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Ellen Faherty

Munster Technological University, ellen.faherty@mycit.ie

Kelsey Hough

Munster Technological University, kelsey.hough@mycit.ie

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# **Analysis of the Reasons and the Extent to Which Irish College Students Use Vitamins and Supplements in 2021**

**Ellen Faherty\* and Kelsey Hough\***

\*Department of Biological Sciences, Munster Technological University, Bishopstown, Cork, Ireland.

## **ABSTRACT**

The aim of the current study was to establish the health, personal and social factors that influence the use of vitamin/supplements (VS) among college students in Ireland. An online questionnaire was carried out on 495 Irish third level students during March 2021. The questionnaire included enquiries about demographic characteristics, understanding of health, VS use and factors that influence this. VS use was reported by 82.6% of the surveyed population despite previously published reports that VS usage is typically higher in older cohorts. It was seen that Vitamin D, multivitamins and iron are used most commonly. This usage was highly influenced by the desire to maintain general health on a personal level and also encouraged more socially by global health threats. Students' use of VS is affected by a broad array of factors. The most common health related factor that influenced VS use was the emerging correlation between Vitamin D and improved COVID-19 prognosis. Recommendations from friends, family and word of mouth proved to be the most influential social factor while on a personal level maintenance of general health was the most impactful factor. This highlights a worrying trend as it is clear a gap exists between medically diagnosed deficiencies and VS usage. Existing knowledge could be enhanced with additional information and education on this topic for both the consumer and medical professionals.

**KEYWORDS:** Vitamins, supplements, college, students, Irish.

## **INTRODUCTION**

A food supplement is defined by the European Food Safety Authority as a concentrated source of nutrients or other substances with a nutritional or physiological effect, whose purpose is to supplement a normal diet (EHSA, 2017). The use of vitamins/supplements (VS) has been seen to steadily increase with time, perhaps owing to the increased variety of VS available which has increased from 700 in 2007 to 2,500 in 2017 (Food Safety Authority of Ireland, 2020). This is also due in part to the personal, social and health related factors perceived by the user that change with time. Due to the rapid changes seen in such trends, the findings of this study would be better complimented by more recent reports however this data was not available at the time of analysis.

The global dietary supplement market size was estimated at \$140.36 billion in 2020 and is expected to reach \$151.85 billion in 2021 (Grandview Research, 2018). This lucrative market requires regulation to protect both product integrity and consumer safety. The EU Register of Nutrition and Health claims provides a reference of the acceptable health claims that can be made by a product with the aim of protecting the consumer from emphatic advertising and marketing efforts (EU Commission, 2008). This ensures that any claim made in the EU is clear, accurate and based on scientific evidence.

The evidence from numerous studies shows that VS users differ from non-users in demographic characteristics as well as certain psychological factors (Dickinson and MacKay, 2014). VS use in many populations has been consistently reported to increase with age, education, and socioeconomic status, with females being more likely to use VS also (Dickinson and MacKay, 2014). Previously reported reasons for VS use refer to improvement and maintenance of general health and help in attaining recommended intakes. These associations with VS use have been studied extensively in other countries, however little is known about VS users and non-users in Ireland.

VS use in Ireland is most relevant in the context of Vitamin D supplementation. Vitamin D deficiency is common across all age groups in Ireland with 47% of 18–39-year-olds suffering from this deficiency (Joint Committee on Health, 2021). The recommended intake of 20-50ug per day cannot be met by diet alone constituting the need for supplementation (Joint Committee on Health, 2021). This represents warranted use of VS across the population, exemplifying a rich environment in which to study VS consumption in a broader context. However, this is outside the scope of the current study.

The aim of the current study was to determine the health, personal and social factors that influence VS use among Irish students, the first investigation of this kind in this population.

## **MATERIALS AND METHODS:**

### **Survey Population**

This study is based on Irish third level students between the ages of 18 to 30+, conducted from March 1st to March 29th, 2021. Three demographic characteristics were used as covariates in the analysis: gender, age and perception of own health status to which the respondents belong. A total of 500 students were surveyed of which 495 were deemed valid. Excluded were those who did not provide valid acknowledgement of consent.

### **Ethical Approval**

An ethics application was made to the module co-ordinators in lieu of MTU Research Ethics Committee and submitted on the 23<sup>rd</sup> of February 2021. The application form provided details on the research protocol through a series of yes or no questions and description of the research to be undertaken. In the interest of ethics all data collected was anonymized. The participants were briefed on the purpose of the study asked to consent to the collection and storage of the data provided. Data was stored on personal computers with protective passwords. The data was retained for the duration of the research and destroyed in June 2021.

### **Questionnaire Design**

The survey was conducted using Google forms. The use of VS was ascertained using a combination of open and closed question types with participants provided with the option for free text in some cases. The analysis was limited to dietary supplements containing vitamins and/or minerals or both and included those both freely available and medically prescribed. Individual and combined preparations of vitamins and minerals were included. Excluded from this analysis were meal replacement products.

### **Mechanism of Distribution**

Surveys were distributed online via University College Cork's student survey database. Social media were also used as a means of distribution via link sharing on Facebook and WhatsApp.

## **Mechanism of Data Analysis:**

Data generated from the Google forms survey were transformed and gathered on Microsoft Excel for analysis, being also categorical in nature. Likert scale analysis was applied to appropriate questions and analysed accordingly in terms of percentage of total survey population. Options provided in free text were also analysed and tabulated accordingly. Bar charts were used to represent the data provided in relation to the main reasons, personal factors and health related influences that impact the student's use of VS.

## **RESULTS**

### **Participant Characteristics**

A total of 495 student responses were included in the analysis. The participants were characterised as follows: Sex (77.2% females, 22.2% male, 0.4% non-binary, 0.2% prefer not to say.) The age of the population ranged from 18 to 30+ with the age breakdown as follows: (18-20, 35.4%.) (21-23, 43.6%) (24-26, 7.5%) (27-29, 3.8%.) (30+, 9.7%).

Participants were also characterised in terms of college department (29.3% Science, Engineering and Food Science), (25.7% Medicine and Health), (21.8% Arts, Celtic Studies and Social Science), (18.8% Business and Law), (4.4% Other).

### **Participants' Health and Prevalence of Vitamin/Supplement usage**

When asked to rate their health, participants responded as follows: 31.9% very good, 51.7% good, 13.9% moderate, 2.4% poor, 0% very poor.

Participants were then asked whether they use vitamins or supplements with 82.6% responding yes and 17.4% responding no. In addition to this, participants were asked which vitamins/supplements they use, as summarised in table 1 in which % represents the percentage of respondents. Of the survey population who take VS, 75.3% indicated that they take more than one vitamin/supplement while 24.7% take only one.

The survey population who do not use vitamin supplements were asked to provide reasons for this choice. A selection of common reasons were provided along with the option of free text with participants invited to select as many options as applied to their choice. A total of 88 valid responses were obtained of which 63.6% selected only one reason for their choice while the remaining 36.4% selected 2+ reasons for choosing not to take VS. The results are summarised in table 2.

**Table 1: Breakdown of vitamins/supplements used by 82.6% of survey population.**

Vitamin/Supplement	%	N=	Vitamin/Supplement	%	N=
Vitamin D	19.3	240	Biotin	0.16	2
Multivitamins	16.2	201	Iodine	0.16	2
Iron	13.7	170	Echinacea	0.16	2
Vitamin C	11	137	Spirulina	0.16	2
Omega 3/Fish Oil	9.08	113	Coenzyme Q10	0.16	2
Vitamin B (incl. B12)	8.6	107	Curcumin	0.16	2
Magnesium	5.6	70	Antioxidants	0.08	1
Zinc	5.2	65	DIM	0.08	1
Calcium	3.1	39	Peppermint capsule	0.08	1
Probiotics	1.52	19	Glucosamine	0.08	1
Vitamin A	1.2	15	Glucosamine	0.08	1
Evening Primrose Oil	0.8	10	L-arginine	0.08	1
Folic Acid	0.56	7	Lysine	0.08	1
Protein Powder	0.32	4	Lemon Theanine	0.08	1
Collagen	0.24	3	Ginseng	0.08	1
Ashwaganda	0.24	3	Menomin	0.08	1
Revive active	0.24	3	Vegan Supplement	0.08	1
Creatine	0.16	2	Stress Reducing Supplement	0.08	1
Apple Cider vinegar supplement	0.16	2	Royal Jelly	0.08	1
Vitamin E	0.16	2	Rhodiola Rosea	0.08	1
Vitamin K	0.16	2	Ginkgo Biloba	0.08	1
Selenium	0.16	2	Hair, Skin, Nail supplement	0.08	1

**Table 2: Analysis of the reasons why students did not use vitamins/supplements in a survey of Irish students aged 18 years and over (N=86):**

Reason	Percentage of Respondents (%)
I find it too difficult to get into the habit	30.4
I believe my diet satisfies my requirements	26.4
I do not feel confident in choosing a vitamin/supplement for myself	17.6
I do not believe the proclaimed benefits of vitamin/supplement usage	8.8
Cost	7.2
I did not see benefits from previous use	6.4
No evidence for vitamin/supplement usage in the absence of deficiency	1.6
Never thought about taking a vitamin/supplement	0.8
Adverse reaction to vitamin usage (Vit C, Headaches)	0.8

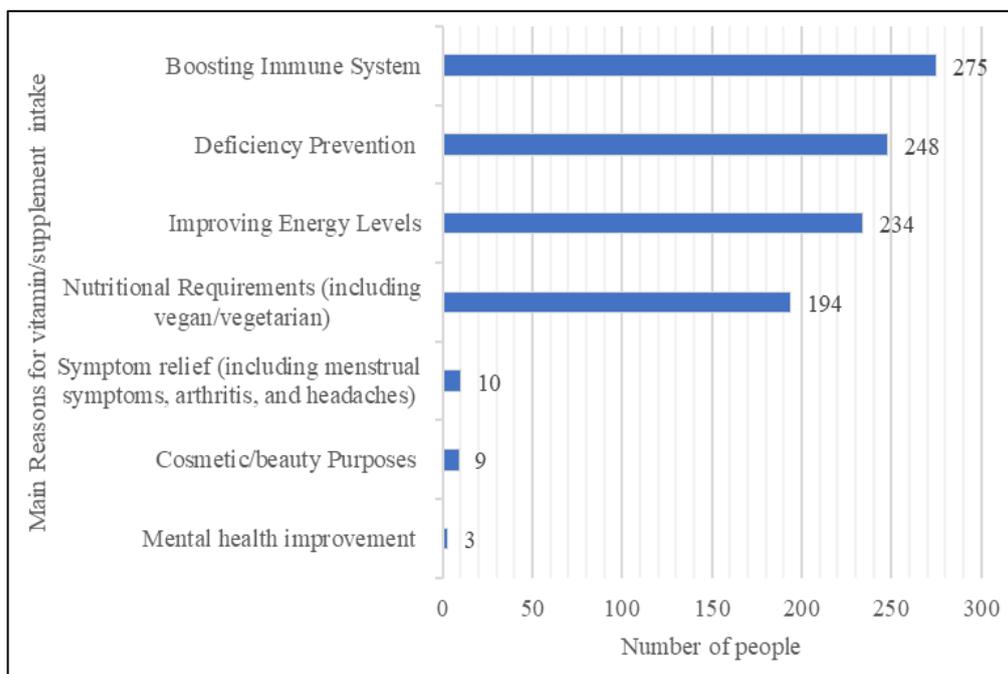
Participants were also asked to describe the frequency of their VS usage. From students who provided valid responses (n=418) results were as follows: Every day (66.74%), Regularly (2-3 times a week) (22.72%), Seasonally (6.46%), In response to events (e.g. disease outbreaks/holidays abroad) (2.63%), As remembered (0.96%), In response to deficiency testing (0.48%).

Of the total survey population (n=495), 37.2% had been tested for a vitamin or mineral deficiency while the remaining 62.8% had not been. When asked to provide details of such testing a total of 182 valid responses were obtained with results analysed in terms of individual vitamin/mineral deficiencies which resulted as follows: B vitamins, including B12, (60.9%), Iron (35.3%), Vitamin D (22.2%), Broad panel blood test for deficiencies (5.3%), Calcium (3%), Folic acid (2.6%), Vitamin C (1.9%), Zinc (1.1%), Iodine (0.8%), Copper (0.4%), Potassium (0.4%), Phosphorus (0.4%), Magnesium (0.4%), Vitamin A (0.4%).

**Influences and Purposes for Vitamin/Supplement Usage:**

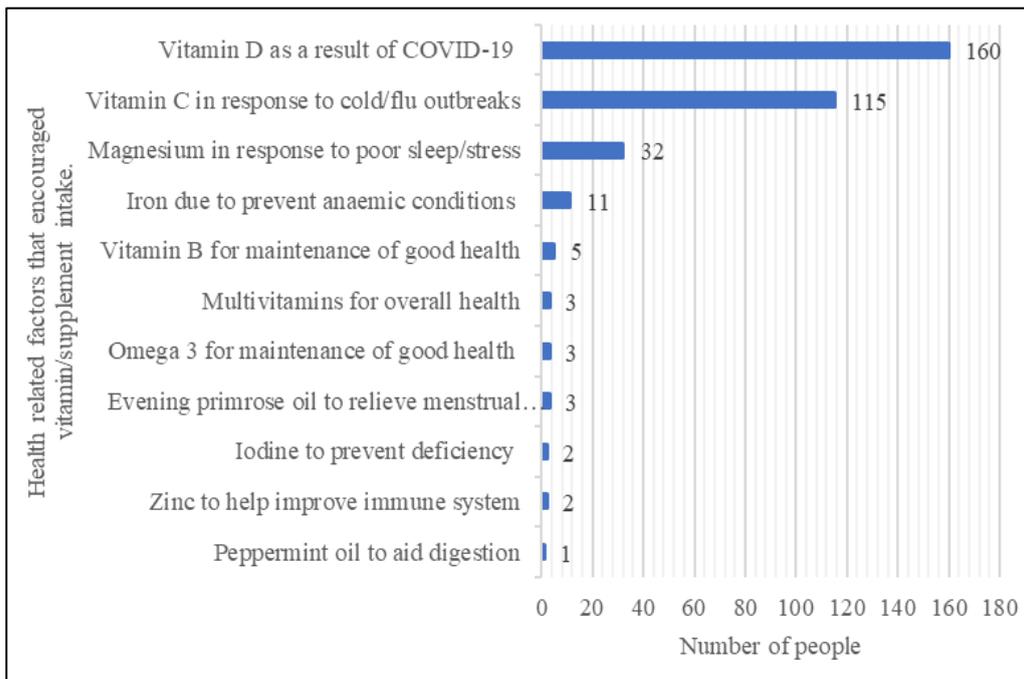
The survey population that uses vitamins/supplements (n=412) were asked to further describe the health, personal and social factors that influenced their VS use.

Participants were invited to select all reasons that applied to their VS usage, with the option for free text provided. The main reasons for VS intake were as follows: Boosting immune system (28.3%), deficiency prevention (25.5%), improving energy levels (24%), nutritional requirements (19.9%), symptom relief (1%), cosmetic/beauty purposes (0.9%) and mental health improvement (0.3%). A total of 20.6% of the survey population (n=412) did not detail the main reasons for VS usage.



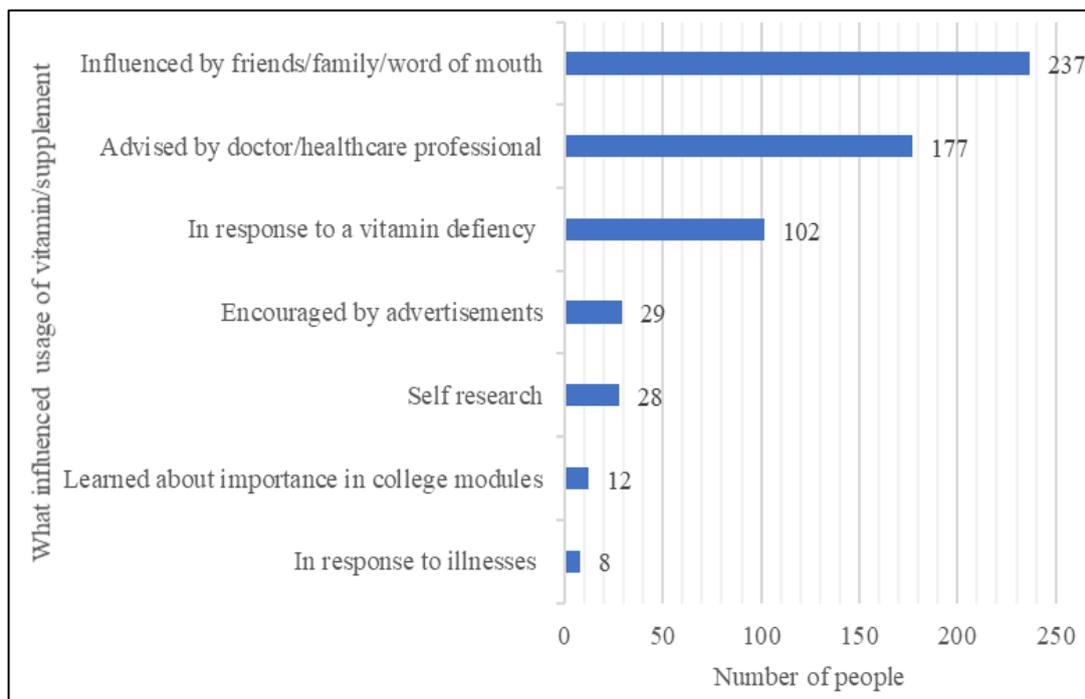
**Figure 1: The main reasons for vitamin/supplement intake.**

A total of 40% of the survey population said that no health-related factors encouraged their VS use. The remaining 60% were asked to select all reasons that applied to their intake with the additional option for free text. Answers are in terms of multiple options. Taking vitamin D as a result of COVID-19 (47.5%) was the most common factor. A third of the survey population (34.1%) thought cold and flu outbreaks to be an encouraging factor for the use of vitamin C. Magnesium was used by 9.5% of respondents in response to poor sleep/stress. The most prevalent factor detailed in free text was iron to prevent anaemic conditions (3.3%).



**Figure 2: Health related factors that encouraged vitamin/supplement intake among the survey population.**

Respondents were provided with common influences of VS usage and provided with the option of free to disclose any influences that apply. Analysis accounts for multiple options selected by respondents. The influences for VS use were as follows: influenced by friends/family/word of mouth (40%), advised by doctor/healthcare professional (29.8%), in response to a vitamin deficiency (17.2%), encouraged by advertisements (4.9%), self- research (4.7%), learned about the importance in college modules (2%) and in response to an illness (1.3%).



**Figure 3: Personal and social factors that influenced use of vitamins/supplements.**

## **Personal Understanding and Behaviour regarding Vitamin/Supplement Usage:**

It was important to address how understanding of VS influenced behaviour and opinions. Therefore, participants were asked whether they believed all VS preparations for any vitamin are created equally. Results were as follows: Yes (11.5%), No (53.3%), I do not know (35.2%).

The survey population who believed all VS were not created equally were asked what they think makes a particular VS superior. Respondents (n=298) were asked to choose from a selection of common options and were also invited to disclose any extra information in the option for free text in which the following results were obtained: dose per unit (23.3%), ingredient type (21.1%), third party verification (21%), form (tablet, liquid, spray, gummy) (17.5%), cost (16.5%), bioavailability (0.4%), and brand reputability (0.1%).

The participants' understanding of the role of VS in health was explored by asking if they had little disposable income whether they would choose to improve their health through food choices/nutrition or through supplementing with VS. 88.1% said they would improve their health through food choices/nutrition while the remaining 11.9% said they would choose to supplement with VS.

## **DISCUSSION**

A survey was conducted of students in third level education in Ireland in 2021 with the aim to establish health, personal and social factors that affected how the students incorporate vitamins/supplements (VS) into their lifestyles. Food supplements are defined by the European Health Safety Authority as concentrated sources of nutrients or other substances with a nutritional or physiological effect. (EHSA, 2017). It is believed that this is the first investigation of its kind among third level students in Ireland.

In order to perform a critical investigation of VS usage among an Irish student population, it was first important to gain an understanding of how participants perceive their own health. Likert scale analysis was applied, with the majority of participants rating their health as good (51.7%) or very good (31.9%). Of the 495 valid responses obtained, 82.6% were VS users while the remaining 17.4% were not. The incorporation of VS into one's routine is influenced by a number of factors and therefore a comparison was made between both those who use VS and those who choose not to.

Of 418 VS users, 66.7% consume VS daily, indicating that VS are a part of their everyday routine and are seen as a positive contributor to health. VS are used seasonally by 6.5% of respondents suggesting they are conscious of potential associated benefits, relating to, for example, cold and flu symptoms during flu season, thus having a positive outlook on VS usage. A further 2.6% take VS in response to events (e.g., disease outbreaks/holidays abroad) indicating that their intake is influenced by current affairs such as the COVID-19 pandemic and emerging research that links Vitamin D to improved prognosis due to its role in the orchestration of the innate and adaptive immune response (McCartney and Byrne, 2020). This indicates that attitudes are malleable and students are open minded to new emerging research that links to their wellbeing.

Notably, less than 1% (0.96%) of users revealed they only take VS as they remembered, indicating that intake is not a habit they prioritise when considering their health. A final 0.5% of users do so in response to deficiency testing. It is not clear whether this low percentage may be due to the lack of deficiency testing amongst the student population or conversely, the absence of deficiency as a result of participants being regular users of VS, preventing states of deficiency developing. A study of students across 5 U.S universities revealed that college students consume more dietary supplements than the general population (Liebermann et al. 2015). Moreover, it has been proven longitudinally that supplementation increases with age, making it likely that habits formed during student life will not only continue but develop further (Liebermann HR et al. 2015).

Of the VS users surveyed, the majority (54.9%) reported being satisfied that their chosen VS lived up to its claim. A further 16.8% reported being very satisfied with their chosen VS while just 1.5% report being unsatisfied with the VS used. A health claim is any statement that establishes a relationship between dietary intake of a substance and health. The EU register of Nutrition and Health Claims provides a library of both authorised and non-authorised health claims that can be made by an individual nutritional supplement based on scientific research, prohibiting the sale of misleading products in the EU (EU Commission 2008). The students' awareness of this legislation was not established in the current study nor was the basis of their satisfaction (medically defined or personal opinion).

Levels of satisfaction among the survey population cannot be attributed to the efficacy of the VS used alone however, due to the myriad of personal factors that define satisfaction. It is difficult to define what is meant by a satisfactory result from VS use when this usage is not prescribed in a medical context and instead takes place outside medically quantifiable terms. Instead, this is more heavily reliant on personal opinion and perception of health on an individual basis. The potency of the placebo effect should be considered as the field of nutritional supplement research tends to neglect the use of placebo in supplementation studies (Frame, 2018). Satisfaction may also be affected by how compliant the user was relative to the products' recommended guidelines, whether or not deficiency was present and thus ameliorated by use or, whether the user had no insufficiencies due to a well-balanced diet and lifestyle to begin with.

Of the population identified as users, 75.3% use more than one VS regularly while the remaining 24.7% take only one. Evaluation of the individual VS used by students (Table 1) revealed that Vitamin D was the most common choice (19.3%), followed by Multivitamins (16.2%) and Iron (13.7%). The prevalence of Vitamin D usage among an Irish student population in 2021 can be contributed to both long-standing awareness of Vitamin D insufficiency in Ireland (O'Sullivan et al. 2008). A report published by House of the Oireachtas Joint Committee on Health revealed that 47% of 18–39-year-olds in Ireland had a Vitamin D deficiency (Joint Committee on Health, 2021). The current pandemic climate in which Vitamin D levels are positively correlated with improved prognosis regarding COVID-19 (McCartney & Byrne, 2020). This correlates further with motivations for usage detailed by students with 47.5% of those taking Vitamin D doing so as a result of COVID-19 (Figure 2), which demonstrates the impact of health-related factors on VS use.

Personal factors that influence VS use are also represented in the results generated. A large proportion of students in Ireland take VS preventatively regarding future health problems, as seen in Figure 1. Among the 418 users, 28.3% reported using VS to boost their immune system while 25.5% mentioned that their VS use was in an effort to prevent or manage deficiencies. The use of VS to maintain health was also identified as the most frequent motive in previous studies conducted, regardless of the age of participants (Frey et al., 2017). A study carried out among German adults indicated 'prevention of nutrient deficiencies' (62.4%) and 'achievement or improvement of general well-being' (34.7%) as the most common motives for VS use (Frey et al., 2017).

Taking VS for additional personal benefits besides prevention was also reported in this study in Figure 1 such as for the improvement of energy levels (24%). The basis for taking VS to improve energy was explored in a study among various populations worldwide, identifying that the decreased fatigue levels noted by the participants after starting various supplements may have been due to pre-existing deficiencies being managed (Tardy et al., 2020). Interestingly, 19.9% of students reported their use of VS was due to personal nutritional requirements as vegans or vegetarians. The large proportion of this group may be contributed to the age of the participants in this study with 54% of the vegan population and 48% of the vegetarian population in Ireland being between the ages of 18-34 (Bord Bia Insight Centre, 2018).

To gain a further insight into this role of VS in health, the student's likelihood of improving their health through food choices or through use of VS while having little disposable income was explored. A large proportion (88.1%) admitted they would improve their health through their nutritional choices while the remaining 11.9% said they would use VS as a means of improving health. The majority of students

choosing to use nutrition as a means of improving health could be due to the students broad understanding that having a

varied and balanced diet is sufficient for providing the vitamins and minerals needed (Tardy et al., 2020). Consequently, the 11.9% who would choose VS could be made up of those who are unable to get the required nutrients through their diet and require extra VS, such as vegans, vegetarians, and those with vitamin deficiencies. This highlights how complex VS use is in the absence of definitive deficiency testing.

Based on a study by Frey et al., (2017), common reasons related to general health are often reported to justify the use of VS. However, other studies have suggested that many VS users perceive supplements to be healthy but were unsure of what exact benefits or risks were associated with VS use (Barnes et al., 2016). This is reflected in the non-users surveyed in the current study of which 17.6% admitted they do not feel confident in choosing a VS for themselves. This presents an opportunity for deficiency testing to provide confidence to the VS user regarding their choice of VS and also the need for this.

The current study expanded on this literature to find that when asked directly about health-related factors that may have encouraged or influenced VS use, various reasons were provided for specific VS use, as seen in Figure 2. The results demonstrate an interesting trend, with a total of 47.5% of VS users reporting that the current understanding of Vitamin D enhancing the immunoprotection against SARS-CoV-2 encouraged them to supplement with Vitamin D (McCartney & Byrne, 2020). Similarly, it was discovered that 34.1% of students were encouraged to take Vitamin C in response to cold or flu outbreaks while 9.5% admitted to taking magnesium supplements because of poor sleep or periods of stress. These results from Figure 2 agree with the aforementioned statement that students are adaptable to incorporating new VS into their diets in response to external cues such as emerging research associated with health but are also aware of responses in their own bodies associated with a need for supplementation.

A study carried out on an Australian student population discovered that >50% of participants were uncertain of the effectiveness of the VS they used (Barnes et al., 2016). It is likely that this is due to difficulty in acquiring sources of information regarding which VS to use. When questioned on whether the students were aware if all VS were equal in their quality or concentration, 35.2% stated that they did not know, highlighting the requirement for further education on VS.

The current study also investigates the social factors that influenced the use of VS in the student population, as summarised in Figure 3. Interestingly, 40% of the population revealed they would be influenced to use VS based upon friends, family, and word of mouth. I

Conversely, 29.8% of students indicated their VS use was based upon advice from a doctor or healthcare professional. While this appeared to be a more trustworthy health source, a study carried out on medical students in Serbia suggested that the education in university modules on VS was lacking and that these healthcare professionals would not feel confident in identifying a VS for a patient to use (Stanojević-Ristić et al., 2017).

Of non-users of VS surveyed, 30.4% attributed their non-use to difficulty faced in adopting the habit of taking VS regularly (Table 2). Habit formation is central to a healthy lifestyle and research has shown that VS users are more likely to adopt habits conducive to health such as a consciously balanced diet and regular exercise habits than non-users (Dickinson et al. 2014). The intrinsic motives of users may explain their decisions to incorporate VS in active pursuit of optimal health and well-being despite this attitude and behaviour profile affiliating them with the population who require supplementation least (Dickinson et al. 2014). This is an example of habit aggregation that is seen among students and indeed the general population that increases positively with age and year of study in the context of health as described by a study of students in Queen's University Belfast and University of Ulster, Northern Ireland (Gray, 2006).

It appears that there is somewhat of an understanding of this concept among the student population as 26.4% of VS non-users said that a satisfactory diet justified their decision not to supplement. In the absence of clinical deficiency, VS usage does not reduce the risk of developing non-communicable disease such as cardiovascular disease, cancer and type 2 diabetes mellitus according to results obtained in randomised controlled trials (Zhang et al., 2020). A balanced diet lowers the risk of developing such disease states when sustained across the lifespan (CDC 2021).

The aim of the current study was to establish the health, personal and social factors that determine the use of VS among Irish third level students. It was discovered that students actively engage in VS use. Of the student population surveyed (n=495), 82.6% identify as VS users. When this is contrasted with the proportion of the same population who have been tested for deficiency, (37.2%) it is apparent that there is a gap between levels of usage and levels of testing. VS use among college students is found to be more influenced by nonmedical advice, particularly from friends, family or word of mouth in 40% of cases. This identifies the impact of social influence when choosing to improve one's health, raising the question of whether the general population, as represented by students in this case, have greater confidence in non-medical, media type information sources than traditional medical advice. As established by Stanojević-Ristić et al, (2017), healthcare professionals felt their knowledge of VS from university degree level was insufficient when advising patients. From this it becomes apparent that VS knowledge and information needs to be disseminated from expert level not only to the consumer directly, but also to medical professionals.

Aside from mainstream marketing of VS, additional education or information on such products would be well received by the student population having determined the baseline level of interest in this study. The significance of VS use in student life could be better explored across an extended time period spanning multiple seasons with change in tendencies noted. The current COVID-19 pandemic has induced hyperawareness of health and wellbeing with a potential increase in VS usage as a result. This represents the impact of health-related factors on VS usage among students. This cannot be disclosed with certainty as this study provides the first detailed investigation into this topic among the student population in Ireland, however.

**Corresponding author:** Kelsey Hough (kelseyough7@gmail.com)

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