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Hepatitis B—A Vaccination Success Story

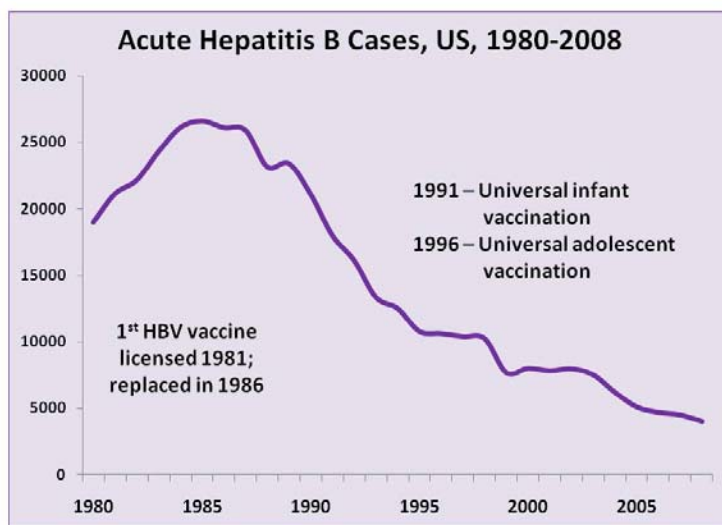
Viral hepatitis is a term commonly applied to several clinically similar yet etiologically and epidemiologically distinct diseases. Five different hepatitis viruses (A, B, C, D, and E) are recognized that cause illness in people, and in some cases, other animals. Hepatitis B (aka serum hepatitis) is caused by the hepatitis B hepadnavirus (HBV), a DNA virus related to hepatitis viruses of ducks, ground squirrels, and woodchucks.

Infection with HBV may result in acute and chronic illness; persons with chronic infections may subsequently develop HBV-related liver disease (eg cirrhosis and cancer). An estimated 2 billion persons worldwide have been infected with HBV, and more than 350 million have chronic, lifelong infections. Men are more likely to become carriers and consequently are more likely to develop chronic liver disease and to develop primary cancer of the liver. The ratio of males:females among those with primary cancer of the liver is about 8:1. Also, data suggest that when fathers are HBV carriers, there is a higher probability that their offspring will be male, although this remains controversial (*J Political Econ* 2005;113:1163-1216).

HBV is most commonly transmitted through injection-drug use, sexual contact with an infected person, or contact from an infected mother to her infant during delivery. It also can be transmitted in settings involving nonsexual interpersonal contact for an extended period (eg among household contacts of a person with chronic HBV infection).

The first “recognized” outbreak of HBV was in 1883, when shipyard workers in Germany were given a small-pox vaccine containing human lymph. In the 20th century, evidence accumulated associating serum hepatitis with use of contaminated needles and syringes, and eventually blood transfusions. In 1965, the HBV surface antigen (Australian antigen) was described and in 1970 the virus (Dane particle) was isolated. These events led to the development of tests for HBV and vaccines.

Following the licensure of the 1st generation of HBV vaccines in 1981, efforts focused on vaccination of men-who-have-sex-with-men (MSM) and intravenous drug injectors. These efforts persist today in the form of the Kansas City Health Department’s hepatitis A/hepatitis B vaccination clinics for MSM (*J Men’s Health Gender* 2007;4:39-43). Efforts then shifted to vaccination of infants and adolescents to break the cycle of mother-to-infant transmission, since as many as 90% of infants infected went on to become chronic carriers. Overall, 24% of chronic infections resulted from perinatal infections. These vaccination programs eventually led to a decline in acute cases of hepatitis B (see graph).



Kansas City experienced a similar decline in acute HBV infections with only 52 confirmed cases being reported in 2008.

Public health surveillance does not track chronic HBV infections; it is assumed that they also are in decline.

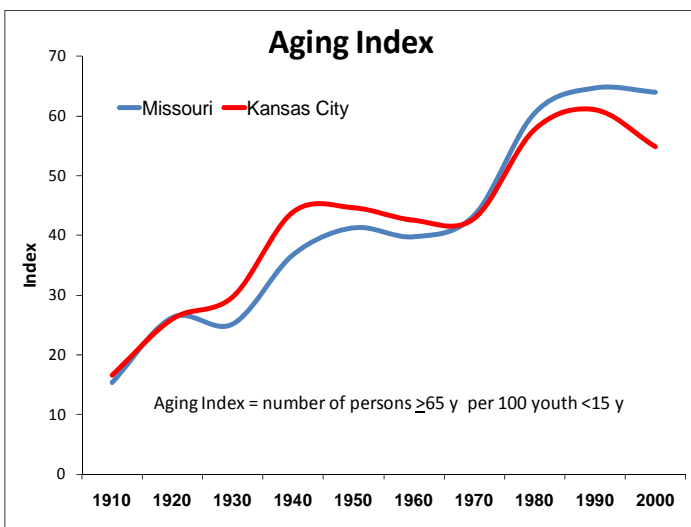
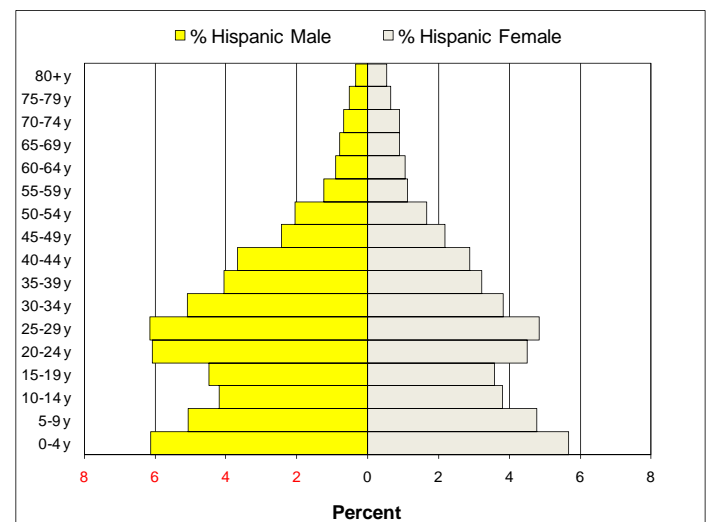
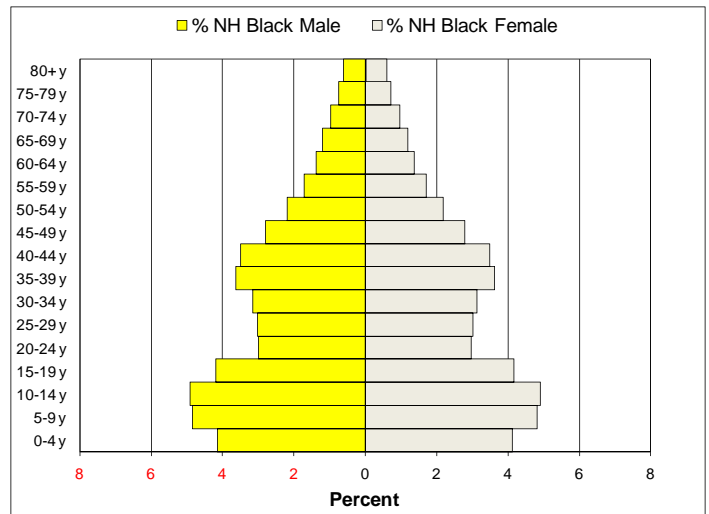
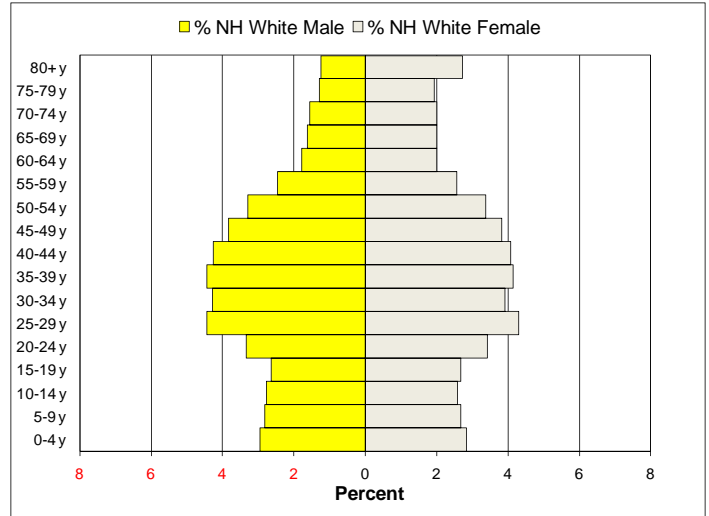
Age-Related Demographic Changes

Although the world's population is aging, children still outnumber older people as of 2008. However, projections indicate that in fewer than 10 years, older people (≥ 65 y) will outnumber children (< 5 y) for the first time in history, according to the report, *An Aging World: 2008* (US Census Bureau, *International Population Reports*, June 2009).

Declining fertility and improved health and longevity have generated rising numbers and proportions of the older population in most of the world. Life expectancy at birth is increasing and the number of the oldest old (≥ 80 y) is increasing. Combined, these dynamics are causing a 1) an increasing trend in population decline in countries around the world, 2) a growing burden of chronic non-communicable diseases, 3) changes in family structures, 4) shifts in the patterns of work and retirement, 5) a restructuring of social insurance systems, and 6) an emergence of new economic challenges.

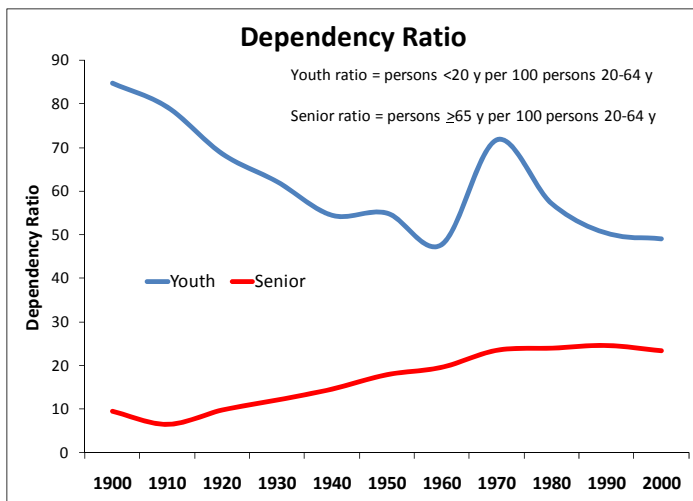
Two demographic measures easily demonstrate how these dynamics are affecting Kansas City. The first is the Aging Index (number of persons ≥ 65 y per 100 persons < 15 y of age) and is shown below for both Missouri and Kansas City. Note how the two trend lines parallel each other up through 1990 and then diverge by 2000. This divergence is partially the result of immigration into the city by Hispanics and their influence on the rise in the number of births. Births to whites have been declining for many years while those to blacks have struggled to remain level. As a result, the structure of each of these

populations in 2000 looked different (see charts below).



The non-Hispanic white population is decidedly older than that of non-Hispanic blacks. Meanwhile, the pyramid for Hispanics is much wider and younger at the base than at the top, in contrast to those for the other two groups.

The other demographic measure is the Dependency Ratio. This measure reflects either the number of youths (<20 y of age) or seniors (≥65 y old) compared to the number of working age adults 20-64 y old. As can be seen in the chart below the youth dependency ratio has been declining reflecting lower birth rates and fertility rates, while the senior dependency ratio has been increasing reflecting increased life expectancy and declining death rates.



The demographic changes illustrated here have significant bearing on the current health care reform debate, namely how can the growing numbers of seniors be assured of health care and how will seniors live in their old age?

Potpourri

RISE TOBACCO PRICES and associated taxes are turning more smokers into tobacco growers, according to the Associated Press. In urban lots and on rural acres, smokers and smokeless tobacco users are planting Virginia Gold, Goose Creek Red, Yellow Twist Bud and dozens of other tobacco varieties. A noticeable increase in smoker-grown tobacco coincided with implementation of the \$0.62 federal tax on cigarettes last April. For about

In a nutshell, any health insurance based on taxation of workers and employers finds itself with a declining support base relative to the dependent numbers (senior dependency ratio above). Thus, taxes would need to be increased. If seniors must purchase their own health care then financially many will be unable to do so and become more dependent on charitable care, government programs, and/or their offspring and other relatives for care (assuming they have offspring and relatives who can care for them). Also, many seniors require assistance for the daily activities of living and assisted living facilities and nursing homes are expensive care options.

While there are many policy issues, such as increased immigration to supplement the workforce, etc, that can be proposed to address some of the issues generated by an aging population, they too are subject to much controversy and political opposition. In addition, countries, such as Mexico and other Western Hemisphere countries, that have traditionally had young workers come to Kansas City to work, also are facing rapidly increased aging of their populations. For example, the aging index for Latin American/Caribbean countries is projected to increase by 3.4 times by 2040.

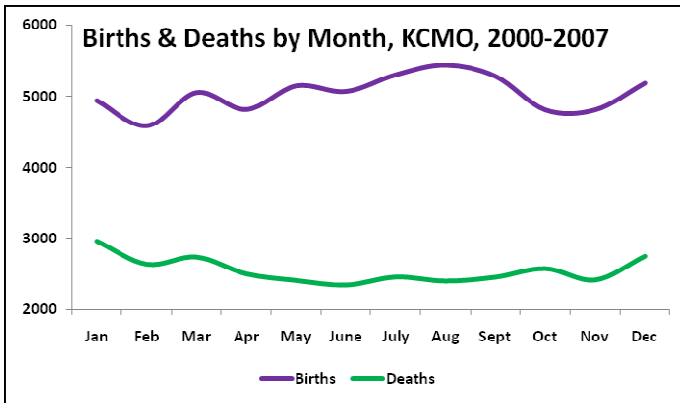
While there have been reports of modest baby booms in two dozen countries in recent years, including the US, (*Nature 2009;460:741-743*), those booms were reversed in 2008 due to the worldwide economic recession. The number of births declined 2% in the US in 2008 (*Natl Vital Stat Rep 2009;57:19*), and both Missouri and Kansas noted fewer births. Increased birth rates will not reverse the aging index and dependency ratio trends discussed here for many decades.

\$0.30 a person can grow enough tobacco to be equivalent to a pack of cigarettes. Provided the tobacco is not sold or traded, the Food and Drug Administration (FDA) does not regulate home-grown tobacco, and neither the FDA nor the US Department of Agriculture keep statistics on home growers. Sales of tobacco seeds for home growing have been running almost 5 times higher than in 2008, according to some seed companies (*The Clarion-Ledger,*

Community & Hospital Letter

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BETWEEN 2000 AND 2007, the number of births in Kansas City was highest in August, while the number of deaths peaked in January. The fewest births occurred in February and the number of deaths was lowest in June.



PRIOR INFECTION with the human papilloma virus (HPV) improved survival in persons with oropharyngeal small cell carcinoma (*Cancer Prev Res 2009; epub ahead of print, 29 July*). Disease-free survival was significantly greater in white than in black patients treated with chemoradiation; the worse survival of black patients was associated with a lower prevalence of HPV infection. Survival was similar for black and white HPV-negative patients.

CHRONIC INFECTION WITH hepatitis C virus (HCV) affects 170 million people worldwide and is the leading cause of cirrhosis in North America. Although the recommended treatment for chronic infection involves a 48-week course of interferon combined with ribavirin, it is well known that many patients will not be cured by treatment, and that patients of European ancestry have a significantly higher probability of being cured than pa-

tients of African ancestry (*Nature 2009; epub ahead of print, 16 August*). In addition to limited efficacy, treatment is often poorly tolerated because of side effects that prevent some patients from completing therapy. A genetic polymorphism near the *IL28B* gene is associated with an approximately twofold change in response to treatment, both among patients of European and African ancestry. Because this genotype leads to a better response and is substantially more common in European than African populations, it explains approximately half of the difference in response rates to therapy between persons of African and European ancestry. Those individuals of African ancestry who had the gene variant showed a better response rate than persons of European ancestry who did not have it, indicating that the gene is a better predictor of therapeutic success than race/ethnicity.

A 30 MINUTE TEST for diagnosing tuberculosis has been developed (*Angewandte Chemie 2009; 48:5657-5660*). Using magnetic nanoparticles the test can recognize *Mycobacterium tuberculosis* organisms in sputum, even at very low concentrations.

THE AGE-ADJUSTED DEATH RATE for the US decreased from 776.5 deaths per 100,000 population in 2006 to 760.3 deaths per 100,000 population in 2007 (*Natl Vital Stat Rep 2009; 58(1)*). Age-adjusted death rates in 2007 decreased significantly from 2006 for 8 of the 15 leading causes of death. Life expectancy at birth rose by 0.2 years to 77.9 years.

RESEARCHERS AT CARNEGIE MELLON UNIVERSITY have developed a website, <http://deathriskrankings.com>, which allows users to calculate their risk of dying. The website can calculate a user's risk of dying within the next year or a longer period and rank the probable cause of death.

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