Supplementary Online Content

Wang L, Gao P, Zhang M, et al. Prevalence and ethnic pattern of diabetes and prediabetes in China in 2013. *JAMA*. doi:10.1001/jama.2017.7596

This supplementary material has been provided by the authors to give readers additional information about their work.

eAppendix   Additional Information about the Hemoglobin A1c Assay Used

Hemoglobin A1c was measured in a single laboratory for all participants, the Clinical Laboratory of the KingMed Center (Guangzhou, China). This laboratory has received consecutive certifications by the National Glycohemoglobin Standardization Program (NGSP, Level I Laboratory Certification). It is listed in the NGSP website which was updated in January 2017 (**eFigure A1**, full document can be found at http://www.ngsp.org/docs/labs.pdf). The Laboratory has regularly participated the proficiency-testing program and passed the College of American Pathologists (CAP)'s Laboratory Accreditation Program.

List of NGSP Certified Laboratories (updated 01/17, listed by date certified)

Laboratory	Method/s	Certification Type	Date Certified
Q^2 Solutions (Pty.) Limited, a Quintiles Quest Joint Venture, Centurion, South Africa	Bio-Rad D-10	**Level I Laboratory**	May, 2016
Laboratorio Médico Las Américas, Medellin-Antioquia, Colombia	Abbott Architect c4000	**Level I Laboratory**	April, 2016
Greenacres Chemistry, Port Elizabeth, South Africa	Bio-Rad D-10	Level II Laboratory	April, 2016
Western Cape (N1 City), Cape Town, South Africa	Bio-Rad Variant II	Level II Laboratory	April, 2016
Ampath Nelspruit, Nelspruit Mpumalanga, South Africa	Bio-Rad D-10	Level II Laboratory	April, 2016
National University Hospital, Singapore	Bio-Rad Variant II Turbo	**Level I Laboratory**	April, 2016
Diagnosticos da America S/A (DASA), Barueri, Brazil	**Bio-Rad Variant II**	**Level I Laboratory**	April, 2016
Kingmed Center for Clinical Laboratory, Guangzhou, China	Bio-Rad D-10	**Level I Laboratory**	April, 2016

eFigure A1: Relevant session in the List of NGSP Certified Laboratories from NGSP website

In our study, HbA$_{1c}$ was directly measured from a venous blood sample using quantitative high performance liquid chromatography and Boronate affinity method (Bio-Rad D-10™ Hemoglobin Analyzer). Venous blood samples were stored at -80°C until HbA$_{1c}$ was measured, which is within the range of the stability according to the manufacturer's instruction (i.e. ≤1 month). The Bio-Rad D-10 Hemoglobin Analyzer is

certified by the NGSP as traceable to the Diabetes Control and Complications Trial (DCCT) reference. This method has been used by many clinical trials and epidemiological studies.

Regular maintenance was performed every day during the period of measurement. Quality Control (QC) samples were applied before and after each batch of the HbA_{1c} analyses, i.e. 100-150 samples per day. Calibration was applied when appropriate. Criteria for out-of-control (OOC) situations were flagged at QC rules 1–3s or 2–2s [1]. The precision of the Bio-Rad D-10™ Hemoglobin Analyzer was evaluated according to the Clinical & Laboratory Standards Institute (CLSI) guideline[2]. This method is also adapted by the NGSP for use in the certification of glycohemoglobin methods. The total imprecision, in terms of coefficients of variation (CVs) were 1.16% and 1.22% at HbA_{1c} levels of 5.7% and 9.4% respectively in our study. The four technicians who performed the assay were all trained and had at least 4 years of experience in a medical laboratory (one had 15 years of experience). Technicians were blind to the survey information of each participant, including diabetes status of participants.

References

1. CLSI/NCCLS C24-A3. *Statistical Quality Control for Quantitative Measurements: Principles and Definitions: Approved Guideline, 3rd edition*. Wayne, PA, USA: Clinical and Laboratory Standards Institute, 2006.

2. NCCLS. *Evaluation of Precision Performance of Quantitative Measurement Methods; Approved Guideline – Second Edition*. NCCLS document EP5-A2 [ISBN 1-56238-542-9]. NCCLS, Wayne, Pennsylvania USA, 2004.

eTable 1 AAPOR outcome rate calculator (Panel of in-person household surveys)*

	Final Disposition Codes	CCDRFS survey in 2013
Interview (Category 1)		
Complete (all versions)	1.0/1.10	179,347
Partial (all versions)	1.2000	1655
Eligible, non-interview (Category 2)	2.0000	
Refusal and breakoff (phone, IPHH, mail, mail_U)	2.1000	2517
Refusal (phone, IPHH, mail, web)	2.1100	686
Household-level refusal (phone, IPHH, mail, web)	2.1110	1910
Known-respondent refusal (phone, IPHH, mail, web)	2.1120	121
Non-contact (phone, IPHH, mail, web, mail_U)	2.2000	3497
Respondent unavailable during field period (IPHH, mail, mail_U)	2.2500	2125
Other, non-refusals (phone, IPHH, mail, web, mail_U)	2.3000	209
Total sample used		192,067
I=Complete Interviews (1.1)		179,347
P=Partial Interviews (1.2)		1655
R=Refusal and break off (2.1)		5234
NC=Non Contact (2.2)		5622
O=Other (2.0, 2.3)		209
Response Rate 1		
I/(I+P) + (R+NC+O) + (UH+UO)		0.934
Response Rate 2		
(I+P)/(I+P) + (R+NC+O) + (UH+UO)		0.942
Response Rate 3		
I/((I+P) + (R+NC+O) + e(UH+UO))		0.934
Response Rate 4		
(I+P)/((I+P) + (R+NC+O) + e(UH+UO))		0.942
Cooperation Rate 1		
I/(I+P)+R+O		0.962
Cooperation Rate 2		
(I+P)/((I+P)+R+O))		0.971
Cooperation Rate 3		
I/((I+P)+R))		0.963
Cooperation Rate 4		
(I+P)/((I+P)+R))		0.972

* This standardized table to calculate response rates, cooperation rates and completion rates was developed by American Association for Public Opinion Research (AAPOR) and downloaded from www.aapor.org, version 4, May 2016. Contents listed in the original table but not applicable for this survey were not listed.

eTable 1 (continued) AAPOR response rate calculator (Panel of in-person household surveys)*

	Final Disposition Codes	CCDRFS survey in 2013
Refusal Rate 1		
R/((I+P)+(R+NC+O) + UH + UO))		0.027
Refusal Rate 2		
R/((I+P)+(R+NC+O) + e(UH + UO))		0.027
Refusal Rate 3		
R/((I+P)+(R+NC+O))		0.027
Contact Rate 1		
(I+P)+R+O / (I+P)+R+O+NC+ (UH + UO)		0.971
Contact Rate 2		
(I+P)+R+O / (I+P)+R+O+NC + e(UH+UO)		0.971
Contact Rate 3		
(I+P)+R+O / (I+P)+R+O+NC		0.971

* This standardized table to calculate response rates, cooperation rates and completion rates was developed by American Association for Public Opinion Research (AAPOR) and downloaded from www.aapor.org, version 4, May 2016. Contents listed in the original table but not applicable for this survey were not listed.

eTable 2   Numbers of participants, numbers of replacements and the replacement rates in each province

	No of participants	No. of replacement	Replacement rate (%)
Overall	170,287	10,642	6.25
Beijing	4057	284	7.00
Tianjin	3983	192	4.82
Hebei	7447	307	4.12
Shanxi	4648	248	5.34
Neimenggu	4654	96	2.06
Liaoning	5669	919	16.21
Jilin	4511	265	5.87
Heilongjiang	5820	165	2.84
Shanghai	3961	271	6.84
Jiangsu	7675	361	4.70
Zhejiang	5833	455	7.80
Anhui	6998	295	4.22
Fujian	5821	528	9.07
Jiangxi	5868	123	2.10
Shandong	8149	315	3.87
Henan	8116	495	6.10
Hubei	5780	196	3.39
Hunan	7438	965	12.97
Guangdong	8022	560	6.98
Guangxi	5863	491	8.37
Hainan	3363	118	3.51
Chongqing	5249	333	6.34
Sichuan	6921	291	4.20
Guizhou	4529	275	6.07
Yunnan	5770	500	8.67
Xizang	2427	99	4.08
Shaanxi	5737	195	3.40
Gansu	4560	243	5.33
Qinghai	3437	740	21.53
Ningxia	3418	149	4.36
Xinjiang	4563	168	3.68

When the selected individual was not available (or refused to participant), a replacement was then chosen from all households of similar composition in the same neighbourhood or village after excluding the already selected households using the simple random sampling method. The replacements were used to ensure an adequate sample size within each selected community.

eTable 3   Basic characteristics of participants included and excluded in the survey

	Participants excluded (N = 9060)		Participants included (N = 170,287)	
	N	Mean (SD) or N(%) *	N	Mean (SD) or N(%) *
Age at survey (years)	9060	50.0 (15.0)	170,287	51.6 (14.2)
Sex (Male)	9060	4021(44.4%)	170,287	72736(42.7%)
BMI (kg/m^2)	7416	24.4 (3.61)	170,287	24.3 (3.63)
SBP (mmHg)	7729	130.1 (20.2)	170,104	131.5 (20.9)
Smoking status (Current)	9040	1890 (20.9%)	170,189	41515 (24.4%)
Education (Junior High School or higher)	9039	5013 (55.5%)	170,188	88034 (51.7%)
Physical activity (MET-mins/week)	9025	4473 (6023)	170,228	5731 (6672)

Abbreviations: BMI: body mass index; SBP: systolic blood pressure; MET: Metabolic equivalent.

* Statistics were unweighted estimations.

eTable 4   Charateristics of treated patients with diabetes with and without adaquate glycemic control

	Patients with adequate glycemic control		Patients without adequate glycemic control		P values
	N	Mean (SD) or N (%) *	N	Mean (SD) or N (%) *	
Age at survey (years)	4515	59.8(11.5)	4480	58.9(11.0)	<0.001
BMI (kg/m^2)	4515	25.7(3.5)	4480	25.7(3.6)	1.00
Obesity (BMI≥30 kg/m^2)	4515	484(10.7%)	4480	519(11.6%)	0.19
SBP (mmHg)	4511	140.6(21.0)	4474	142.9(22.0)	<0.001
Smoking status (Current)	4512	785(17.4%)	4480	891(19.9%)	0.002
Education (Junior High School or higher)	4512	2548(56.5%)	4480	2227(49.7%)	<0.001
Physical activity(MET-mins/week)	4512	3855(4651)	4478	4188(4825)	0.001
Alcohol (Never)	4515	3418(75.7%)	4480	3447(76.9%)	0.17
Meat (g/d)	4422	107.1(125.6)	4372	104.9(128.4)	0.42
Vegetables (g/d)	4390	353.6(229.5)	4340	350.0(222.6)	0.46
Fruit (g/d)	4451	88.1(131.1)	4407	71.8(117.0)	<0.001
Treatments					
Oral	4515	3581(79.3%)	4480	3557(79.4%)	0.92
Insulin	4515	703(15.6%)	4480	1168(26.1%)	<0.001
Lifestyle change (sport or diet)	4515	2047(45.3%)	4480	1882(42.0%)	0.001
Glucose monitor	4515	1142(25.3%)	4480	1048(23.4%)	0.04
FPG (mg/dL)	4498	122.5(28.8)	4464	191.0(64.9)	<0.001
HbA$_{1c}$ (%)	4515	6.0(0.6)	4480	8.7(1.6)	<0.001

Abbreviations: BMI: body mass index; SBP: systolic blood pressure; MET: Metabolic equivalent; FPG: fasting plasma glucose; HbA$_{1c}$: hemoglobin A1c.

* Statistics were unweighted estimations.

eTable 5   Characteristics of participants by ethnic groups

	Mean (SD) or N (%) *					
	Han (N=150,766)	**Tibetan (N=3103)**	**Zhuang (N=2081)**	**Manchu (N=2106)**	**Muslim (N=2085)**	**Uyghur (N=1929)**
Age at survey (years)	52.0(14.1)	44.2(12.1)	53.2(13.8)	50.3(13.3)	48.6(14.3)	46.1(15.4)
Sex (Male)	64,012(42.5%)	1328(42.8%)	798(38.3%)	893(42.4%)	990(47.5%)	1029(53.3%)
BMI (kg/m^2)	24.4(3.6)	23.5(3.8)	23.0(3.5)	24.7(3.6)	24.8(3.6)	25.3(4.4)
SBP (mmHg)	131.8(20.9)	128.9(20.4)	129.1(21.2)	135.3(21.6)	128.1(20.1)	123.4(20.4)
Smoking status (Current)	37,058(24.6%)	613(20.0%)	420(20.2%)	600(28.5%)	355(17.0%)	232(12.0%)
Physical activity (MET-mins/week)	5558(6553)	6680(7239)	7323(7777)	5342(6755)	5679(5763)	6297(6790)
Obesity (BMI≥30 kg/m^2)	10,135(6.7%)	201(6.5%)	71(3.4%)	150(7.1%)	172(8.2%)	268(13.9%)
Alcohol (Never)	101,982(67.6%)	1569(50.6%)	1444(69.4%)	1419(67.4%)	1772(85.0%)	1843(95.5%)
Meat (g/day) [&]	75.5(31.9,144.0)	125.0(58.6,228.6)	158.3(85.2,245.7)	55.0(24.3,95.7)	49.9(17.6,112.4)	57.2(28.2,150.0)
Vegetables (g/d) [&]	300.0(200.0,500.0)	150.0(64.3,300.0)	300.0(200.0,450.0)	250.0(150.0,400.0)	212.5(100.0,400.0)	200.0(100.0,400.0)
Fruit (g/d) [&]	50.0(14.3,142.9)	25.0(6.7,64.3)	42.9(15.0,100.0)	42.9(14.3,100.0)	57.1(14.3,150.0)	100.0(50.0,375.0)
Total cholesterol (mg/dL)	186.9(39.6)	178.8(36.3)	192.7(39.9)	190.0(39.5)	170.5(39.6)	163.5(35.5)
HDL cholesterol (mg/dL)	52.7(15.1)	56.9(15.2)	55.7(16.0)	53.8(15.0)	47.6(12.8)	43.5(10.7)
FPG (mg/dL)	102.7(28.8)	91.9(18.0)	102.7(28.8)	106.3(30.6)	100.9(27.0)	95.5(32.4)
2h PG (mg/dL)	118.9(46.8)	100.9(37.8)	120.7(48.6)	117.1(50.5)	113.5(41.4)	108.1(43.2)
HbA$_{1c}$ (%)	5.5(0.9)	5.4(0.7)	5.4(1.0)	5.5(0.9)	5.3(0.9)	5.6(1.1)

Abbreviations: BMI: body mass index; SBP: systolic blood pressure; MET: Metabolic equivalent; FPG: fasting plasma glucose; 2h PG: 2-hour plasma glucose; HbA$_{1c}$: hemoglobin A1c.

* Statistics were unweighted estimations.   [&] Median (25th – 75th) was provided.

eTable 6   ORs (95% CI) of ethnic groups for diabetes and prediabetes in the study set with complete information on all adjusted risk factors

	OR (95% CI), Chinese Han as the reference				
	Tibetan **(N = 2803)**	**Zhung** **(N = 1911)**	**Manchu** **(N = 1858)**	**Uyghur** **(N = 1676)**	**Muslim** **(N = 1954)**
Diabetes (155,844 participants in total)					
Model 1	0.27(0.22,0.32)	0.78(0.68,0.90)	1.00(0.87,1.14)	0.82(0.71,0.95)	0.67(0.58,0.78)
Model 2	0.36(0.30,0.43)	0.76(0.66,0.88)	1.07(0.94,1.22)	1.03(0.88,1.19)	0.75(0.65,0.87)
Model 3	0.39(0.32,0.47)	0.92(0.80,1.06)	1.10(0.96,1.26)	1.14(0.97,1.33)	0.73(0.63,0.85)
Model 4	0.41(0.34,0.49)	0.93(0.81,1.08)	1.09(0.95,1.25)	1.15(0.99,1.35)	0.74(0.63,0.86)
Model 5	0.42(0.35,0.50)	0.91(0.78,1.05)	1.09(0.95,1.25)	1.08(0.93,1.27)	0.73(0.63,0.85)
Prediabetes (155,844 participants in total)					
Model 1	0.71(0.65,0.77)	1.14(1.04,1.25)	1.16(1.05,1.27)	1.09(0.99,1.20)	0.74(0.67,0.82)
Model 2	0.81(0.74,0.88)	1.12(1.07,1.18)	1.19(1.08,1.31)	1.23(1.11,1.36)	0.79(0.72,0.87)
Model 3	0.80(0.74,0.87)	1.17(1.06,1.28)	1.14(1.04,1.25)	1.21(1.10,1.34)	0.78(0.71,0.86)
Model 4	0.77(0.71,0.84)	1.16(1.06,1.27)	1.14(1.04,1.26)	1.20(1.08,1.32)	0.77(0.70,0.85)
Model 5	0.77(0.71,0.84)	1.14(1.04,1.25)	1.14(1.04,1.25)	1.23(1.11,1.36)	0.78(0.71,0.86)

Model 1: unadjusted.

Model 2: adjusted for age and sex.

Model 3: adjusted for age, sex, smoking status, systolic blood pressure, body mass index, location.

Model 4: adjusted for age, sex, smoking status, systolic blood pressure, body mass index, location, education, physical activity.

Model 5: adjusted for age, sex, smoking status, systolic blood pressure, body mass index, location, education, physical activity, total cholesterol, and HDL cholesterol.

ORs of minority ethnic groups were calculated using multivariable logistic regression. Ethnic group was defined as a 7-category variable in the model. Seven categories were defined as Chinese Han (reference), Tibetan, Zhuang, Manchu, Muslim, Uyghur and others. 155,844 participants in total for the analysis was the number of participants used in the logistic regression including all 7 categories of the participants.