

Estimation of global insulin use for type 2 diabetes, 2018-30

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Appendix

Details of input cohorts

Due to space limitations, detailed citations for referenced cohorts were not possible to list in the main text. Here, we reference the input cohort data, which were obtained from: the U.S. National Health and Nutrition Examination Survey (N = 1,441 with diabetes, 2009-2014);¹ the U.S. National Institutes of Health Global Health Centres of Excellence surveys from South Africa (N = 1,842 with diabetes, 2012) and India (N = 1,605 with diabetes, 2015);^{2,3} the South Africa National Health and Nutrition Examination Survey (N = 747 with diabetes, 2012);⁴ the U.K. National Health Service National Diabetes Audit (N = 16,585 with diabetes, 2016-2017);⁵ the Indian Jaipur Diabetes Registry (N = 8,699 with diabetes, 2014);⁶ the Swedish National Diabetes Register (N = 17,827 with diabetes, 2016);⁷ the Danish Adult Diabetes Registry (N = 11,205 with diabetes, 2014-2015);⁸ the Turkish Nationwide survey of Glycemic and Other Metabolic Parameters of Patients with Diabetes Mellitus (TEMD study; N = 4,672 with diabetes, 2017);⁹ the China Health and Nutrition Study (N = 1,422 with diabetes, 1999-2015);¹⁰ the DiabCare study of the Philippines (N = 770, 2008);¹¹ the Japan National Health and Nutrition Survey (N = 1434 with diabetes, 2016);¹² the Korea National Health and Nutrition Examination Survey (N = 1,341 with diabetes, 2010-2012);¹³ and the Joint Asia Diabetes Evaluation Registry (N = 3,415 with diabetes from China, 15,196 from Hong Kong, 3,714 from India, 1,651 from Korea, 3,365 from Philippines, 692 from Vietnam, and 78 from Taiwan, 2007-2012).¹⁴ See reference list at the end of this Appendix.

Appendix Table 1:

Estimates of absolute number of people aged 20-79 years old with T2DM for the years 2018 and 2030, by country, based on IDF estimates.¹⁵ 95% confidence intervals are in parentheses. Monte Carlo sampling from the Gaussian distributions around these estimates was performed to incorporate the prevalence estimates into the outcome metrics. Classification of countries into regions is based on the International Standards Organization (ISO-3166) standard.

Country	Region	2018	2030
Afghanistan	Asia	1053371 (806706, 1519286)	1735972 (1315472, 2520914)
Albania	Europe	242142 (201328, 281372)	264658 (220480, 306960)
Algeria	Africa	1775544 (1182966, 2504770)	2443267 (1573364, 3432722)
Andorra	Europe	5899 (4841, 7776)	6629 (5412, 8665)
Angola	Africa	361802 (210879, 583250)	641394 (380636, 1059184)
Anguilla	Americas	1266 (980, 1558)	1523 (1148, 1842)
Antigua and Barbuda	Americas	8376 (7318, 9858)	10808 (9248, 12797)
Argentina	Americas	1728226 (1161169, 2535758)	2115204 (1471724, 3121943)
Armenia	Asia	163474 (106228, 270722)	175315 (111916, 314755)
Aruba	Americas	10905 (8659, 13926)	11379 (8904, 14484)
Australia	Oceania	1109756 (820101, 1367965)	1307034 (964216, 1612486)
Austria	Europe	578860 (482250, 746813)	670050 (544232, 812824)
Azerbaijan	Asia	475406 (308887, 771191)	568494 (364164, 1011771)
Bahamas	Americas	37195 (31945, 44455)	45120 (37604, 54011)
Bahrain	Asia	165463 (144834, 187189)	236962 (207196, 267498)
Bangladesh	Asia	6964460 (5381702, 10066385)	10331890 (7818844, 17844294)
Barbados	Americas	34519 (29181, 41139)	36271 (29824, 43810)
Belarus	Europe	465478 (379258, 995696)	463867 (379892, 936213)
Belgium	Europe	489465 (414227, 658096)	563199 (478336, 751277)
Belize	Americas	31641 (26298, 37442)	46333 (38600, 54549)
Benin	Africa	41138 (27585, 152265)	60019 (41092, 220249)
Bermuda	Americas	6403 (5210, 7700)	6226 (5028, 7442)
Bhutan	Asia	40351 (34021, 48669)	58819 (50240, 69588)
Bolivia (Plurinational State of)	Americas	391655 (306674, 620737)	563271 (442596, 891327)
Bosnia and Herzegovina	Europe	355029 (296772, 410643)	366553 (307572, 423014)
Botswana	Africa	53703 (30174, 89870)	89837 (44728, 146150)
Brazil	Americas	12483620 (10907665, 13871159)	17932750 (15509660, 20284592)
British Virgin Islands	Oceania	2793 (1942, 3784)	3428 (2288, 4636)

Brunei Darussalam	Asia	40591 (32689, 50660)	51980 (40652, 64931)
Bulgaria	Europe	408496 (312315, 553814)	397173 (302744, 554026)
Burkina Faso	Africa	154901 (103508, 341589)	249268 (175916, 592128)
Burundi	Africa	137536 (96068, 275190)	249218 (148748, 601528)
Cabo Verde	Africa	6301 (4754, 16445)	9075 (7380, 25133)
Cambodia	Asia	247640 (226498, 278527)	368324 (336600, 417771)
Cameroon	Africa	685681 (545318, 861466)	1034476 (825916, 1290784)
Canada	Americas	2536461 (2310079, 3605333)	2828931 (2576316, 3963758)
Cayman Islands	Americas	5370 (4579, 6436)	6705 (5544, 8109)
Central African Republic	Africa	122645 (97436, 154276)	202814 (162116, 252807)
Chad	Africa	245711 (195223, 308843)	469930 (374724, 586747)
Channel Islands	'oceania	6840 (5834, 9097)	7741 (6516, 10507)
Chile	Americas	1194562 (968696, 1509074)	1635503 (1330040, 2052791)
China	Asia	111912900 (97135933, 146253900)	130175500 (113405864, 163337009)
China, Hong Kong SAR	Asia	620164 (521920, 742623)	697720 (587656, 836408)
China, Macao SAR	Asia	44487 (37526, 53735)	57699 (48672, 69515)
Colombia	Americas	2680858 (1832041, 3681089)	3915764 (3138500, 4758026)
Comoros	Africa	31660 (20932, 48879)	49815 (33100, 76002)
Congo	Africa	149839 (119415, 187887)	223649 (178028, 280019)
Cook Islands	Oceania	1526 (1043, 2442)	2589 (1528, 3594)
Costa Rica	Americas	314064 (261502, 374354)	387305 (314724, 463165)
Côte d'Ivoire	Africa	218019 (157070, 533761)	317909 (246028, 834944)
Croatia	Europe	210704 (152018, 447248)	202784 (147784, 443270)
Cuba	Americas	881872 (773338, 977614)	1070122 (920228, 1216624)
Curaçao	Americas	18196 (13672, 22260)	19535 (14896, 24104)
Cyprus	Asia	91566 (59824, 154812)	110522 (72808, 183985)
Czech Republic	Europe	746650 (528602, 992980)	815324 (597468, 1074245)
Dem. People's Republic of Korea	Asia	822711 (753318, 938325)	944538 (864208, 1093520)
Democratic Republic of the Congo	Africa	1765753 (1405219, 2216557)	3191200 (2542584, 3990432)
Denmark	Europe	375927 (310962, 435461)	408950 (336704, 472635)
Djibouti	Africa	39192 (28425, 59629)	52555 (34900, 83642)
Dominica	Americas	5902 (4660, 7566)	6893 (5380, 8785)
Dominican Republic	Americas	516104 (313894, 722264)	678949 (428264, 925164)
Ecuador	Americas	574084 (355057, 902437)	1042334 (739484, 1498838)
Egypt	Africa	8222605 (4172479, 9637605)	11675690 (5564772, 13742440)
El Salvador	Americas	327472 (271114, 433611)	404822 (312620, 552416)
Equatorial Guinea	Africa	31884 (25602, 39560)	46601 (37180, 58212)

Eritrea	Africa	86550 (61018, 157127)	157878 (98492, 321711)
Estonia	Europe	53495 (36112, 105893)	55529 (37240, 107587)
Ethiopia	Africa	2544054 (1064246, 3978151)	3336534 (1757664, 6626130)
Faroe Islands	Europe	2397 (1821, 2953)	2668 (2032, 3340)
Fiji	Oceania	79510 (57164, 164640)	87198 (59204, 152327)
Finland	Europe	357470 (237031, 445504)	358451 (245340, 447932)
France	Europe	3181527 (2521002, 3990908)	3418907 (2682628, 4305015)
French Guiana	Americas	13385 (11701, 14857)	22770 (19520, 25869)
French Polynesia	Oceania	44039 (35138, 52807)	46547 (36948, 56133)
Gabon	Africa	66183 (52579, 83306)	96563 (76992, 120703)
Gambia	Africa	14746 (13658, 46662)	24599 (22768, 75804)
Georgia	Asia	225317 (150554, 368704)	235271 (152488, 413941)
Germany	Europe	7190853 (5588558, 8179664)	6899742 (5678424, 7954977)
Ghana	Africa	501145 (141788, 847598)	511924 (292124, 1154934)
Greece	Europe	563015 (434274, 1279596)	622950 (483484, 1319760)
Greenland	Americas	849 (718, 2386)	849 (718, 2386)
Grenada	Americas	6435 (4836, 8815)	8505 (6564, 11243)
Guadeloupe	Americas	52018 (40238, 63217)	56121 (43180, 68749)
Guam	Oceania	25422 (20412, 31784)	28715 (21924, 36479)
Guatemala	Americas	763886 (473673, 1164502)	1214721 (719884, 1832447)
Guinea	Africa	123083 (85569, 282608)	185116 (134140, 450028)
Guinea Bissau	Africa	18484 (13696, 46298)	26982 (20728, 69537)
Guyana	Americas	51156 (41715, 70268)	58466 (46160, 78326)
Haiti	Americas	350988 (222919, 621926)	493518 (319668, 1233958)
Honduras	Americas	293829 (198434, 489075)	510330 (369760, 745513)
Hungary	Europe	681856 (496396, 1228223)	679389 (486028, 1212655)
Iceland	Europe	17607 (11734, 22278)	20689 (14316, 26110)
India	Asia	72515680 (52780422, 91884372)	97984690 (73723892, 122943283)
Indonesia	Asia	10163610 (8389611, 11282555)	13129440 (10981832, 14695560)
Iran (Islamic Republic of)	Asia	4985973 (3696940, 6758239)	7085210 (5164852, 9596423)
Iraq	Asia	1434580 (971431, 1962382)	2304600 (1542348, 3093410)
Ireland	Europe	141008 (105672, 199628)	194527 (147192, 261218)
Israel	Asia	412470 (315486, 707880)	547151 (418148, 929804)
Italy	Europe	3306987 (2859446, 3951471)	3591734 (3115728, 4275263)
Jamaica	Americas	205859 (158151, 266600)	252008 (189212, 318552)
Japan	Asia	6950767 (5638516, 9349323)	6587593 (5347852, 8802972)

Jordan	Asia	410733 (322997, 703945)	613262 (490512, 1039147)
Kazakhstan	Asia	799934 (524211, 1306241)	923920 (595472, 1664134)
Kenya	Africa	470785 (171369, 1779367)	806258 (422092, 3754071)
Kiribati	Oceania	12797 (6143, 17968)	15239 (9316, 20695)
Kuwait	Asia	444198 (370884, 535420)	668372 (520308, 923989)
Kyrgyzstan	Asia	218023 (146004, 341813)	276854 (184644, 518304)
Lao People's Democratic Republic	Asia	117111 (107077, 131677)	188192 (171968, 212187)
Latvia	Europe	98313 (75696, 126425)	97482 (74904, 124426)
Lebanon	Asia	570006 (442046, 717728)	631496 (493992, 791828)
Lesotho	Africa	30410 (17370, 52206)	44457 (26764, 74220)
Liberia	Africa	44374 (32937, 109938)	66648 (51052, 171580)
Libya	Africa	437317 (311660, 584694)	560971 (375812, 733194)
Liechtenstein	Europe	2747 (2224, 3049)	2828 (2416, 3168)
Lithuania	Europe	104959 (88282, 155223)	105609 (89256, 154040)
Luxembourg	Europe	24284 (15688, 43049)	30251 (19024, 52832)
Macedonia	Europe	183613 (152635, 213221)	200313 (167184, 231811)
Madagascar	Africa	383087 (242477, 632602)	662649 (397056, 1074326)
Malawi	Africa	204442 (123182, 363926)	390955 (233836, 655957)
Malaysia	Asia	3466658 (2959475, 4092486)	4621662 (3981568, 5390309)
Maldives	Asia	18534 (15510, 43272)	27637 (21904, 46345)
Mali	Africa	146026 (102960, 345065)	237180 (174864, 594194)
Malta	Europe	41073 (22387, 51804)	43882 (23976, 54975)
Marshall Islands	Oceania	10164 (6578, 13797)	9621 (6252, 12805)
Martinique	Americas	49261 (36674, 59706)	46920 (35388, 57433)
Mauritania	Africa	42990 (31600, 107666)	62440 (49240, 168657)
Mauritius	Africa	221730 (90222, 262526)	244800 (159088, 290294)
Mexico	Americas	11967890 (5741522, 14647724)	16274520 (8313900, 19977102)
Micronesia (Fed. States of)	Oceania	6123 (4406, 9030)	9310 (6720, 12960)
Moldova	Europe	187254 (148553, 264791)	234445 (191724, 321294)
Monaco	Europe	2131 (1716, 2609)	2337 (1884, 2914)
Mongolia	Asia	96291 (30782, 176701)	119723 (40588, 221205)
Montenegro	Europe	56089 (46628, 65102)	59024 (49196, 68310)
Montserrat	Americas	459 (402, 532)	524 (484, 620)
Morocco	Africa	1635004 (1231678, 2652294)	2241846 (1663352, 3484550)
Mozambique	Africa	300071 (192576, 541431)	511798 (303768, 935847)
Myanmar	Asia	1449515 (1038224, 2298843)	2643735 (1932512, 3837701)
Namibia	Africa	46147 (27030, 73564)	72560 (43600, 120216)

Nauru	Oceania	1460 (1051, 1889)	1611 (1080, 2101)
Nepal	Asia	657108 (435670, 1369372)	931796 (640284, 2063810)
Netherlands	Europe	943684 (676032, 1284715)	1037266 (736944, 1333805)
New Caledonia	Oceania	44820 (33930, 56061)	47902 (38908, 57450)
New Zealand	Oceania	316454 (232706, 402682)	338123 (259884, 420853)
Nicaragua	Americas	367569 (233135, 515416)	454314 (319444, 631990)
Niger	Africa	170693 (107704, 337352)	275763 (175816, 603702)
Nigeria	Africa	1710470 (1199146, 4040407)	2516065 (1904492, 6480549)
Niue	Oceania	239 (145, 316)	214 (116, 306)
Norway	Europe	291620 (200209, 365860)	340100 (240044, 426634)
Oman	Asia	369448 (249552, 462541)	544860 (375984, 675942)
Pakistan	Asia	7503461 (5068829, 11156193)	10995720 (7639344, 16080949)
Palau	Oceania	2346 (1602, 5051)	3172 (1732, 6022)
Panama	Americas	217090 (169298, 273477)	321697 (266440, 380268)
Papua New Guinea	Oceania	634321 (278875, 888434)	837167 (530976, 1160104)
Paraguay	Americas	299785 (259903, 338162)	446715 (380940, 510164)
Peru	Americas	1133160 (804665, 1719635)	1636648 (1114620, 2588600)
Philippines	Asia	3701124 (2817893, 4796906)	5014895 (3728880, 6581034)
Poland	Europe	2165593 (1523183, 6214533)	2262371 (1604812, 5844306)
Portugal	Europe	1031139 (725206, 1310302)	1071754 (766572, 1346624)
Puerto Rico	Americas	387705 (308179, 474341)	401566 (317424, 492305)
Qatar	Asia	260928 (229414, 296874)	390418 (342492, 441609)
Republic of Korea	Asia	3394361 (2460310, 4369531)	3996904 (2934152, 5126737)
Réunion	Africa	107165 (77290, 129096)	122928 (90884, 162954)
Romania	Europe	1710243 (1045290, 2195755)	1559033 (919592, 2107770)
Russian Federation	Europe	8323771 (6150186, 11169173)	10296650 (5987504, 14328933)
Rwanda	Africa	213430 (123970, 354544)	420148 (252812, 791552)
Saint Kitts and Nevis	Americas	4931 (3415, 6945)	6084 (4212, 8557)
Saint Lucia	Americas	13939 (11368, 19314)	17232 (13648, 22873)
Saint Vincent and the Grenadines	Americas	8281 (6636, 11016)	10028 (7884, 12999)
Samoa	Oceania	7268 (4966, 16412)	8672 (5820, 20312)
San Marino	Europe	2033 (1667, 2397)	2345 (1912, 2763)
Sao Tome and Principe	Africa	1762 (1317, 4560)	2643 (2104, 7365)
Saudi Arabia	Asia	3851964 (2954474, 4427450)	5469494 (4091752, 6280745)
Senegal	Africa	137876 (94233, 321353)	221791 (163420, 561438)
Serbia	Europe	828088 (690590, 958688)	819075 (684648, 946715)

Seychelles	Africa	7640 (5501, 10600)	12474 (7920, 16860)
Sierra Leone	Africa	60130 (42418, 139974)	87706 (64244, 213367)
Singapore	Asia	593076 (492114, 685353)	692618 (569140, 805408)
Sint Maarten (Dutch part)	Americas	3495 (2974, 4192)	4326 (3560, 5200)
Slovakia	Europe	396253 (236205, 475762)	451771 (261424, 537988)
Slovenia	Europe	156974 (100130, 207361)	169676 (104076, 222991)
Solomon Islands	Oceania	43077 (22953, 65124)	62058 (36076, 93538)
Somalia	Africa	222422 (158073, 374171)	386390 (244276, 708242)
South Africa	Africa	1829207 (1014950, 3729624)	2633569 (1367424, 5259500)
South Sudan	Africa	433982 (310884, 579605)	645568 (456804, 857835)
Spain	Europe	3497947 (2621566, 5015841)	3964455 (2929116, 5663136)
Sri Lanka	Asia	1168936 (791970, 1819035)	1322407 (882028, 2060194)
State of Palestine	Asia	172415 (104868, 364354)	286916 (158268, 610090)
Sudan	Africa	2218476 (1089710, 3758088)	2819352 (1451136, 5413432)
Suriname	Americas	44747 (29465, 89601)	52974 (38484, 82308)
Swaziland	Africa	17008 (9794, 29913)	23890 (14388, 40543)
Sweden	Europe	482449 (392324, 653875)	490056 (389996, 715770)
Switzerland	Europe	459769 (432382, 684840)	541227 (503700, 748367)
Syrian Arab Republic	Asia	726032 (547335, 996339)	1266416 (962324, 1724851)
Taiwan	Asia	1904876 (1362021, 2516152)	2090333 (1509376, 2722720)
Tajikistan	Asia	266955 (179299, 410837)	372998 (251064, 691050)
Thailand	Asia	4106930 (2998277, 4839127)	4654619 (3261984, 5423349)
Timor-Leste	Asia	32923 (27522, 38308)	47021 (40612, 53809)
Togo	Africa	172842 (49037, 278306)	253791 (78192, 408005)
Tokelau	Oceania	206 (110, 273)	252 (100, 340)
Tonga	Oceania	7129 (4649, 11318)	8609 (6228, 13838)
Trinidad and Tobago	Americas	115823 (91386, 157592)	145971 (121328, 181037)
Tunisia	Africa	751936 (563012, 1137407)	948897 (631676, 1366639)
Turkey	Asia	6625234 (5664827, 8081333)	8606189 (7377472, 10455463)
Turkmenistan	Asia	208272 (133923, 339282)	269369 (172880, 485995)
Tuvalu	Oceania	1697 (956, 2210)	1561 (836, 2354)
Uganda	Africa	297550 (165203, 674855)	867422 (494512, 2022548)
Ukraine	Europe	2729566 (1770750, 4692247)	2639892 (1687936, 4777706)
United Arab Emirates	Asia	1186784 (1005931, 1415700)	1699868 (1429464, 2034054)
United Kingdom	Europe	2682726 (2288142, 3600088)	3056956 (2574424, 4210151)
United Republic of Tanzania	Africa	939479 (578124, 2090382)	1826426 (1129524, 3882806)

United States of America	Americas	29338180 (26690902, 31679401)	31825320 (28715312, 34490266)
United States Virgin Islands	Oceania	11811 (9450, 14098)	11106 (8912, 13266)
Uruguay	Americas	149073 (118525, 196662)	168875 (125384, 261274)
Uzbekistan	Asia	1220580 (680900, 2050170)	1550373 (919460, 2841012)
Vanuatu	Oceania	16776 (12277, 25124)	30838 (22040, 42794)
Venezuela (Bolivarian Republic of)	Americas	1369611 (1021586, 1905704)	2618469 (2032188, 3329925)
Viet Nam	Asia	3520101 (2736766, 4858207)	4818023 (3490424, 7353720)
Western Sahara	Africa	9552 (8184, 25873)	12658 (10896, 36979)
Yemen	Asia	543920 (401731, 1001477)	927772 (694008, 1597533)
Zambia	Africa	230349 (132762, 377875)	423312 (252392, 703175)
Zimbabwe	Africa	114253 (70434, 467417)	334696 (202784, 668168)

Appendix Table 2:

(A) RECODe equations used to estimate rates of microvascular complications of T2DM. The 10-year risk of an outcome can be computed as $1 - \lambda^{\exp(\sum(\beta \cdot x) - \text{mean}(\sum(\beta \cdot x)))}$, where β are the equation coefficients and x are the values for each covariate for an individual patient within the cohort under study. Lambda values were 0.973 for renal failure/ESRD, 0.921 for vision loss, and 0.870 for loss of pressure sensation. After the equations' baseline hazard rates were recalibrated to match DALY estimates from the Global Burden of Disease project for each complication (see GBD website for cause-specific DALY estimates),²² the $\text{mean}(\sum(\beta \cdot x))$ values were 1.37 for renal failure, 130.9 for severe vision loss, and 4.99 for pressure sensation loss. To estimate the reduction in risk with treatment, we used estimates from a prior systematic review, in which the risks were first converted to rates (where initial rate = $-\ln(1 - \text{risk})/10$), then calculated the new reduced rate of each treatment as $(\text{initial rate} \cdot (\text{new A1c}/\text{initial A1c})^b)$, where b is 1.14 for renal failure, 1.29 for severe vision loss, and 1.19 for pressure sensation loss.⁴ The new A1c was calculated from initial A1c as noted in the main text, by using values from a meta-analysis to estimate reduction with each treatment (typically 1-2% reduction with each oral medication, then reduction to target A1c level with insulin instead of sulfonylurea if necessary).¹⁷ Blank cells indicate that the particular covariate is not included in the given equation (a beta coefficient of zero).

Covariate	Renal failure/end-stage renal disease	Severe vision loss	Pressure sensation loss
Age, years	-0.01938	0.02285	0.03022
Women	-0.01129	0.2264	-0.18680
Black	0.08812	- 0.16770	-0.09448
Hispanic or Latino	0.2338	-	-
Tobacco smoking, current	0.1483	-	-
Systolic blood pressure, mm Hg	0.00303	0.00824	0.00456
Cardiovascular disease history	-0.02164	0.1127	0.26672
Blood pressure-	-0.07952	0.06393	0.18192

lowering drugs			
Oral diabetes drugs	-0.12560	- 0.23490	-0.25747
Anticoagulants	0.03199		
HbA1c, %	0.1369	0.1449	0.18866
Total cholesterol, mg/dL	-0.00111	- 0.00017	0.00219
HDL cholesterol, mg/dL	0.00629	0.00545	-0.00539
Serum creatinine, mg/dL	0.8609	0.6947	0.60442
Urine albumin:creatinine ratio, mg/g	0.00036	0.0002	-

(B) Hypoglycaemia risk equation. The risk equation was developed from the ACCORD study sample (N = 10,251),¹⁶ using elastic net regularization¹⁷ for parameter selection and refitting to avoid imprecise standard errors. The logistic regression equation estimates 5-year probability of hypoglycaemia requiring medical assistance. The risk equation was estimated through 5-fold cross-validation using individual participant data from the ACCORD trial. The equation had a C-statistic of 0.76, and passed the Hosmer-Lemeshow test for calibration.¹⁸ To calculate the probability of a hypoglycemic event requiring medical assistance, an individual's value for each covariate is multiplied by the coefficient then added to the intercept to derive a sum of terms, then the 5-year probability of a major hypoglycaemic event equals $1/(1+\exp(-\text{sum of terms}))$.

Covariate	Coefficient	Standard Error	Wald Z score	P value
Intercept	-8.8533	3.0621	-2.89	0.0038
Age, years	0.0136	0.0274	0.50	0.6190
Female	0.2835	0.3580	0.79	0.4284
Starting haemoglobin A1c value, %	0.6870	0.2184	3.15	0.0017
Change in haemoglobin A1c with therapy, %	0.1323	0.1593	0.83	0.4063
Systolic blood pressure, mmHg	-0.0026	0.0098	-0.26	0.7924
Alanine aminotransferase, mg/dL	-0.0472	0.0195	-2.42	0.0157
Loss of foot vibratory sensation	0.5126	0.4702	1.09	0.2757
Units of insulin per day	0.0005	0.0046	0.12	0.9080

On sulfonylurea	-0.3323	0.4269	-0.78	0.4363
Severe vision loss	0.0226	0.3919	0.06	0.9540
Serum creatinine, mg/dL	1.1783	0.7396	1.59	0.1112
Time since diabetes diagnosis, years	0.0391	0.0226	1.73	0.0844

Appendix Table 3:

Disability weights used for estimating DALYs averted through insulin treatment, based on a prior global survey and systematic review.¹⁹

Disease outcome	Utility value (95% CI)
Renal failure/end-stage renal disease	0.573 (0.397, 0.749)
Severe vision loss	0.191 (0.129, 0.269)
Pressure sensation loss	0.099 (0.066, 0.145)
Hypoglycaemia requiring medical attention	0.054 (0.033, 0.084)
Daily finger sticks and injections	0.009 (0.004, 0.018)

Appendix Table 4:

Numerical values corresponding to main text Figure 2. 95% confidence intervals are listed in parentheses.

(A) People with type 2 diabetes mellitus estimated to use insulin

	Base case (7%)	Intensive (6.5%)	Liberal (8%)	Age-tailored (7% (<75yo), 8% (>75yo))	Risk based (<5% risk)
Africa	5119862 (2999782, 8733785)	7112791 (4167460, 12133449)	2818170 (1651196, 4807412)	4544439 (2662636, 7752192)	7112791 (4167460, 12133449)
Americas	17272413 (13595462, 20657257)	23995776 (18887556, 28698186)	9507403 (7483467, 11370552)	15331161 (12067463, 18335581)	23995776 (18887556, 28698186)
Asia	47558556 (38157723, 61597425)	66070932 (53010784, 85574492)	26178065 (21003483, 33905600)	4221343 (33869163, 54674469)	66070932 (53010784, 85574492)
Europe	8523506 (6240663, 12033426)	11841319 (8669869, 16717489)	4691667 (3435102, 6623662)	7565546 (5539273, 10680985)	11841319 (8669869, 16717489)
Oceania	518356 (370282, 671140)	720129 (514416, 932385)	285323 (203818, 369422)	460098 (328666, 595711)	720129 (514416, 932385)

(B) Number of U100 insulin vials (1000 units each) used per year

	Base case (7%)	Intensive (6.5%)	Liberal (8%)	Age-tailored (7% (<75yo), 8% (>75yo))	Risk based (<5% risk)
Africa	87651814 (50501623, 144857489)	121770667 (70159601, 201243902)	48246941 (27798042, 79735153)	77800596 (44825728, 128576905)	121770667 (70159601, 201243902)
Americas	323833311 (257426785, 383481167)	449886847 (357631290, 532752893)	178250353 (141697638, 211082835)	287437572 (228494498, 340381584)	449886847 (357631290, 532752893)
Asia	725118538 (585106758, 937297246)	1007374109 (812862130, 1302144310)	399133230 (322065343, 515924581)	643622211 (519346404, 831954080)	1007374109 (812862130, 1302144310)
Europe	167389188 (122645636, 236554000)	232546164 (170385988, 328633682)	92137470 (67508892, 130208452)	148576258 (108861450, 209967613)	232546164 (170385988, 328633682)
Oceania	9900809 (7098276, 12781196)	13754743 (9861312, 17756333)	5449788 (3907165, 7035264)	8788054 (6300498, 11344713)	13754743 (9861312, 17756333)

(C) Net DALYs averted by insulin treatment

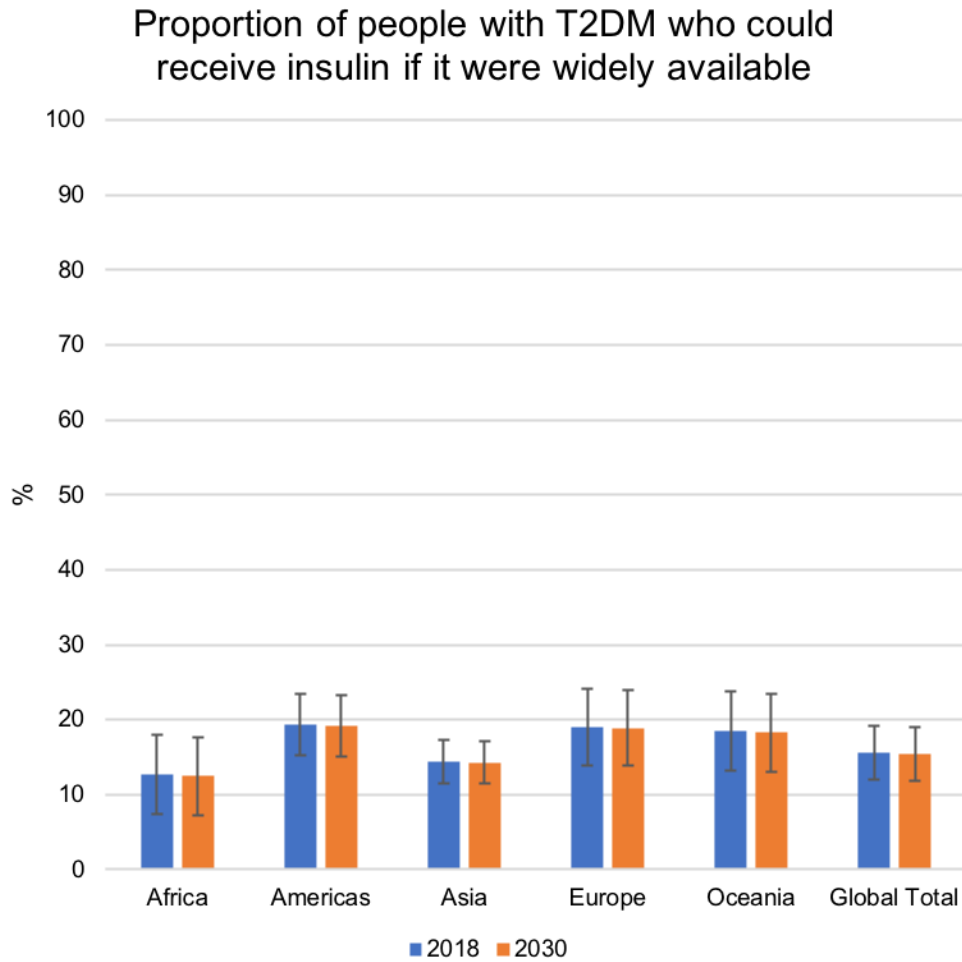
	Base case (7%)	Intensive (6.5%)	Liberal (8%)	Age-tailored (7% (<75yo), 8% (>75yo))	Risk based (<5% risk)
Africa	26585 (15532, 45613)	19091 (11154, 32755)	33817 (19757, 58020)	38337 (22397, 65774)	33471 (19555, 57426)
Americas	58216 (45933, 69554)	41806 (32985, 49948)	74051 (58428, 88474)	83948 (66237, 100298)	73293 (57830, 87569)
Asia	215179 (172646, 277939)	154524 (123981, 199593)	273711 (219609, 353543)	310291 (248959, 400793)	270909 (217360, 349923)
Europe	29282 (21192, 41539)	21028 (15218, 29830)	37247 (26956, 52839)	42225 (30559, 59901)	36865 (26680, 52298)
Oceania	1839 (1298, 2408)	1321 (932, 1729)	2339 (1652, 3063)	2652 (1873, 3472)	2315 (1635, 3031)

(D) Ratio of DALYS averted by prevention of microvascular events with insulin treatment, versus from DALYS induced by insulin treatment (including hypoglycaemia requiring medication attention, daily finger sticks, and injections), worldwide.

Target A1c = 7%	Target A1c = 6.5%	Target A1c = 8%	Target A1c = 7% (<75yo), =8% (≥75yo)	Target risk ≤5%
2.0 (1.4, 3.4)	1.5 (1.1, 2.6)	6.0 (4.2, 10.2)	4.3 (3.0, 7.4)	6.0 (4.2, 10.2)

Appendix Figure 1:

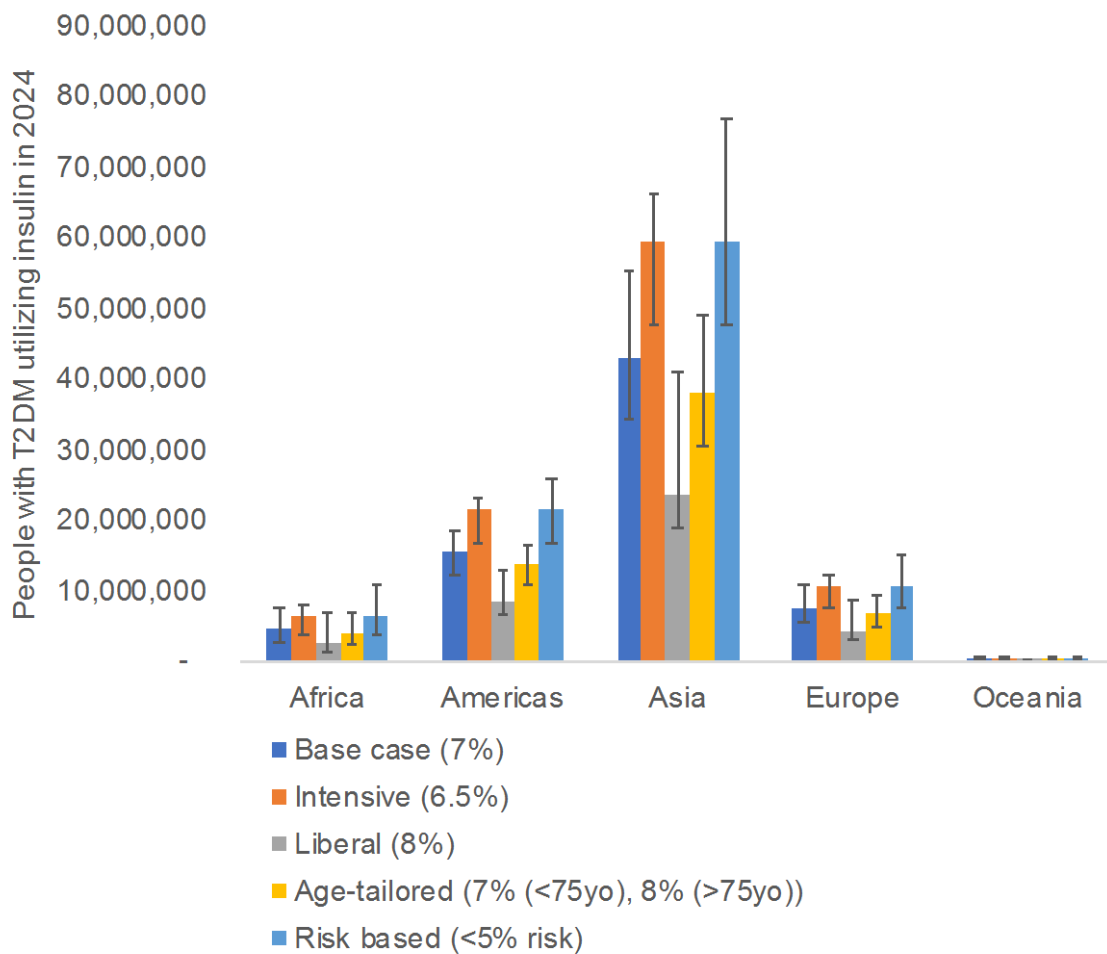
Proportion of people with T2DM who would receive insulin if targeting A1c of 7% after maximum oral therapy, if insulin were widely available.



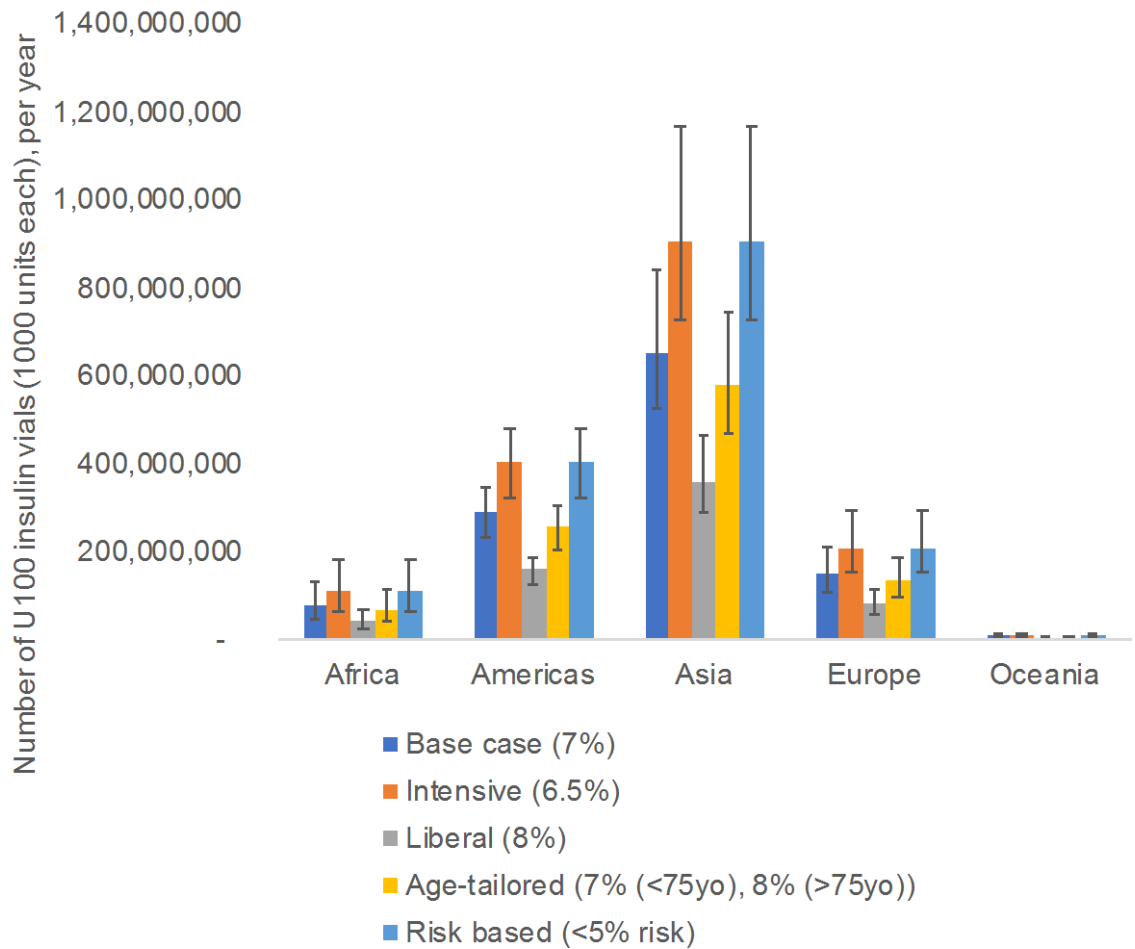
Appendix Figure 2:

Variations in insulin treatment and DALYs averted under alternative treatment targets in the year 2024. All estimates are made with the approach defined in the Methods section that accounted for both demographic change and increased insulin access. The height of the bars reflects the mean, and error bars reflect 95% confidence intervals.

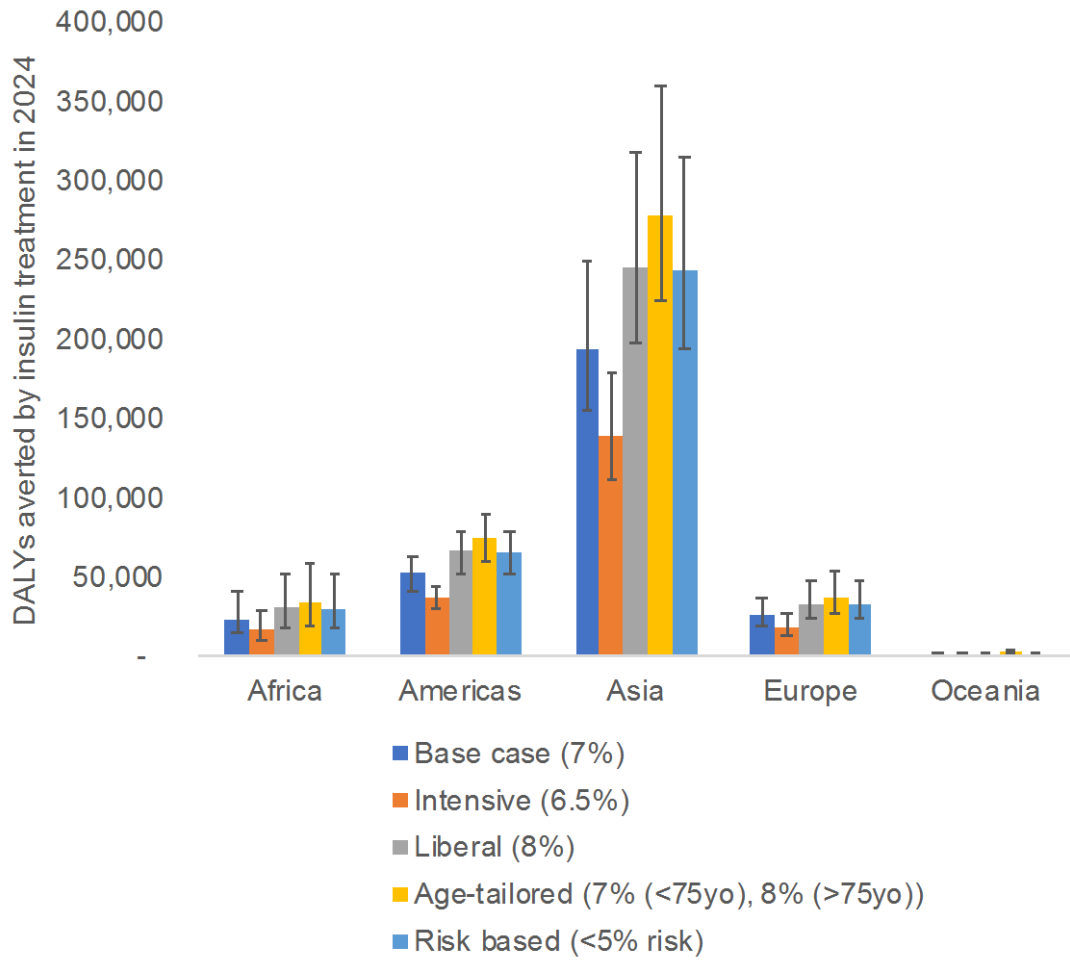
(A) People with type 2 diabetes mellitus estimated to use insulin



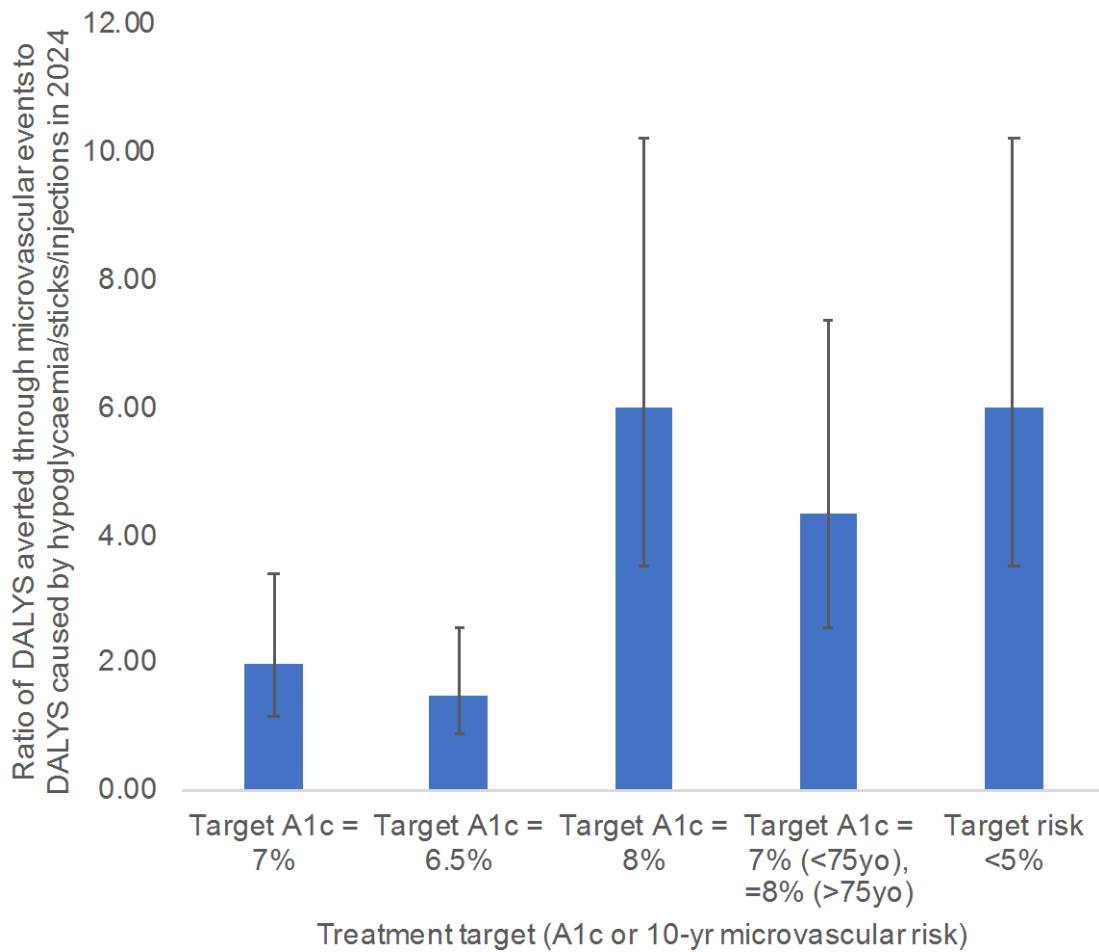
(B) Number of U100 insulin vials (1000 units each) used per year



(C) Net DALYs averted by insulin treatment



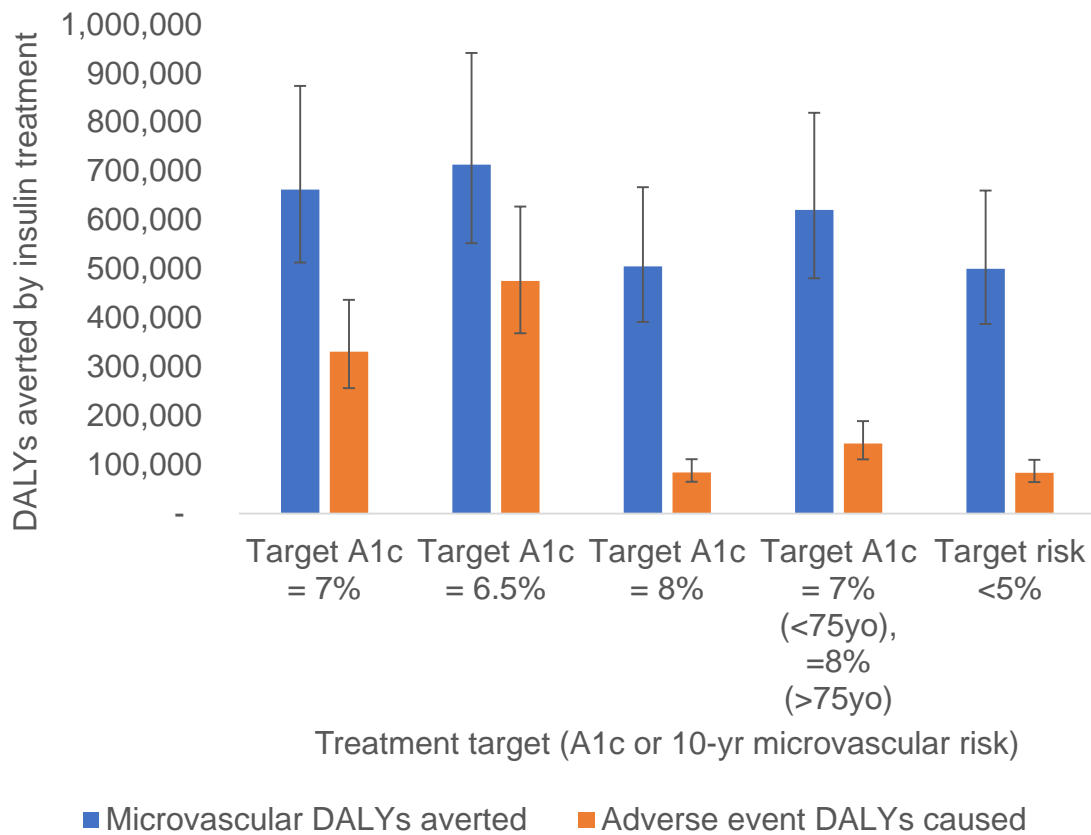
(D) Ratio of DALYS averted by prevention of microvascular events with insulin treatment, versus from DALYs induced by insulin treatment (including hypoglycaemia requiring medication attention, daily finger sticks, and injections), worldwide.



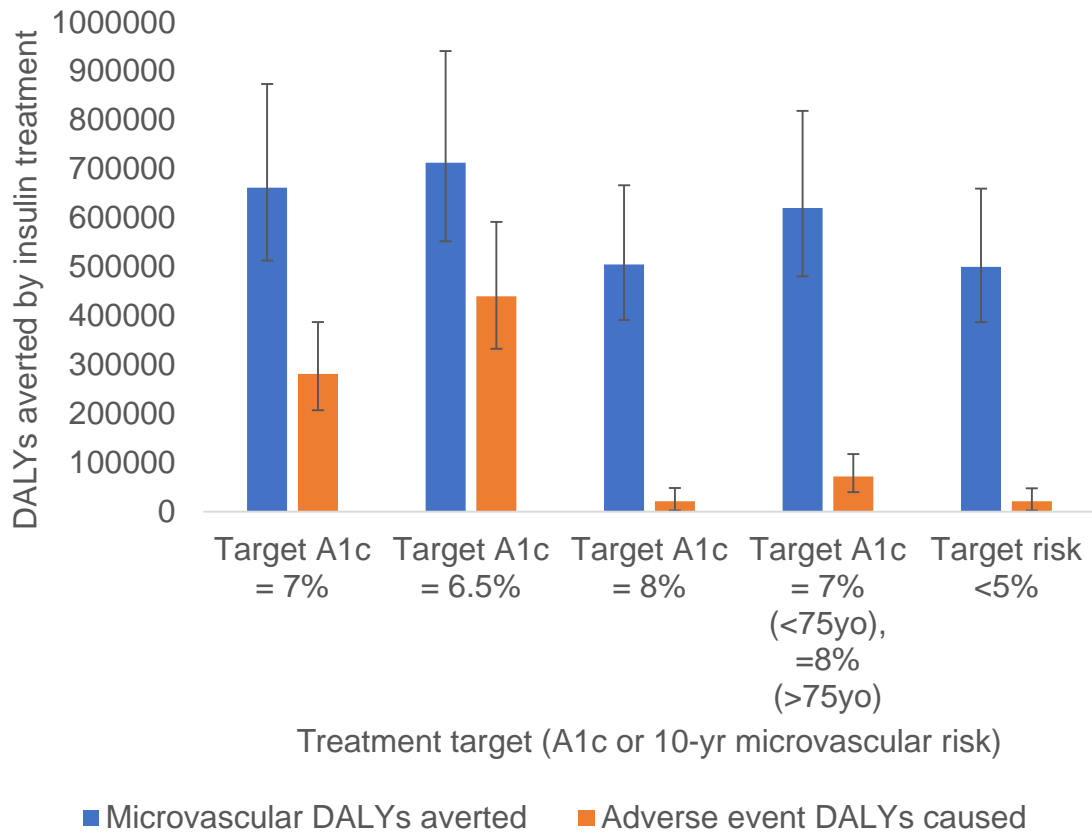
Appendix Figure 3:

Variations in DALYs averted by treatment in 2030 when (A) not having access to newer oral agents (GLP-1 receptor agonists, DPP-4 inhibitor, and SGLT2 inhibitor) and using sulfonylureas in addition to metformin before insulin; and (B) having universal access to the newer oral agents before insulin initiation.

(A)



(B)



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