

A comparison of biomarkers in two populations: the US and Japan

Extended Abstract

Eileen M. Crimmins, Yasuhiko Saito, Jung Ki Kim, Sarinnapha Vasunilashorn
University of Southern California

Introduction

Currently, Japan has the highest life expectancy in the world, with 2005 estimates indicating that Japanese males live on average 78.7 years and females live 85.5 years (World Health Organization, 2005). This is in stark contrast to the 1960s, when longevity for Japanese males and females was substantially lower than that for several developed countries (Powell & Aneski, 1990). Within the last thirty years, however, the health status of the entire Japanese population has rapidly improved and has surpassed Western levels of longevity, where Americans rank only in the top 30 (United Nations, 2006) with males living on average 75.3 years and females living 80.4 years.

Within populations, an early sign of deteriorating health with age is the onset of high risk biological markers. More specifically, biomarkers of health have been associated with poorer physical and cognitive function, more heart disease, and higher mortality. In this paper, we compare biological risk in Japan with that in the U.S. in order to understand the paths to long life expectancy in the Japanese compared to the relatively short life expectancy of Americans.

Methods

We used data from the National Health and Nutrition Examination Study (NHANES) (1999-2004) and the Japanese Nutrition Survey Report (2004) to investigate age patterns and country differences in biological markers of health. NHANES is a nationally representative sample of the U.S. population. Each year about 5,000 individuals of all ages undergo detailed interviews, clinical examinations of medical, dental, and physiological measures, as well as laboratory tests. The 2004 Japanese Nutrition Survey Report is a sample population from the 2004 *Kokumin Seikatsu Kiso Chousa* (Comprehensive Survey of Living Conditions of People on Health and Welfare). It draws a sample from 300 census tracts (approximately 5,000 households and 15,000 household members) selected from all census tracts in Japan. However, due to the Niigata-Chuetsu Earthquake, the survey was not conducted in 2 of the 300 census tracts. The study involved participant surveys for demographics, physical examinations, and laboratory evaluations.

Results

It is well known that Americans are heavier than the Japanese. This is evident in Figure 1, which shows the percentage of individuals with a body mass index (BMI) of 25 or greater for the United States (U.S.) and Japan. For both countries, the percentage of being overweight increases with age up to age 70. An exception to this trend is among Japanese males, where being overweight reaches a peak during the 50s. In all groups,

people at the oldest ages are less likely to be overweight. Compared to the Japanese males, around 10 to 20 percent more of American males are overweight in each age group. For women, the inter-country differences are even greater.

Measured blood pressure is higher in Japan than in the U.S (Figure 2). The proportion of people who have high systolic blood pressure (SBP) is approximately twice as high in Japan from ages 40 to 60. For males, these differences extend to even later ages. As for diastolic blood pressure (DBP), the differences between the Japanese and Americans are even greater. Until approximately age 70, more Americans are currently taking blood pressure medication (Figure 3a). If one assumes that all of those taking medication have diagnosed high blood pressure, the proportion of Japanese with high blood pressure either diagnosed and treated or untreated but measured as high, is higher than in the U.S.

On the other hand, Americans are more likely to have high cholesterol, except among women in their 50s (Figure 4a and 4b). Americans are also more likely to be on cholesterol lowering medications (Figure 3b); if this is taken into account, the percentage of Americans with high cholesterol that is either treated or untreated is about twice as high in American men after age 50. The differences among women are not as great compared to differences among men; in fact, American and Japanese women have similar cholesterol levels in their 50s. The differences in the proportion with high-risk levels of high-density lipoprotein (HDL) cholesterol are even greater than for total cholesterol (Figure 4c). Very few Japanese women have low HDL, and within some age groups, American males are about 3 times as likely to have low HDL.

Across most age groups, high levels of triglycerides are somewhat more common among American women than Japanese women; however, for men, the percent with high levels are similar in both countries (Figure 3d). Additionally, glycosylated hemoglobin is higher among American women than among Japanese women (Figure 4a); however, among men, the two countries are roughly similar up to age 60. Low albumin is very uncommon among Japanese women but characterizes a high percentage of American women, particularly those at younger ages (Figure 5c). Moreover, percentage with low albumin is higher among American men than Japanese men, though these differences are reduced at the oldest ages.

Conclusions

While it is known that the Japanese are less heavy and generally more healthy than Americans, we find that the levels of biological risk are not always more favorable among the Japanese. Blood pressure indicators are worse for the Japanese compared to Americans. On the other hand, lipid levels tend to be higher among Americans than Japanese. Additionally, inflammation, as implicated via high albumin levels, seems particularly higher among American women compared to their Japanese counterparts. This study indicates that the differences in risk levels of biomarkers are likely dependent on environmental factors potentially related to culture, diet, and lifestyle.

References

Powell M. & Aneski M. 1990. *Health care in Japan*. Routledge: London.

United Nations. 2006. United Nations World Population Prospects: The 2006 revision. United Nations: New York.

World Health Organization. Life Tables for WHO Member States. Accessed on September 15, 2007 on website:
http://www.who.int/whosis/database/life_tables/life_tables.cfm

Figures

Figure 1. Percentage males and females overweight by age in the U.S. and Japan: (body mass index ≥ 25 kg/m²)

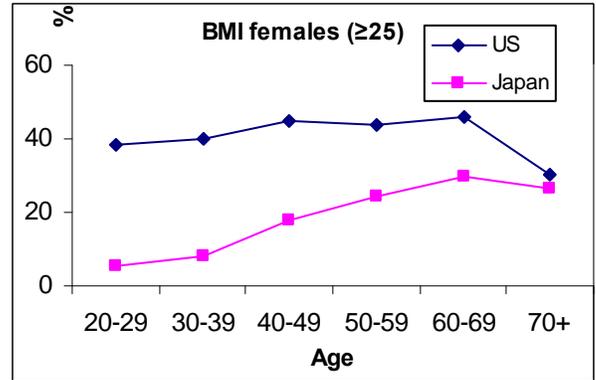
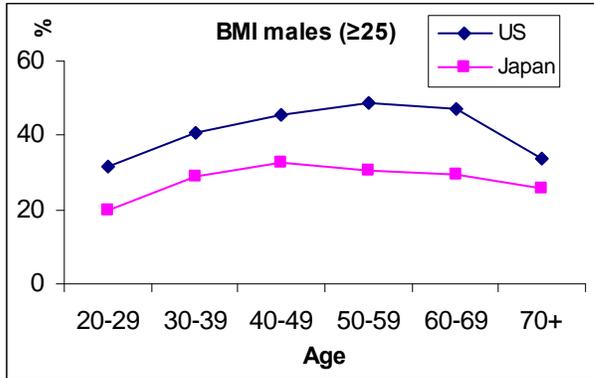
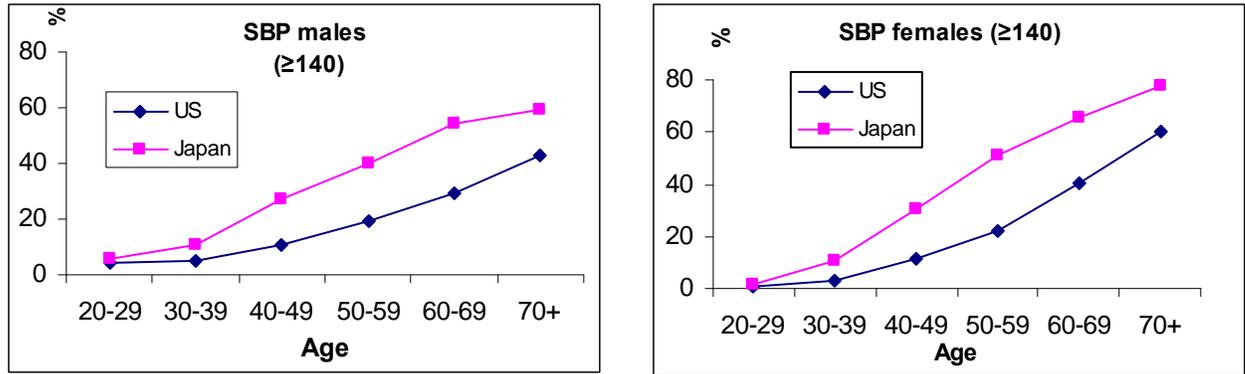
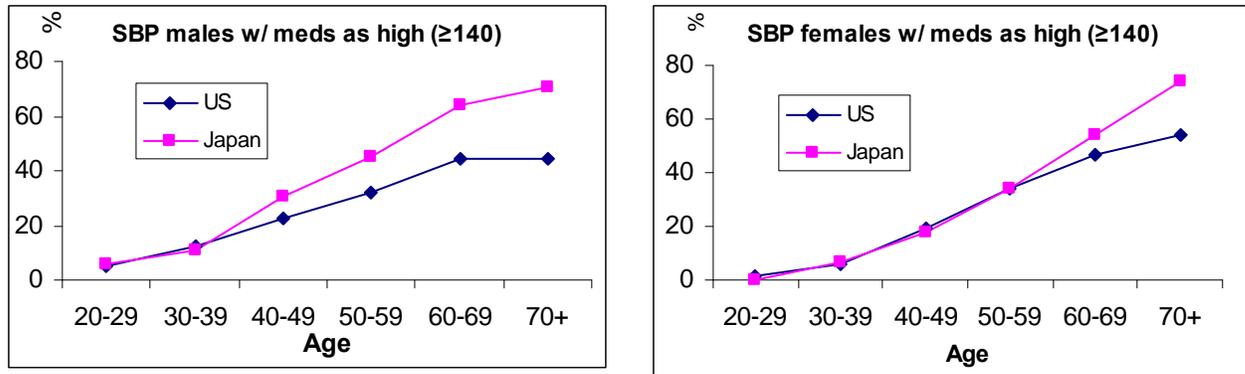


Figure 2. Percentage of age groups in the U.S. and Japan with:

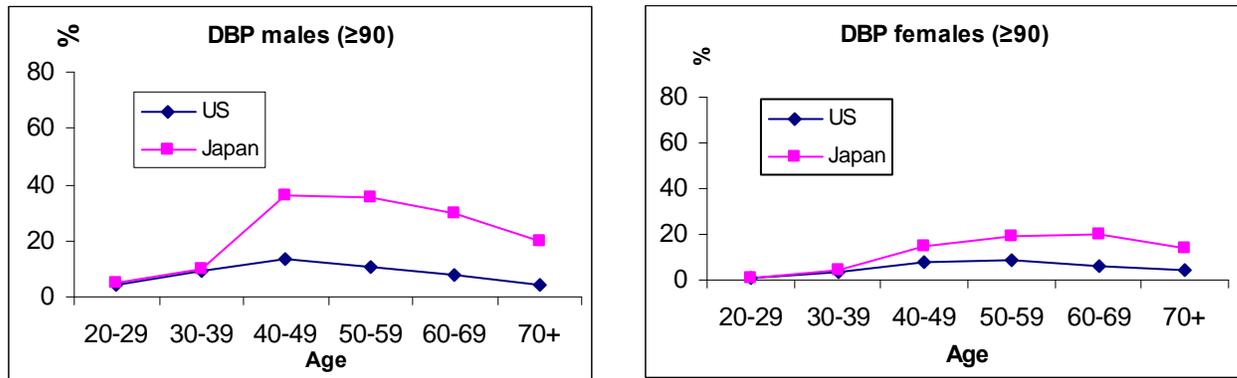
a) High measured systolic blood pressure (≥ 140 mmHg)



b) Either measured high systolic blood pressure or taking medications



c) High measured diastolic blood pressure (≥ 90 mmHg)



d) Either measured high diastolic blood pressure or taking medications

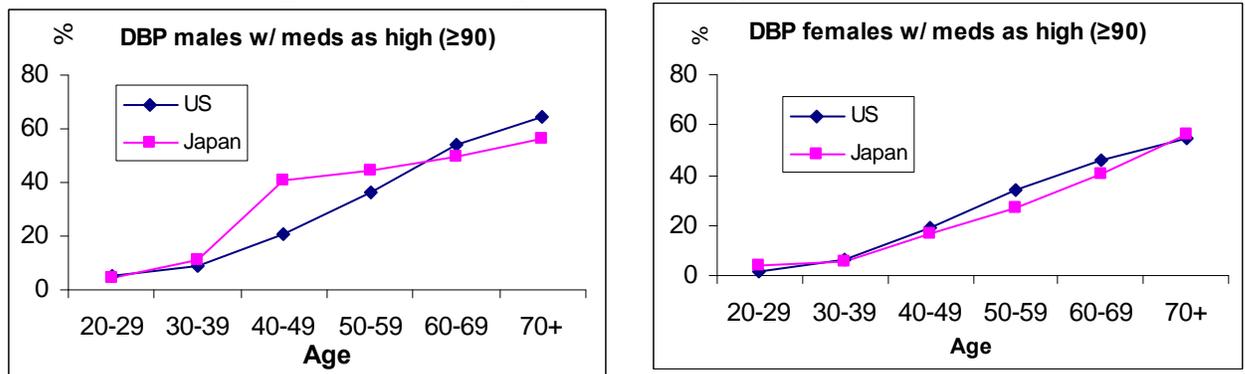
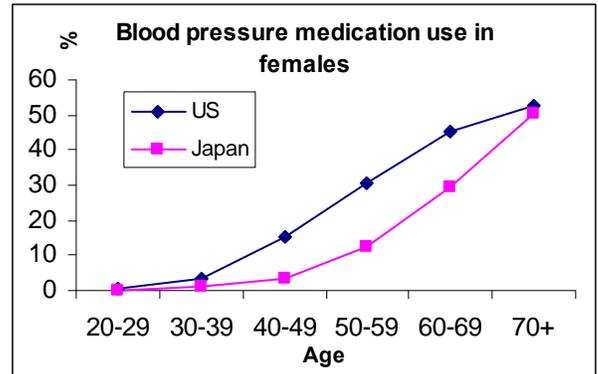
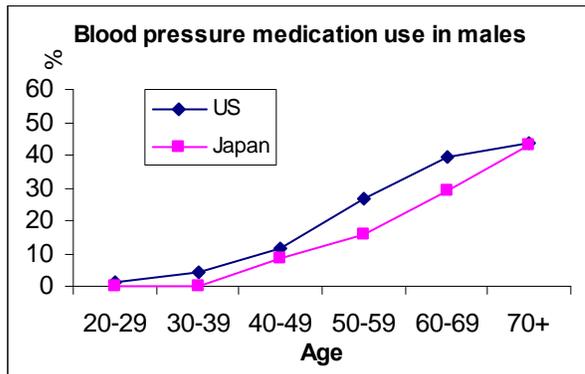


Figure 3. Percentage of males and females in the U.S. and Japan:

a) Taking blood pressure medication



b) Taking cholesterol medication

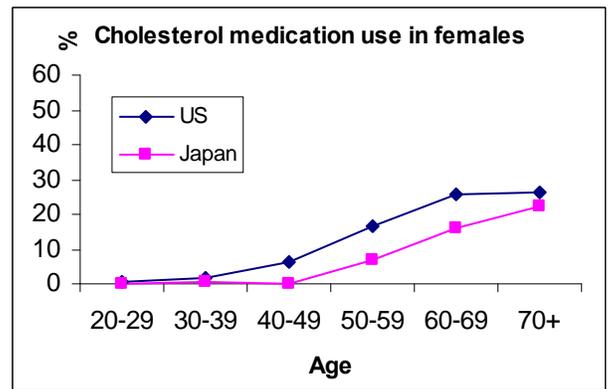
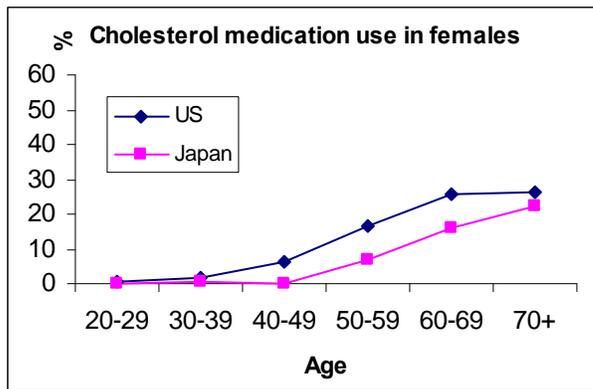
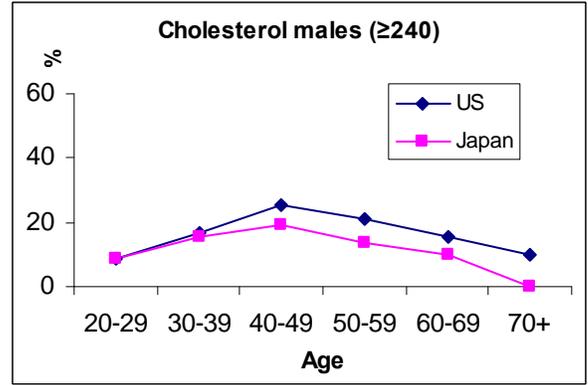
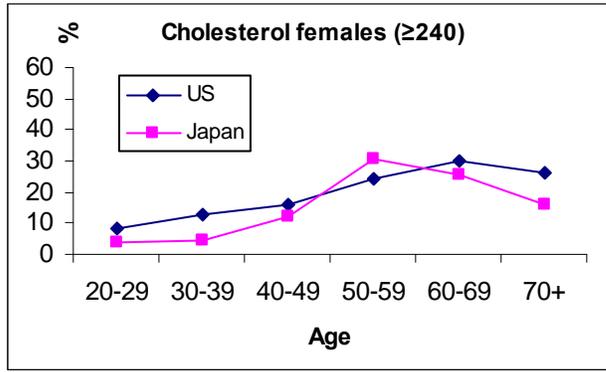
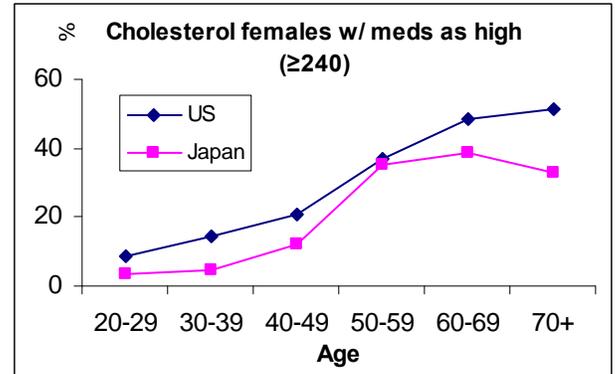
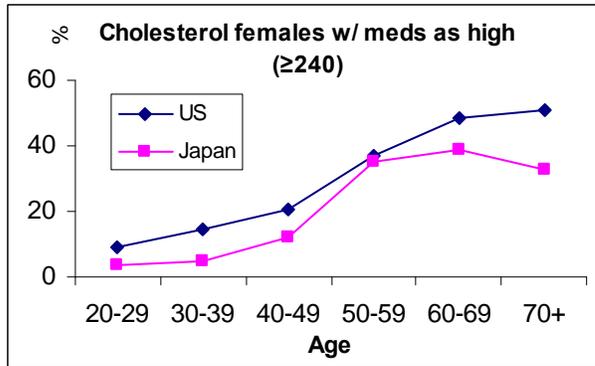


Figure 4. Percentage of age groups in the U.S. and Japan with:

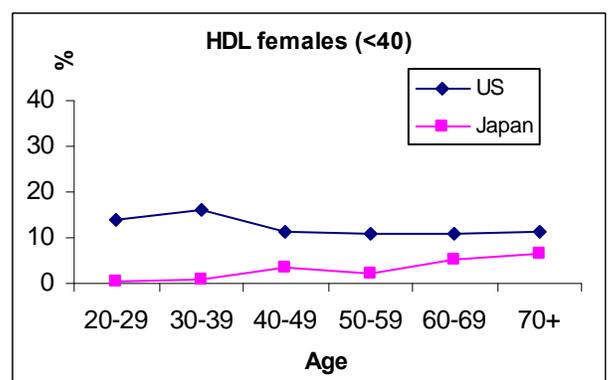
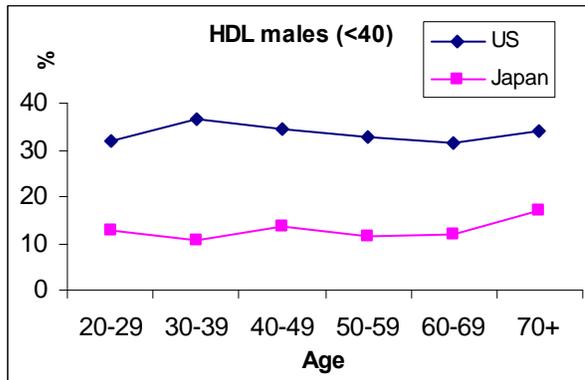
a) High measured cholesterol (≥ 240 mg/dl)



b) Either measured high cholesterol (≥ 240 mg/dl) or taking medications



c) High measured high-density lipoprotein (≥ 40 mg/dl)



d) High measured triglycerides (> 200 mg/dl)

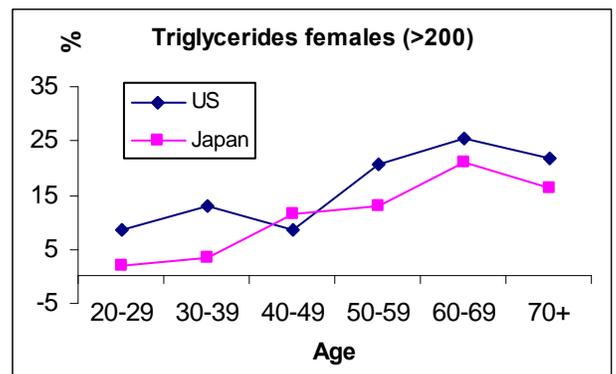
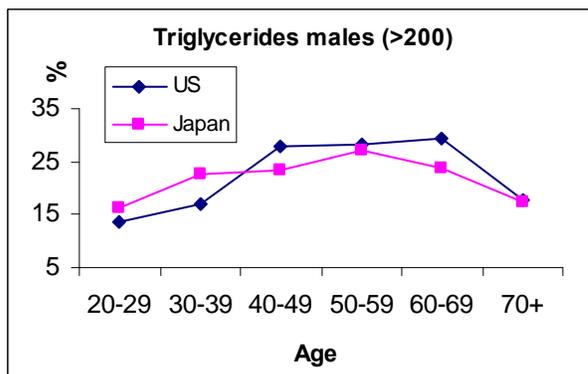
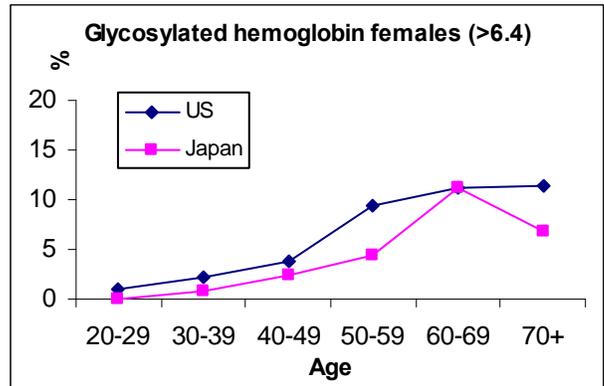
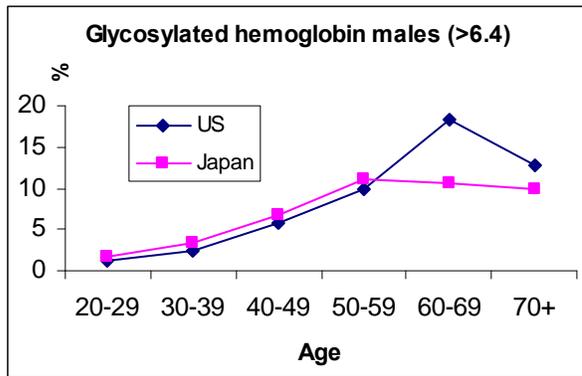
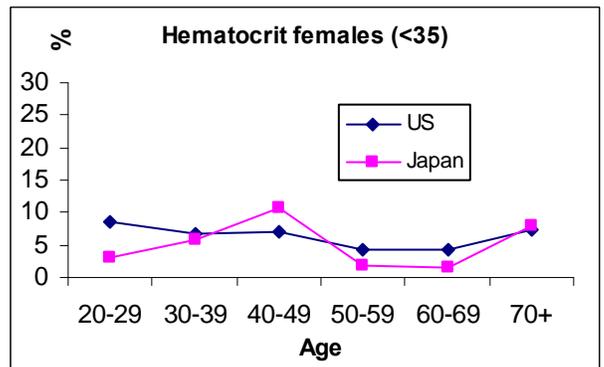
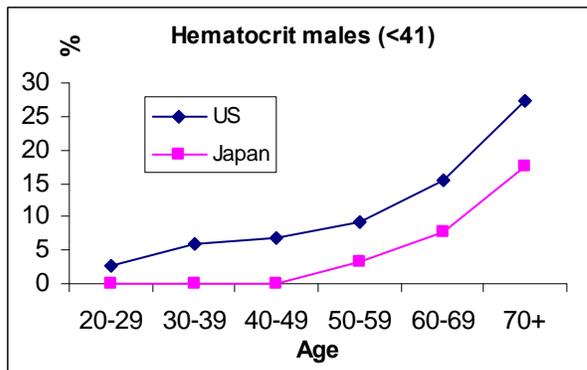


Figure 5. Percentage of age groups in the U.S. and Japan with:
a) High measured glycosylated hemoglobin (>6.4%)



b) High measured hematocrit (<41% males, <35% females)



c) High measured albumin (<3.8 g/dl)

