

US insulin estimates

Sanjay Basu

3/3/2019

NHANES download and organize

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[illegible]

[illegible]


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```

NHANES A1c distributions

```
##
## TRUE
## 2832
```

```
## Warning in mmedist(data, distname, start = arg_startfix$start.arg, fix.arg
## = arg_startfix$fix.arg, : weights are not taken into account in the default
## initial values
```

```
##          2.5%          50%          97.5%
## 5.117686  8.021034 12.559457
```

```
## [1] 8.241078
```

```
## Warning in mmedist(data, distname, start = arg_startfix$start.arg, fix.arg
## = arg_startfix$fix.arg, : weights are not taken into account in the default
## initial values
```

```
##          2.5%          50%          97.5%
## 4.734349  7.043004 10.468578
```

```
## [1] 7.194178
```

```
## Warning in mmedist(data, distname, start = arg_startfix$start.arg, fix.arg
## = arg_startfix$fix.arg, : weights are not taken into account in the default
## initial values
```

```
##          2.5%          50%          97.5%
## 4.108089  6.497238 10.265809
```

```
## [1] 6.682712
```

```
## Warning in mmedist(data, distname, start = arg_startfix$start.arg, fix.arg
## = arg_startfix$fix.arg, : weights are not taken into account in the default
## initial values
```

```
##          2.5%          50%          97.5%
## 4.192802  6.530120 10.160793
```

```
## [1] 6.704287
```

Demographic change approach:

Demographic change approach: multiply number of people with diagnosed diabetes from 2020-2030 (from IDF estimates) by proportion of people anticipated to be treated with insulin given current estimates (from NHANES) by amount of insulin per person (given distribution of body weights in NHANES).

Demographic change plus improved insulin access:

calculate additional number of people with diabetes not yet on insulin who would be diagnosed if US reached highest OECD country diagnosis level (UK, at 81.5% diagnosis per IDF Diabetes Atlas 9th edition). Estimate insulin necessary given current ADA-EASD guidelines (i.e. start with metformin, then either metformin+ SU, +TZD, +DPP-4, +SGLT-2, or +GLP-1RA). The base case should target HbA1c of 7%. [Sensitivity analyses not yet done: (i) For increased age or significant comorbidities, loosen target to 8%. (ii) try three orals before insulin.]

Match NHANES People to MEPS to get imputed insulin dispensed

```
## Warning: NAs introduced by coercion
```

```
##
## iter imp variable
## 1 1 tob sbp bprx cvd_hx_baseline chol hdl screat uacr alt wt yrsdiab
## 2 1 tob sbp bprx cvd_hx_baseline chol hdl screat uacr alt wt yrsdiab
## 3 1 tob sbp bprx cvd_hx_baseline chol hdl screat uacr alt wt yrsdiab
## 4 1 tob sbp bprx cvd_hx_baseline chol hdl screat uacr alt wt yrsdiab
## 5 1 tob sbp bprx cvd_hx_baseline chol hdl screat uacr alt wt yrsdiab
## 6 1 tob sbp bprx cvd_hx_baseline chol hdl screat uacr alt wt yrsdiab
## 7 1 tob sbp bprx cvd_hx_baseline chol hdl screat uacr alt wt yrsdiab
## 8 1 tob sbp bprx cvd_hx_baseline chol hdl screat uacr alt wt yrsdiab
## 9 1 tob sbp bprx cvd_hx_baseline chol hdl screat uacr alt wt yrsdiab
## 10 1 tob sbp bprx cvd_hx_baseline chol hdl screat uacr alt wt yrsdiab
```

```
## Warning: Number of logged events: 3
```

```
##
## iter imp variable
## 1 1 baseline_age female black yrsdiab unitsperday
## 2 1 baseline_age female black yrsdiab unitsperday
## 3 1 baseline_age female black yrsdiab unitsperday
## 4 1 baseline_age female black yrsdiab unitsperday
## 5 1 baseline_age female black yrsdiab unitsperday
## 6 1 baseline_age female black yrsdiab unitsperday
## 7 1 baseline_age female black yrsdiab unitsperday
## 8 1 baseline_age female black yrsdiab unitsperday
## 9 1 baseline_age female black yrsdiab unitsperday
## 10 1 baseline_age female black yrsdiab unitsperday
```

```
## Warning: Number of logged events: 15
```

Table 1: Comparison of unmatched samples

	0	1	p	SMD
n	28608	2832		
baseline_age (mean (SD))	57.41 (16.64)	60.38 (14.71)	<0.001	0.189

	0	1	p	SMD
female = TRUE (%)	15809 (55.3)	1316 (46.5)	<0.001	0.177
black = TRUE (%)	7572 (26.5)	715 (25.2)	0.166	0.028
yrsdiab (mean (SD))	18.82 (14.24)	11.20 (11.17)	<0.001	0.596

Table 2: Sample sizes

	Control	Treated
All	28608	2832
Matched	4680	2803
Unmatched	23928	29
Discarded	0	0

Table 3: Summary of balance for matched data

	0	1	SMD
n	4680	2803	
baseline_age (mean (SD))	60.28 (14.98)	60.18 (14.65)	0.007
female = TRUE (%)	2149 (45.9)	1316 (46.9)	0.021
black = TRUE (%)	1181 (25.2)	712 (25.4)	0.004
yrsdiab (mean (SD))	12.76 (10.47)	11.31 (11.17)	0.134

Calculate difference between estimated insulin needs (2020-2030) and imputed (based on current 2018 utilization).

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##      0.000   0.000   0.000   8.856  26.355  39.445
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.   NA's
##      10.41   21.92   38.36   45.90   63.01  126.03  1444
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.   NA's
##     -126.03  -57.53  -32.88  -36.99  -16.44   26.91  1444
```

```
## [1] 0.6617232
```

##	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
##	-126.0274	-60.2740	-35.6164	-43.0035	-20.5479	-0.2373	1444

```
## [1] 0.08333333
```

##	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
##	0.0175	5.1666	10.4049	10.7869	15.3742	26.9111	1444

##	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
##	1.900	4.000	5.350	5.634	6.650	17.000	1444

##	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
##	7.000	7.500	8.400	8.886	9.700	15.600	1444

##	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
##	68.40	80.80	85.20	86.74	91.00	112.70	1444

##	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
##	68.70	83.01	89.11	88.90	97.03	112.70	1444