

## Supplementary Materials

**Figure S1.** Number and average temperature at or above the 99<sup>th</sup> heat index percentile by zip code from 2016 to 2019

Figure S1a illustrates the number of days during summer months (May – September) from 2016 to 2019 where the heat index was greater than or equal to the 99<sup>th</sup> percentile for each zip code. The number of days ranges from one (green) to 161 (dark red). Locations that have no color represent areas with no zip codes or areas not having any day at or above the 99<sup>th</sup> percentile during the summer months in 2016-2019. Figure S1b illustrates the average heat index during excess heat days, ranging from 50.7 °F (green) to 106 °F (dark red). Locations that have no color represent areas with no zip codes or areas not having any day at or above the 99<sup>th</sup> percentile during the summer months in 2016-2019.

**Figure S2.** Incidence of hypoglycemia among Medicare Part A, B, D eligible beneficiaries, U.S. (A) and Taiwan (B)

Figure S2 shows the incidence rates of hypoglycemia among Medicare Part A, B, D eligible beneficiaries from 2016-2019, in patients using metformin only (no other anti-diabetes medications), sulfonylurea only (no other anti-diabetes medications), or any insulin use (may also be taking other anti-diabetes medications).

**Figure S3.** Percentage of Patients with Common Comorbidities Among U.S. and Taiwan Insulin Users

Figure S3 illustrates the percentage of patients with common comorbidities among our U.S. and Taiwan Insulin Users (base cohort).

**Table S1.** Odds of hypoglycemia by heat index percentile category among insulin users

**Table S2.** Odds of hypoglycemia among insulin users by heat index percentile and summer month

**Table S3.** Odds of hypoglycemia among type 1 diabetes beneficiaries using insulin (N = 1,433)

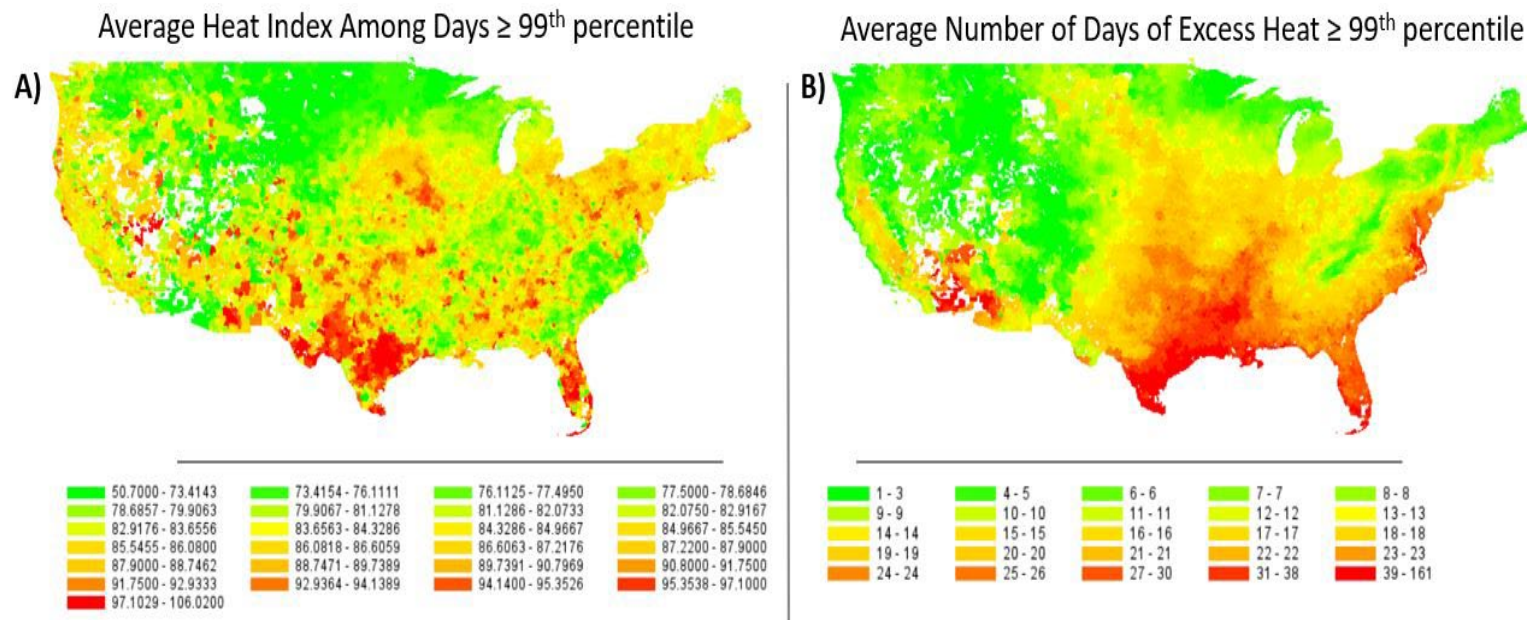
**Table S4.** Odds of hypoglycemia among beneficiaries using long-acting insulin only (N = 10,487)

**Table S5.** Odds of hypoglycemia among beneficiaries by maximum temperature percentile categories among insulin users

**Table S6a.** Odds of hypoglycemia among insulin users by heat index percentile and climatic region, U.S.

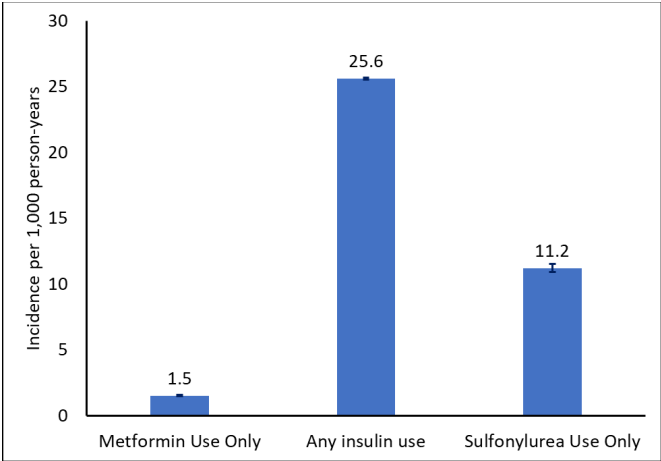
**Table S6b.** Odds of hypoglycemia among insulin users by heat index percentile and climatic region, Taiwan

**Figure S1.** Number and average temperature at or above the 99<sup>th</sup> heat index percentile by zip code from 2016 to 2019

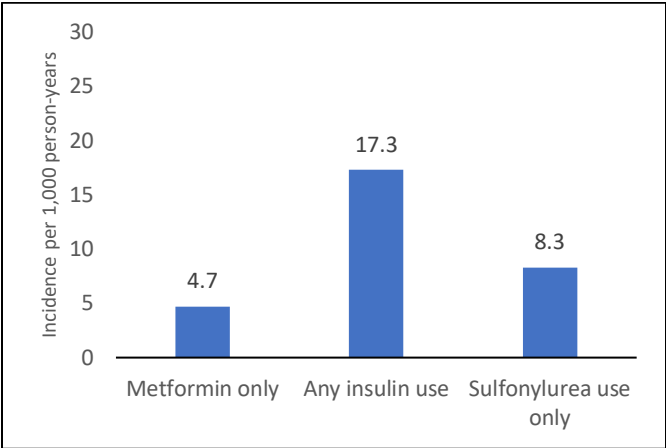


**Figure S2.** Incidence of hypoglycemia among Medicare Part A, B, D eligible beneficiaries, U.S. (A) and Taiwan (B)

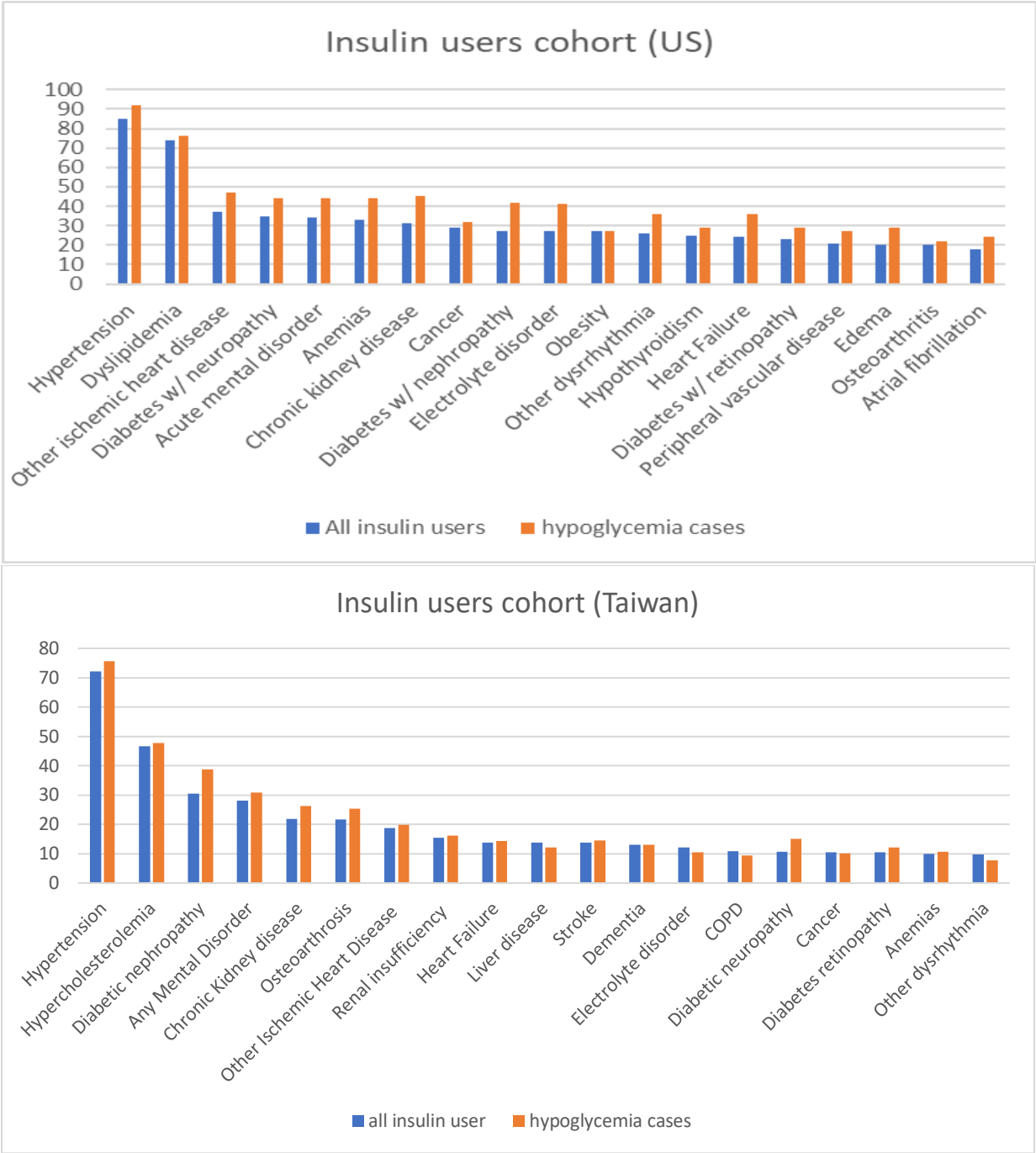
A.



B.



**Figure S3.** Percentage of Patients with Common Comorbidities Among U.S. and Taiwan Insulin Users



**Table S1.** Odds of hypoglycemia by heat index percentile category among insulin users

	<b>U.S.</b>		<b>Taiwan</b>	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI) *	Unadjusted OR (95% CI)	Adjusted OR (95% CI) *
<b>Percentile</b>				
<b>≥99<sup>th</sup></b>	1.38 (1.28, 1.48)	1.41 (1.31, 1.52)	1.40 (1.21, 1.62)	1.38 (1.19, 1.60)
<b>95-98<sup>th</sup></b>	1.14 (1.08, 1.20)	1.15 (1.09, 1.22)	1.24 (1.14, 1.34)	1.22 (1.12, 1.33)
<b>85-94<sup>th</sup></b>	1.12 (1.08, 1.17)	1.14 (1.09, 1.18)	1.20 (1.13, 1.28)	1.19 (1.12, 1.27)
<b>75-84<sup>th</sup></b>	1.09 (1.04, 1.13)	1.10 (1.06, 1.14)	1.34 (1.26, 1.43)	1.34 (1.26, 1.43)
<b>25-74<sup>th</sup></b>	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
<b>&lt;25<sup>th</sup></b>	0.92 (0.88, 0.95)	0.91 (0.88, 0.95)	0.42 (0.32,0.56)	0.43 (0.32, 0.56)

\* adjusted for number of inpatient hospitalizations, number of ED visits, number of outpatient visits, and number of medications in the past 5 weeks

**Table S2.** Odds of hypoglycemia among insulin users by heat index percentile and summer month

<b>Percentile</b>	<b>Overall</b>	<b>June</b>	<b>July</b>	<b>August</b>	<b>September</b>
<b>U.S.</b>	N=32,461	N=7,813	N=7,740	N=7,620	N=7152
<b>≥99<sup>th</sup></b>	1.41 (1.31, 1.52)	1.38 (1.16, 1.65)	1.20 (1.02, 1.40)	1.15 (0.97, 1.36)	1.96 (1.74, 2.22)
<b>95-98<sup>th</sup></b>	1.15 (1.09, 1.22)	0.91 (0.81, 1.03)	1.08 (0.97, 1.20)	0.95 (0.84, 1.06)	1.82 (1.64, 2.02)
<b>85-94<sup>th</sup></b>	1.14 (1.09, 1.18)	0.96 (0.89, 1.04)	1.31 (1.22, 1.40)	0.96 (0.89, 1.04)	1.39 (1.29, 1.50)
<b>75-84<sup>th</sup></b>	1.10 (1.06, 1.14)	1.08 (0.99, 1.16)	1.07 (0.99, 1.16)	1.03 (0.95, 1.12)	1.27 (1.17, 1.38)
<b>25-74<sup>th</sup></b>	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
<b>&lt;25<sup>th</sup></b>	0.91 (0.88, 0.95)	0.86 (0.80, 0.92)	0.90 (0.83, 0.97)	1.11 (1.03, 1.19)	0.77 (0.70, 0.84)
<b>Taiwan</b>	N=10,162	N=2229	N=2169	N=2142	N=2152
<b>≥99<sup>th</sup></b>	1.38 (1.19, 1.60)	3.14 (1.98, 4.97)	5.92 (4.42, 7.92)	0.77 (0.62, 0.96)	0.06 (0.03, 0.14)
<b>95-98<sup>th</sup></b>	1.22 (1.12, 1.33)	3.61 (3.05, 4.23)	2.74 (2.32, 3.24)	0.57 (0.48, 0.66)	0.20 (0.16, 0.27)
<b>85-94<sup>th</sup></b>	1.19 (1.12, 1.27)	3.36 (2.95, 3.83)	2.82 (2.46, 3.24)	0.52 (0.45, 0.59)	0.29 (0.25, 0.34)
<b>75-84<sup>th</sup></b>	1.34 (1.26, 1.43)	2.77 (2.41, 3.08)	2.40 (2.09, 2.77)	0.57 (0.49, 0.65)	0.71 (0.62, 0.80)
<b>25-74<sup>th</sup></b>	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
<b>&lt;25<sup>th</sup></b>	0.43 (0.32, 0.56)	0.33 (0.21, 0.50)	0.29 (0.10, 0.81)	1.42 (0.61, 3.31)	1.48 (0.81, 2.69)

Data shown are N or adjusted odds ratio (95% confidence interval). Odds ratios are adjusted for number of inpatient hospitalizations, ED visits, outpatient visits, and medications in the past 5 weeks.

**Table S3.** Odds of hypoglycemia among U.S. type 1 diabetes beneficiaries using insulin (N = 1,433)

Percentile	Unadjusted OR (95% CI)	Adjusted OR (95% CI) *
≥99 <sup>th</sup>	1.34 (0.98, 1.83)	1.43 (1.04, 1.97)
95-98 <sup>th</sup>	1.29 (1.03, 1.61)	1.30 (1.04, 1.62)
85-94 <sup>th</sup>	1.13 (0.97, 1.32)	1.13 (0.97, 1.32)
75-84 <sup>th</sup>	1.11 (0.94, 1.31)	1.12 (0.95, 1.33)
25-74 <sup>th</sup>	1.00 (Ref)	1.00 (Ref)
<25 <sup>th</sup>	0.96 (0.82, 1.12)	0.96 (0.82, 1.12)

\*adjusted for number of inpatient hospitalizations, number of ED visits, number of outpatient visits, and number of medications in the past 5 weeks

**Table S4.** Odds of hypoglycemia among U.S. beneficiaries using long-acting insulin only (N = 10,487)

Percentile	Unadjusted OR (95% CI)	Adjusted OR (95% CI) *
≥99 <sup>th</sup>	1.43 (1.27, 1.61)	1.45 (1.27, 1.62)
95-98 <sup>th</sup>	1.11 (1.02, 1.22)	1.10 (1.01, 1.20)
85-94 <sup>th</sup>	1.13 (1.06, 1.21)	1.14 (1.07, 1.22)
75-84 <sup>th</sup>	1.10 (1.03, 1.18)	1.11 (1.03, 1.19)
25-74 <sup>th</sup>	1.00 (Ref)	1.00 (Ref)
<25 <sup>th</sup>	0.94 (0.88, 1.00)	0.95 (0.84, 1.01)

\*adjusted for number of inpatient hospitalizations, number of ED visits, number of outpatient visits, and number of medications during the 5 week period of case and control days.

**Table S5.** Odds of hypoglycemia among U.S. beneficiaries by maximum temperature percentile categories among insulin users

<b>Percentile</b>	<b>Unadjusted OR (95% CI)</b>	<b>Adjusted OR (95% CI) *</b>
<b>≥99<sup>th</sup></b>	1.38 (1.26, 1.52)	1.41 (1.29, 1.55)
<b>95-98<sup>th</sup></b>	1.23 (1.16, 1.31)	1.23 (1.16, 1.31)
<b>85-94<sup>th</sup></b>	1.14 (1.10, 1.19)	1.13 (1.09, 1.18)
<b>75-84<sup>th</sup></b>	1.08 (1.04, 1.12)	1.07 (1.02, 1.11)
<b>25-74<sup>th</sup></b>	1.00 (Ref)	1.00 (Ref)
<b>&lt;25<sup>th</sup></b>	0.92 (0.89, 0.95)	0.90 (0.87, 0.93)

\*adjusted for number of inpatient hospitalizations, number of ED visits, number of outpatient visits, and number of medications during the 5 week period of case and control days.

**Table S6a.** Odds of hypoglycemia among insulin users by heat index percentile and climatic region, U.S.

Percentile	Central	East North Central	Northeast	Northwest	South	Southeast	Southwest	West	West North Central
	N=5,943	N=2,619	N=6,584	N=803	N=4,685	N=5,489	N=1,015	N=2,541	N=646
≥99 <sup>th</sup>	1.39 (1.15, 1.68)	1.55 (1.18, 2.04)	1.42 (1.22, 1.65)	1.45 (0.93, 2.27)	1.42 (1.20, 1.69)	1.54 (1.28, 1.85)	1.37 (0.83, 2.25)	1.32 (1.03, 1.70)	1.52 (0.87, 2.64)
95-98 <sup>th</sup>	1.17 (1.03, 1.33)	1.27 (1.02, 1.57)	1.11 (0.98, 1.25)	0.96 (0.67, 1.38)	1.22 (1.08, 1.39)	1.19 (1.06, 1.34)	0.99 (0.72, 1.35)	1.20 (0.99, 1.45)	1.04 (0.68, 1.59)
85-94 <sup>th</sup>	1.06 (0.97, 1.16)	1.03 (0.90, 1.19)	1.16 (1.07, 1.26)	0.90 (0.70, 1.16)	1.27 (1.15, 1.39)	1.17 (1.08, 1.28)	1.59 (1.30, 1.94)	1.08 (0.94, 1.24)	0.85 (0.62, 1.15)
75-84 <sup>th</sup>	1.07 (0.97, 1.07)	1.04 (0.91, 1.20)	1.05 (0.97, 1.16)	1.07 (0.84, 1.36)	1.18 (1.06, 1.31)	1.16 (1.06, 1.26)	1.28 (1.02, 1.58)	1.04 (0.90, 1.19)	1.16 (0.87, 1.53)
25-74 <sup>th</sup>	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
<25 <sup>th</sup>	0.90 (0.83, 0.98)	0.88 (0.78, 0.99)	0.91 (0.85, 1.00)	0.91 (0.71, 1.17)	0.98 (0.89, 1.08)	0.92 (0.84, 1.01)	0.78 (0.63, 0.96)	0.80 (0.70, 0.93)	0.89 (0.70, 1.13)

Data shown are N or adjusted odds ratio (95% confidence interval). Odds ratios are adjusted for number of inpatient hospitalizations, ED visits, outpatient visits, and medications during 5 week period of case and control days.

**Table S6b.** Odds of hypoglycemia among insulin users by heat index percentile and climatic region, Taiwan

Percentile	Taipei area	North area	Central area	South area	Kao-ping area	East area
	N=1,213	N=2,413	N=1,769	N=1,509	N=1,020	N=430
≥99 <sup>th</sup>	1.41 (0.98, 2.02)	1.59 (1.23, 2.06)	1.37 (1.06, 1.77)	1.54 (1.14, 2.1)	1.80 (1.31, 2.48)	1.12 (0.62, 2.01)
95-98 <sup>th</sup>	1.36 (1.08, 1.71)	1.31 (1.12, 1.53)	1.22 (1.03, 1.43)	1.30 (1.08, 1.56)	1.84 (0.95, 1.48)	1.22 (0.86, 1.73)
85-94 <sup>th</sup>	1.5 (1.25, 1.8)	1.33 (1.17, 1.51)	1.26 (1.08, 1.46)	1.31 (1.12, 1.53)	1.42 (1.17, 1.73)	1.20 (0.89, 1.62)
75-84 <sup>th</sup>	1.40 (1.16, 1.69)	1.42 (1.25, 1.62)	1.18 (1.01, 1.38)	1.20 (1.03, 1.41)	1.48 (1.21, 1.80)	1.43 (1.03, 1.98)
25-74 <sup>th</sup>	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
<25 <sup>th</sup>	0.61 (0.31, 1.19)	0.54 (0.34, 0.86)	0.46 (0.29, 0.72)	< 0.001	0.72 (0.24, 2.11)	< 0.001

Data shown are N or adjusted odds ratio (95% confidence interval). Odds ratios are adjusted for number of inpatient hospitalizations, ED visits, outpatient visits, and medications during 5 week period of case and control days.