

# **Fruits and vegetables consumption among elderly people: a cross sectional study from Iran**

Leili Salehi<sup>1</sup>, Hassan Eftekhar<sup>2</sup>, Kazem Mohammad<sup>3\*</sup>, Sedigheh Sadat Tavafian<sup>4</sup>, Abolghasem Jazayeri<sup>5</sup>, Ali montazeri<sup>6\*</sup>

1 Department of Health Education, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

2 Department of Health Education, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

3 Department of Epidemiology and Statistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran.

4 Department of Health Education, Faculty of Medicine, Tarbiat Modares University, Tehran, Iran

5 Department of Nutrition, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

6 Department of Mental Health, Iranian Institute for Health Sciences Research, ACECR, Tehran, Iran

## **Authors' e-mail:**

LS: [leilisalehi@razi.tums.ac.ir](mailto:leilisalehi@razi.tums.ac.ir)

HE: [eftkhara@sina.tums.ac.ir](mailto:eftkhara@sina.tums.ac.ir)

KM: [mohamadk@tums.ac.ir](mailto:mohamadk@tums.ac.ir)

SST: [tavafian@modares.ac.ir](mailto:tavafian@modares.ac.ir)

AJ: [jazayeria@sina.tums.ac.ir](mailto:jazayeria@sina.tums.ac.ir)

AM: [montazeri@acecr.ac.ir](mailto:montazeri@acecr.ac.ir)

### **Corresponding authors**

Professor Kazem Mohammad, Department of Epidemiology and Statistics, School of Public Health, Tehran University of Medical Sciences, P.O. Box 13214-14489, Tehran, Iran. E-mail: [mohamadk@tums.ac.ir](mailto:mohamadk@tums.ac.ir)

Professor Ali Montazeri, Iranian Institute for Health Sciences Research, P.O. Box 13185-1488, Tehran, Iran. AM: [montazeri@acecr.ac.ir](mailto:montazeri@acecr.ac.ir)

## **Abstract**

**Background:** There are substantial evidences that low fruits and vegetables consumption are major risk factors for many chronic diseases. The aim of this study was to assess fruits and vegetables consumption among elderly in Iran.

**Methods:** This was a cross sectional study to investigate on fruits and vegetables intake in a randomly selected sample of old people who were members of elderly centers in Tehran, Iran. A multidimensional questionnaire was used to collect data regarding demographic characteristics, daily consumption of fruits and vegetables, knowledge, self-efficacy, social support, perceived benefits, and barriers towards fruits and vegetables consumption.

**Results:** In total, 400 old individuals took part in the study. The mean age of participants was 64.07 (SD = 4.49) years, and most were female (74.5%). The mean served fruits and vegetables per day was 1.76 (SD = 1.15). Ninety seven percent of participants (n = 388) did not know recommended intake of at least five servings of fruits and vegetables in each day. Similarly, 88.3% (n=353) did not know the size of a single serving per day. The most frequent perceived benefits and barriers towards fruits and vegetables consumption were availability and being expensive. Perceived benefits (OR = 0.95, 95% CI = 0.93-0.98) and barriers (OR = 1.03, 95% CI = 1.01-1.06), and self-efficacy (OR = 0.92, 95% CI = 0.89-0.96) were significantly associated with fruits and vegetables consumption.

**Conclusion:** Fruits and vegetable intake among elderly in Iran was lower than the recommended minimum of five daily servings and varied greatly across age, education and income level. In addition the results indicated that low perceived benefits, low self-efficacy, and high perceived barriers could lead to lower consumption of F&V. It seems that in order to improve F&V consumption among Iranian elderly, raising awareness, improving

perception benefits and enhancing self-efficacy regarding F&V consumption should be receive more attentions. Indeed planning health education programs and nutritional interventions for this group of population are essential.

## **Background**

Coronary heart disease (CHD), cancer and stroke are important causes of death [1] that are more prevalent among elderly [2] and there are substantial evidences indicating that low fruits and vegetables (F&V) intake are major risk factors for such diseases [3]. Several studies showed that enough consumption of F&V have been associated with reduced cancer risk [4,] and CHD [5]. Furthermore, previous studies have shown strong negative relationships between low F&V intake and obesity [6], diabetes [7] and hypertension [8]. Despite all these benefits of F&V on reducing burdens of chronic diseases, individuals have not yet adapted with the minimum recommended consumption of five servings of F&V per day that was recommended by the '5 A Day Program' [9]. Based on data obtained from F&V intakes in 21 countries (mainly developing countries) only in three countries, F&V intake meet the minimum World Health Organization (WHO) recommended consumption [10]. In response to the increasing burden of chronic diseases related to low consumption of F&V, and given the importance of early death prevention due to these diseases, the need for nutritional intervention programs has been emphasized.

A study showed several factors such as nutritional knowledge and attitudes towards the benefits of F&V intakes, skills and self efficacy in buying, preparing and serving F&V may influence an individual's likelihood of achieving five a day servings of F&V consumption [11]. It is stated that preventing disease and promoting healthy eating behaviors would be succeeded if these influencing variables were considered through appropriate behavioral models [12]. One of the most popular models for studying behavioral determinants is Trans Theoretical Model [13]. The core component of the model is the stage of change, with other

components such as process of change, decisional balance, and self-efficacy [14].

Many studies have shown variables that influence F&V consumption among elderly population worldwide [15-16], but little is known in Iran about the frequency, distribution, and determinants of the old population's consumption patterns for F&V [17]. In Iran the total mean energy intake exceeded requirements which mainly obtained from carbohydrate like simple sugar. Iranian diet is mainly composed of bread and rice as major energy sources while chronic diseases are main causes of mortality and morbidity in Iran [18] and has been found to have a raising trend in the country [19, 20]. In Iran, Cardio vascular disease (CVD) accounted for 38% of deaths [21], cancer is the third cause of death [22], diabetes accounted for 7.7% [23] and 82% of women and 63% of men above 50 years and over are overweight [24]. The present study was conducted to investigate F&V consumption and its determinants among elderly in Iran.

## **Methods**

### *Design and data collection*

This cross sectional study was conducted between September 2007 and April 2008 among a randomly selected sample of old people who were members of elderly centers in Tehran, Iran. Tehran has 23 elderly centers in which free educational and social services are offered to members. From all listed members of these elderly centers, a random sample of eligible people aged 60 years and over was selected. The individuals who did not agree to be studied and who were hospitalized or suffering from serious illness or experienced surgical operation (up to 3 months before the date of data collection) were excluded from the study.

Ethics committee of Tehran University of Medical Sciences approved the study. Before conducting the study, the aim, method and confidentiality were explained completely to the potential participants and if they were satisfied to take part in the study, they were asked to read and sign consent form. Furthermore, the headmasters of all 23 elderly centers were approached about their willingness to participate in the study. To collect data, trained interviewers conducted face-to-face interviews.

### *Instruments*

We used several instruments to collect data. These are explained as follows:

*1. Demographic and anthropometrics Questionnaire:* This part of questionnaire consisted of demographic and anthropometrics data including variables such as age, sex, education, income, and BMI (Weight was measured by a digital scales while the subjects were minimally clothed and not wearing shoes. Height was measured while the subjects were standing and not wearing shoes by a tape measure and the shoulders were in a normal position. BMI was calculated and expressed in kg/m<sup>2</sup>), Economic status was measured using the asset-based approach developed by Ferguson and colleagues [25] and has been used in previous cross-national studies of economic status and health in developing countries [26]. According to this scale, 0-3 assets were determined as low, 4-6 assets were determined as intermediate and 8 or more assets as high economic situation. The items considered as assets were: television, refrigerator, washing mashing, microwave oven, dishwasher, computer, electrical broom, and automobile and phone.

*2. Stages of change questionnaire regarding F&V consumption behavior:* This part of questionnaire was consisted of five statements by which the participants were categorized

into different stages of change: pre-contemplation, contemplation, preparation, action, and maintenance regarding his/her F&V consumption behavior. This part was included multiple-choice questions adapted from the literature [27]. Participants were asked to choose the statement that best described their status. Choices for the questions were 1) I am not currently consuming 5 servings of F&V a day and I am not thinking of doing so in the upcoming 6 months, 2) I am not currently consuming 5 servings of F&V a day but I have thought about that, 3) I am not currently consuming 5 servings of F&V a day but I plan to do so within the next 6 months, 4) I am currently consuming 5 servings of F&V a day but I have only been doing so for less than six months, and 5) I am currently consuming 5 servings of F&V a day and I have been doing that for more than six months. The reliability was assessed using Cronbach's alpha coefficient and it was found to be 0.79.

*3. Self-efficacy rating scale:* Self-efficacy was assessed using a five-item questionnaire developed by Ma et al. [27]. Each item is rated on a 5-point scale (from not at all confident to very confident regarding recommended F&V consumption behaviors and it gives a score ranging from 5 to 25. A higher score indicates a greater degree of self-efficacy. The scale was tested for validity and consistency and it was found to be valid (as assessed by content validity) and reliable (as examined by Cronbach's alpha coefficient that was equal to 0.95).

*4. Support rating scale:* In order to assess influences of family and friends on healthy eating, the 6-item family support healthy eating habits scale and the 6-item friend support for healthy eating habits scale were used [28]. Each item is rated on a 5-point scale (from none to very often) and it gives a score ranging from 6 to 30 for each section. The Cronbach's alpha coefficient for the scale was found to be 0.85.

*5. Knowledge instrument regarding F&V consumption:* The knowledge of participants was

measured using a six-item questionnaire. The first question was: "Would you say what is recommended servings for F&V consumption per day?" The response categories included '1', '2-3', '5 or more'. The second item was: "Would you say that a single serving of beans is 'more' 'less', or 'about as much' as can fit in the palm of your hand?" The next four items used an agree/disagree response format. The items were: "F&V are a good source of fiber"; "If you take vitamin pills, you do not have to eat a lot of F&V"; "Boiling and evaporation is best method to cook vegetables"; "As long as you eat F&V, it does not matter what color they are." Correct responses were summed to create a total knowledge score of 0 to 6. The scale was found to be valid (approved by ten nutrition specialists) and reliable (Cronbach's alpha coefficient was 0.72).

*6. Perceived benefits and barriers regarding F&V consumption:* This part was generated from previous studies and focus group discussions with convenience samples of older adults. The final perceived benefit questionnaire consisted of 16 items. Each item is rated on a 5-point scale ranging from very important to not at all important. The perceived barrier consisted of 11 items. Each item is also rated on a 5-point scale ranging from very important to not at all important. The total score for the perceived benefits ranged from 16 to 80 and for perceived barriers from 11 to 55. These scales were found to be valid and reliable. The Cronbach's alpha coefficient for the benefit scale was 0.73 and for the barrier scale it was 0.69.

*7. F&V daily consumption:* The last part of questionnaire consisted of different items that were related to available F&V in Tehran's Markets. Participants were asked to estimate their daily servings of F&V in breakfast, lunch, dinner, and between meals as snacks or deserts accordance with nutrition guideline card. The nutrition guideline card categorized

one serving of vegetables into one of three following groups: (1) one cup of raw green leafy vegetables such as spinach or salad; (2) one-half cup of other vegetables cooked or chopped raw, such as tomatoes, carrots, pumpkin, corn, Chinese cabbage, beans, or onions; and (3) one-half cup of vegetable juice. The nutrition guideline categorized one serving of fruit into one of three groups: (1) one medium size fruit, such as an apple, banana, or orange; (2) one-half cup of cooked, chopped, or canned fruit; and (3) one-half cup fruit juice, not artificially flavored. Two questions were asked about intake of F&V through using the 24-hour dietary recall data. Researchers were also instructed to tell respondents to consider a “typical day” to be one when a person is eating fruits or vegetables and not the average over the period of inquiry.

#### *Data analysis*

Descriptive and analytic statistics such as frequency, mean and standard deviation, one-way analysis of variance, t-test and logistic analysis were used to analyze the data.

Logistic regression analysis was performed to identify the magnitude of association between F&V serving eaten per day and independent variables including age, gender, education, marital status, economic status, chronic disease, and perceived benefits and barriers, self-efficacy and knowledge regarding F&V consumption. To avoid infinite odds ratios, some categories were merged. For example, marital status was categorized to ‘married’ and ‘never married, divorced, and widowed’. For the purpose of analysis relative to mean daily serving consumption, respondents were divided into two groups: those with equal or higher than

mean daily serving F&V consumption (good or better than good) and those with lower than mean (less than good).

The Pearson correlation coefficient was used to study the relationships between social support (friends and family) and F&V intakes.

### *Ethics*

Ethics committee of Tehran University of Medical Sciences approved the study. All participants gave informed const.

### **Results**

Of 454 eligible individuals, 32 individuals did not agree to be interviewed due dislike. Thus 422 individuals who signed consent form entered into the study. A total of 22 questionnaires were excluded from analysis due to incomplete answers. In total, 400 old individuals (102 men and 298 women) from 23 elderly centers took part in the study. The mean age of participants was 64.07 (SD = 4.49) years ranging from 60 to 87. The majority of participants were married (55%), unemployed (80%) with BMI between 25 and 29 (48%). The results showed that F&V consumption among participants was low. Overall, the mean serving of F&V intake eaten per day for the whole sample was 1.76 (SD = 1.15). Table 1 shows the characteristics of the study sample and the mean serving of F&V per day for the study subgroups.

The data analysis indicated that 97% of participants (n=388) did not know recommended

intake of at least five servings of fruits and vegetables in each day. Similarly 93% (n=372) did not know about the importance of F&V color; and 88.3% (n=353) did not know recommended size of one serving. However, 74.3% of participants (n=297) were acknowledged that F&V are an important source of fiber, 70.3% (n=281) correctly reported vitamin pills were not as valuable as F&V, 76% (n = 304) were aware of boiling and evaporating are healthy methods of cooking vegetables. The mean score of participants' knowledge was 2.41 (SD = 0.88), ranging from 0 to 6 with higher score indicating a better condition.

The perceived benefits and barriers regarding F&V intake are shown in table 2. The most frequent perceived benefits and barriers towards fruits and vegetables consumption were availability (95%) and being expensive (55.5%). The mean score for perceived benefits was 55.7 (SD = 8.86), ranging from 16 to 80 with higher scores indicating higher perceived benefits. The mean score for perceived barriers was 35.01 (SD = 8.2), ranging from 11 to 55 with higher scores indicating higher perceived barriers. The mean score for self-efficacy was 13.1 (SD = 6.23), ranging from 5 to 25 with higher scores indicating higher self-efficacy.

Logistic regression analysis was performed to estimate variables that contribute to less than good F&V consumption. The results of analysis are shown in Table 3. Except for perceived benefits (OR = 0.95, 95% CI = 0.93-0.98), perceived barriers (OR = 1.03, 95% CI = 1.01-1.06) and self-efficacy (OR = 0.92, 95% CI = 0.89-0.96), other variables did not show significant association with less than good fruit and vegetable consumptions.

Finally the correlation between F&V intake and support from family and friends was studied and it was found that there were significant correlation between F&V consumption and support ( $r = 0.31$ ,  $P < 0.001$  and  $r = 0.28$ ,  $P < 0.001$  respectively).

## **Discussion**

This study revealed that F&V consumption among Iranian elderly is much lower than recommended. Furthermore, the prevalence of low F&V consumption tended to be increased with age. Previous findings [29, 30] from high-income countries such as the U.S. and France showed that prevalence of low F&V consumption decreased with age. Many developing countries do not have any data on F&V consumption patterns in their populations [31]. Although previous studies [32, 33] showed significant differences between male and female in terms of F&V intakes, in the present study there were no differences between both genders.

As expected this study showed that participants who were more educated and wealthier had consumed more F&V. These results are similar to what have been reported by other investigators [34, 35]. It seems that more research is needed to assess any relationships between educational level of elderly people and their knowledge regarding F&V intakes.

Although this study showed the majority of participants had knowledge regarding different health benefits of F&V and also believed that vitamin pills are not real substitution for fresh F&V, nearly most participants did not know about the amount of daily F&V consumption and the correct size of F&V in each serving that recommended by WHO. Van Duyn and co-

workers indicated that being aware about how many F&V a person should eat per day has been associated with higher levels of consumption [36].

The current results provide further support for studies that indicate that F&V prices are a barrier to consumption for low-income consumers, and thus developing public policies to make F&V more affordable for low-income families should be examined [37]. A previous study indicated that one percent decrease in the price of F&V would lead to a 2% increase in the participations' consumption of F&V and 1% increase in family income would increase F&V consumption up to 4% [38].

According to results of this study, married participants in comparison with singles or widowers consumed more F&V. A study showed that just married men consumed more F&V in compared with single men and there were no differences between women in this regards [39]. This might indicate that there is need for further investigation on this issue in different cultures.

The finding of this study also indicated that social support from family and friends could increase F&V intakes among elderly participants. Others also reported positive relationship between social support from family and friends and F&V intake [40] Thrasuer et al. examined types rather than source of support as determinants of healthy eating among African American adults. They found that informational and instrumental support was associated with healthy eating [41] In Iran, most elderly are living with their family members and are well supported by informational, emotional and instrumental support, and

in case of living alone family members are responsible for their needs. Additionally, peer support predominantly gives emotional and informational support to them. This situation could lead to better healthy behaviors (such as F&V consumption).

Participants who had stood in more advanced stage of change of F&V consumption behavior were more likely to consume these foods. These are consistent with findings by other researchers [42]. These results implies that stage of readiness to change eating habits should be considered as influencing factors while planning interventions for increasing F&V. For example, motivational strategies for encouraging F&V consumption may be more effective for elderly who are in the pre contemplation or contemplation stages, while supportive strategies to maintain a level of F&V consumption may be more appropriate for who are in maintenance stage.

Consistent with other previous findings [43], our study found that elderly people who are in normal range of BMI consumed more F&V. This relationship might be explained by the lower energy density and higher volume of fiber and water content in F&V [44] which leads to more ideal weight.

Current study supported previous results [45] regarding higher intake of F&V due to chronic disease. The risk of chronic disease at older adults might increase consumption of F&V.

As this study showed, variables such as knowledge, perceived benefits and barriers and self-efficacy could significantly predict F&V consumption. It has been shown that self-efficacy,

and perceived barriers are important predicting factors for diet behaviors and many health behaviors [46, 47]. Furthermore, knowledge has also been associated with healthy eating [48]; therefore, one can indicate that improving individuals abilities through continued education and training may lead to enhanced intake of F&V. Thus, it is important that policy makers and all who are responsible for peoples' health should be aware of these influencing variables.

Given that all our respondents were members of elderly centers, the findings of this study might not be generalized to all elderly who live in Tehran. These elderly may differ from others in terms of socioeconomic status, family cohesiveness, social support, and availability and access to F&V. Further studies are needed to examine the mediating factors affecting F&V consumption in a larger and more diverse group of elderly.

## **Conclusion**

The findings demonstrated that F&V consumption among elderly was low and varied greatly across age, education and income level. In addition the results indicated that low perceived benefits, low self-efficacy, and high perceived barriers could lead to lower consumption of F&V. Therefore, it seems that in order to improve F&V consumption among Iranian elderly, raising awareness, improving perception benefits and enhancing self-efficacy regarding F&V consumption should be receive more attentions. Indeed planning health education programs and nutritional interventions for this group of population are essential.

**List of abbreviations:** F&V: Fruits and vegetables, CHD: Coronary heart disease, CVD: Coronary heart disease, BMI: Body Mass index

### **Competing interest**

The authors declare that they have no competing interests.

### **Authors' contributions**

**LS** as a PhD student carried out the study, analyzed the data and involved in drafting the manuscript. **HE** has supervised the study; contributed to the study design and gave final approval for the study to be published. **KM** contributed to the study design, performed the statistical analysis, and supervised the study. **SST** involved in drafting, and revising it critically for important intellectual content. **AJ** helped in writing process. **AM** contributed to the analysis, edited the paper and provided the final version. All authors read and approved the final manuscript.

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**Table 1: The Characteristics of study sample (n=400)**

	No (%)	F&V serving /day Mean (SD)	P value
<b>Age</b>			0.003
60-64	255 (63.8)	1.83 (1.18)	
65-69	87 (21.7)	1.73 (1.1)	
70-74	47 (11.75)	1.52 (1.04)	
75-79	8 (2)	1.53 (0.88)	
80-84	2 (0.5)	0.57 (0.61)	
>85	1 (0.25)	0.29 (0.29)	
<b>Gender</b>			0.813
Female	102 (25.5)	1.77 (1.5)	
Male	298 (74.5)	1.74 (1.16)	
<b>Education</b>			< 0.001
Illiterate	165 (41.2)	1.63 (0.96)	
Primary	143 (35.8)	1.74 (1.15)	
Junior secondary	64 (17)	1.57 (0.98)	
Senior secondary	22 (5.5)	3.15 (1.73)	
College	6 (1.5)	2.98 (1.54)	
<b>Marital status</b>			< 0.001
Married	230 (57.5)	1.95 (1.16)	
Never married	3 (0.75)	1.66 (0.76)	
Divorced	2 (0.5)	2 (0.10)	
Widowed	165 (41.25)	1.51 (1.1)	
<b>Economic Status</b>			< 0.001
Low (0-3 assets)	306 (76.5)	1.68(1.03)	
Intermediate (4-6 assets)	65 (16.3)	1.57(0.99)	
High (8 or more assets)	29 (7.3)	3.34(1.52)	
<b>Employment status</b>			<0.001
Employed	54 (13.5)	1.60 (1.03)	
Unemployed	320 (80)	1.71 (1.12)	
Retired	26 (6.5)	2.31 (1.29)	
<b>BMI</b>			<0.001
<25	106 (26.5)	2.78 (1.15)	
25-29	192 (48)	1.66 (0.74)	
≥ 30	103 (25.5)	0.92 (1.01)	
<b>Stage of change (n = 386)</b>			<0.001
Pre contemplation	283 (73.4)	1.63 (0.98)	
Contemplation	76 (19.6)	1.47 (0.94)	
Preparation	27 (7)	2.28 (0.68)	
Action	6 (1.5)	5.0 (0.1)	
Maintenance	8 (2)	5.25 (0.7)	
<b>Chronic disease</b>			<0.001
Yes	197 (49.25)	2.03 (1.29)	

No	203 (50.75)	1.49 (0.92)	
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**Table 2: Frequency of responses to survey questions regarding the benefits and barriers**

<b>Perceived benefits</b>	<b>No.</b>	<b>%</b>
I can find any kind of F&V in my local stores	381	95.25
F&V contain more vitamins and minerals	379	94.75
Consuming F&V was recommended in our religion	339	84.75
F&V decrease the risk of chronic disease	330	82.5
F&V make our diet diverse	327	81.75
Eating F&V is a good way for treating chronic disease	330	82.5
Eating F&V would help me to be less aggressive	317	79.25
Eating F&V treats constipation	315	78.75
Eating F&V would help me maintain my weight	311	77.75
Eating more F&V advised by physicians	285	71.25
Eating F&V cheering my family members	274	61.75
Eating F&V is common in my culture	264	66
Eating F&V would keep me from getting sick	145	36.25
Eating F&V would help me to live longer	130	32.5
I feel I am caring my body health if I eat more F&V	119	29.75
By eating F&V I feel better	59	14.75
<b>Perceived barriers</b>		
Eating F&V is expensive	222	55.5
Habit of eating F&V has been established since childhood	153	38.25
Eating F&V leads to overeating	147	36.75
Media advertisements are not about eating F&V	127	31.75
I do not have time to prepare F&V	107	26.75
Eating more F&V is not recommended in my culture	95	23.75
My family members do not like consumption of F&V	82	20.5
Eating more F&V is difficult for me	82	20.5
I have health problems (like flatus) with eat F&V	80	20
I have limitation ways to provide F&V in my meal	80	20
I do not like taste of F&V	38	9.5

**Table 3:Odds ratios and 95% CI obtained from logistic regression analysis for poor F&V consumption per day**

		<b>OR (95% CI)</b>	<b>P</b>
<b>Age</b>		1.031(0.98-1.08)	0.23
<b>Sex</b>			
	Male	1.0 (ref.)	
	Female	1.383(0.78-2.45)	0.26
<b>Education</b>			
	Literate	1.0 (ref.)	
	Illiterate	1.55 (0.93-2.57)	0.08
<b>Marital Status</b>			
	Married	1.0 (ref.)	
	Single/divorced/widowed	1.48 (0.94-2.31)	0.08
<b>Economic Status</b>			
	High	1.0 (ref.)	
	Intermediate	1.68 (0.53-4.87)	0.39
	Low	1.69 (0.62-4.65)	0.30
<b>Employment Status</b>			
	Employed	1.0 (ref.)	
	Unemployed/retired	1.56(0.28-1.47)	0.30
<b>Chronic Disease</b>			
	No	1.0 (ref.)	
	Yes	1.37 (0.88-2.14)	0.15
<b>Perceived benefits</b>		0.95 (0.93-0.98)	0.002
<b>Perceived barriers</b>		1.03 (1.01-1.06)	0.02
<b>Self efficacy</b>		0.92 (0.89-0.96)	< 0.001
<b>Knowledge</b>		0.80 (0.61-1.06)	0.13