

CHANGES IN FOOD GROUP CONSUMPTION AND ASSOCIATIONS WITH SELF-RATED DIET, HEALTH, LIFE SATISFACTION, AND MENTAL AND PHYSICAL FUNCTIONING OVER 5 YEARS IN VERY OLD CANADIAN MEN: THE MANITOBA FOLLOW-UP STUDY

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Abstract: *Objective:* To identify longitudinal food group consumption trends and the relationship to perceived changes in diet, health, and functioning. *Design:* A prospective longitudinal study. *Setting:* Canada. *Participants:* Seven hundred and thirty-six community-dwelling Canadian men (mean age: 2000=79.4 yrs; 2005=84.5 yrs) participating in the Manitoba Follow-up Study. *Measurements:* Self-reported food consumption, self-rated diet and health, life satisfaction, physical and mental functioning from questionnaires completed in 2000 and 2005. *Results:* The majority of participants did not consume from all four food groups daily, based on Canada's Food Guide recommendations, with only 8% in 2000 and up to 15% in 2005. However, over a five year period, more men improved their consumption in each food group than declined. An association was found between change in the self-rating of the healthiness of their diet and change in consumption of vegetables and fruit, or grain products. Men whose self-rating of the healthiness of their diet remained high or improved between 2000 and 2005, were 2.15 times more likely (95%CI=1.45, 3.17) to also have increased consumption of vegetables and fruit, and 1.71 times more likely (95%CI=1.51, 2.54) to have increased consumption of grain products, relative to men whose self-rating of the healthiness of their diet declined between 2000 and 2005. Men who consumed more food groups daily had better mental and physical component scores. *Conclusion:* Dietary improvements are possible in very old men. Greater daily food group consumption is associated with better mental and physical functioning. Given these positive findings, there is still a need to identify older men who require support to improve their dietary habits as nearly half of the participants consumed two or fewer groups daily.

Key words: Older men, health, food consumption, community-dwelling.

Introduction

Nutrition plays a significant role in the health and quality of life of older adults. Insufficient research exists on dietary change in older men, which becomes increasingly important as the population ages, and the proportion of men and those over 85 years of age increase (1). Diet is a modifiable risk factor for many acute and chronic illnesses older adults may develop, thus interventions need to be specific for this group.

Researchers have observed specific dietary patterns in older men. Men older than 70 years of age consumed more fruits and vegetables than men aged 19-30 and 31-50 years (2). Researchers also have identified an increased consumption of carbohydrates, improved fatty acid consumption, and consistent protein intake in older men over time (3). Robinson et al. observed that men from Hertfordshire (U.K.) commonly maintained a traditional diet (characterized by red meat, processed meat, and vegetable consumption) as they aged (4). Other researchers have characterized traditional diets by low variety and higher consumption of starchy foods common worldwide in the early twentieth century during the receding famine when the men were born (5).

Canada's Food Guide to Healthy Eating recommend that

men aged 51+ years consume a variety of foods from the four food groups daily: seven servings of vegetables and fruit; seven servings of grain products, three servings of milk and alternatives; and three servings of meat and alternatives (6). Studies show that the majority of older men do not meet this dietary recommendation. Lengyel, Tate, and Bayomi observed that only 64% of men (mean age = 82 years in 2000) consumed fruit and vegetables daily, 58% of men consumed grain products daily and even lower proportions for milk and alternatives, and meat and alternatives (7).

Consuming a wide variety of foods daily is vitally important to ensure optimal health in our aging population. Men who consumed fruits and vegetables, and grain products daily were four times more likely to report a superior self-rated health and three times more likely to report greater life satisfaction compared to those consuming these food groups less than once per day (8). Frequent consumption of vegetables in older adults resulted in higher micronutrient serum levels associated with optimal physical and mental health (9). Researchers observed that a diet characterized by higher fruit, vegetable, and fish consumption was associated with fewer errors on the Mini-Mental State Examination suggesting the important association between diet and mental functioning (10).

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To our knowledge, research available on food consumption of older men seldom contains a longitudinal component. Our study examines aspects of nutrition and health of men entering the oldest-old age category (85+ years). The objectives of this study were: 1) to identify dietary characteristics of very old adult men by analyzing food group consumption over a period of five years; 2) to identify if the self-assessed characteristics in 2005, measured by self-rated diet, self-rated health, and life satisfaction, were associated with changes in diet since 2000; 3) to observe if a change in diet over five years was associated with a change in health during the same time; and 4) to examine the relationship between mental and physical functioning and the number of food groups consumed daily.

Methodology

The Manitoba Follow-up Study

The Manitoba Follow-up Study (MFUS) is a prospective longitudinal study, which has followed a cohort of 3,983 World War II Royal Canadian Air Force aircrew recruits since July 1, 1948. The original purpose of the study was to examine the significance of electrocardiographic changes for the prediction of subsequent development of cardiovascular disease (11). Further details of the design, methodology and conduct of MFUS are published elsewhere (12).

Study Design and Study Population

With the increased interest in healthy aging and gerontology over the last 15 years, MFUS began examining successful aging and nutrition in older adult men. In 1996, the Successful Aging Questionnaire (SAQ) was developed and administered to the cohort to begin collection of information on self-rated health, functioning, limitations on daily activities, and perspectives on successful aging. In 2000 and 2005, a nutrition component was added to identify food consumption trends among older adult men. Details of the nutrition component are published in Lengyel, Tate, & Bayomi (7). The 2000 and 2005 MFUS SAQ's were mailed to all participants to obtain information on self-reported food group consumption, functional abilities, physical limitations, self-rated health, self-rated diet, and life satisfaction.

Nutrition Component of the Questionnaire

Participants answered the following question: How often do you NOW eat/drink these foods? The survey listed 13 food items in 2000 and 17 in 2005. Eleven common items in 2000 and 2005 were combined into the four food groups based on the 1997 version of Canada's Food Guide (13) as follows: 1) Vegetables and Fruit: "fruit" and "vegetables"; 2) Grain Products: "grains (e.g., bread, pasta, rice)"; 3) Meat and Alternatives: "beans, nuts, or soy products," "poultry (e.g., chicken, turkey)," "meat (e.g., beef, pork)," "eggs" and "fish"; and 4) Milk products: "milk," "milk alternatives (fortified soy, rice, grain beverages)" and "cheese/dairy

products." The remaining items, "coffee/ tea," "alcohol," "soda pop/juice," "pastries/sweets," "salty snacks," and "vitamin/nutritional supplements," were not grouped or analyzed for this study. From these 11 food items, the frequencies of consumption of the four food groups by participants were classified in five categories: not at all, rarely, most days, every day, and every meal. For this analysis, these five categories were re-coded into the following groups: D (every day or every meal), M (most days), and R (rarely or not at all). Food group consumption change from 2000 to 2005 was defined as: Still every day, improved, still most days, and still rarely/decline.

Mental Component Score (MCS) and Physical Component Score (PCS)

The SF-36 consists of 36 items assessing 8 health domains: limitations in physical activity due to health issues, limitations in social activity due to physical/emotional issues, limitations in typical role activities because of physical problems, limitations in typical role activities due to emotional problems, bodily pain, general mental health, vitality, and general health perceptions (14). All 36 questions were used to derive domain scores and were based on a Likert-Scale response or a simple "Yes or No" answer. The MCS and PCS scores were derived from weighted sums of the domain scores and standardized to a mean of 50 with a standard deviation of approximately 10 units. Therefore, both scores measure functioning and are presented on a unit-less scale, but have the same distribution. So, comparisons between the two are possible (14).

Self-Rated Diet, Self-Rated Health, and Life Satisfaction

Self-rated diet is a global measure of how people perceive their own diet and may be used to assess patterns of individual diet quality in populations (15). In the 2000 and 2005 MFUS questionnaires the question was: "Compared to others your age, how healthy is your diet?" Participants selected from the following choices: much healthier, somewhat healthier, as healthy, somewhat less healthy, much less healthy, or don't know. Change in self-rated diet over five years was based on comparisons of participants' responses in 2000 to 2005. It was defined as: "Change for the better" (still healthier, still as healthy, and improved) and "Change for the worse" (still less healthy and declined).

Self-rated health is a subjective measure of one's own perceived health status. It is simplistic, easily assessed, and has demonstrated the ability to identify individuals with increased risk for morbidity and mortality (16). The self-rated health question read, "In general, would you say your health is...excellent, good, fair, poor, or bad?" Change in self-rated health over five years was based on comparisons of participants' responses in 2000 to 2005. It was classified as: "Change for the better" (still excellent, still good or improved, and improvement from fair/poor/bad to at least good) and "Change for the worse" (still fair/poor/bad, decline from

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excellent, and decline from good).

Life satisfaction is a component of quality of life and includes behavioural competence, well-being, physical status and environmental aspects (living situation) (17). The life satisfaction question read, “How would you describe your satisfaction with life in general at present?” The respondents chose from the following: excellent, good, fair, poor, or bad. Life satisfaction change over five years was based on comparisons of participants’ responses in 2000 to 2005. It was grouped as: “Change for the better” (still excellent, still good or improved, and improvement from fair/poor/bad to at least good) and “Change for the worse” (decline from excellent, decline from good, and still fair/poor/bad).

Respondent Sample

One thousand four hundred-eighteen surveys were completed in 2000 and 954 in 2005. Exclusion criteria for the analysis included: 1) Questionnaires completed by proxy respondents; 2) Members living in a long-term care facility; 3) Surveys with inadequate dietary intake information. The exclusion criteria resulted in 1213 surveys from 2000 and 848 from 2005. Only men who survived to 2005 and who had a useable survey could be used for our analysis. Among these community-dwelling men, 87% (736) responded in 2005 and had a 2000 survey, which were used in our analysis.

Statistical Analysis

Data from the 2000 and 2005 questionnaires were compiled and analyzed using SAS version 9.2. The distribution of variables was described as percentages and/or means with standard deviations. Tests of hypotheses for association between food group consumption, change in food group consumption, self rated diet, self-rated health, life satisfaction, and change in health responses were assessed with chi-square statistics. Crude odds ratios were calculated with 95% confidence intervals for associations between change in diet and change in health from two by two tables. Differences in MCS and PCS by number of food groups consumed daily in 2005 were examined with analysis of variance models and followed by Duncan’s multiple range tests. A p-value of <0.05 was set as the level of significance for all statistical tests.

Results

Participant demographics and sample sizes for each parameter measured are provided in Table 1. The mean age of the men at survey completion in the years 2000 and 2005 was 79.4 years (range 70.4-90.1) and 84.5 years (range 75.9-95.1), respectively. The majority of men reported they had good or better self-rated health and life satisfaction in 2005 (84.3% and 83.4% respectively), which was not significantly different from the percentage in 2000.

Table 1
 Participant demographics (n=736)

Characteristic	2000 Mean ± SD ¹ or %	2005 Mean ± SD or %
Age	79.4 ± 3.0	84.5 ± 3.0
Marital Status (n=728)		(n=728)
Married	82.5	71.7
Widowed	13.6	22.9
Single	1.0	1.7
Divorced/Separated	2.9	3.7
# of Instrumental Daily Living Activity Limitations (n=731)		(n=728)
None	42.9	27.5
One	27.8	18.5
Two or more	29.3	54.0
# of Daily Living Activity Limitations (n=732)		(n=729)
None	89.8	69.3
One or more	10.2	30.7
SF-36 Component		
Mental Component Score (n=687)		(n=666)
55.2 ± 7.7		54.2 ± 8.3
Physical Component Score (n=687)		(n=666)
46.7 ± 9.3		41.6 ± 10.1
Self-Rated Diet – “Compared to others your age, how healthy is your diet?” (n=694)		(n=686)
Much healthier	25.7	19.7
Somewhat healthier	35.7	32.4
As healthy	36.9	44.7
Somewhat less healthy	1.4	2.3
Much less healthy	0.3	0.9
Change in Self-Rated Diet (2000 vs. 2005) (n=653)		
Still healthier	43.4	
Still as healthy	24.2	
Still less healthy	0.3	
Improved	11.0	
Declined	21.1	
Self-Rated Health – “How would you describe your health compared to others your age?” (n=734)		(n=732)
Excellent	29.2	12.3
Very Good	-	38.3
Good	58.6	33.7
Fair	11.3	13.9
Less than Fair	0.9	1.8
Change in Self-Rated Health (2000 vs 2005) (n=730)		
Still excellent	9.6	
Still good or improved	49.7	
Improvement from fair, poor, or bad to at least good	6.9	
Decline from excellent	19.7	
Decline from good	9.0	
Still fair, poor, or bad	5.1	
Life Satisfaction – “How would you describe your satisfaction with life in general at present?” (n=731)		(n=732)
Excellent	39.4	24.5
Good	52.7	58.9
Fair	6.8	13.5
Less than Fair	1.1	3.1
Change in Life Satisfaction (2000 vs 2005) (n=728)		
Still excellent	17.0	
Still Good or improved	42.6	
Improvement from fair, poor, or bad to at least good	4.3	
Decline from excellent	22.4	
Decline from good	10.0	
Still fair, poor, or bad	3.7	

1. SD = Standard Deviation

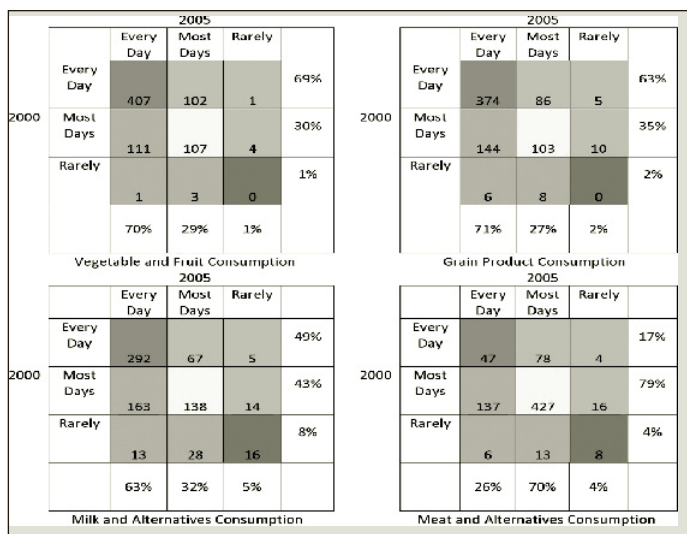
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Food Group Consumption Characteristics

Figure 1 represents frequency and change of food group consumption by year for each of the four food groups. In 2000, 69% (407+102+1 = 510/736) of men consumed vegetables and fruit every day and in 2005 a similar proportion, 70% (407+111+1 = 519/736) of men consumed from the vegetables and fruit group every day. Approximately 80% of the men who reported daily consumption from the vegetables and fruit, grain products, and milk and alternatives groups in 2000 continued as daily consumers in 2005. Only 36% (47/(47+78+4)) of daily meat and alternatives consumers in 2000 continued as daily consumers in 2005.

Figure 1

Food group consumption and change in food group consumption over 5 years



The pattern of dietary intake remained stable over five years for over 60% of the sample in all four food groups. The largest improvement was seen in the milk and alternatives food group with 28% of men improving (from rarely to most days/every day or most days to every day). There was about a 20% improvement in consumption of both grain products, and meat and alternatives; whereas only 16% of men increased their consumption of vegetables and fruit.

The proportion of men consuming all four food groups every day increased from 8% in the year 2000 to 15% in the year 2005. A large proportion (43%) consumed two or fewer food groups daily in 2005. Over half of the men (55%) reported daily vegetables and fruit consumption at both time points, and the same was seen for grain products (51%). Smaller proportions of the cohort consumed dairy products and, meat and alternatives daily at both time points. Only 40% of participants maintained daily consumption of milk and alternatives, and 6% maintained daily consumption of the meat and alternatives food group over five years (data not shown).

Association between Self-Rated Diet and Change in Food Group Consumption

Table 2 reports the percentages of men who reported a healthier self-rated diet in 2005 within categories of food group consumption change from 2000 to 2005. More men rated their diets healthier in 2005 when they consumed vegetables and fruit, grain products, and meat and alternatives still every day or improved over five years compared to men who reported still most days and still rarely/declined consumption (p<0.05). No significant difference was shown between change in milk and alternatives consumption and self-rated diet measure. Also, there was no significant association between self-rated health or life satisfaction in 2005 when compared to food group consumption change.

Table 2

Percentage of men reporting healthier self-rated diets in 2005 by change in food group consumption between 2000 and 2005

Food Group	Change in Food Group Consumption from 2000 to 2005			
	Still Every Day	Improved Consumption	Still Most Days	Still Rarely/Decline
Vegetables & Fruit*	58%	46%	29%	34%
Grain Products*	54%	49%	33%	43%
Milk & Alternatives	51%	46%	49%	45%
Meat & Alternatives*	60%	59%	45%	44%

*Percentages within each food group vary significantly (p<0.05).

Change in Food Group Consumption and Change in Health

Table 3 represents odds ratios relating change in food group consumption to change in diet, health, and life satisfaction. Men with improved or sustained daily consumption of vegetables and fruit over five years were 2 times more likely to have a good or improved self-rated diet than those with poor or declined vegetables and fruit consumption (odds ratio = 2.15, 95% CI = (1.45, 3.17)). Men whose consumption of meat and alternatives remained daily or improved over five years were 67% more likely to have a good or improved self-rated health than men with poor or declined consumption.

Table 3

Odds ratios of reported changes in self-rated diet, self-rated health, and life satisfaction by change¹ in food group consumption over a period of 5 years

Change in Food Group Consumption	Vegetables & Fruit	Grain Products	Milk & Alternatives	Meat & Alternatives
Change in Self-Rated Diet	2.15 (1.45, 3.17) ²	1.71 (1.15, 2.54)	0.86 (0.58, 1.3)	1.03 (0.68, 1.56)
Change in Self-Rated Health	1.02 (0.73, 1.42)	1.35 (0.96, 1.88)	1.25 (0.91, 1.73)	1.67 (1.17, 2.40)
Change in Life Satisfaction	1.20 (0.86, 1.67)	1.22 (0.87, 1.70)	1.34 (0.98, 1.85)	1.38 (0.98, 1.96)

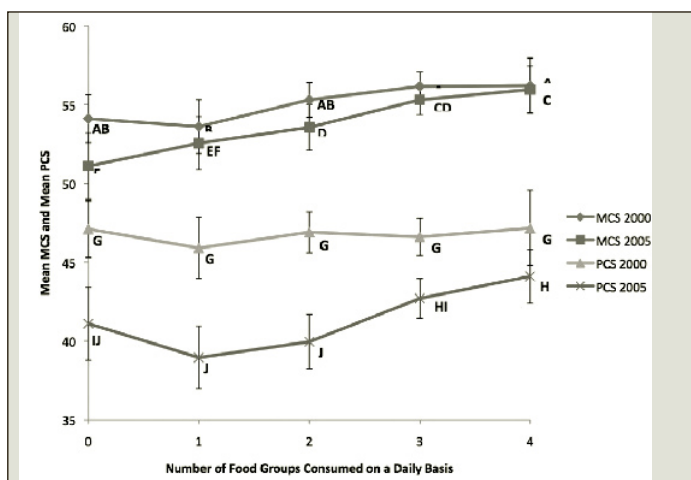
1. Change for the better vs. change for the worse; 2. 95% Confidence Interval

Mental and Physical Functioning and Frequency of Daily Food Group Consumption

Figure 2 represents the mental and physical component scores in 2000 and 2005 by the number of food groups consumed daily. In general, greater PCS scores in 2005 were observed in men who consumed more food groups on a daily basis in 2005. Mean PCS in 2000 was not significantly different across number of food groups consumed daily. The multiple range tests resulted in more significant associations of MCS and PCS with the number of food groups consumed on a daily basis in 2005 than 2000. Figure 2 also illustrates that the physical functioning of the men was lower than their mental functioning and levels of each were lower in 2005 than in 2000 (when men were five years older).

Figure 2

Means and 95% Confidence Intervals for Mental Component Scores (MCS) and Physical Component Scores (PCS) in 2000 and 2005 of Older Adult Men by Frequency of Daily Food Group Consumption



*Labelled data points without a common letter differ significantly (p-value <0.05).

Discussion

We examined the dietary, health and functioning characteristics of a cohort of 736 very old community-dwelling men who survived a five year interval from approximately 80 to 85 years of age. The majority of participants did not consume from all four food groups daily, as per Canada’s Food Guide recommendations, with only 8% in 2000 and up to 15% in 2005. However, in a positive light, over a five year period, more men improved their consumption in each food group than declined. We found an association between men’s self-rating of the healthiness of their diet and consumption of vegetables and fruit, and grain products. Positive change in self-rated health was associated with daily consumption of meat and alternatives. Very old men who consumed more food groups daily had better mental and physical functioning.

The number of participants following Canada’s Food Guide recommendation of consuming items from all four food groups daily increased over time (from 80 to 85 years of age) indicating an improvement in diet. This could be attributed to one’s re-evaluation of their diet, the desire to improve one’s diet after a medical diagnosis or for symptom management (18). Others have suggested healthy eating messages are influential to adult diets (19). Our own research suggests that nutrition is linked to older men’s definition of successful aging (20). The improvement of diet over time could also be due to the survivor effect as the participants who survived the five year interval and responded to both the 2000 and 2005 surveys may be healthier and more health conscious.

The frequency of consumption from vegetables and fruit, grain products, and milk and alternatives appear to be similar in 2005. However, the frequency of consumption for the meat and alternatives food group was significantly lower. The meat and alternatives food group contains foods that are excellent sources of protein important for maintenance of lean body mass and physical functioning. Visvanathan and McPhee Chapman (21) indicate that low protein intake is a determinant of anorexia and sarcopenia in older adults. The low meat and alternative intake can have detrimental effects on physical functioning as measured by PCS in our study. The below average PCS measurement indicates that older men declined in physical functioning more than mental functioning over time, possibly impacting food group consumption.

Low frequency of consumption and lack of compliance to the Canada’s Food Guide recommendation for the meat and alternatives food group may be due to a multitude of factors such as chewing difficulties, health conditions, widowhood, decreased interest in eating well, poor appetite, and the ability to acquire and prepare food (22-24). In addition, older adult men may be concerned with their cardiovascular health and avoid foods that are high in saturated fat such as red meat. Healthcare professionals can educate older men on choosing softer/minced meat and alternatives, and making lower saturated fat options such as fish, skinless chicken, lean red meat, eggs, beans, and soy products (25, 26).

Significant associations between the number of food groups consumed daily and MCS and PCS were more apparent in 2005 than 2000 indicating the increased significance of diet for functioning as one ages. As well, when men consumed more food groups on a daily basis, better MCS and PCS were observed. Regardless of their food group consumption in 2000, men who consumed from all four food groups daily in 2005 maintained mental functioning and experienced the smallest decline in physical functioning over five years.

Older men tend to rate the healthiness of their diet based on their vegetables and fruit, grain products, and meat and alternatives food group consumption, but not milk and alternatives consumption. The milk and alternatives food group contains food items high in calcium, vitamin D, vitamin B12, and protein necessary for optimum health. It appears that the

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participants were aware of the healthiness of their diet, thus this question may be an appropriate screening tool for health professionals assisting in the nutrition education of older adults.

A limitation in our nutritional assessment was that we were not able to quantify the number of servings from the four food groups as the nutrition questionnaires were not intended to measure food quantity. The other is the possibility of confounding variables in the self-rated health and life satisfaction measurements. Health and life satisfaction encompass aspects other than nutrition, and it is possible that other variables affected the outcomes of the health measures.

The Manitoba Follow-up Study offers a unique opportunity to look at a very large sample size of men entering the oldest-old age category (85+ years). With the growing oldest-old population, it is increasingly important to understand their dietary practices and the effects on their health. Based on existing research, other studies have identified similar trends such as improvements in diet over time (3), inadequate food group consumption and associations with health (7).

This paper outlines older men's dietary habits, how their diet changes as they age, associations between their diet, self-rated diet, and functioning, and possible determinants of dietary practices. Findings from our study are valuable for nutritional screening practices, nutrition education programs, health care services, menu planning, food service delivery and future research directed towards older adults. Healthcare professionals can assist with the maintenance or achievement of good dietary practices in older adult men. This study illustrates that dietary improvements of community-dwelling older men is possible at any age and is associated with sustained mental and physical functioning. Due to the importance and the lack of adherence to Health Canada's recommendation, there is a need to identify older men who require support to improve dietary habits and functioning.

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