1.2 ► Heart Disease among Indians Living Abroad

Some 20 million Indians live outside India, nearly 1.7 million of them in the US (census data from 2000). Disconcertingly, the heart disease rate among America's Indian immigrants is three to four times higher than that of the general population. Equally troubling, these high rates are observed even among health-oriented Indians, including vegetarians and physicians. Over the past half century, similarly high rates have been found among Indians in Canada, Fiji, Kenya, Malaysia, Mauritius, Qatar, Singapore, South Africa, Tanzania, Trinidad, and Uganda. This section summarizes the most recent data on the magnitude and seriousness of heart disease among Indians worldwide.

Did you know...
According to the 2000 US Census, the average per capita income of Indians in the US is $60,093, compared to the US average of $38,885 and Indian average of $534.

The most accurate way to do this is to compare mortality rates, hospitalization rates, incidence rates, and prevalence data. These are the most commonly used measures of the impact of heart disease on a population. To better appreciate the material below, it is important that you first grasp what terms like prevalence and incidence mean. For a fuller review, read *Appendix A: Measuring the Impact of Heart Disease*, at the end of this book. Meanwhile, here is a quick summary of the terms we will be employing:

- The **prevalence** of a disease is the proportion of a population who have that disease at any given time. It offers a "snapshot" of the total number of people who currently have that disease, regardless of when they first developed it.
- The **incidence rate** of a disease, in contrast to prevalence, is the number of *new* cases diagnosed each year or over a given period of time. Incidence is, therefore, a rate, while prevalence is a stock. If incidence is like the rate at which water is entering a bathtub from a faucet, prevalence is the total amount of water currently in the bathtub. A **high-incidence, low-prevalence disease** would be a seasonal disease such as the flu. Many new cases emerge each year particularly in winter (giving it a high incidence), but it has a low prevalence (total number) because people recover from it quickly. On average, not many people have the flu at any point. In contrast, a **low-incidence, high-prevalence disease** might be heart disease or diabetes. Such chronic, lifelong illnesses tend to have a low annual incidence, but over time they acquire high prevalence.

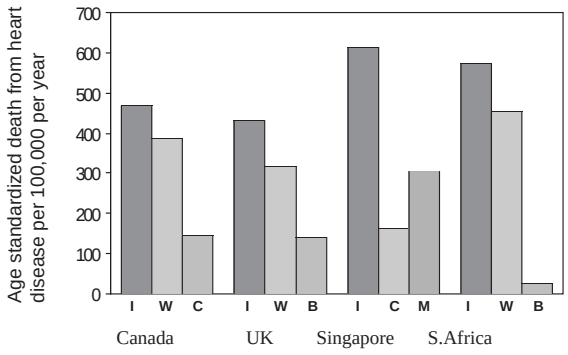

Figure 1.13.. Age-standardized death rates from heart disease among Indian men per 100,000 per year compared to other ethnic groups in Canada, UK, Singapore and South Africa. Note that in each of these four countries, Indians have the highest mortality rates. (I= Indians, B=blacks, W=whites, C=Chinese, M= Malays) Source. Enas, EA. Ref 1.16. *Reproduced with permission © British Journal of Diabetes & Vascular Disease.*

Although Indians are the highest socioeconomic group in the US, and one of the best educated, the Kaiser Study found that the hospitalization rate for heart disease among its Indian patients was **four times** that of its non-Indian patients.

- The **hospitalization** rate, or number of new admissions, is a rough surrogate for the incidence rate. Like airline flight manifests, it is relatively easy for hospitals to total up how many people they admitted in a year with a particular disease because they keep careful year-round records.
- The **mortality** rate, or **death** rate, of a disease is the estimated proportion of the population who have died from it over a period of time, for example, the past year.

Let's step back for a moment. The overall point to bear in mind here is that, no matter which measure one uses to assess heart disease rates worldwide, the evidence consistently shows that Indians have the highest or among the highest rates of heart disease—regardless of what region they live in, their socioeconomic background, their religion, or their gender. To put it bluntly: the Indian community, including those living abroad, is at very high risk of heart disease (Figure 1.13).

HEART DISEASE RATES: HIGH NO MATTER HOW YOU SLICE IT

Indians in the United States

Upon initial reflection, one would not expect Indians in the US to be more susceptible to heart disease than any other group. For one thing, many are vegetarians. For another, a large percentage of them are highly educated professionals, and heart disease is very much a disease that reflects lifestyle choices. Highly educated groups—physicians, for example—tend to take aggressive steps to modify their lifestyle and bring their heart disease rates down. Indians have a higher socioeconomic status than any other ethnic group in the US, including whites. Although they comprise only 0.3% of the US population, Indians make up 5% of its physician population and 10% of cardiologists. As of 2000, Indians in the US included 50,000 engineers, 45,000 Ph Ds, 40,000 physicians and 10,000 medical students and medical residents. Their level of professional attainment makes it all the more surprising that they would have such high levels of heart disease.

*The heart disease rate in the Physicians Health Study was **one-third** that of the general US population. In the CADI Study, it was **four times** that of the US population.*

The reasons for this are considered at length in Chapter IV, particularly Section 1, *Cracking the Indian Paradox*. Our present concern here is to document the full picture with evidence that goes beyond the merely anecdotal.

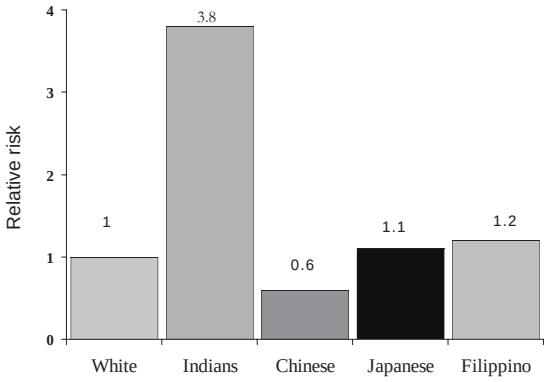

Figure 1.14. Relative rates of hospitalization for heart disease among Kaiser Permanente patients in California. Note that Indians are hospitalized for heart disease nearly four times more often than whites, and more than six times more often than Chinese. Other Asian Americans have rates similar to whites. Source: Klatsky, AL. Ref. 1.29.

The Kaiser Study Although national data on heart disease incidence in Indians are unavailable in the US, one major health maintenance organization (HMO), Kaiser Permanente, has conducted a comprehensive and revealing study using its very extensive patient population base. A key finding of the Kaiser Study was that the hospitalization rate for heart disease among Indian patients was *four times* higher than the rest of its patient population, especially for coronary angioplasty and bypass surgery (Figure 1.14) This finding is all the more alarming because Kaiser Permanente is a conservative HMO that subjects only the most deserving cases to such expensive procedures. Over-diagnosis and over-treatment tend to be rare in managed care. This means that the Indians, who were hospitalized for heart procedures, truly urgently needed them. To put it mildly, that their hospitalization rate is four times higher is a cause for concern .

Although the CADI study participants were mostly physicians, the study was more representative than it sounds because they came from different parts of India and settled in different parts of the US. Also, a third of them were not physicians at all but their spouses. The group was thus demographically representative of Indian physicians in the US, and perhaps of Indian professional families, if not quite of the overall Indian population.

The Coronary Artery Disease in Indians (CADI) Study

The Coronary Artery Disease in Indians Study—or CADI Study, for short—was the first systematic investigation of heart disease among people of Indian origin.

Commissioned by the American Association of Physicians of Indian Origin (AAPI) and conducted between 1990 and 1993, I was its principal investigator. Right off the bat, one distinctive feature of it was that virtually every other previous study had included Indians from various backgrounds. Statistical diversity is normally a good thing, but in these studies this often meant an *overrepresentation* of participants from lower socioeconomic backgrounds and hence a potential skewing of the heart disease data.

*For the same degree of atherosclerosis, Indian Canadians have **twice** the heart disease rate of whites, while Chinese Canadians have **half** the rate.*

The CADI Study, for the first time, showed that the high risk of heart disease among Indians *applied just as much* to highly educated physicians, including cardiologists, who were knowledgeable about the traditional risk factors for heart disease. That was the true surprise, and the startling finding, of the study. It discovered that, despite an extremely low prevalence of standard risk factors among its 1,700 participants, about 10% of these Indian doctors had documented heart disease.

In the 1970s and early 80s, deaths from heart disease decreased in the UK for other ethnic groups but increased for Indians, especially Indian women. In a country such as the UK with such high rates of heart disease among the general population, studies show that Indians there have even higher rates.

The CADI Study was also particularly significant because it was a methodologically rigorous project that reached its conclusions cautiously and conservatively. Indeed, it may actually have *underestimated* rather than overestimating heart disease prevalence among Indians.

One particularly disturbing figure emerged when the CADI data were compared to data from the landmark Framingham Offspring Study (see Appendix B). The age-adjusted prevalence of heart disease for men in the 30-69 age group in the Framingham Study was **25** per 1000. It was **100** in the CADI Study. In other words, Indian physicians were *four times* more likely to develop heart disease than whites (see Figure 1.14). Strikingly, this rate was identical to the four-fold higher rate of hospitalization observed among Indians in California in the Kaiser Permanente study, mentioned above (see Figure 1.13).

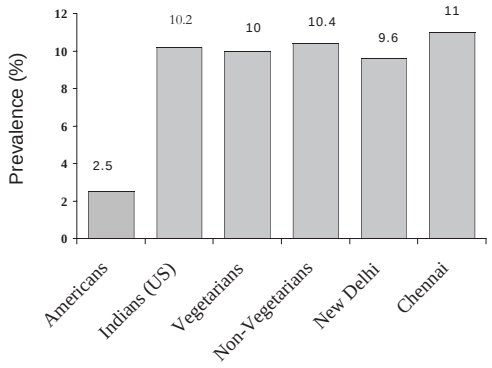

Figure 1.15. Prevalence of heart disease among non-Indian Americans compared to Indians in the US in the CADI Study (second column), were four times as likely to develop heart disease as non-Indian Americans, followed in the Framingham Offspring Study (first column). In comparison to Column 1, the great similarity of heart disease prevalence found in Columns 3 and 4 (vegetarians and non-vegetarians in the CADI Study, respectively) and in Columns 5 and 6 (Indians living in New Delhi and in Chennai, in two different regions of India) strongly suggests that Indians have a genetic predisposition toward heart disease that transcends both geographical region and nutritional choices. Source: Enas, EA. Ref. 1.16. *Reproduced with permission © British Journal of Diabetes & Vascular Disease.*

Other findings: Little difference in heart disease rates was found among the approximately one-third of participants who were the spouses of physicians (primarily husbands of women doctors). They, too, had high rates. Second, the rates did not vary significantly between vegetarians and non-vegetarians, nor between people from different Indian states (although a trend toward a higher rate was observed among physicians originally from Kerala). Finally, unlike other studies, the CADI Study did not find high rates of heart disease among Indian women. This, however, was attributed to the young age of the women participants as well as their small number, which made the sample size more vulnerable to statistical error.

The main point, however, should not be lost: The CADI study focused on physicians—cardiologists, internists, family practitioners—who were aware of the risk factors of heart disease and were, on the whole, doing the best they could to live a healthy lifestyle in terms of diet, exercise, weight management, and so on. With the exception of diabetes, they had an unusually low prevalence of standard risk factors. (These factors are discussed in Chapter II)

Differences in heart disease rates frequently disappear when studies are adjusted for socioeconomic sta-

tus, so the results of the CADI Study were also compared with the Physicians Health Study. This was another long-term study involving more than 22,000 healthy male American physicians who, like the CADI doctors, were very well-informed about the dangers of heart disease and the benefits of prevention. The heart attack rate in the Physicians Health Study was *one-third* that of the overall US population—what one would expect for such a strongly health-oriented group. In the CADI Study, by contrast, the heart attack rate was *four times* that of the overall US population.

*In one study, heart disease rates in South African Indians were nearly **30 times** higher than among South African blacks.*

Whichever way one looks at it, the high rates of heart disease among Indian physicians contrasts sharply not only with the very low rates found in the Physicians Health Study but with the rates among Americans in general. The CADI Study raised the larger question: Why? Because of this, it became a stimulus for further investigative study in the US, in India, and in other countries.

Indians in Canada

The rates of cardiovascular diseases and cancer vary markedly among various ethnic groups in Canada. white Canadians have high death rates from both cancer and heart disease, whereas Canadians of Indian descent have high death rates from heart disease and lower death rates from cancer (see Figure 1.13. Chinese Canadians, by contrast, have low death rates from heart disease but high death rates from cancer. The SHARE Study (see Appendix B), on the other hand, showed that Indians had the highest prevalence of heart disease (11%), similar to that found in the CADI Study. The prevalence was double that of whites (5%) and five times higher than for Chinese (2%).

Heart disease rates have fallen in Canada over the last two decades, but the decline has been slowest among Indians. For the same degree of atherosclerosis (plaque buildup), Indian Canadians have double the heart disease rate of whites, while Chinese Canadians have half the rate of whites. These wide variations in heart disease rates in a study controlled for atherosclerosis levels raise the possibility that, at least for heart disease, different risk factors and protective factors exist among Canadians from different ethnic groups, and that these factors promote or counter the effects of atherosclerosis to varying degrees.

Indians in the United Kingdom

Death rates from heart disease in the UK are among the highest in the world, next only to the countries of the former Soviet Union. This is consistent with the high rates of standard heart disease risk factors found there, and the relatively modest level of intervention of these risk factors. Yet, even in a country with such high heart disease rates among the general population, studies show that Indians living in the UK have even higher rates. For example, they have substantially higher heart disease mortality rates than whites, while blacks and Chinese have substantially lower rates than whites (Figuer 1.13). In one study, the death rate from

How the CADI Study was Conducted: A Rigorous Methodology

About 8% of the participants had at some point in their lives had a heart attack or angina (chest pain due to heart disease). Another set of the participants had had coronary angioplasty, stent, or bypass surgery. By adding up the two categories, the study estimated that the prevalence of heart disease among Indians-the percentage of Indians alive with heart disease-was 10%.

This figure is fairly conservative because of the methodological rigor of the study and its selection criteria. First, only individuals with "hard" evidence of heart disease-such as a heart attack, or severe blockages detectable on a coronary angiogram-were included. People, who had simply had some chest pain but without a confirming abnormal coronary angiogram, were not included. More than 90% of the participants had had their heart disease documented by a coronary angiogram. For the few whose diagnosis of heart disease had not been confirmed by an angiogram, an electrocardiogram had been used. However, because an electrocardiogram was not done for all participants, there could have been an additional number of participants who had silent heart disease which was not detected.

Finally, only physicians healthy enough to travel to the AAPI conventions were included. In short, the Study was accurate, conservative, and methodologically rigorous. Given that they were virtually all physicians, the prevalence of heart disease among Indians is probably even higher than the Study found.

heart disease among Indians was 55% higher than the national average. The differences in heart disease rates were even higher at younger ages—230% higher in Indians younger than 40, compared to whites of the same age, and 313% higher in Indians younger than 30 compared to whites of the same age. It was similarly found that Indians developed their first heart attack at a much younger age, resulting in earlier death. Even Indian doctors die *15 years earlier* than their white colleagues in the UK.

Using data from 1970 to 1972 and 1979 to 1983, the heart disease mortality rate decreased in both men and women in the UK—for example, it decreased by a total of 8% for Western European, American, and Caribbean men during those years—but it increased 6% among Indian men and, even more strikingly, 13% among Indian women. In another study, Indians were twice as likely to be admitted to hospital with a heart attack, and twice as likely to die over the subsequent six months, than white patients. On a brighter note, Indians have the lowest rates of cancer in the United Kingdom. Their high risk of heart disease, however, parallels that of Indians elsewhere.

On the Indian subcontinent itself, important differences exist among Bangladeshis, Pakistanis, Sri Lankans, and national Indians in cardiac mortality and in the prevalence of cardiac risk factors. For example, in one study, deaths from heart disease were 47% higher among Bangladeshis, 42% higher among Pakistanis, and 37% higher among Indians than whites. It is noted that the Indians in the study had slightly higher overall socio-economic status than the Pakistanis and Bangladeshis, which is an important predictor of heart disease (see Chapter III, Section 1), although the direction of its influence depends partly on the stage of development.

These mortality rate differences track traditional risk factor differences. For example, Bangladeshis, who had the highest mortality rates, also tended to have the highest risk factors, particularly men: They had high rates of smoking (57%), the highest concentrations of triglycerides (180 mg/dL), high blood glucose levels (119 mg/dL), and the lowest levels of HDL or good cholesterol (38 mg/dL). They also had the highest rates of diabetes (27%), but the lowest blood pressure levels. Shortness of height is associated with a higher risk of heart attack (see Chapter III, Section 1), and Bangladeshis were the shortest: men were on average 5 feet 4.5 inches tall, versus 5 feet 7 inches for Indians and 5 feet 8.5 inches for whites. These data underscore the fact that the importance of the standard risk factors cannot be ignored (see Chapter IV, Section 1).

Indians in Singapore and Malaysia

Indians make up 7% of Singapore's population. Of these, 80% originate from South India and Sri Lanka. The first report of high levels of heart disease among Singaporean Indians was published in 1959. Based on nearly 10,000 post-mortem studies, the report showed that Indian Singaporeans had seven times the heart disease rate of Chinese Singaporeans. Subsequent studies over the past four decades have shown that Indians are three to four times more likely to have heart attacks than Chinese Singaporeans. This 300-400% difference in heart disease rates between Chinese and Indian Singaporeans even as far back as four decades ago is the first indication that Indians may be genetically predisposed toward heart disease.

There is, however, an even more telling statistic. Over the past 25 years, harmful changes in lifestyle and environment—including higher rates of smoking, greater obesity, more fattening diets, and a more sedentary lifestyle—have doubled the death rates from heart attacks in Singapore. (Little of this increase in mortality rates can be attributed to genetic changes, which take place over a much longer time frame.) What is significant is that the 300% difference in heart disease rates between Chinese and Indian Singaporeans has not narrowed over this 25-year period. The mortality rates have doubled for *both* Indians and Chinese. One would have expected to see somewhat of a convergence. After all, it is highly unlikely that Indians gained twice the weight as Chinese, smoked twice as many more cigarettes, and ate twice as much more fat.

Yet the data show that the increase in risk factor levels from adverse changes in lifestyle has been similar in Chinese and Indians. These data suggest fairly convincingly that harmful changes in lifestyle related to **affluence, urbanization, and sedentary living** have had a greater net adverse effect on Indians than on Chinese. In all likelihood, the adverse lifestyle changes that have taken place in Singapore have magnified the harmful effects of preexisting genetically inherited risk factors. The most recent data (from 2002) indicate that the incidence of heart attacks, and death rate from heart attacks, is more than three times higher among Indian men than Chinese, and

twice as high among Indian women. Similar trends have been observed in Malaysia. In a study of patients who had a heart attack before 40, 56% were Indians, even though Indians comprise only 10% of the Malaysian population.

Indians in Fiji and Mauritius

Indians in Fiji have high rates of diabetes and heart disease and very high mortality rates from these two conditions. Indians with diabetes also have a higher risk of heart disease than the Melanesians, the Fiji natives. For example, compared to people without diabetes, the relative risk of developing heart disease among diabetics is four times higher in Indians compared to only two times higher in Melanesians.

The 1.2 million people who live on the island of Mauritius, in the Indian Ocean, are approximately 70% Indians, 28% Creole, and 2% Chinese. Death rates from heart disease and stroke for the overall population are among the highest recorded in the world (18% in men and 33% in women). However, among them, the Chinese have the lowest and the Indians have the highest rates of heart disease. There has been a substantial rise in obesity in Mauritius. This could further increase the rates of diabetes and heart disease. (The way diabetes and heart disease interrelate is discussed in Chapter II, Section 7.)

Indians in the Middle East

In the Middle East, once again, one finds that heart disease is more common among Indians and occurs at a much lower age than in the native Arab population. In a study of more than 2,500 patients with documented heart attacks, 71% of all patients 40 years old or younger were Indians, even though Indians make up only 5% of the general population. Most Arabs who had heart attacks were significantly older.

Indians in South Africa and Uganda

In the 1970s, South Africans had high rates of heart disease, with whites having the highest rates in the world. Indians, however, have now surpassed this, with particularly high rates at younger ages. Although the overall rates have been declining in South Africa, the reduction has been much slower among Indians. Heart disease among Indians in South Africa is both premature and severe. A recent study in South Africa found three-vessel disease (significant narrowing of all three of the big coronary arteries) in 52% of the patients who had a heart attack before age 45. This high prevalence of multi-vessel disease in young Indians is consistent with studies conducted on Indians in other parts of the world (see section 4).

Risk factors: One study found a substantial difference in fat intake between Indians and blacks. Fat made up 40% of the daily calorie intake of Indians, compared to just 15% for blacks. Furthermore, the major source of dietary fat for blacks was peanuts, in contrast to cottonseed oil and *ghee* (clarified butter) for Indians. Ghee, although tasty, is one of the most cholesterol-laden foods in the world, three times worse than regular butter. (See Chapter V, Section 4, which discusses good and bad oils.) The available data suggest that South African blacks may be protected against heart disease through diet and other factors. For example, heart disease rates were nearly 30 times lower in South African blacks than Indians. In Uganda, heart disease was determined as the major cause of death (43%) among Indians even as early as 1959.

Indians in the Caribbean

The relative risk of hospital admissions for heart attack as compared with white men was 50% in Caribbean men but 200% for Indians. A major survey in Trinidad, the St. James Survey (see appendix B) followed nearly 2,000 adults who had been free of heart disease for 10 years for the development of new heart disease. The relative risk of having a first major coronary event (heart attack, death etc) among Indians was twice that of whites and seven times higher than for people of other ethnic origins, after adjusting for differences in age.

The data from the UK, Trinidad, Uganda, and South Africa suggests very low rates of heart disease in blacks despite a high prevalence of hypertension and stroke. In most of the countries of the Caribbean, heart disease rates among Indians are more than double those of blacks. Since the environment is the same, this suggests that the variation is attributable to either genetics or differences in lifestyle, activity level, body weight, and diet.

Indians and stroke

Conflicting reports have been published on stroke rates among Indians living abroad, with most countries—Canada, for example—reporting no higher rates. However, the stroke rates among Indians in Singapore are similar to those of the Chinese, who are known to have the highest rates of stroke. Data from the UK also show that stroke rates for Indians are very high and fall between the rates for whites and blacks. This is not surprising since heart disease and stroke share common risk factors.

KEY ▪ POINTS ▪ IN ▪ A ▪ NUTSHELL

- ♥ The rate of heart disease among Indians is two to four times higher than people of other ethnic origin.
- ♥ Evidence from multiple countries and regions of the world consistently shows that Indians have the highest or among the highest rates of heart disease, regardless of their religion, gender, or socioeconomic background.
- ♥ High rates of heart disease have been observed among Indians living in the US, Canada, Singapore, the UK, South Africa, Middle East, Trinidad, Mauritius, Fiji, Kenya, and many other countries.
- ♥ Since the environment in each of these countries is the same for Indians as for other populations who live there, the variation must be attributable either to genetics or to differences in lifestyle, activity level, body weight, and diet.
- ♥ Vegetarian and non-vegetarian Indians have similarly high rates of heart disease.
- ♥ Stroke rates have been reported to be high among Indians in the UK and Singapore, but not especially high in other countries.

1.3 ► An Epidemic on the Indian Subcontinent

In the preceding section, we saw that in numerous countries around the world, Indian immigrants have either the highest, or close to the highest, rates of heart disease of any ethnic group—regardless of their gender, religious practice, social class, or economic status. But what about Indians "at home"? This section examines heart disease on the Indian subcontinent itself, home to approximately 1.5 billion people—a billion in India, half a billion in Bangladesh, Pakistan, and Sri Lanka.

Heart disease has often been considered an "affluent person's disease"—an illness associated with easy living, a sedentary lifestyle, and a high-calorie diet rich in cakes, prime-cut meats, and other fattening foods. People in developing countries, who tend to live hardy, frugal lives, are thought to have a low susceptibility to the cardiovascular illnesses of the rich. Africans, for example, have little heart disease.

In the past three decades, heart disease rates have doubled in rural areas of India, and tripled in its urban areas.

By 2020, according to the WHO the number of Indian citizens dying each year from heart disease will exceed 2.4 million, more than twice the number in 1990. One of every four cardiac patients in the world will be Indian.

But not so with Indians. Researchers are discovering that heart disease rates on the Indian subcontinent have all but caught up with the high rates observed among Indians living abroad. For example, a major study found that the prevalence of heart disease in New Delhi and Chennai, both in India, was 10% and 11% respectively—slightly higher than the 10% rate among the Indian participants in the American-based CADI Study (*see the preceding section*). Over the past three decades, heart disease rates in the nation of India have **doubled** in rural areas and **tripled** in urban areas. In Bangladesh, Pakistan, and Sri Lanka, the rates are similar to India's, with urban