International Day for the Evaluation of Abdominal Obesity (IDEA)

A Study of Waist Circumference, Cardiovascular Disease, and Diabetes Mellitus in 168 000 Primary Care Patients in 63 Countries

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Background**—**Abdominal adiposity is a growing clinical and public health problem. It is not known whether it is similarly associated with cardiovascular disease (CVD) and diabetes mellitus in different regions around the world, and thus whether measurement of waist circumference (WC) in addition to body mass index (BMI) is useful in primary care practice.

Methods and Results**—**Randomly chosen primary care physicians in 63 countries recruited consecutive patients aged 18 to 80 years on 2 prespecified half days. WC and BMI were measured and the presence of CVD and diabetes mellitus recorded. Of the patients who consulted the primary care physicians, 97% agreed to participate in the present study. Overall, 24% of 69 409 men and 27% of 98 750 women were obese (BMI≥30 kg/m^2). A further 40% and 30% of men and women, respectively, were overweight (BMI 25 to 30 kg/m^2). Increased WC (>102 for men and >88 cm for women) was recorded in 29% and 48%, CVD in 16% and 13%, and diabetes mellitus in 13% and 11% of men and women, respectively. A statistically significant graded increase existed in the frequency of CVD and diabetes mellitus with both BMI and WC, with a stronger relationship for WC than for BMI across regions for both genders. This relationship between WC, CVD, and particularly diabetes mellitus was seen even in lean patients (BMI<25 kg/m^2).

Conclusions**—**Among men and women who consulted primary care physicians, BMI and particularly WC were both strongly linked to CVD and especially to diabetes mellitus. Strategies to address this global problem are required to prevent an epidemic of these major causes of morbidity and mortality. **(*Circulation*. 2007;116:1942-1951.)**

Key Words: cardiovascular diseases ■ diabetes mellitus ■ epidemiology ■ obesity ■ risk factors

The beneficial impact on cardiovascular morbidity and mortality of favorable trends in population control of classic risk factors such as smoking, hypercholesterolemia, and hypertension may be reversed by the current epidemic of obesity.[1–6] Obesity, in particular abdominal adiposity, is associated with increased risk of cardiovascular disease (CVD) and diabetes mellitus.[7–22] The prevalence of diabetes mellitus is increasing,[23] and already in the United States the lifetime risk of developing diabetes mellitus is high: 33% for men and 38% for women.[24] Given that patients with diabetes mellitus have at least a 2-fold higher risk of cardiovascular mortality than nondiabetic patients,[25] obesity has become a major clinical and public health problem that threatens to overwhelm already extended healthcare services in many countries.

Clinical Perspective p 1951

Recent publications have shown that the overweight and particularly the obese have progressively higher morbidity and mortality.[26,27] The multinational INTERHEART case-control study confirmed the importance of obesity, particularly abdominal adiposity, as a potent risk factor for myocar-

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Table 1. Characteristics of Patients in IDEA by Region

Region	Countries	No. of Patients	Mean Age, y (SD)	Men, %	Mean Waist Circumference, cm (SD)		Mean BMI, kg/m² (SD)	
					Men	Women	Men	Women
Northwestern Europe	Austria, Belgium, Denmark, Finland, France, Germany, Ireland, The Netherlands, Norway, Sweden, Switzerland	29 582	51.7 (16.4)	43.3	97.8 (13.5)	88.3 (14.8)	27.2 (4.6)	26.4 (5.6)
Southern Europe	Greece, Italy, Portugal, Spain, Turkey	31 289	53.0 (15.8)	43.0	99.4 (12.9)	91.3 (14.7)	28.2 (4.5)	27.9 (5.6)
Eastern Europe	Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Russia, Slovakia, Slovenia, Ukraine	30 375	50.2 (15.9)	36.8	96.9 (13.7)	89.7 (15.7)	27.5 (4.8)	27.6 (6.0)
Northern Africa	Egypt, Morocco, Tunisia	5 028	43.1 (14.7)	37.2	93.6 (15.3)	93.1 (16.2)	26.6 (5.4)	28.3 (6.4)
Southern Africa	Republic of South Africa	2 492	42.0 (13.8)	43.2	93.6 (15.5)	89.8 (16.4)	26.9 (5.6)	28.9 (7.2)
Middle East	Israel, Kuwait, Lebanon, Qatar, Saudi Arabia, United Arab Emirates	5 457	41.9 (13.9)	56.0	98.2 (14.2)	93.4 (16.5)	28.2 (5.4)	28.7 (6.9)
Eastern Asia	China, Hong Kong, Korea, Taiwan	11 402	48.4 (15.9)	38.6	86.4 (10.7)	80.2 (10.7)	24.4 (4.0)	23.9 (4.1)
Southern Asia	India, Indonesia, Malaysia, Pakistan, The Philippines, Singapore, Thailand, Vietnam	19 381	43.3 (14.7)	50.0	89.3 (13.4)	84.1 (13.9)	24.7 (4.8)	25.0 (5.6)
Australia	Australia	1 846	49.3 (16.7)	44.5	99.1 (14.9)	89.0 (15.9)	28.0 (5.2)	27.5 (6.3)
Canada	Canada	3 062	51.9 (15.7)	43.8	101.4 (15.2)	92.2 (16.2)	29.2 (5.7)	28.9 (6.9)
Latin America	Argentina, Brazil, Chile, Colombia, Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Peru, Trinidad & Tobago, Venezuela	28 245	44.1 (15.5)	34.4	96.4 (13.4)	89.7 (13.8)	27.8 (4.9)	27.6 (5.7)
Overall		168 159	48.5 (16.1)	41.3	95.8 (14.0)	88.7 (14.9)	27.1 (4.9)	27.0 (5.9)

dial infarction.[15,16] Despite this interest, worldwide data on the distribution of even simple measures such as waist circumference (WC), made with a standardized protocol, are not available. This is crucial if geographic or ethnic thresholds are to be established for interventional programs. It is also important to extend the INTERHEART observations to determine the impact of adiposity on CVD and diabetes mellitus in different regions of the world and in a more widely based population that consults primary care physicians (PCPs).

The International Day for Evaluation of Abdominal obesity (IDEA)[28] was a large, international, noninterventional, cross-sectional study to evaluate abdominal adiposity (WC) measured by a standardized protocol in 168 000 primary care patients on 2 prespecified half-days in 63 countries. This report describes the geographic distribution of WC, overweight, and obesity, and evaluates whether WC in addition to body mass index (BMI) is a useful clinical marker of physician-reported CVD and diabetes mellitus.

Methods

Between May 9 and July 6, 2005, all consecutive patients aged 18 to 80 years who consulted the randomly selected PCPs for any reason were invited to participate in the present study, on 2 half-days prespecified for each of the 63 countries.[28] Women who were known to be pregnant were excluded.

Physicians recorded each patient's age, gender, smoking status, presence of known CVD (defined on the form as coronary heart disease, stroke, or revascularization), and known diabetes mellitus (type 1 or type 2). Disease status used a combination of the physician's knowledge of the patient's history, medical notes, and patient recall. The PCPs were trained to measure WC in the standing position, midway between the lowest rib and the iliac crest.[1] Weight and height were measured, and BMI was calculated. Ethics committee approval was obtained for each participating site and each patient provided written informed consent.

A sample size of >1100 patients per country enabled the frequency of abdominal obesity (with any definition) to be estimated to within 3% with 95% confidence. PCPs were randomly selected in each country by geographic or administrative strata from an exhaustive list of active PCPs, as reported previously,[28] to ensure that participants in the present study were representative of PCP patients.

Statistical Analysis

Data from 63 countries were grouped into 11 regions. Patient characteristics are described by percentages, means, and SD. Regional frequencies of obesity (BMI≥30 kg/m²), overweight (BMI 25 to 30 kg/m²), CVD, and diabetes mellitus were standardized according to the age distribution of the overall study population. Box-and-whisker plots describe regional distributions of WC (median, quartiles). Age- and region-adjusted frequencies of CVD and diabetes mellitus were calculated according to gender-specific WC quintiles with logistic regression in PROC GENMOD (SAS Institute, Cary, NC) with age as a continuous variable. Age- and region-adjusted odds ratios (ORs) were calculated according to the thresholds defined by the National Cholesterol Education Program Adult Treatment Panel III (NCEP)[29] and the International Diabetes Federation (IDF)[30] for WC, comparing groups: 102/88 cm and 94 (90 for Asian)/80 cm with age as a continuous variable. ORs were also calculated for 1-SD increases in WC or BMI. Linearity was tested by addition of squared terms, and ridge regression was used when BMI and WC were jointly analyzed. Age-, region-, and smoking-adjusted frequencies of CVD and diabetes mellitus were calculated according to gender-specific WC tertiles and BMI categories with logistic regression in SAS PROC GENMOD, with age as a continuous variable. Trend tests were used to show whether the frequencies of CVD and diabetes mellitus increased with WC tertiles within each BMI category, and similarly with BMI categories within each WC tertile. Age- and region-adjusted ORs for CVD and diabetes mellitus were also determined for a 1-SD increase in WC within each BMI category. All statistical analyses used SAS statistical software (version 8.2; SAS Institute Inc., Cary, NC).

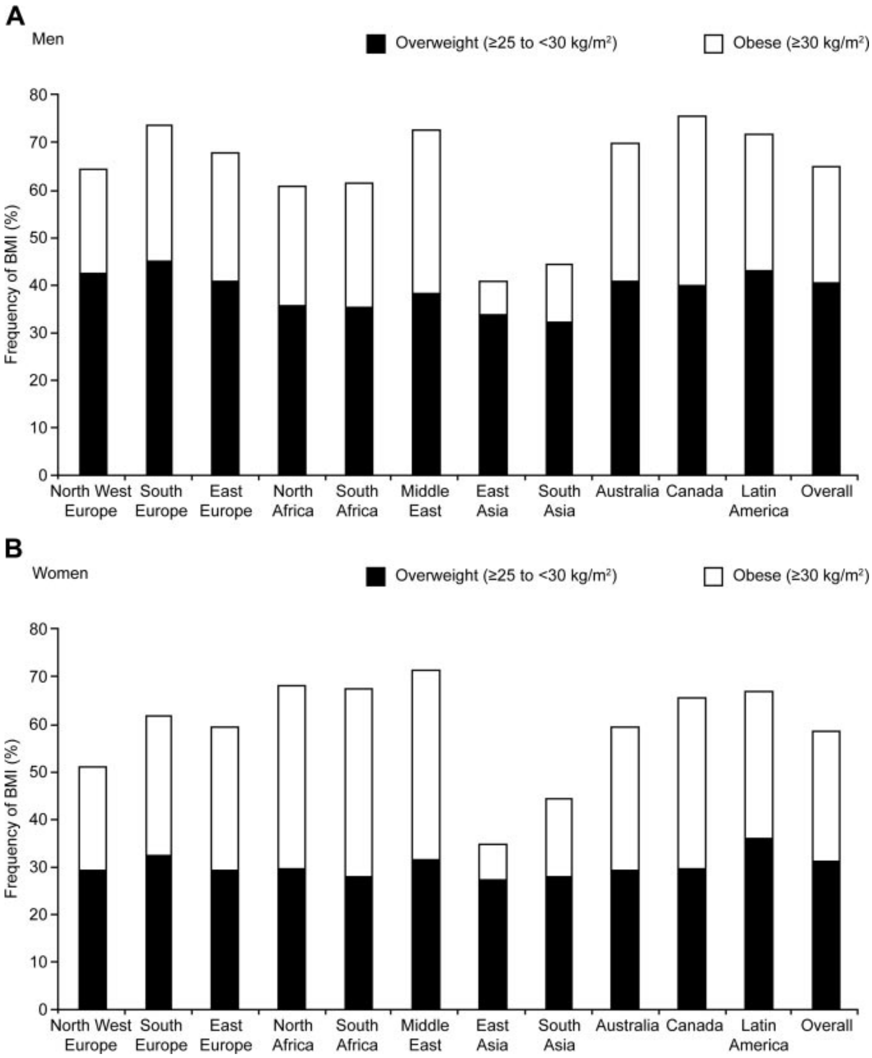

Figure 1. Age-standardized frequency of overweight (BMI 25 to 30 kg/m^2) and obese (BMI≥30 kg/m^2) subjects by region in (A) men and (B) women.

The authors had full access to and take full responsibility for the integrity of the data. All authors have read and agree to the manuscript as written.

Results

Study Participation

A total of 182 970 patients who attended 6393 PCP offices in 63 countries were screened: 177 345 (97%) agreed to participate in the study. Patient (84% to 100%) and physician (4% to 77%, average 30%) participation is given by country in the online-only Data Supplement.[28] Data were analyzed from the 95% of patients (69 409 men, 98 750 women) who met the inclusion criteria and for whom data were available for age, gender, anthropometric parameters, CVD, and diabetes mellitus (Table 1). The mean (SD) age was 48.7 (16.1) and 48.3 (16.1) years for men and women.

Distribution of Overweight and Obesity

In all regions except southern and eastern Asia, >60% of men and 50% of women were either overweight or obese (BMI≥25 kg/m^2). The overall frequency of overweight (BMI 25 to 30 kg/m^2) was 40% in men and 30% in women, and this was remarkably similar across regions (Figure 1). In contrast, the frequency of obesity (BMI≥30 kg/m^2) differed between regions and was consistently low in both men and women in southern and eastern Asia. Obesity ranged from just >7% in men and women in eastern Asia to 36% in both genders in Canada, and 38% to 40% in women in the Middle East and northern and southern Africa.

Distribution of Waist Circumference

A wide distribution of WCs was present within each region, with median WCs higher in men than in women (Figure 2). Overall, the median WC (quartiles) was 95 (86 to 104) cm for men and 88 (78 to 98) cm for women. According to the NCEP criteria (WC>102/88 cm for men/women),[29] 29% of men and 48% of women had abdominal adiposity; with the IDF Caucasian criteria (WC≥94/80 cm for men/women),[30] these frequencies increased to more than half of the population (men, 56%; women, 71%).

Frequency of CVD and Diabetes Mellitus According to Region

The overall frequency of CVD was 16% in men and 13% in women, and was higher in men than in women in all regions except eastern Asia, with wide variability across regions

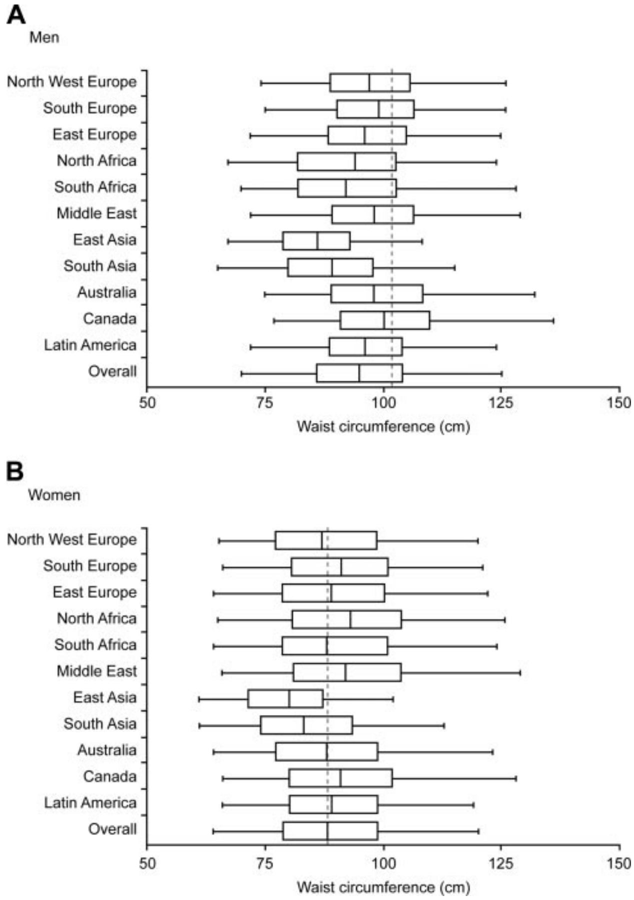

Figure 2. Box-and-whisker plots show the distribution of WC by region for (A) men and (B) women. Data shown are medians, quartiles, and 2.5 and 97.5 percentiles. Vertical lines show WC=102 cm (men) and WC=88 cm (women).

(Figure 3). A very high frequency of CVD was present in Eastern Europe in both men (27%) and women (24%), in contrast to other regions where frequencies ranged from 8% (Canadian women) to 16% (northwestern European men).

The frequency of diabetes mellitus showed more regional variability than CVD (Figure 3). Overall, 13% of men and 11% of women had known diabetes mellitus. Both diabetes mellitus and CVD were more common in men than women in all regions except southern Asia. The highest age-standardized frequency of diabetes mellitus was in the Middle East (22% in men, 19% in women), followed by northern Africa (19% and 16%) and southern Asia (17% and 18%).

Relationship Between WC, CVD, and Diabetes Mellitus

The age- and region-adjusted frequency of CVD increased with WC in both men and women (Figure 4). Men in the highest WC quintile (≥107 cm) had 2.2× more CVD than those in the lowest quintile (<84 cm); for women, when the most abdominally obese were compared to the least abdominally obese (≥101 versus <76 cm), the ratio was 2.6.

The frequency of diabetes mellitus showed an even stronger graded increase across the WC quintiles: in men it increased >3-fold (from 5.7% in the lowest to 19.4% in the highest WC quintile group) and in women it increased by almost 6-fold (3.1% to 17.8%) (Figure 4).

The age- and region-adjusted ORs for CVD and diabetes mellitus according to the NCEP/IDF WC categories are shown in Table 2.

Relationship Between WC, BMI, and CVD

In men, for all regions except northern Africa and the Middle East, the OR for CVD associated with a 1-SD increase in WC was greater than that for a 1-SD increase in BMI (Table 3); for women, this was the case in all but 4 of the 11 regions. Overall, the standardized ORs for CVD were higher for WC than for BMI in both men and women. This was also the case after adjustment of WC for BMI and of BMI for WC: the ORs (95% CI) of WC versus BMI were 1.24 (1.19 to 1.28) versus 1.13 (1.09 to 1.17) for men and 1.21 (1.17 to 1.25) versus 1.20 (1.16 to 1.24) for women, which showed that both WC and BMI were independently associated with CVD.

The frequency of CVD, adjusted for age, region, and smoking status, increased with WC in each BMI category and with BMI in each WC tertile (all $P<0.01$) (Figure 5A and 5B). Importantly, CVD was significantly associated with WC even in lean individuals (BMI<25 kg/m^2), with standardized ORs (95% CI) of 1.10 (1.05 to 1.15) in men and 1.15 (1.11 to 1.19) in women, which corresponds to a 9.3-cm increase in WC in both men and women (Table 4).

Relationship Between WC, BMI, and Diabetes Mellitus

The standardized ORs for diabetes mellitus (Table 3) were higher for WC than for BMI in almost all regions, with overall ORs (95% CI) of 1.59 (1.56 to 1.63) versus 1.52 (1.49 to 1.56) in men and 1.83 (1.79 to 1.87) versus 1.67 (1.64 to 1.71) in women. The exceptions were the Middle East and Australia, where the ORs for diabetes mellitus were consistently higher for BMI than for WC in both genders. In northern-African men with diabetes mellitus, the ORs for WC and BMI were equivalent. After adjustment (WC for BMI and BMI for WC), WC had a higher OR (95% CI) for diabetes mellitus than BMI in the overall patient population (men, 1.35 (1.30 to 1.40) versus 1.23 (1.19 to 1.27); women, 1.55(1.50 to 1.60) versus 1.23(1.19 to 1.27)); thus, both WC and BMI were independently associated with diabetes melli-

Table 2. Age- and Region-Adjusted ORs for CVD and Diabetes Mellitus According to the NCEP/IDF WC Categories

	OR (95% CI) for CVD	OR (95% CI) for Diabetes Mellitus
WC for men		
<94 cm	1	1
94 to 102 cm (90 to 102 cm for Asians)	1.28 (1.21 to 1.36)	1.60 (1.51 to 1.71)
>102 cm	1.90 (1.80 to 2.02)	2.65 (2.49 to 2.81)
WC for women		
<80 cm	1	1
80 to 88 cm	1.31 (1.22 to 1.41)	1.78 (1.64 to 1.94)
>88 cm	1.97 (1.85 to 2.09)	3.94 (3.66 to 4.24)

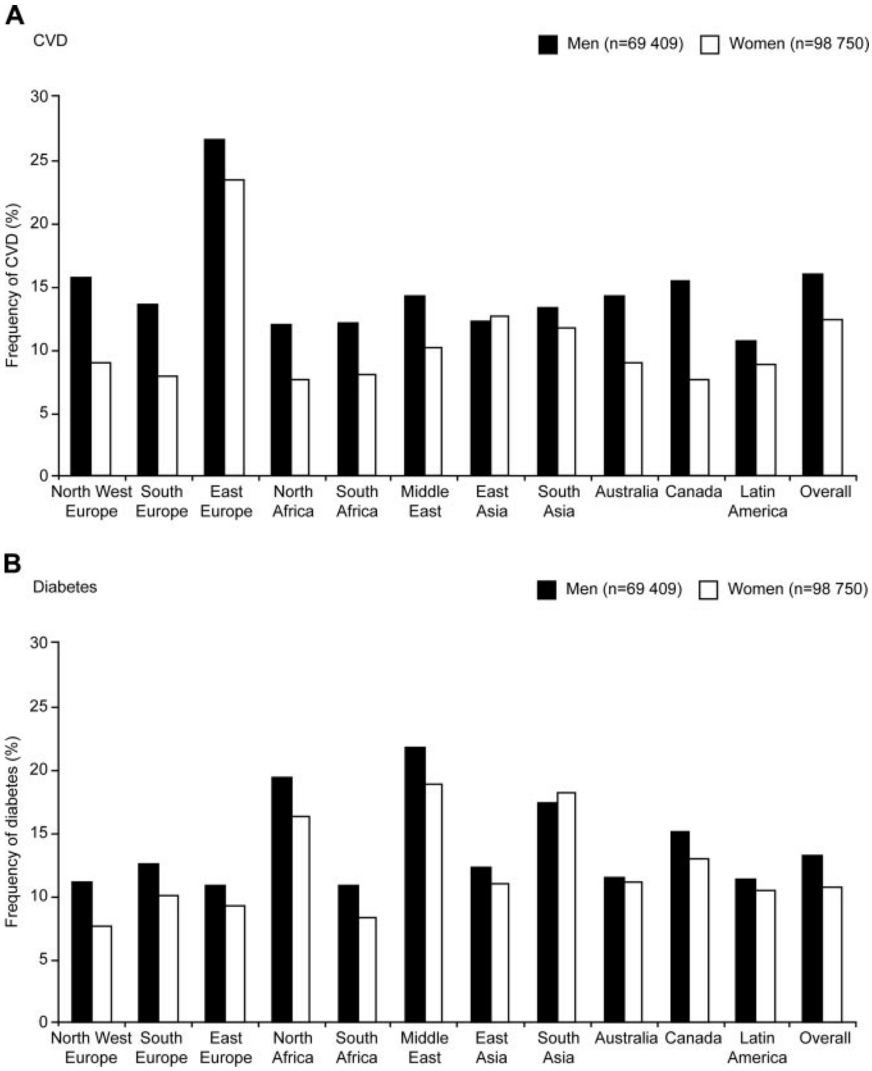

Figure 3. Age-standardized frequencies of (A) CVD and (B) diabetes mellitus by region in men and women.

tus. Furthermore, both WC and BMI were more strongly associated with diabetes mellitus than with CVD, particularly in women (Table 3).

Diabetes mellitus frequency, adjusted for age, region, and smoking status, increased with WC tertiles within each BMI category, and with BMI categories within each WC tertile (all $P<0.01$) (Figure 5C and 5D). Diabetes mellitus was significantly associated with WC even in lean individuals (BMI<25 kg/m^2); for a 9.3-cm increase in WC, the standardized ORs (95% CI) were 1.27 (1.21 to 1.33) in men and 1.43 (1.37 to 1.48) in women (Table 4).

Discussion

IDEA is the largest study to assess the frequency of adiposity in primary care patients: nearly 170 000 ambulant patients from 63 countries across 5 continents were studied to provide a snapshot of patients worldwide. The study results show that excess body weight is pandemic (apart from southern and eastern Asia), with one half to two thirds of the population overweight or obese by current definitions. Abdominal obesity, measured by WC, showed a graded relationship with both CVD and diabetes mellitus at all levels of BMI, importantly even in so-called lean subjects. These relationships were consistent across regions for both men and women, despite the up to 3-fold difference in background frequency of CVD and diabetes mellitus between regions. Our findings support the need for worldwide population-based initiatives to target adiposity. If improvements are not forthcoming, recent favorable trends in cardiovascular morbidity and mortality are likely to be reversed.

Comparisons With Other Studies

In the present study, the ranking of regional frequencies of both CVD and diabetes mellitus from patients in primary care are consistent with other published data. In Eastern Europe, CVD mortality rates are very high[31] for both men and women, and the frequency of diabetes mellitus in the Middle East and northern Africa is known to be high and increasing.[32] Patterns of adiposity contribute to these geographic variations in disease, but other genetic, environmental, and behavioral characteristics are also clearly important.

The findings of IDEA, which associated WC with diabetes mellitus and with all stages of CVD, extend those from the INTERHEART study, which involved only myocardial infarction.[15,16] It is likely that early intervention to target adiposity would have the greatest impact on lifetime mani-

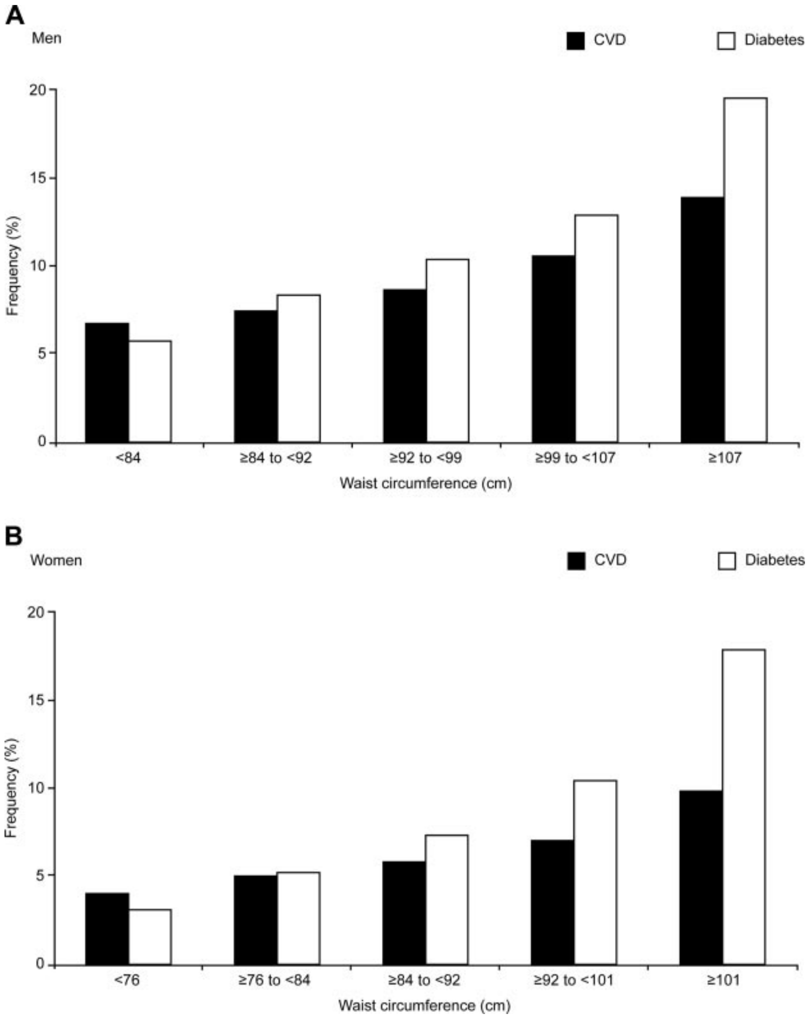

Figure 4. Age- and region-adjusted frequencies of CVD and diabetes mellitus across gender-specific quintiles of WC in the overall study population of (A) men (n=69 409) and (B) women (n=98 750).

festations of diabetes mellitus and atherosclerosis. The greater impact of WC compared with BMI on diabetes mellitus is consistent with prospective studies in American men (the Health Professionals' Follow-Up Study[22]) and women (the Nurses Health Study[19]). These studies also showed that WC was a better predictor of diabetes mellitus than the waist:hip ratio. These epidemiological data are supported by animal and human reports of differences in subcutaneous and visceral fat phenotype, with visceral fat associated with inflammation, unfavorable adipokine profiles, and disturbances of insulin and glucose homeostasis.[33,34]

The mechanisms by which abdominal adiposity may lead to clinical disease are not clarified by the findings of the IDEA study. Two new, large-scale, multinational studies (International Study of Prediction of Intra-Abdominal Adiposity and its Relationships With Cardiometabolic Risk [INSPIRE ME] and INSPIRE ME IAA [Intra-Abdominal Adiposity study]) that will involve detailed profiling of risk factors, inflammatory biomarkers, as well as computed tomography to quantify visceral fat have been initiated. Previous small-scale studies that used computed tomography have shown very strong associations between intraabdominal fat and the development of CVD and diabetes mellitus in Japanese-Americans who are not obese but are at high risk for development of diabetes mellitus.[21,35]

Strengths and Limitations

The IDEA Study was very large and covered most regions of the world. Particular care was taken with the random selection of PCPs to ensure that the physicians, and consequently their patients, were representative within each geographic area of each country. The study population included all patients who consulted their PCPs, with only 2 exclusion criteria: age <18 or >80 years and pregnancy. Patient participation was high, but in some countries the PCP participation was low; when contacted, the PCPs either did not answer the call or refused to participate for different reasons ("Not interested"; "Not available on target days"; "No time to participate"). This may affect the reported frequencies and associations, but it is not possible to determine the extent and direction of any bias this might cause.

The present study was conducted in primary care, as this was a feasible way to recruit large numbers of individuals in each country; the response rate was 97%, even though patients were not remunerated. Results cannot be extrapolated to the general population of the countries, only to the population that consults PCPs.

Table 3. Age-Adjusted, Standardized ORs for CVD and Diabetes in Men and Women Associated With a 1-SD Increase in WC or BMI, by Region

	Age-Adjusted ORs (95% CI) for CVD Associated With a 1-SD Increase in WC or BMI			
	Men		Women	
	WC	BMI	WC	BMI
Northwestern Europe	1.29 (1.23 to 1.36)*	1.27 (1.21 to 1.33)*	1.37 (1.30 to 1.44)*	1.31 (1.24 to 1.37)*
Southern Europe	1.31 (1.25 to 1.38)*	1.22 (1.17 to 1.28)*	1.30 (1.23 to 1.37)*	1.22 (1.16 to 1.28)*
Eastern Europe	1.42 (1.35 to 1.49)*	1.41 (1.34 to 1.48)*	1.48 (1.42 to 1.54)*	1.53 (1.47 to 1.59)*
Northern Africa	1.48 (1.25 to 1.74)*	1.51 (1.30 to 1.77)*	1.50 (1.28 to 1.75)*	1.52 (1.32 to 1.74)*
Southern Africa	1.93 (1.49 to 2.50)*	1.63 (1.29 to 2.06)*	1.51 (1.19 to 1.92)†	1.43 (1.11 to 1.84)‡
Middle East	1.44 (1.25 to 1.66)*	1.49 (1.30 to 1.70)*	1.51 (1.28 to 1.79)*	1.52 (1.29 to 1.78)*
Eastern Asia	1.33 (1.21 to 1.47)*	1.32 (1.20 to 1.46)*	1.32 (1.22 to 1.44)*	1.21 (1.12 to 1.30)*
Southern Asia	1.27 (1.18 to 1.36)*	1.26 (1.17 to 1.35)*	1.30 (1.21 to 1.39)*	1.26 (1.18 to 1.35)*
Australia	1.76 (1.39 to 2.22)*	1.53 (1.24 to 1.89)*	1.19 (0.95 to 1.50)	1.11 (0.87 to 1.40)
Canada	1.26 (1.08 to 1.47)‡	1.19 (1.03 to 1.39)§	1.50 (1.25 to 1.81)*	1.49 (1.25 to 1.77)*
Latin America	1.28 (1.19 to 1.38)*	1.23 (1.15 to 1.32)*	1.36 (1.28 to 1.44)*	1.37 (1.29 to 1.44)*
Overall	1.36 (1.33 to 1.39)*	1.32 (1.29 to 1.35)*	1.40 (1.37 to 1.43)*	1.38 (1.35 to 1.41)*

(*Continued*)

See Table 1 for SDs by region and overall. Overall data are also adjusted for region.
*$P<0.0001$; †$P<0.001$; ‡$P<0.01$; §$P<0.05$.

An important strength of IDEA was the uniform documentation, translated into the various languages, and the physicians' training to measure WC with a standardized approach.[1] In the present study, we chose to use WC as a measure of abdominal adiposity because a close correlation between WC and the amount of intraabdominal fat has been observed with computed tomography.[36] In addition, WC requires only a single measurement, which makes it easier, less time consuming, and less subject to error than measurements that combine waist and hip measurements for the waist:hip ratio. Intra- and interphysician variability in WC measurement was not formally assessed. Despite possible measurement error, clear relationships were shown between WC and both CVD and diabetes mellitus. Furthermore, the relationship was stronger in most cases for WC than BMI, even though the latter should have less measurement error.

Physician-reported diagnosis is probably more reliable than patient-reported diagnosis.[19] In our study no diagnostic procedure was carried out either for diabetes mellitus or CVD (defined as coronary heart disease, stroke, or revascularization). The relationships were clear despite the potentially different definitions used in clinical practice between regions for both conditions. The IDEA questionnaire did not distinguish between type 1 and type 2 diabetes mellitus. Because the majority of patients with diabetes mellitus (85% to 95%) have type 2 diabetes mellitus,[32] the observed relationships between diabetes mellitus and adiposity would be primarily driven by type 2 diabetes mellitus.

It was not possible to determine whether the relationships between WC and CVD or diabetes mellitus differed across ethnic groups within geographic regions, because race was not recorded in IDEA as a result of legal restrictions in some countries. Race within regions may have an impact on the risk of CVD and diabetes mellitus associated with WC, as suggested by INTERHEART,[16] but race is difficult to document accurately.

Conclusions

IDEA showed that the frequency of adiposity is high in all regions of the world, even in Asian populations that are usually considered to be lean. The regional frequencies of overweight were surprisingly similar, but regional differences were present in the frequency of obesity. The lower levels of marked adiposity in regions such as southern and eastern Asia

Table 4. Age- and Region-Adjusted Standardized ORs (95% CI) for CVD and Diabetes Mellitus in Men and Women Associated With a 1-SD Increase in WC by BMI Categories

	Men			Women		
BMI Category	1 SD WC (cm)	OR (95% CI) for CVD	OR (95% CI) for Diabetes Mellitus	1 SD WC (cm)	OR (95% CI) for CVD	OR (95% CI) for Diabetes Mellitus
BMI$<$25 kg/m^2	9.3	1.10 (1.05 to 1.15)*	1.27 (1.21 to 1.33)*	9.3	1.15 (1.11 to 1.19)*	1.43 (1.37 to 1.48)*
BMI 25 to 30 kg/m^2	8.5	1.19 (1.15 to 1.23)*	1.23 (1.18 to 1.27)*	9.2	1.12 (1.08 to 1.16)*	1.32 (1.27 to 1.37)*
BMI$\geq$30 kg/m^2	11.4	1.23 (1.18 to 1.28)*	1.34 (1.29 to 1.39)*	11.9	1.24 (1.20 to 1.29)*	1.43 (1.38 to 1.47)*
Overall	14.0	1.36 (1.33 to 1.39)*	1.59 (1.56 to 1.63)*	14.9	1.40 (1.37 to 1.43)*	1.83 (1.79 to 1.87)*

*$P<0.0001$.

Table 3. Continued

Age-Adjusted ORs (95% CI) for Diabetes Mellitus Associated With a 1-SD Increase in WC or BMI			
Men		Women	
WC	BMI	WC	BMI
1.76 (1.67 to 1.86)*	1.72 (1.63 to 1.81)*	2.17 (2.05 to 2.29)*	1.96 (1.86 to 2.06)*
1.45 (1.38 to 1.53)*	1.39 (1.33 to 1.46)*	1.78 (1.69 to 1.87)*	1.68 (1.60 to 1.76)*
1.83 (1.72 to 1.95)*	1.73 (1.63 to 1.83)*	1.98 (1.88 to 2.09)*	1.82 (1.73 to 1.91)*
1.57 (1.38 to 1.79)*	1.57 (1.38 to 1.78)*	1.63 (1.46 to 1.82)*	1.44 (1.30 to 1.60)*
1.71 (1.38 to 2.11)*	1.52 (1.25 to 1.85)*	1.89 (1.52 to 2.34)*	1.70 (1.38 to 2.09)*
1.35 (1.22 to 1.50)*	1.40 (1.27 to 1.54)*	1.86 (1.64 to 2.11)*	1.89 (1.68 to 2.12)*
1.38 (1.25 to 1.51)*	1.25 (1.14 to 1.37)*	1.45 (1.33 to 1.57)*	1.32 (1.23 to 1.43)*
1.53 (1.44 to 1.62)*	1.43 (1.35 to 1.51)*	1.57 (1.47 to 1.67)*	1.41 (1.33 to 1.50)*
1.49 (1.20 to 1.85)†	1.50 (1.22 to 1.83)†	1.45 (1.20 to 1.75)†	1.54 (1.28 to 1.86)*
1.92 (1.65 to 2.23)*	1.81 (1.57 to 2.09)*	2.40 (2.06 to 2.80)*	2.02 (1.76 to 2.32)*
1·36 (1.27 to 1.46)*	1.34 (1.26 to 1.43)*	1.66 (1.57 to 1.75)*	1.51 (1.44 to 1.59)*
1.59 (1.56 to 1.63)*	1.52 (1.49 to 1.56)*	1.83 (1.79 to 1.87)*	1.67 (1.64 to 1.71)*

are not necessarily reassuring, as the impact of adiposity—particularly abdominal adiposity—is rising and may be more acute in certain populations. IDEA emphasizes the need for a global approach to adiposity from early in life. Adiposity in teenagers is rapidly increasing and is associated with adverse changes in arterial wall structure and function, the early stages of atherosclerosis.[37] The Diabetes Prevention Program has shown the beneficial effects of weight reduction,[38] and

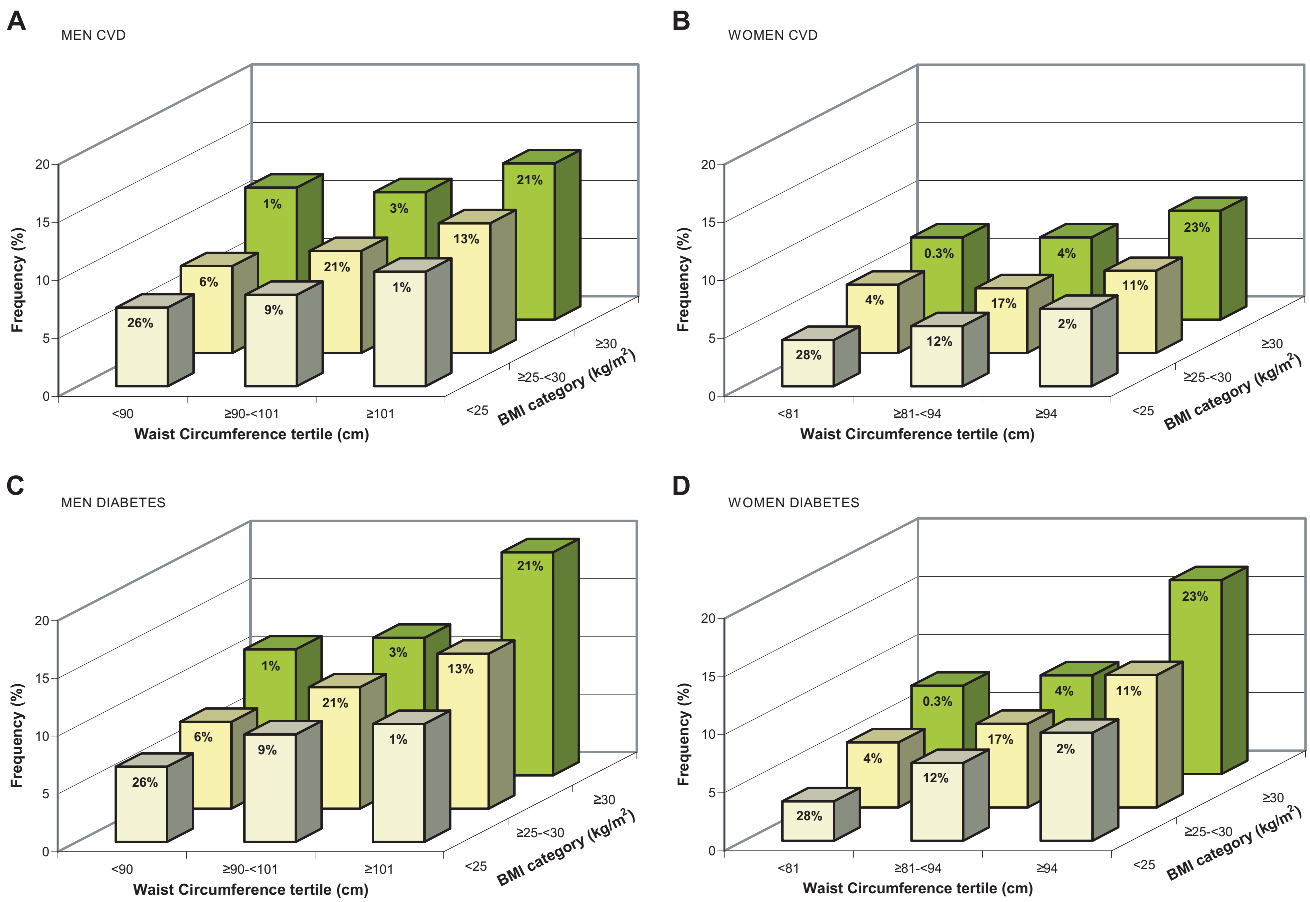

Figure 5. Frequency of known CVD for men (A) and women (B), and known diabetes mellitus for men (C) and women (D), adjusted for age, region, and smoking status, by gender-specific WC tertiles and BMI categories. The percentage of patients in each of the 9 groups is shown.

objective measures of improvements in the arterial wall can be rapidly identified after lifestyle modifications, such as diet and physical exercise, in the young.[39]

IDEA has already increased global awareness of abdominal adiposity among PCPs, but the importance of this risk factor remains inadequately recognized. Routine measurement of WC—a convenient and inexpensive measure in primary care—provides a clinical marker for risk of CVD and diabetes mellitus in all regions of the world, even in patients with normal weight. The rise in adiposity worldwide is likely to contribute to major increases in morbidity and mortality from diabetes mellitus and CVD unless it can be adequately addressed by public health programs.

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CLINICAL PERSPECTIVE

The INTERHEART case-control study has highlighted the importance of adiposity, particularly central adiposity, for myocardial infarction. In the International Day for the Evaluation of Abdominal Obesity (IDEA) study of 170 000 consecutive patients who consulted randomly chosen primary care physicians in 63 countries, the frequency of overweight patients (body mass index (BMI) between 25 and 30 kg/m^2) was similar across geographical regions (40% men, 30% women), in contrast to obesity (24% men, 27% women), which was lowest in southern and eastern Asia, highest for men in southern Europe, the Middle East, and Canada, and highest for women in southern and northern Africa and the Middle East. Regional trends were similar for high waist circumference. Previously diagnosed cardiovascular disease and previously diagnosed diabetes mellitus were both associated with a high waist circumference, and each additional centimeter increased risk, even after accounting for BMI. The relations were stronger for diabetes mellitus. Overall and in most regions, the associations with waist circumference were stronger than with BMI. For men, a waist circumference >102 cm in comparison to <94 cm (90 cm for Asian men) carried an odds ratio of 1.90 for cardiovascular disease and 2.65 for diabetes mellitus; for women, a waist circumference >88 cm in comparison to <80 cm carried an odds ratios of 1.97 for cardiovascular disease and 3.94 for diabetes mellitus. The waist circumference should be measured—in addition to the BMI—in clinical practice because it is associated with prevalent cardiovascular disease (not just myocardial infarction) and with prevalent diabetes mellitus, even in the so-called lean populations with BMI<25 kg/m^2.

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Beverley Balkau, John E. Deanfield, Jean-Pierre Després, Jean-Pierre Bassand, Keith A.A. Fox, Sidney C. Smith, Jr, Philip Barter, Chee-Eng Tan, Luc Van Gaal, Hans-Ulrich Wittchen, Christine Massien and Steven M. Haffner

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