D
cades ago, the global epidemic of
type 2 diabetes was predicted by
epidemiologists who observed large
and rapid increases in the prevalence of
type 2 diabetes among indigenous peoples
who adopted Western lifestyles (1–4). Sub-
sequent epidemiological studies demon-
strated that essentially all non-Europid
populations who escape the ravages of
communicable diseases, enjoy abundant
food and less physically demanding life-
styles and survive to middle and old age
are at increased risk for type 2 diabetes,
its complications, and comorbidities. The
global epidemic of type 2 diabetes has been
documented in a series of progressively more
precise, refined, and sobering projections (5).

In 1993, King et al. (6) assembled es-
timates of the prevalence of diabetes for
adults around the world. In 1997, Amos
et al. (7) first used age-specific prevalence
rates for type 2 diabetes from different
countries and current and projected age
distributions of the world population to
estimate the present and future numbers
of people with diabetes worldwide. Using
similar methods but incorporating addi-
tional age- and sex-specific and rural- and
urban-specific diabetes prevalence rates,
King et al. (8), Wild et al. (9), and Shaw
et al. (10) repeated these analyses. In gen-
eral, these studies projected that the num-
ber of adults with diabetes in the world will
more than double between 2000 and 2030,
with most of the increase occurring in de-
veloping countries, particularly in Asia.
Not surprisingly, countries with the largest
populations have and will have the greatest
number of individuals with diabetes. Ac-
cordingly, India and China top the lists.
The most recent studies have projected that
by 2030, India will have 79–87 million
and China 42–63 million adults with dia-
betes (9,10). The latter projection did not
account for the rapid change in lifestyle
occurring in China and appears to have
substantially underestimated the future
burden of diabetes in that country. A recent
national study found that 92.4 million Chi-
nese adults may already have diabetes (11).

As pointed out by King et al. (12) and
Hsu et al. (13) in this issue of Diabetes Care,
Asian Americans, Native Hawaiians, and
Pacific Islanders (AANHPI) are a hugely
diverse population. Asian Americans, as
defined by the U.S. Census Bureau, may in-
clude persons with origins in China, the Re-
public of the Philippines, India, Vietnam,
Korea, or Japan. AANHPI are clearly at in-
creased risk for type 2 diabetes, yet are far
from unique. The story around the world
is much the same. Type 2 diabetes is now a
global epidemic. The authors are correct
that our ability to address the epidemic of
type 2 diabetes in AANHPI will require ins-
gights from epidemiological and pathophysiologi-
sal and clinical tri-
als. Stemming the epidemic will also re-
cially appropriate interventions.

An important epidemiological find-
ing, highlighted by the authors, is that
Asian Americans with type 2 diabetes are
more likely to have seemingly normal in-
dices of adiposity (using Europid criteria)
compared with other ethnic groups with
diabetes (12). However, the optimal BMI
cutoff to predict type 2 diabetes, hyper-
tension, dyslipidemia, and cardiovascular
morbid and mortality in Asian popula-
tions is lower than in other populations
(14). Asian Americans with diabetes are
less likely to be obese than whites, but in
every BMI category Asian Americans have
a higher prevalence of diabetes than whites.
Asian respondents to both the 2001 Be-
vioral Risk Factor Surveillance System and
the 2006–2008 National Health Interview
Survey were 70% more likely to have
diabetes than whites after adjusting for age,
sex, and BMI (12). Accordingly, the World
Health Organization has recommended
that a BMI cutpoint ≥23 kg/m² be used to
define overweight in Asian populations
(15). This compares to a BMI cutpoint for
overweight ≥25 kg/m² in other popu-
lations. Similarly, the International Diabetes
Federation in its consensus worldwide
definition of the metabolic syndrome rec-
ommended that waist circumference cut-
points ≥90 cm for Asian men and ≥80 cm
for Asian women be used to define central
obesity. These compare with cutpoints
≥102 cm and ≥88 cm in other U.S. men
and women and ≥94 cm and ≥80 cm in
Europid men and women. These cutpoints
have been endorsed by the International
Diabetes Federation and other interna-
tional organizations to harmonize the
definition of the metabolic syndrome (16).

If clinicians apply general U.S. criteria to
define overweight and central obesity when
they determine who should be screened for
diabetes, they will fail to identify high-risk
Asian Americans.

Another important epidemiological
finding, highlighted by the authors, is that
in Asian Americans, fasting plasma glucose
and hemoglobin A₁C (HbA₁C) are less sen-
sitive for diagnosing diabetes than the oral
glucose tolerance test, which includes an
assessment of the 2-h postchallenge plasma
glucose. In Asian Americans, fasting plasma
glucose was only 69% sensitive and HbA₁C
≥6.5% only 40% sensitive compared with
the oral glucose tolerance test in diagnosing
diabetes. As Hsu et al. conclude, “these di-
agnostic considerations are particularly sig-
nificant in Asian Americans because they
have higher risks for diabetes, often present
without overt signs of obesity, and may be
misdiagnosed if a test with low sensitivity is
used” (13).

Although gaps remain in our knowl-
edge, evidence for the efficacy of interven-
tions to delay or prevent the development
of type 2 diabetes in AANHPI is remarkably
robust. As summarized by Hsu et al. (13),
at least five randomized, controlled clinical
trials have evaluated the efficacy of lifestyle
interventions in high-risk Asian or Asian
American populations, and six trials have
evaluated the efficacy of medications in-
cluding metformin, α-glucosidase inhibi-
tors, and thiazolidinediones. The good news
is that lifestyle interventions (29–71% risk
reduction) and metformin (26–52% risk
reduction) appeared to be as effective if
not more effective in Asian populations.
Also, the α-glucosidase inhibitor voglibose
appears to be remarkably effective (58% risk
reduction) in one trial from Japan. Al-
though treatment algorithms that address
the underlying pathophysiological pro-
cesses among native Asian and AANHPI
populations are desirable, they are not gen-
erally available. Even the American Diabe-
tes Association/European Association for
the Study of Diabetes consensus guidelines
for diabetes management fail to account for
potential pathophysiological differences
among subpopulations that might impact
treatment choices (17).
What is clear is that all interventions, whether for AANHPI populations or other at risk populations, must be grounded in a knowledge of the values, norms, knowledge, beliefs, practices, experiences, and languages of the culture (12,13). Interventions that involve behavioral self-management need to involve the target communities and incorporate a solid understanding of acculturation, alternative health pathways, psychosocial stressors, support systems, literacy, dietary preferences, and attitudes toward physical activity.

King et al. and Hsu et al. do an excellent job describing risk factors for diabetes, diagnostic issues, and the enormous and growing burden of diabetes in AANHPI. They summarize the results of clinical trials that clearly demonstrate the efficacy and feasibility of lifestyle and medication interventions for diabetes prevention. They also provide a realistic if somewhat sobering perspective on the challenges of successfully implementing such interventions.

Although we believe it is of value to focus on this unique and high-risk community, we also believe it is important to remember that type 2 diabetes is a global epidemic. The issues raised by the authors are universally relevant. To successfully address this epidemic, we must measure it, understand its risk factors, develop valid and efficient approaches to screening and diagnosis, and develop and implement culturally specific interventions for prevention and treatment.

The evidence base for diabetes prevention is robust, but the epidemic continues unabated. Type 2 diabetes has progressed beyond the point where it can simply be considered a “medical problem.” It is a societal problem and an international problem and must be addressed as such. Interventions must address school education, advertising, food availability and price, the built and workplace environments, and possibly tax policy. Health systems must remove barriers and indeed provide incentives to encourage the adoption of safe and effective interventions for diabetes prevention. However, it is disappointing that both articles failed to discuss the emerging evidence that the intrauterine environment and epigenetic factors may play an important role in obesity and type 2 diabetes in adult life (18). This may be a productive area for future research, and in the meantime, a greater emphasis on maternal health may be an important strategy to reduce the global epidemic. The recent evidence that circulating mediators of appetite that encourage weight regain after diet-induced weight loss persist also highlights the need for the primary prevention of obesity (19). It is only with such an all encompassing approach that we can begin to combat the scourge of type 2 diabetes.

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