Supplementary Methods

Stochastic Simulation

The additions to the waiting list due to NASH were simulated using numerical expressions derived from the predictive distribution in linear regression models. We first simulated the obese population. Let p_i denote the obese population in year y_i in the dataset ($i = 1, 2, \text{K}, n_1$). We fit a linear regression to the US obese population to obtain the intercept of the model, $\hat{\beta}_0$, the coefficient for the year of prediction, $\hat{\beta}_1$, and the mean square error of the regression model, $\hat{\sigma}_1^2$. To simulate the obesity population at year $k\,(k > n_1)$, $\hat{p}_k$, we used the following expression:

$$\hat{p}_k = \hat{\beta}_0 + \hat{\beta}_1 y_k + t_{\nu_1}\hat{\sigma}_1\sqrt{1 + \frac{1}{n_1} + \frac{(y_k - \bar{y})^2}{\sum_{i=1}^{n_1}(y_i - \bar{y})^2}}, \qquad (1)$$

where $\hat{\sigma}_1$ is the standard deviation of the obese population model, $\bar{y}$ is the average year in which the regression was fit, n_1 is the number of years used to fit the regression model, and t_{ν_1} is a simulated random variable from the standard student-t distribution with $\nu_1 = n_1 - 2$ degrees of freedom.

Similarly, the additions to the waiting list due to NASH were simulated using a numerical expression derived from a linear regression model. Using the obese population at year i, p_i, we predicted NASH additions to the waiting list, with a lag of L years, at year $i + L$ ($i = 1, 2, \text{K}, n_2$). We fit a linear regression model to get the intercept of the model, $\hat{\delta}_0$, the coefficient of obese population, $\hat{\delta}_1$, and the mean square error of the regression model, $\hat{\sigma}_2^2$. The future NASH additions to the waiting list at year $k + L$, $\hat{N}_{k+L}$, were obtained based on the point estimates of the lagged obese population, $\hat{p}_k$. Future NASH additions to the waiting list at the year were simulated from:

$$\hat{N}_{k+L} = \hat{\delta}_0 + \hat{\delta}_1\hat{p}_k + t_{\nu_2}\hat{\sigma}_2\sqrt{1 + \frac{1}{n_2} + \frac{(\hat{p}_k - \bar{p})^2}{\sum_{i=1}^{n_2}(p_i - \bar{p})^2}}, \qquad (2)$$

where $\hat{p}_k$ was obtained from equation (1), $\hat{\sigma}_2$ is the standard deviation of the NASH additions to the waiting list model, p_i is the obese population from the i$^{\text{th}}$ year used to fit the model, $\bar{p}$ is the average obese population in which the regression was fit, n_2 is the number of years used to fit the regression model, and t_{ν_2} is a simulated value from the standard student-t random variable with $\nu_2 = n_2 - 2$ degrees of freedom.

For the case of multiple predictors, equation (2) becomes

$$\hat{N} = \boldsymbol{P}_0^{'}\hat{\boldsymbol{\delta}} \pm t_{\nu_2}\hat{\sigma}_2\sqrt{1+\boldsymbol{P}_0^{'}\left(\boldsymbol{P}^{'}\boldsymbol{P}\right)^{-1}\boldsymbol{P}_0}, \quad (3)$$

where $\boldsymbol{P}_0^{'} = \left[1, p_{01}, p_{02}, \ldots\right]$ is a vector of new observations, $\hat{\boldsymbol{\delta}} = \left[\hat{\delta}_0, \hat{\delta}_1, \hat{\delta}_2, \ldots\right]$ is a vector of regression coefficients, and $\boldsymbol{P}$ is the design matrix of the linear model.

The simulation using (1) and (2) was replicated 10,000 times. The point estimates were obtained by averaging the simulated values, and 95% prediction intervals were generated by taking the 2.5% and 97.5% quantiles of the prediction results of the replications.

Supplementary Results

Supplemental Figure 1 – Historical trend in obesity prevalence in the US

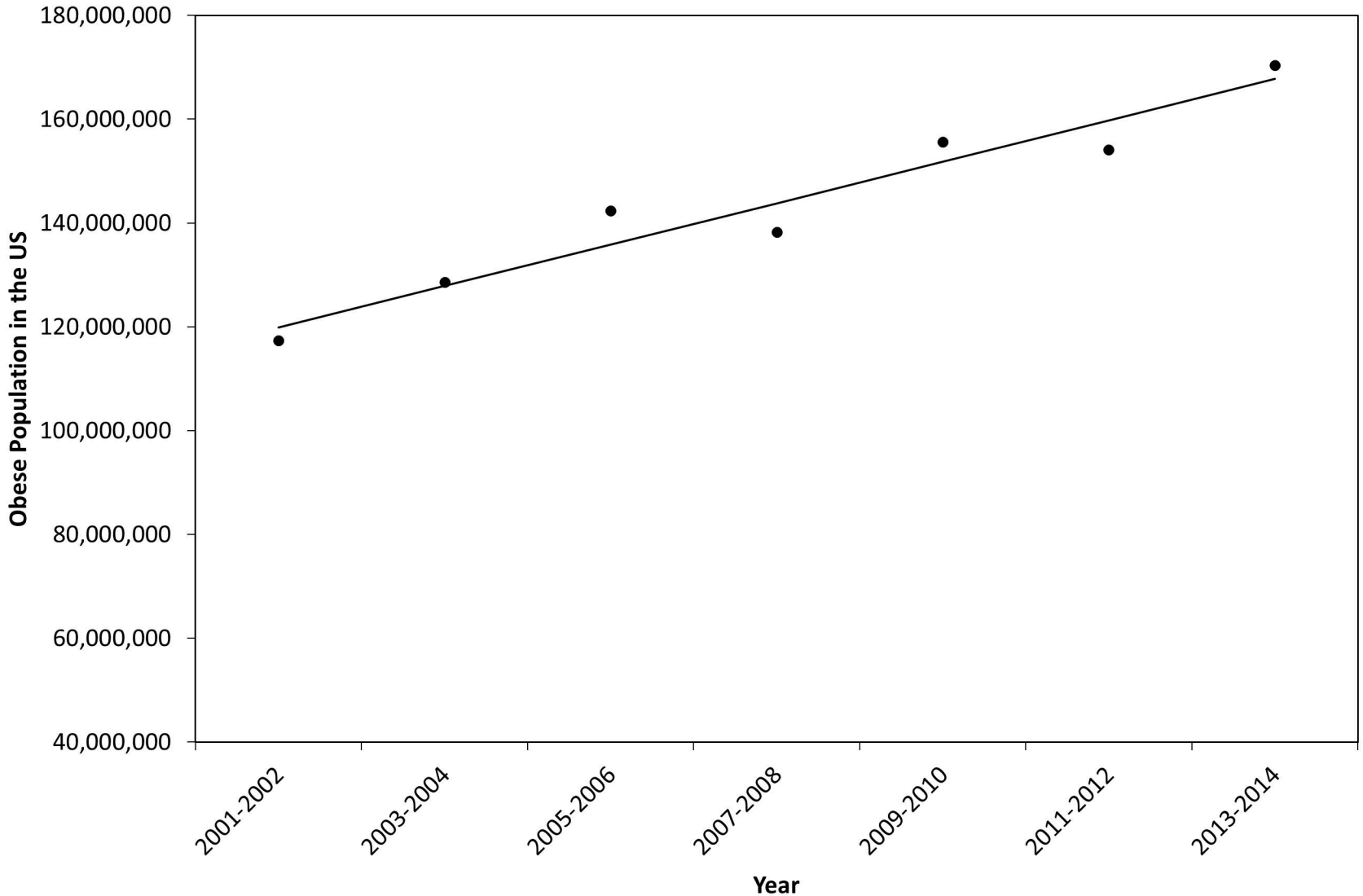
Supplemental Figure 2 – Projected Trend in Obesity in the US with Linear Growth in Obesity Rates

Supplemental Table 1: Regression Coefficients and P-Values for National Analysis. The estimates of the obese population were divided by 1×10^6 to obtain easily legible coefficient estimates.

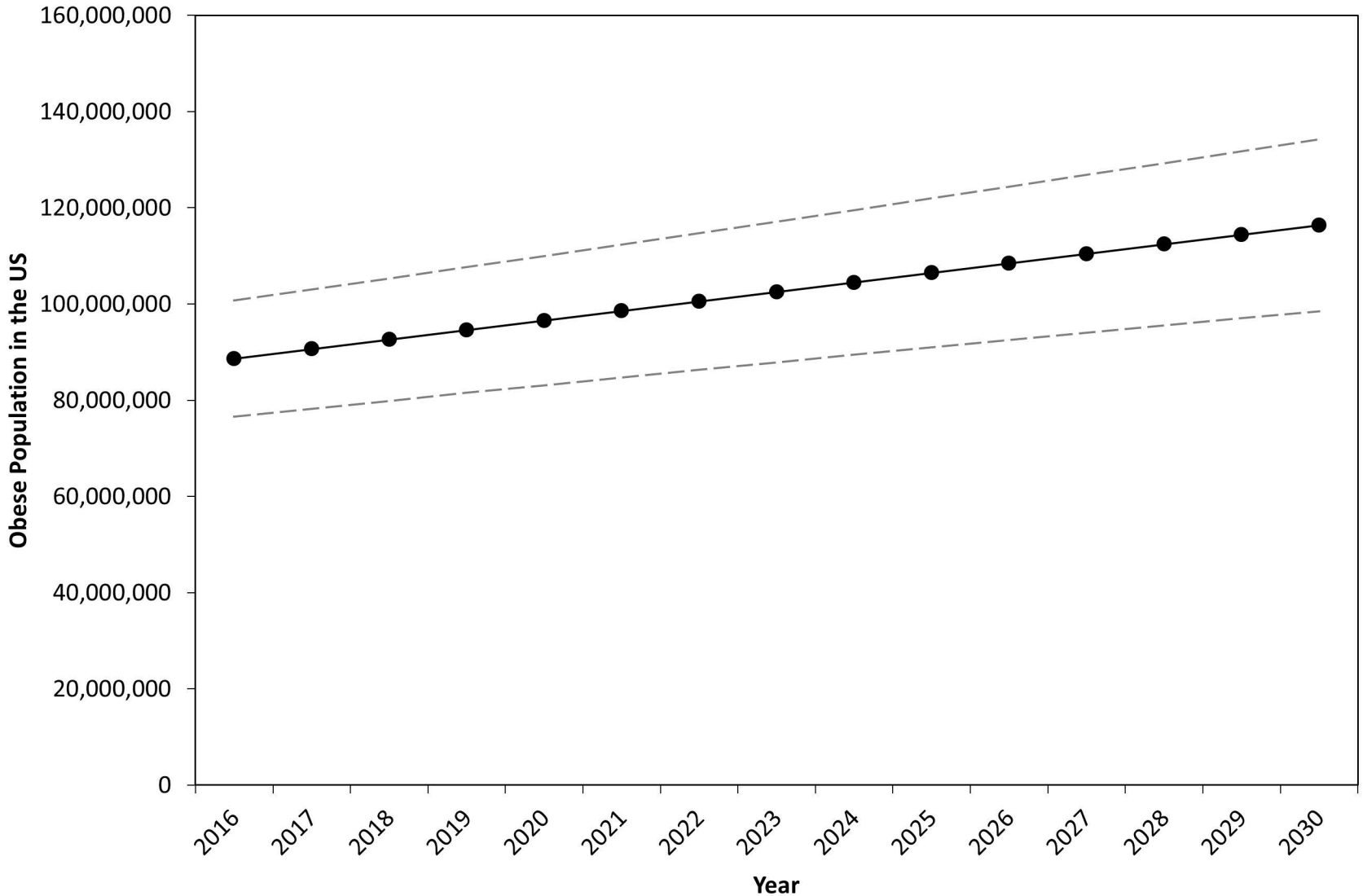
Variables	***Coeff.***	**95% CI**		***P***
		Lower	***Upper***	
Intercept	-461.86	-1207.79	284.07	0.16
BMI > 30	28.34	16.49	40.20	< 0.01

Supplemental Table 2: Point Estimates (Prediction Intervals) of NASH Additions to the Waiting List from 2016 to 2030 under Different Time Lags

Year	*Time Lag (Years)*										
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
2016	1433 (779, 2095)	1456 (831, 2084)	1450 (955, 1944)	1771 (1123, 2420)	1331 (830, 1833)	1518 (1210, 1826)	1432 (994, 1870)	1710 (870, 2549)	1570 (1107, 2033)	1354 (1157, 1550)	1654 (1329, 1979)
2017	1470 (825, 2163)	1497 (889, 2141)	1618 (935, 2359)	1446 (878, 2014)	1803 (1181, 2425)	1401 (1107, 1696)	1644 (1145, 2143)	1443 (817, 2069)	1826 (1231, 2420)	1641 (1402, 1881)	1500 (1233, 1768)
2018	1508 (859, 2211)	1539 (920, 2171)	1660 (975, 2387)	1587 (909, 2320)	1502 (967, 2036)	1874 (1504, 2244)	1523 (1062, 1984)	1603 (860, 2345)	1523 (1079, 1968)	1894 (1581, 2206)	1862 (1425, 2299)
2019	1537 (886, 2222)	1579 (964, 2222)	1707 (1025, 2411)	1627 (943, 2382)	1633 (995, 2332)	1572 (1256, 1888)	2013 (1360, 2666)	1511 (840, 2183)	1704 (1178, 2231)	1595 (1366, 1824)	2179 (1540, 2817)
2020	1574 (928, 2271)	1611 (1000, 2261)	1753 (1066, 2508)	1669 (972, 2431)	1676 (1015, 2387)	1701 (1224, 2213)	1700 (1181, 2219)	1880 (868, 2893)	1601 (1125, 2077)	1774 (1498, 2049)	1804 (1401, 2207)
2021	1603 (932, 2312)	1643 (1032, 2307)	1795 (1101, 2540)	1699 (986, 2488)	1705 (1036, 2452)	1742 (1274, 2258)	1840 (1213, 2558)	1645 (865, 2424)	2019 (1303, 2736)	1672 (1424, 1919)	2028 (1488, 2568)
2022	1618 (947, 2320)	1672 (1049, 2332)	1825 (1134, 2582)	1729 (1008, 2506)	1741 (1069, 2493)	1778 (1293, 2311)	1878 (1226, 2605)	1747 (853, 2727)	1752 (1199, 2304)	2085 (1707, 2463)	1900 (1440, 2360)
2023	1641 (973, 2340)	1693 (1069, 2350)	1851 (1145, 2603)	1762 (1022, 2539)	1764 (1095, 2495)	1811 (1328, 2342)	1916 (1243, 2659)	1773 (825, 2768)	1865 (1224, 2606)	1821 (1531, 2110)	2419 (1617, 3220)
2024	1663 (993, 2371)	1708 (1067, 2370)	1881 (1189, 2626)	1789 (1036, 2594)	1799 (1121, 2538)	1845 (1362, 2395)	1945 (1283, 2707)	1797 (861, 2822)	1903 (1222, 2677)	1936 (1507, 2426)	2087 (1509, 2665)
2025	1672 (1005, 2371)	1727 (1095, 2381)	1900 (1190, 2659)	1810 (1078, 2601)	1818 (1113, 2578)	1868 (1376, 2396)	1974 (1279, 2757)	1839 (858, 2922)	1935 (1226, 2705)	1968 (1545, 2448)	2224 (1500, 3063)
2026	1686 (1016, 2394)	1747 (1118, 2422)	1927 (1209, 2716)	1828 (1102, 2620)	1836 (1127, 2599)	1891 (1380, 2438)	2010 (1341, 2794)	1855 (848, 2964)	1964 (1253, 2786)	1999 (1570, 2498)	2277 (1538, 3151)
2027	1687 (1018, 2384)	1748 (1138, 2420)	1937 (1221, 2722)	1850 (1102, 2648)	1860 (1135, 2633)	1909 (1401, 2462)	2027 (1311, 2827)	1873 (874, 3003)	1985 (1270, 2789)	2026 (1579, 2523)	2311 (1550, 3197)
2028	1697 (1032, 2416)	1760 (1127, 2446)	1946 (1236, 2709)	1862 (1107, 2678)	1869 (1145, 2640)	1926 (1424, 2482)	2054 (1344, 2871)	1894 (845, 3020)	2012 (1259, 2845)	2055 (1609, 2580)	2349 (1564, 3259)
2029	1690 (1022, 2403)	1761 (1124, 2443)	1947 (1238, 2719)	1869 (1105, 2696)	1880 (1165, 2666)	1944 (1447, 2497)	2071 (1319, 2882)	1913 (852, 3056)	2038 (1271, 2906)	2077 (1607, 2600)	2367 (1575, 3272)
2030	1694 (1016, 2398)	1767 (1120, 2433)	1957 (1255, 2729)	1874 (1130, 2683)	1889 (1172, 2687)	1956 (1459, 2507)	2080 (1324, 2895)	1920 (860, 3066)	2051 (1284, 2891)	2104 (1640, 2635)	2413 (1582, 3329)



Supplemental Figure 1



Supplemental Figure 2