The demography of food in health security: current experience with dairy consumption in Taiwan

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To establish a food guide, the ‘total diet’ needs to be considered, based on prevailing patterns of food and nutrient intake; these will be culturally acceptable and recognize the prevailing social and economic conditions that affect food availability. Dairy produce is a good source of high quality protein, and provides significant amounts of vitamins and minerals. People who consume more dairy have higher intakes of calcium and vitamin B2 with less chance of deficiency. We used four National Nutrition Surveys in Taiwan (NAHSITs) to establish the current demographic predictors of dairy intakes, an indicator of food security in an affluent society. There was a U shape relationship between dairy consumption practices (whether or not) and age. In Taiwanese, the practice is higher in school children (49.3%), adolescents (32.1%) and elderly (43.6%) than it is in middle age (22.2-25.9%). Average daily dairy intake decreases with age; in the elderly, the intake is less than half a serving. Forty seven percent of first grade children consumed a serving or more of dairy while the 6th graders dropped to 37%. Less than 20% adults consume one serving or more a day. The rate increases to 40% for elderly. Physiologic limitation and dietary habit account for 25% and 50% of dairy avoidance, respectively. Education, financial status, ethnicity, regionality and health seeking behaviors are determinants of dairy consumption in all age groups. There is a need for alternative Food Guides for non-dairy consumers. Attention to dairy intake for socio-economically disadvantaged groups is required.

Key Words: dairy, demographics, dietary quality, health, NAHSITs

INTRODUCTION
Food security was defined by the US Agency for International Development as “When all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life”. Achieving food security requires that the aggregate availability of physical supplies of food is sufficient, that households have access to those food supplies through their own production, through the market or through other sources, and that the utilization of those food supplies is appropriate to meet the specific dietary needs of individuals. On the other hand, the Life Sciences Research Office has defined food insecurity as “Exists whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain.” Both food security and insecurity include psychological and socio-cultural dimensions.

Selected population characteristics, such as gender, age, ethnicity, education, occupation, and even location, are frequently used in economic and market research. Distributions of values within a demographic variable, and across households, are both of interest, as well as trends over time.

To establish a Food Guide, the “total diet” needs to be considered, based on prevailing patterns of food and nutrient intake; these will need to be culturally acceptable and to recognize the prevailing social and economic conditions that affect food availability. Dairy produce is a good source of high quality protein, and provides significant amounts of vitamins and minerals. People who consume more dairy have higher intakes of calcium and vitamin B2 (riboflavin) with less chance of deficiency. A British cohort study showed that people who consumed more calcium and dairy products in childhood tended to avoid stroke and live longer than those who did not. However, dairy intake was higher in households with higher socioeconomic status. In addition, those who ate the most dairy also ate the most fruit and vegetables, so they had the healthiest diets overall. Increased dairy

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products in younger life seem to be a marker for those who have a more reasonable diet.

Taiwanese are recommended to consume one to two servings dairy a day. However, given limited dairy produce and the reliance on imports, the average dairy availability is only 0.6 serving per caput per day.5 The purpose of the present study was to establish the current demographic predictors of dairy intakes as an indicator of food security in an affluent society.

**METHODS**

**Study participants**

Data for this paper were obtained from four population representative Nutrition and Health Surveys in Taiwan (NAHSITs) between 1993 and 2008. NAHSITs were national survey aimed at studying the nutrition and health status of free-living people aged four or older in Taiwan. More details about the study design and sampling methodology are provided by Pan et al.6-9

![Figure 1.](image)
Data collection
The survey involved face-to-face interviews. Data collected included demographic variables; dietary intakes: 24-hour dietary intake and a simplified food frequency questionnaire (FFQ); life-style related variables: smoking, alcohol consumption, betel nut chewing, and physical activity; medical history; and medication usage. Physical examination included anthropometric measurements and fasting blood samples were collected.

Estimation of dairy intakes
Daily dairy consumptions were calculated for the participants by using dietary information provided from a 24-hour dietary recall and FFQ. The 24-hour dietary recall provided population means and FFQ provided the frequency of dairy consumption over time.

Demographics
Demographic variables included in the present study were gender, age, ethnicity, residential area, education (mater-
nal education for school children), financial status (per-
ception and household income).

Statistical analysis
All data were weighted to represent the population in
Taiwan. The population size of each sex/age group in
each stratum was obtained from the national household
registry system. The sampling weights were calculated by
dividing the population by its corresponding sampling
weights to represent the people of his or her own sex/age
group in the stratum. All the analyses were carried out
using SAS version 8.01\textsuperscript{10} statistical software and SUD-
DAN version 8.0\textsuperscript{11} was used to account for the sampling
design. Logistic regression analyses were used to examine
the effect of demographic variables on dairy consumption
status. Statistical significance was defined as \(p<0.05\).

RESULTS
We found that there was a U shape relationship between
dairy consumption practices (whether or not) and age. In
Taiwanese, the practice is greater in school children
(49.3%), adolescents (32.1%) and elderly (43.6%) than it
is in middle age (22.2-25.9%) (Figure 1-(A)). Average
daily dairy intake decreases with age; in the elderly, the
intake is less than half a serving. Median intakes in grams
were 260, 270, 249, 172, 73.5 and 44.4 for children, adol-
secent, 19-30, 31-45, 46-64 years and elderly, respect-
ively (Figure 1-(C)). Forty seven percent of first grade
children consumed one serving of dairy or more while the
6\textsuperscript{th} grade dropped to 37%. Less than 20% of adults
consumed one serving or more a day. The rate increased to
40% for elderly. (data not shown)

Among 4,471 NAHSIT 2005-2008 participants, 45.4%
ate no dairy. Physiologic limitations (diarrhea, 22%;
bloating, 2.9%; constipation, 1.3%) account for 25% dairy
avoidance. More than half the population reported that
dairy was not part of their diet due to “no such habit”
(32.2%), “dislike” (17.1%), “no right time” (10.3%), or
“dared not to” (7.1%). Three percent of participants re-
ported that high cost was the reason, particularly for those
who were from the Eastern region and for indigenes.
(data not shown)

Education, financial status, ethnicity, and locality were
four significant demographic determinants for not-once-a-
day dairy in the elderly. Those elderly with high school or
more education compared to those who with no education,
had significant lower relative risk of not-once-a-day dairy.
The same results were found for perceived financial status.
Those elderly without financial difficulty or “more than
enough” had significant lower chance for not-once-a-day dairy.
Aboriginals had higher chance compared to Fukien-
ese while immigrant Chinese Mainlanders had signifi-
cant lower chance. Elderly who lived in the Eastern re-
gion had significantly higher risk compared to those who
lived in the Hakka region. (Figure 2) In addition, elderly
who were not supplement users (OR = 2.30), smokers
(OR = 2.04) or betel nut chewers (OR = 2.48) also had
higher risk for not-once-a-day dairy.

In addition to supplement use, in school children, ma-
ternal education level and household monthly income
were two significant demographic predictors for no dairy
intake. (data not shown)

DISCUSSION
From these four national nutritional surveys, we found the
Taiwanese population have low intake of dairy products.
Dairy is not a habitual food for more than 40% in this
population. Dairy consumption correlates with certain
demographic variables (age, gender, education, financial
status, ethnicity and regionality), health seeking behaviors
(supplement use) as well as life-style related variables
(smoking and Betel nut chewing).

Implication to nutrition policy
- Should provide alternate Food Guides for non-dairy
consumers.
- Pay attention to dairy intake for socio-economically
disadvantaged groups.

Future work
- Include food security measurement in future NAHSITs.
- Consider the impact of changing demography: aging,
immigration, family structure, in food security

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REFERENCES
1. Riely F, Mock N, Cogill B, Bailey L, Kenefick E. Food se-
curity indicators and framework for use in the monitoring
and evaluation of food aid programs. IMPACT: Food secu-
rit y and nutrition monitoring project. Arlington, VA, USA,
Food and Nutrition Technical Assistance Project (FANTA).
2. Anderson SA. Core indicators of nutritional status for diffi-
wikipedia.org/wiki/Demographics
4. Lee MS, Lo FY, Huang LY, Chen MC. Reappraisal the ap-
propriateness of the dairy food guidelines in Taiwan by us-
ing three NAHSITs datasets. Taipei: Department of Health;
2009.
6. Pan WH, Hung YT, Shaw NS, et al. Elderly Nutrition and
Health Survey in Taiwan (1999-2000): research design, meth-
Survey in Taiwan (NAHSIT) 1993-1996: design, contents,
M-D. Nutrition and Health Survey in Taiwan (NAHSIT)
1993-1996: dietary nutrient Intakes assessed by 24-hour re-
Survey of Taiwan Elementary School Children 2001-2002:
research design, methods and scope. Asia Pac J Clin Nutr.
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