with cancer development, diabetes and the environment were believed to be least likely. Professional training and scientific evidence emerged as the strongest subjective norms. Nutrition professionals perceived themselves to be in control of the target behaviour, yet their clients significantly less so ( $p < 0.0001$ ). **Conclusion:** Nutrition professionals’ attitudes, subjective norms and behavioural control can aid responsive empowerment to support dairy-related nutrition education of South Africans.

**Keywords:** dairy intake, nutrition professionals, Theory of Planned Behaviour

## Introduction

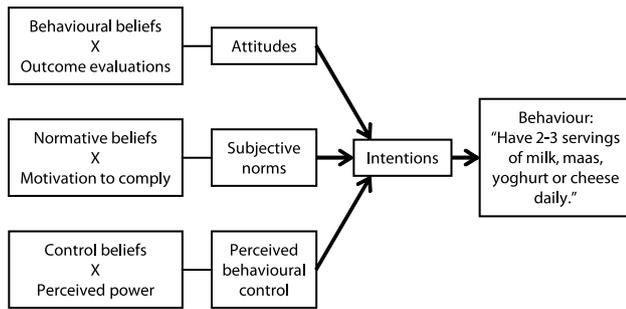
South Africa has a high burden of malnutrition and diet-related non-communicable diseases (NCDs).<sup>1,2</sup> Milk and milk products have the potential to fill identified nutrient intake gaps,<sup>3,4</sup> and to reduce the risks for developing NCDs,<sup>4–6</sup> even though differences between specific dairy products (e.g. fresh or fermented<sup>7</sup>), dairy components (e.g. fat type and amount<sup>8</sup>) and specific NCDs (e.g. hypertension vs different cancers<sup>9</sup>) may exist. The intake of dairy in South Africa is presumed to be well below the international recommended intake range of 500–750 ml (2–3 servings) per person per day.<sup>10</sup> These low intakes are suggested by market research<sup>11</sup> and a secondary analysis of the only National Food Consumption Survey of 1999, which showed that 19–35% of people aged 10 years and older consumed milk, with a mean per capita daily intake of 38–74 g, depending on the dietary assessment method.<sup>12</sup> Similarly, data from the Prospective Urban and Rural Epidemiological (PURE) Study<sup>13</sup> and Mchiza *et al.*<sup>14</sup> point to low dairy consumption.

Non-adherence to dairy recommendations has been observed in developed countries (e.g. Switzerland<sup>15</sup>) and developing societies (e.g. Shanghai<sup>16</sup>). This has been associated with real or perceived health concerns, such as hypersensitivities (lactose intolerance and allergy), cardiovascular disease and weight management,<sup>17–19</sup> challenges related to understanding and implementing the recommendations,<sup>13,19</sup> as well as socio-economic, cultural and personal preferences (e.g. taste).<sup>13</sup>

The latest revision of the South African food-based dietary guidelines (SA-FBDG) includes a specific guideline to promote intake of selected dairy products: “Have milk, maas or yoghurt every day”.<sup>13</sup> Such a guideline will only result in an improved

nutrition situation if adopted. Nutrition professionals are agents of change in the field of dietary intakes. Their own attitudes in relation to intake of milk and dairy products may be important in this regard. Furthermore, the social context as well as environmental factors – especially the perception thereof<sup>20</sup> – can predict compliance with the SA-FBDG. It appears that barriers to meeting dietary guidelines vary across food groups, suggesting that targeted strategies are needed to increase adherence for the different guidelines.<sup>18</sup> To our knowledge, no studies focussing on dairy intake and factors influencing this have been published in South Africa.

Studying dietary behaviours and nutrition education or promotion should be driven by appropriate theoretical models,<sup>21,22</sup> as such models explain and predict behaviour, and may provide direction when interventions are planned.<sup>23</sup> The Theory of Planned Behaviour (TPB) is one of the most frequently cited models for predicting human social and health-related behaviour.<sup>20,22,24,25</sup> This theory contains three constructs which determine an individual’s intention to perform a particular behaviour: *Attitude* (the extent of rational and emotional favourability to perform a behaviour), *subjective norm* (social pressures) and perceived *behavioural control* (perceived ease or difficulty to perform a behaviour, as well as anticipated obstacles).<sup>22,25</sup> These three constructs respectively represent personal, social and environmental influences on the intention to perform a behaviour.<sup>23</sup> Since we assumed that consciousness and rationality would be major driving forces in terms of own eating behaviour and nutrition promotion for South African nutrition professionals, the TPB was deemed appropriate as a basis for this study. In the past, the theory was repeatedly used in relation to nutrition consultations and diverse dietary



**Figure 1:** Conceptual framework: Theory of Planned Behaviour (based on Ajzen<sup>20</sup>).

behaviours.<sup>23,26–32</sup> Numerous groups<sup>19,33,34</sup> specifically studied dairy consumption based on this theory.

Based on the TPB, the aim of the study was to determine, among South African nutrition professionals, their intention, attitudes, subjective norms and perceived behavioural control to consume dairy. Apart from dairy as a group, the emphasis was on the primary dairy products mentioned in the SA-FBDG, i.e. milk, maas and yoghurt.<sup>13</sup> In addition, “basic” cheese (i.e. gouda or cheddar) was added because behavioural belief (attitudes) may differ across dairy products, and South African consumption data suggest that in higher Living Standards Measure (LSM) groups, significantly more dairy is consumed than in lower LSM groups.<sup>11</sup> A secondary objective was to use the findings as a base for contextualised recommendations.

The conceptual framework applying the TPB is given in Figure 1. The target behaviour was operationally defined as “Have 2–3 servings of milk, maas, yoghurt or cheese daily”. The other concepts were contextually defined and aligned to the TPB.<sup>12,23</sup>

## Methods

In a cross-sectional, quantitative survey the study population (“nutrition professionals”) referred to dietitians who were members of the Association for Dietetics in South Africa (ADSA) ( $n = 1589$ ) and nutritionists or nutrition scientists who were members of the Nutrition Society of South Africa (NSSA) ( $n = 272$ ) mid-2015. Convenience sampling was done through the electronic member databases of the two organisations. In addition, participants were recruited during two continuing professional development events, both in Gauteng, South Africa during the data collection period (August – October 2015).

Questionnaire development was informed by previous studies employing the TPB and/or investigating dairy consumption and its determinants.<sup>17,19,23,33–37</sup> A team of seven (dairy) nutrition professionals critically reviewed the items to check for relevance, understandability and face validity in the South African context, since elicitation is a first step in appropriately applying the TPB.<sup>20</sup> The questionnaire was tested prior to administration. Attention was paid to layout and design (namely through the use of icons, colour and filter questions) to ensure efficient navigation and low respondent burden.

In the final questionnaire twelve items measured *behavioural beliefs* related to dairy as a group, and also in relation to milk, maas, yoghurt and cheese individually. The items included nutritional benefits, practical reasons for consuming dairy products and disadvantages of dairy. Each item started with “For me 2–3 servings of dairy (or the individual dairy product) are

associated with ...”. *Outcome evaluation*, the other component of attitudes in the TPB, was assessed for each behavioural belief for dairy as a group. Each behavioural belief score was multiplied by the outcome evaluation score of the corresponding belief. The sum of all these products constituted the attitude.

Seven significant others or normative beliefs were identified as potentially influencing nutrition professionals’ dairy consumption. The base question was “According to (significant other) I should/should not have 2–3 servings of dairy daily”. Subjective norms were calculated as the summated score of the products of each normative belief and its respective motivation to comply.

Five perceptions as to whether nutrition professionals think they have the resources (facilitators and barriers) to consume 2–3 servings of dairy daily, acted as possible control beliefs. Perceived behavioural control over being able to personally consume dairy was reflected by a summated score of control beliefs multiplied by the perceived power to do so. In addition to completing control beliefs and perceived power in relation to themselves, participants were requested to provide this information in respect of most of their adults clients/patients. The response options for all questions were anchored on a seven-point, continuous scale.

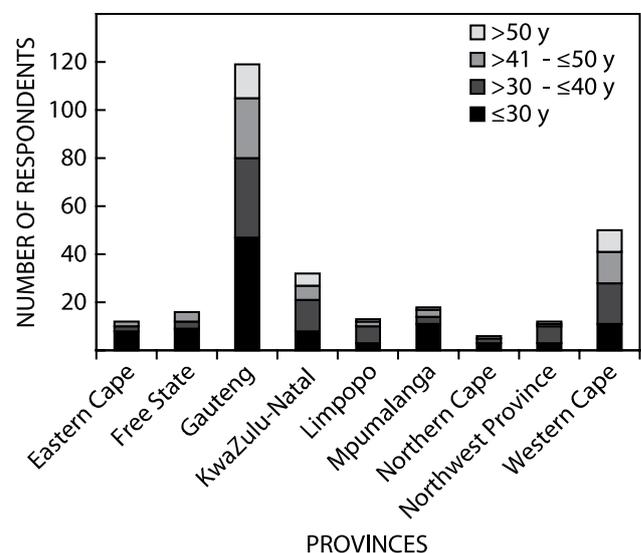
During data management the following was applied: If respondents reported being both, dietitians and nutritionists, the former was used. If work environment was public and private, the former was used (assuming that this would be the major part, supplemented by private practice). Age was categorised.

Other variables were calculated in accordance with the TPB.<sup>20,23</sup> Stata (StataCorp Statistical Software. Release 14; Revision 23 June 2015) was used for data analysis. The Research Ethics Committee of the Faculty of Health Sciences of the University of Pretoria approved the study (Approval: 76/2015).

## Results

### Description of sample

From a total of 306 responses, 282 were usable. Not every respondent answered all the questions among these. This represents a response rate of about 15%. The mean age was  $36.4 \pm 10.5$  years (range: 22–78 years). Most ( $n = 252$ ; 90.3%) of



**Figure 2:** Age group and province of residence of respondents ( $n = 281$ ).

**Table 1:** Primary work environment of nutrition professionals ( $n = 280$ )

Primary work environment	Professional				Total	
	Dietitian		Nutritionist/ Nutrition scientist		n	%
	n	%	n	%		
Public sector: Clinical	57	95.0	3	5.0	60	21.3
Public sector: Non-Clinical	11	73.3	4	26.7	15	5.3
Private sector: Non-Clinical	20	100.0	0	0.0	20	7.1
Private sector: Clinical (Hospital-based)	21	87.5	3	12.5	24	8.5
Private practice	89	98.9	1	1.1	90	31.9
Academic/research institution	25	67.6	12	32.4	37	13.1
Other	29	85.3	5	14.7	34	12.1
Total	252	89.8	28	10.2	280	100

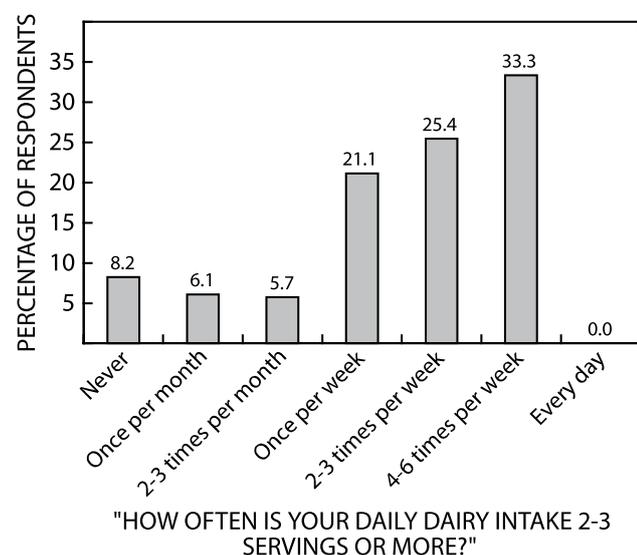
the respondents were dietitians and came from Gauteng, South Africa ( $n = 119$ ; 42.3%) (Figure 2).

The majority of respondents (31.9%) considered private practice as their primary work environment. About 21% reported working in a clinical environment in the public sector (Table 1).

### Dairy consumption and intention to consume dairy

Figure 3 shows that most respondents reported consuming 2–3 servings of dairy 4–6 times per week. None of the respondents reported consuming the reference amount daily, and about 40% of the respondents stated that their consumption was on target once per week or less often.

Table 2 summarises intakes of specific dairy foods. The “as such consumption” ranged from very low (11.5%) for maas to very high (over 90%) for cheese and yoghurt. For these latter two products, the amount consumed per intake occasion was mostly

**Figure 3:** Frequency of target dairy consumption by nutrition professionals ( $n = 279$ ).

a small portion. Milk was primarily consumed as part of other dishes/foods, particularly with coffee, tea and cereals.

The mean score for *intention* to consume 2–3 servings of dairy daily was  $5.2 \pm 0.12$  (median value = 6 in a scale ranging from 1 [= unlikely] to 7 [= likely]).

### Attitudes and components

The mean dairy intake beliefs, outcome evaluations and attitudes related to dairy are given in Table 3. Within the TPB, behavioural beliefs refer to an individual's belief about the results of a behaviour. By combining the behavioural beliefs with the outcome evaluations, attitude scores are derived. The highest dairy attitude scores were related to the link of dairy to bone health and nutritional quality. Cancer development, diabetes, environmental concerns and adverse effects scored lowest.

### Subjective norms and components

Normative beliefs refer to an individual's perception of how a particular behaviour will be judged by significant others. From Table 4 it can be seen that the mean normative beliefs ranged from 4.6 for doctors, with whom the professionals work, to 6.5 for professional training. Respondents indicated the strongest motivation to comply with scientific evidence, and the lowest inclination towards the media. Only in the case of scientific evidence was the motivation to comply higher than the normative belief. Taken together, the same pattern emerged, i.e. that nutrition professionals took scientific evidence as the subjective norm for dairy-related behaviour, and rated media lowest in the hierarchy of significant others.

The mean score for general dairy intake subjective norm suggests that in general nutrition professionals are of the opinion that their significant others “support” the dairy intake recommendation. However, some individual significant others (e.g. media) are perceived to differ.

### Perceived behavioural control and components

In response to the general questions regarding how much control the nutrition professionals perceived themselves and their clients/patients to have to consume the recommended 2–3 servings of dairy daily, the mean scores were  $6.3 \pm 1.2$  and  $4.6 \pm 1.5$  (where 1 = no control and 7 = great control), respectively. The responses to the more specific perceived facilitators or barriers for themselves and their clients/patients regarding dairy consumption are in Table 5.

In relation to their own dairy-related behaviour, there was little difference between the different facilitators or barriers given in the questionnaire, both in terms of control belief and for the perceived power. The latter was always rated higher than the control, meaning that the potential barriers were rated as more or less midway in terms of creating a difficulty for consumption (about 4.5 on a scale from 1 = very difficult to 7 = very easy), but that this was perceived to not have a large influence (score always  $\geq 5$ ). The resultant behavioural control consequently also differed very little across the four listed barriers.

The above is in contrast to nutrition professionals' perception of their clients' situation: the scores were consistently and significantly lower (paired t-test and Wilcoxon's matched pairs signed ranks test both  $p < 0.0001$ ). This suggests that, in general, the nutrition professionals perceived their clients to have less control and power over their dairy intake than they perceived for themselves.

**Table 2:** Intake of selected dairy foods by nutrition professionals (n = 279)

		Milk		Maas		Yoghurt		Cheese <sup>1</sup>	
		n	%	n	%	n	%	n	%
Consumption as such?	Yes	127	45.5	32	11.5	262	93.9	270	96.8
	No	152	54.5	247	88.5	17	6.1	9	3.2
Portion size per "as such" consumption occasion <sup>2</sup>	Small	44	34.6	19	59.4	209	79.8	202	75.1
	Medium	79	62.2	11	34.4	50	19.1	66	24.5
	Large	4	3.2	2	6.3	3	1.1	1	0.4
Consumption as part of other foods?	Yes	266	95.3	116	41.6	192	68.8	NA	NA
	No	13	4.7	163	58.4	87	31.2	NA	NA
Companion foods <sup>3</sup>	Coffee/Tea: n = 242			Cereal: n = 31		Cereal: n = 143		NA	
	Cereal/porridge: n = 219			Other (e.g. quiche, rusks): n = 93		Shakes/smoothies: n = 73		NA	
	Shakes/drinks: n = 104					Other (mixed dishes): n = 104		NA	
	Other (e.g. custard, lasagne): n = 198							NA	

<sup>1</sup>For cheese no differentiation between consumption as such or as part of other foods was made.

<sup>2</sup>Milk and maas: small = ± 125 ml, medium = ± 250 ml, large = ± 500 ml; Yoghurt: small = ± 100–175 ml, medium = ± 250 ml, large = ± 500 ml; Cheese: small = ± 30 g, medium = ± 80 g, large = ± 120 g.

<sup>3</sup>More than one could be chosen.

**Table 3:** Means ± standard deviations of behavioural beliefs, outcome evaluations and attitudes related to dairy

Statement <sup>1,2</sup>	Specific dairy products				Dairy in general		
	Behavioural belief <sup>1</sup>				Behavioural belief <sup>1</sup>	Outcome evaluation <sup>2</sup>	Attitude <sup>3</sup>
	Milk	Maas	Yoghurt	Cheese			
...good taste"	5.5 ± 1.9	2.7 ± 2.0	6.6 ± 0.9	6.6 ± 1.0	6.1 ± 1.2	5.5 ± 1.9	35.0 ± 14.6
...nutritional quality"	6.4 ± 1.2	5.4 ± 1.7	6.4 ± 1.0	5.5 ± 1.7	6.5 ± 1.1	6.4 ± 1.1	42.1 ± 10.4
...bone health"	6.5 ± 1.7	5.7 ± 1.7	6.4 ± 1.2	5.7 ± 1.7	6.5 ± 1.1	6.5 ± 1.1	42.9 ± 10.7
...weight management"	5.2 ± 1.7	4.0 ± 2.0	5.6 ± 1.6	3.7 ± 1.9	5.2 ± 1.6	5.2 ± 1.7	29.2 ± 14.9
...cardiovascular health (including hypertension)"	5.1 ± 1.8	4.3 ± 2.0	5.3 ± 1.9	3.7 ± 1.9	5.3 ± 1.7	5.1 ± 1.9	29.1 ± 15.5
...growth in pregnancy, lactation, infancy and childhood only"	5.5 ± 2.1	4.7 ± 2.2	5.4 ± 2.1	4.6 ± 2.2	5.6 ± 2.1	5.5 ± 2.1	33.8 ± 17.5
...adverse reactions"	3.1 ± 2.0	2.9 ± 1.9	2.8 ± 2.0	2.7 ± 1.9	3.0 ± 1.9	2.9 ± 2.0	10.6 ± 12.6
...familiarity"	5.5 ± 1.6	3.5 ± 2.4	5.9 ± 1.4	5.7 ± 1.5	5.6 ± 1.5	5.7 ± 1.5	33.0 ± 13.6
...performance in physical activity"	4.9 ± 1.9	3.7 ± 2.0	4.8 ± 1.9	3.9 ± 1.9	5.0 ± 1.8	4.8 ± 1.9	26.3 ± 15.5
...cancer development"	2.1 ± 1.6	2.0 ± 1.3	2.0 ± 1.6	2.3 ± 1.8	2.1 ± 1.6	2.2 ± 1.7	6.2 ± 9.9
...diabetes mellitus"	2.3 ± 1.8	2.1 ± 1.5	2.1 ± 1.7	2.3 ± 1.7	2.3 ± 1.8	2.5 ± 1.9	8.1 ± 11.6
...environmental concerns"	2.5 ± 1.8	2.2 ± 1.6	2.3 ± 1.7	2.5 ± 1.9	2.5 ± 1.8	2.4 ± 1.8	8.6 ± 11.6

<sup>1</sup>Behavioural belief: "For me 2–3 servings of (dairy or selected food items) are associated with..."; Scale: 1 (unlikely) to 7 (likely).

<sup>2</sup>Outcome evaluation: "For me 2–3 servings of (dairy or selected food items) are important for..."; Scale: 1 (unlikely) to 7 (likely).

<sup>3</sup>Behavioural belief × Outcome evaluation.

## Discussion, Recommendations and Conclusion

Against the backdrop of poor compliance with dietary recommendations internationally<sup>15,16</sup> and low intakes of dairy-related nutrients in South Africa,<sup>14</sup> this study showed that few local nutrition professionals – the presumed opinion leaders in the field of dietary behaviour – habitually consume 2–3 servings of dairy daily. The challenge related to promoting dairy intake in South Africa is thus at least two-pronged: firstly, addressing the dairy-related behaviour of nutrition professionals so as to make them credible educators, advocates and agents of change;<sup>21</sup> and, secondly, to address the population at large.

The findings from this study provide direction for promoting dairy intake of nutrition professionals. Among those with the resources to do so, current high intakes of yoghurt and cheese,

with emphasis on low-fat versions, should be reinforced. In addition, modifying current milk-intake patterns so as to increase the "as such" consumption, particularly among children for strong habit formation,<sup>38</sup> is recommended. Decreased dairy consumption during adolescence appears to be primarily driven by reduced milk intake.<sup>39</sup> Interventions during childhood occur in a critical period,<sup>40</sup> and a systematic review provides some evidence of effectiveness in terms of increasing dairy intake.<sup>41</sup> Lastly we strongly suggest introducing maas into the diet, through increased exposure (e.g. through tasting), knowledge dissemination (e.g. explaining the new relevant regulations [i.e. Act 119 of 1990: Regulation R.260 of 2015]) and skills transfer (e.g. recipes and ideas for use). Promoting "as such" milk and maas intake would be part of the healthy and sustainable food and diet approach called "Plates, pyramid, planet".<sup>42</sup> Since it is

**Table 4:** Means  $\pm$  standard deviations of normative beliefs, motivation to comply and subjective norms ( $n = 261$ )

Significant others	Normative belief score <sup>1</sup>	Motivation to comply score <sup>2</sup>	Subjective norm score <sup>3</sup>
My professional training	6.5 $\pm$ 1.1	6.1 $\pm$ 1.5	40.3 $\pm$ 12.3
Scientific evidence	6.4 $\pm$ 1.1	6.6 $\pm$ 0.8	41.8 $\pm$ 10.3
International and SA authorities	6.4 $\pm$ 1.0	5.8 $\pm$ 1.5	37.4 $\pm$ 12.6
Doctors with whom I work	4.6 $\pm$ 1.7	4.2 $\pm$ 1.8	20.2 $\pm$ 13.5
My family/relatives/friends	4.8 $\pm$ 1.6	3.9 $\pm$ 1.8	20.1 $\pm$ 13.5
My culture	5.3 $\pm$ 1.5	3.8 $\pm$ 1.9	21.2 $\pm$ 13.6
Media	4.9 $\pm$ 1.7	3.2 $\pm$ 1.9	16.7 $\pm$ 13.5
General dairy intake subjective norm score <sup>4</sup> (95% CI)			5.6 $\pm$ 1.6 (5.4; 5.8)
Calculated dairy intake subjective norms scale <sup>5</sup> (95% CI)			197.6 $\pm$ 63.4 (189.8; 205.4)

<sup>1</sup>Statement: "According to (significant other), I should have 2–3 servings of dairy daily." (1 = should not; 7 = should)

<sup>2</sup>Question: "How much do you want to do what (significant other) recommends?" (1 = not at all; 7 = very much).

<sup>3</sup>Normative belief  $\times$  motivation to comply.

<sup>4</sup>Statement: "People who are important to me think that I should not (=1)/should (=7) have 2–3 servings of dairy daily".

<sup>5</sup> $\Sigma$  normative belief,  $\times$  motivation to comply.

likely that maas consumption is largely characteristic of cultural groups that are currently underrepresented in the nutrition profession, transformation of the composition of the professions to more closely reflect the South African demographics, may in the long-term be associated with higher intakes of maas in this group.

This study described – within the TPB – personal, social and environmental factors of South African nutrition professionals

influencing the consumption of 2–3 servings of dairy daily. Among the personal factors it was found that the behavioural beliefs related to the four individual dairy products investigated (i.e. milk, maas, yoghurt and cheese), largely followed a similar pattern across the twelve items in the scale used, with some product-specific differences, mainly related to maas. The attitude scores ranged from high for items related to well-established properties of dairy (e.g. bone health and nutritional quality), to low for items associated with less known and/or controversial associations (e.g. cancer development,<sup>43–47</sup> diabetes mellitus<sup>48</sup> and environmental concerns<sup>49,50</sup>). The positive attitudes should be strengthened, whereas empowerment regarding interpretation of complex matters should be undertaken.

The social factors included measurement of the nutrition professionals' perception of significant others' norms and their own motivation to comply with these significant others. It emerged that scientific information and their professional training were perceived by nutrition professionals to be most important in terms of supporting a dairy intake of 2–3 servings per day. Media was ranked lowest as a subjective norm, suggesting rationality as a driver of behaviour. We, hence, recommend ongoing capacity development of existing and emerging nutrition professionals to critically judge the strength of scientific evidence linking dairy to health. Studies such as those by Quann *et al.*<sup>3</sup> and Drewnowski,<sup>51</sup> but for the South African context, could shape nutrition professionals' attitudes towards dairy, since scientific information was found to be a strong normative belief. Alliances between academia and institutions charged with nutrition promotion should be explored as an effective way to appropriately promote milk, maas or yoghurt intake.

Barriers and facilitators to dairy intake represented the environmental factors. The data showed that the scores for the potential barriers or facilitators to own intake were similar and suggested a perception of having control to consume 2–3 servings of dairy daily. The scores for clients' dairy intake were also similar, but significantly lower than those for the nutrition

**Table 5:** Means  $\pm$  standard deviations of nutrition professionals' and their adult patients'/clients' control beliefs, perceived power and behavioural control scores

Facilitators/Barriers <sup>1,2</sup>	Control belief score <sup>1</sup>		Perceived power score <sup>2</sup>		Perceived behavioural control score <sup>3</sup>	
	Own	Adult client	Own	Adult client	Own	Adult client
... are not readily available or accessible in your home	4.6 $\pm$ 2.1	3.4 $\pm$ 2.1	5.6 $\pm$ 1.9	3.6 $\pm$ 2.1	27.7 $\pm$ 17.1	15.5 $\pm$ 15.9
... are not readily available or accessible outside your home (e.g. at work or no shops close by)	4.2 $\pm$ 2.2	3.4 $\pm$ 2.1	5.5 $\pm$ 2.0	3.7 $\pm$ 2.1	25.0 $\pm$ 17.1	15.9 $\pm$ 16.0
... are expensive	4.5 $\pm$ 1.8	3.1 $\pm$ 2.0	5.0 $\pm$ 1.9	3.1 $\pm$ 2.0	24.1 $\pm$ 15.2	12.8 $\pm$ 14.0
... might go bad (perishability)	4.5 $\pm$ 1.9	3.4 $\pm$ 1.9	5.2 $\pm$ 1.8	3.7 $\pm$ 1.9	25.0 $\pm$ 15.3	15.4 $\pm$ 14.2
... have unclear intake recommendations <sup>4</sup>	NA	3.3 $\pm$ 1.6	NA	3.8 $\pm$ 1.9	NA	13.9 $\pm$ 11.3
General dairy intake control <sup>5</sup> (95% CI)					6.3 $\pm$ 1.2 (6.1; 6.4)	4.6 $\pm$ 1.5 (4.4; 4.8)
Calculated dairy intake control <sup>6</sup> (95% CI)					101.8 $\pm$ 54.6 (95.1; 108.4)	71.7 $\pm$ 60.3 (63.5; 80.0)

<sup>1</sup>Question: "How difficult is it for you/your adult clients/patients to have 2–3 servings of dairy daily if these (facilitator/barrier) ... ?" (1 = very difficult; 7 = very easy).

<sup>2</sup>Question: "To what degree do the following conditions prevent you/your adult clients/patients from having 2–3 servings of dairy daily?" (1 = great influence; 7 = no influence).

<sup>3</sup>Control belief  $\times$  corresponding perceived power.

<sup>4</sup>Only asked in relation to client.

<sup>5</sup>Question: "How much control do you feel you/your adult clients have to consume 2–3 servings of dairy daily?" (1 = no control; 7 = great control).

<sup>6</sup> $\Sigma$  control belief,  $\times$  perceived power.

professionals' own intake. It follows that nutrition professionals should be enabled to develop or use tools or techniques that will increase their clients' propensity to choose dairy and overcome perceived cost and access barriers to intake.

The information obtained from this study may guide nutrition promotion among South African nutrition professionals. This approach to tailored consumer messaging has been described previously. Kim *et al.*,<sup>34</sup> for example, used the TPB to conclude that for elderly Americans, nutrition education should focus on improving their attitudes and removing the barriers to dairy consumption, whilst the subjective norms played a minor role. Similarly Nolan-Clark *et al.*<sup>19</sup> found that normative beliefs were less amenable to change, and that interventions aimed at changing dairy-related behaviour should focus on modifying control and behavioural beliefs. We are not aware of studies using the TPB focussing on dairy among nutrition professionals, even though the importance of nutrition professionals' attitudes towards food and nutrition-related matters has been studied within various other theoretical frameworks.<sup>52,53</sup>

Notwithstanding a reasonable sample size, it is debatable whether a response rate of 15% makes the findings representative of the population. This occurred despite duplicate invitations to participate through ADSA, relatively low respondent burden by using the personal computer and mobile-friendly e-format, and the lucky draw. Our premise that nutrition professionals' personal disposition is related to their professional nutrition promotion, or whether the saying "do as I tell you to do, don't do as I do" applies, requires substantiation. The strength of the study lies in its uniqueness, locally and internationally, in terms of investigating nutrition professionals' socio-cognitive disposition related to a dairy food-based dietary guideline, within a rigorously applied conceptual framework, the TPB.

Implementation of the South African "milk-maas-yoghurt guideline" – even without the quantification thereof – is profoundly complex as it is determined by many factors. Knowledge of nutrition professionals' attitudes and perceived norms and facilitators or barriers related to dairy intake, allows for responsive interventions in this target group either on the personal, social or environmental level. These recommendations constitute one link in bridging the current guideline-practice gap and may result in an increased likelihood of effective nutrition (i.e. dairy) education by the nutrition professionals as agents of change.

*Conflict of interest* – The authors declare that they are both members of the Technical Advisory Committee of the CEP of Milk SA.

*Acknowledgements* – This study was funded by the Consumer Education Project (CEP) of Milk SA, but conducted and published independently. The Technical Advisory Committee of the CEP and participating dietitians and nutritionists/nutrition scientists through ADSA and NSSA are hereby acknowledged.

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Received: 24-06-2016 Accepted: 24-09-2016