

# DOHMH Roadmap: DALY Estimates

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## Background

### Objective

The objective of this analysis is to estimate DALYs lost in New York City due to the following major categories of conditions (with about 100 conditions in total within these categories):

- Major depression
- Alcohol use
- Marijuana use
- Heroin use
- Cocaine use
- Stimulant use
- Sedative use
- Tranquilizer use

## Definition of Key Terms

### DALY

**Disability-adjusted life years.** The DALY is a year of life lived in perfect health and consists of two elements: YLLs and YLDs. The DALY is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. It was developed in the 1990s as a way of comparing the overall health and life expectancy of different countries.

$$DALY = YLL + YLD$$

### YLL

**Years of life lost.** Years of life lost is an estimate of the average years a person would have lived if he or she had not died prematurely.

$$YLL = (Number\ of\ deaths) * (Standard\ life\ expectancy\ at\ age\ of\ death\ in\ years)$$

### YLD

**Years of life lost due to disability.** This is the morbidity component of the DALY score. To estimate YLD for a particular cause in a particular time period, the number of incident cases in that period is multiplied by the average duration of the disease and a weight factor that reflects the severity of the disease on a scale from 0 (perfect health) to 1 (dead). The basic formula for YLD is the following:

$$YLD = (number\ of\ incident\ cases) * (disability\ weight) * (average\ duration\ of\ disease)$$

## Methods

### Data Sources

- 2013 NYCHANES - prevalence estimates
- 2002-2008 NSDUH - drug use prevalence estimates
- 2013 NYC Vital Statistics - mortality estimates
- 2010 Global Burden of Disease Study - national YLD/YLL rates
- 2013 NYC American Community Survey - population estimates

The challenge with using NYCHANES and NSDUH data to estimate the prevalence of a condition is that the  $n$  may be too small. To increase their utility of these surveys, we will aggregate age groups into the following strata: childhood (0-14), late adolescence/early adulthood (15-24), adulthood (25-64), and later life (65+).

### DALY Estimation

#### YLLs

To estimate compute NYC YLLs, we will use NYC mortality counts stratified by age, sex, and race. In concordance with the literature on DALY estimation, life expectancy estimates based on the life expectancy in Japan (82.5 years for women and 80.0 years for men) were used for the calculation of YLL. In order to remain consistent with the methodology of the 2010 Global Burden Disease Study, no age weighting or discounting was applied.

## YLDs

To compute NYC YLDs, we will use the two approaches described below:

**2005 NYC DOHMH / Michaud (2006)** In order to compare the magnitude of the DALY scores to the [2005 NYC DOHMH study](#), we will replicate the previous study’s methodology, which was based on [Michaud CM, et al.](#) The burden of disease and injury in the United States 1996. Population Health Metrics 2006,4:11.

“For NYC YLD, U.S. Census Bureau population estimates for New York City in 2005 by sex were used to calculate years lived with disability (YLD) by applying national YLD rates and ratios from the Michaud et al. study. If the national YLL:YLD ratio was less than 10, then the NYC YLD was equal to the national YLD:YLL ratio multiplied by NYC YLL. If the national YLD:YLL ratio was greater than or equal to 10 (producing unreliable City estimates), then NYC YLD was equal to the national YLD rate multiplied by the NYC population.”

Implementing the Michaud approach will thus require the following data elements:

- NYC Population by age, sex
- National YLD rates by age, sex
- NYC YLLs by age, sex

In order to remain consistent with the demographic weighting approach used by NYC DOHMH for the 2013 NYCHANES data, NYC population estimates were obtained from the [2013 American Community Survey](#), which is available on the NYC Department of City Planning website. Since the data from the Michaud study are from 1996 and patterns of disease and disability have changed, we will update the approach using national YLD/YLL rates from the 2010 Global Burden of Disease Study.

**Prevalence-based YLDs** Years lived with a disability (YLD) due to each disease can be calculated on the basis of either the incidence or the prevalence of the disease. The initial GBD studies estimated YLD on the basis of the incidence of each disease. Thus, in the 1990 study for example, the YLD estimates measured the future loss of health resulting from disease episodes that began in 1990. One advantage of this approach is that it is consistent with that used for mortality: YLL measure the future loss of life resulting from deaths in a particular year.

The 2010 GBD study adopted the alternative approach and calculated YLD based on the prevalence of the impairments resulting from each disease in the year for which the estimates are made. This approach has the advantage that it assigns YLD to the ages at which they are lived, rather than to the age at which the disease episode that produced them began.

Because prevalence is approximately incidence x duration, prevalence YLD for a condition (across all ages) is approximately the same as the no frills incidence YLD. As such, we can estimate YLDs using the following formula:

$$YLD = (number\ of\ prevalent\ cases) * (disability\ weight)$$

We can estimate the number of prevalent cases for each condition using survey data from 2013 NYCHANES. Annual prevalence for drug use can be estimated using data from 2002-2008 NSDUH. Disability weights can be extracted from the 2010 Global Burden of Disease study. However, we should note that the prevalence YLD for a condition may be quite different in magnitude to the incidence-based YLD, depending on how age weighting and discounting are applied. As such, comparisons to previous NYC DALY studies should be done with caution.

Further information about estimating DALYs can be found from the Global Burden of Disease concept paper ([WHO, 2006](#)).

## Disease Rankings

Since our goal is to communicate the burden of diseases in New York City, we will rank each condition in decreasing order of the DALY score. We will also test the stability of the rankings by comparing the results generated from the Michaud approach and the prevalence-based YLDs approach. Moreover, since the 2010 GBD study also provides 95% confidence intervals around point estimates for disability weights and national YLD/YLL rates, further stability checks can be conducted by reporting DALY estimations with their respective upper and lower bounds.

## Estimation of Substance Use Dependence

Prevalence estimates of substance use cannot be directly substituted for prevalence of drug dependence or abuse disorders. We make the following assumptions about the average proportion of dependence among users ([National Addiction Centre, 2003](#)):

- Alcohol - 15.4%
- Cocaine - 16.7%
- Heroin - 23.1%
- Cannabis - 9.1%

## DALY Estimation

### Michaud YLD Approach

This section contains an implementation of the Michaud approach described in the above methods section. We first create a search index containing all the disease conditions of interest.

This search index is then fed through the `calculateDALY` workhorse function to estimate DALYs for each disease condition. The result is a `data.frame` object containing the following columns: `cause_name`, `sex`, `y11`, `yld`, `yld_upper`, `yld_lower`, `daly`, `daly_upper`, `daly_lower`.

### Prevalence-Based YLD Approach

Similar to the section, we implement the prevalence-based YLD approach here using the same search index.

## Results

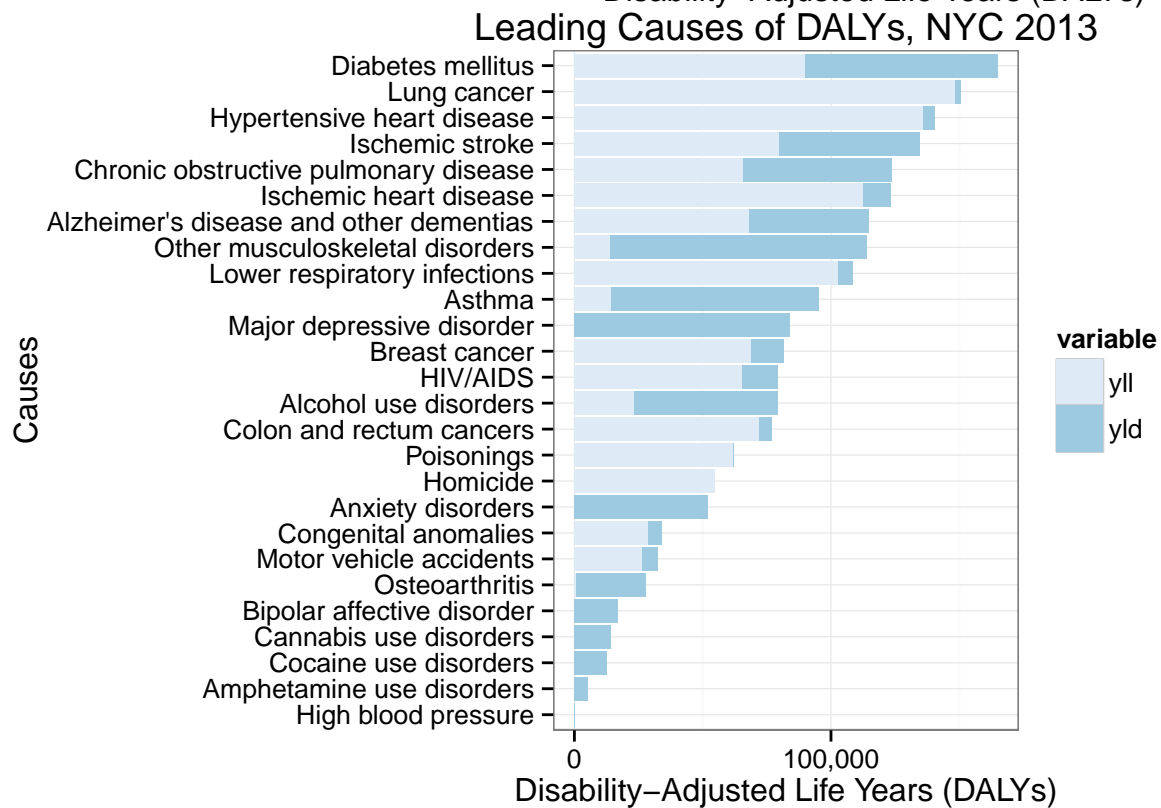
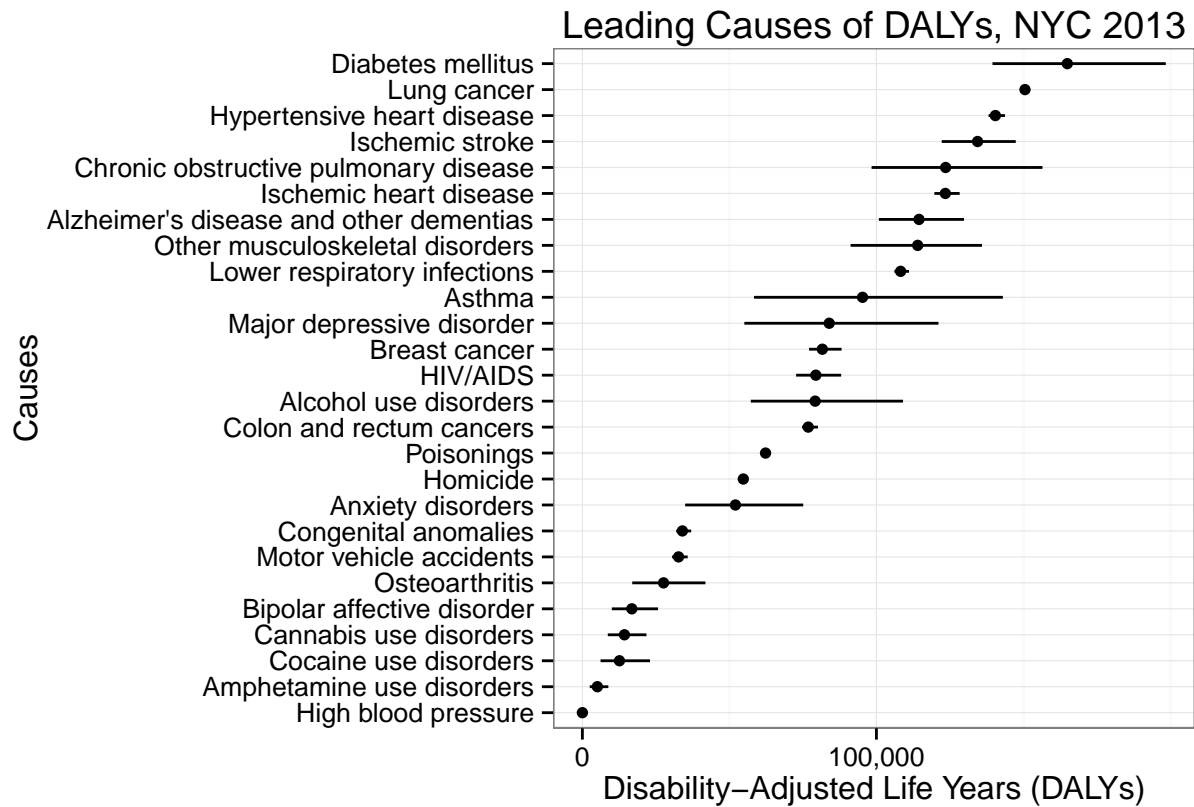
### Michaud YLD Approach

Raw results for this approach can be found under the `results` directory under the filename `nyc_daly_michaud.csv`. The file can be opened in Excel and manipulated with a pivot table for aggregation and stratification purposes.

### 2013 NYC DALY Estimates, Total

##	cause_name	y11	yld
## 1	Diabetes mellitus	89921.8593	75004.5038
## 2	Lung cancer	148291.6356	2242.9612
## 3	Hypertensive heart disease	136003.5344	4455.7610

## 4			Ischemic stroke	79787.1576	54618.9896
## 5			Chronic obstructive pulmonary disease	65616.6564	57924.3517
## 6			Ischemic heart disease	112699.3626	10745.5490
## 7			Alzheimer's disease and other dementias	68064.1642	46430.6034
## 8			Other musculoskeletal disorders	14183.9916	99856.4516
## 9			Lower respiratory infections	102769.2461	5474.2794
## 10			Asthma	14317.4262	80967.8293
## 11			Major depressive disorder	0.0000	83953.4440
## 12			Breast cancer	68867.0554	12738.7979
## 13			HIV/AIDS	65584.2354	13821.0196
## 14			Alcohol use disorders	23367.4429	55797.8826
## 15			Colon and rectum cancers	71883.4068	4926.7991
## 16			Poisonings	61951.4430	345.3933
## 17			Homicide	54727.1791	NA
## 18			Anxiety disorders	0.0000	52051.1850
## 19			Congenital anomalies	28760.0643	5247.0472
## 20			Motor vehicle accidents	26587.8134	6120.9172
## 21			Osteoarthritis	643.1706	26968.3798
## 22			Bipolar affective disorder	0.0000	16820.2498
## 23			Cannabis use disorders	0.0000	14302.9941
## 24			Cocaine use disorders	0.0000	12611.2693
## 25			Amphetamine use disorders	0.0000	5091.8564
## 26			High blood pressure	0.0000	0.0000
##	yld_upper	yld_lower	daly	daly_upper	daly_lower
## 1	108498.2802	49557.68891	164926.363	198420.140	139479.548
## 2	3954.0205	1054.45769	150534.597	152245.656	149346.093
## 3	7743.7734	2146.86933	140459.295	143747.308	138150.404
## 4	67602.9376	42427.48230	134406.147	147390.095	122214.640
## 5	90860.6617	32740.18649	123541.008	156477.318	98356.843
## 6	15616.1724	7032.87825	123444.912	128315.535	119732.241
## 7	61713.3788	32776.61067	114494.768	129777.543	100840.775
## 8	121723.6960	77041.06298	114040.443	135907.688	91225.055
## 9	8303.9475	3354.63057	108243.525	111073.194	106123.877
## 10	128691.7057	44033.85664	95285.256	143009.132	58351.283
## 11	121099.5658	55076.00007	83953.444	121099.566	55076.000
## 12	19278.9232	8233.44871	81605.853	88145.979	77100.504
## 13	22434.1402	7110.37787	79405.255	88018.376	72694.613
## 14	85682.7067	33915.45149	79165.325	109050.150	57282.894
## 15	8225.5483	2835.32887	76810.206	80108.955	74718.736
## 16	912.0096	48.92806	62296.836	62863.453	62000.371
## 17	NA	NA	54727.179	NA	NA
## 18	75104.5772	34951.04848	52051.185	75104.577	34951.048
## 19	8241.7517	3153.12659	34007.112	37001.816	31913.191
## 20	9229.5870	3914.37900	32708.731	35817.400	30502.192
## 21	41201.1994	16315.88023	27611.550	41844.370	16959.051
## 22	25727.1579	10011.62505	16820.250	25727.158	10011.625
## 23	21780.4478	8642.25054	14302.994	21780.448	8642.251
## 24	23003.0360	6172.23042	12611.269	23003.036	6172.230
## 25	8836.4159	2504.36684	5091.856	8836.416	2504.367
## 26	0.0000	0.00000	0.000	0.000	0.000



- Diabetes mellitus is the leading cause of disease in 2013, but has a wide range of uncertainty
- Disaggregated drug use disorders ranked relatively low, particularly for non-alcohol-related substances
- Major depressive disorder just missed the top 10 cutoff

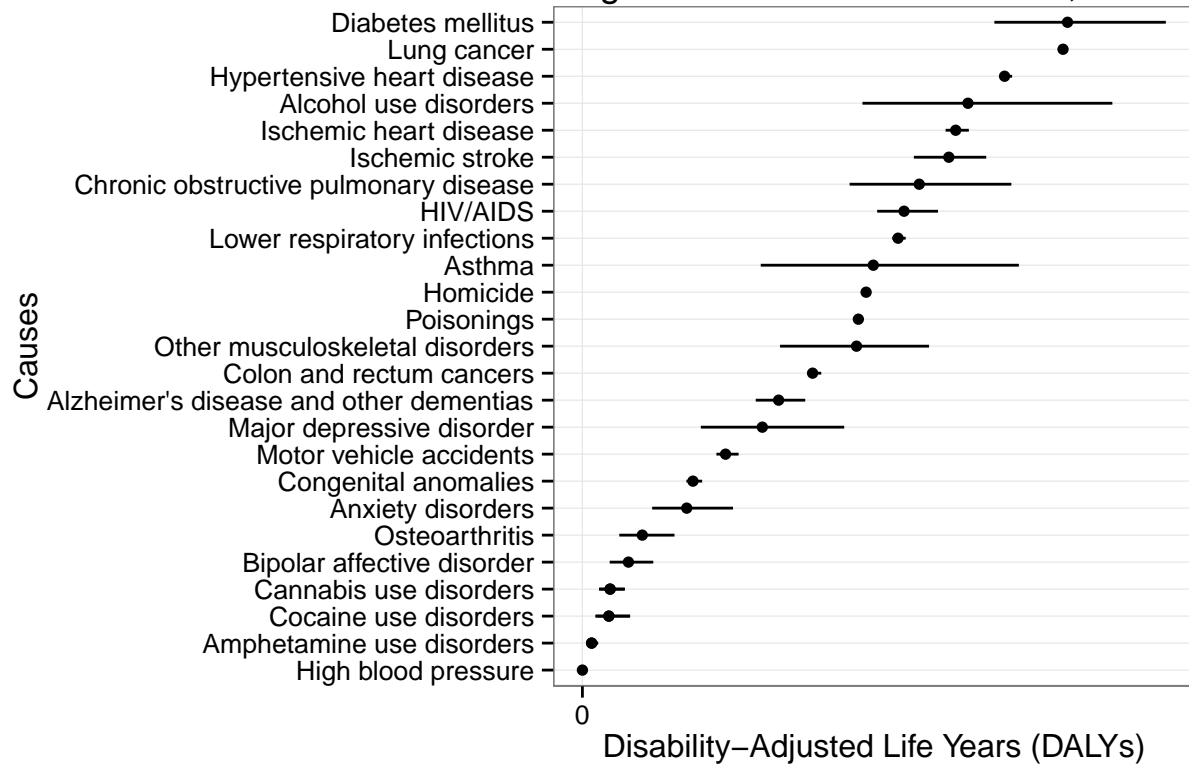
## 2013 NYC DALY Estimates, Male

##		cause_name	sex	yll	yld
## 1		Diabetes mellitus	Male	44350.2597	34179.2699
## 2		Lung cancer	Male	76727.5088	1073.4292
## 3		Hypertensive heart disease	Male	66787.3957	1551.5667
## 4		Alcohol use disorders	Male	18467.5988	43944.2346
## 5		Ischemic heart disease	Male	55740.9066	4685.5329
## 6		Ischemic stroke	Male	34381.1722	24933.7621
## 7		Chronic obstructive pulmonary disease	Male	29087.5511	25436.1167
## 8		HIV/AIDS	Male	42537.5495	9527.5167
## 9		Lower respiratory infections	Male	48779.8376	2313.7384
## 10		Asthma	Male	7320.0714	39768.0782
## 11		Homicide	Male	45926.7164	NA
## 12		Poisonings	Male	44405.4957	264.4099
## 13		Other musculoskeletal disorders	Male	4854.9161	39516.5937
## 14		Colon and rectum cancers	Male	35103.8723	2158.4156
## 15		Alzheimer's disease and other dementias	Male	19116.5536	12644.7087
## 16		Major depressive disorder	Male	0.0000	29121.7638
## 17		Motor vehicle accidents	Male	19023.4258	4148.8107
## 18		Congenital anomalies	Male	15210.3239	2684.3674
## 19		Anxiety disorders	Male	0.0000	16888.1881
## 20		Osteoarthritis	Male	307.6397	9383.8038
## 21		Bipolar affective disorder	Male	0.0000	7448.7748
## 22		Cannabis use disorders	Male	0.0000	4486.3505
## 23		Cannabis use disorders	Male	0.0000	4486.3505
## 24		Cocaine use disorders	Male	0.0000	4278.1546
## 25		Cocaine use disorders	Male	0.0000	4278.1546
## 26		Amphetamine use disorders	Male	0.0000	1493.7404
## 27		Amphetamine use disorders	Male	0.0000	1493.7404
## 28		High blood pressure	Male	0.0000	0.0000
##	yld_upper	yld_lower	daly	daly_upper	daly_lower
## 1	50092.6831	22339.66951	78529.530	94442.943	66689.9292
## 2	1835.5390	552.42866	77800.938	78563.048	77279.9374
## 3	2772.9602	726.84613	68338.962	69560.356	67514.2418
## 4	67319.8291	26869.84596	62411.833	85787.428	45337.4447
## 5	6813.3881	3052.60257	60426.439	62554.295	58793.5092
## 6	30985.2622	19269.71803	59314.934	65366.434	53650.8903
## 7	40347.4100	14170.01592	54523.668	69434.961	43257.5671
## 8	15020.5207	5179.74703	52065.066	57558.070	47717.2966
## 9	3550.9975	1397.14831	51093.576	52330.835	50176.9859
## 10	63336.0811	21549.29019	47088.150	70656.153	28869.3616
## 11	NA	NA	45926.716	NA	NA
## 12	670.9745	43.52524	44669.906	45076.470	44449.0209
## 13	51263.2757	27139.66096	44371.510	56118.192	31994.5771
## 14	3558.7848	1248.81817	37262.288	38662.657	36352.6905
## 15	16956.4678	8941.37768	31761.262	36073.021	28057.9313
## 16	42380.4459	19171.86261	29121.764	42380.446	19171.8626
## 17	6260.4445	2667.35247	23172.236	25283.870	21690.7782
## 18	4172.2215	1627.16383	17894.691	19382.545	16837.4878
## 19	24380.0577	11291.23403	16888.188	24380.058	11291.2340
## 20	14596.6142	5660.76344	9691.444	14904.254	5968.4032
## 21	11473.0601	4413.85914	7448.775	11473.060	4413.8591
## 22	6858.2744	2705.22634	4486.351	6858.274	2705.2263

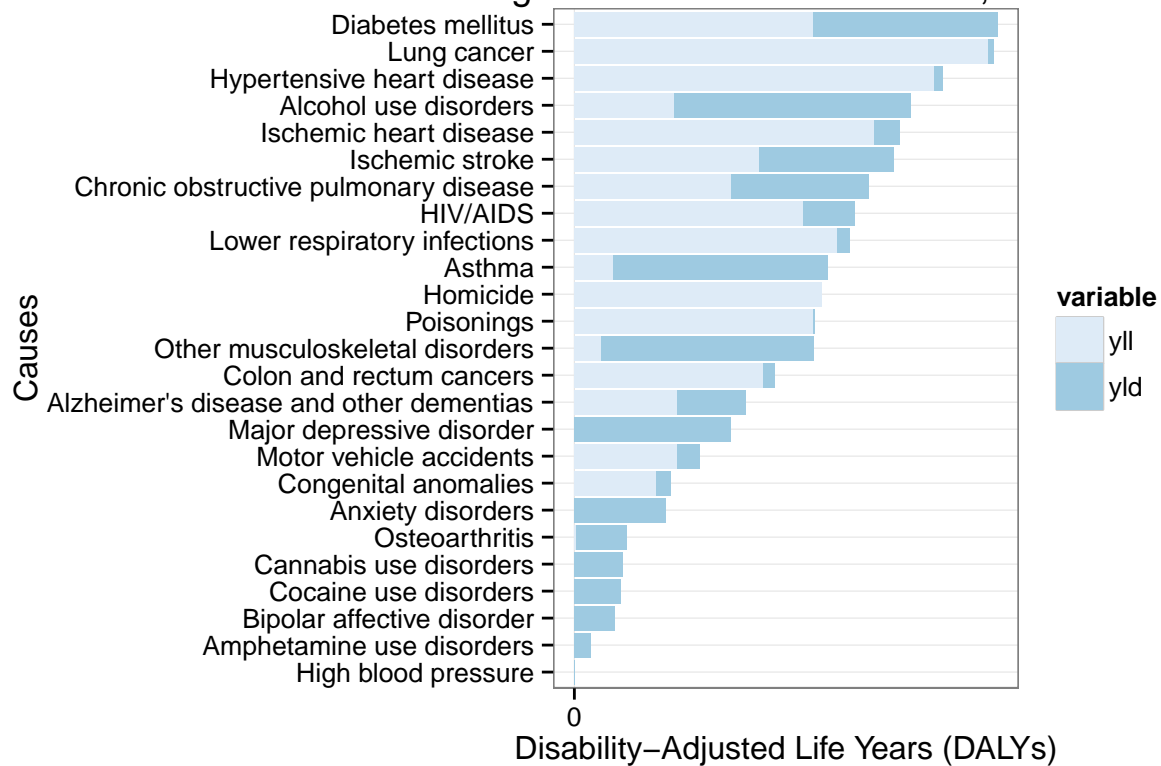
## 23	6858.2744	2705.22634	4486.351	6858.274	2705.2263
## 24	7712.7210	2125.95597	4278.155	7712.721	2125.9560
## 25	7712.7210	2125.95597	4278.155	7712.721	2125.9560
## 26	2547.8702	744.48335	1493.740	2547.870	744.4833
## 27	2547.8702	744.48335	1493.740	2547.870	744.4833
## 28	0.0000	0.00000	0.000	0.000	0.0000



## Leading Causes of DALYs in Males, NYC 201



## Leading Causes of DALYs in Males, NYC 2013



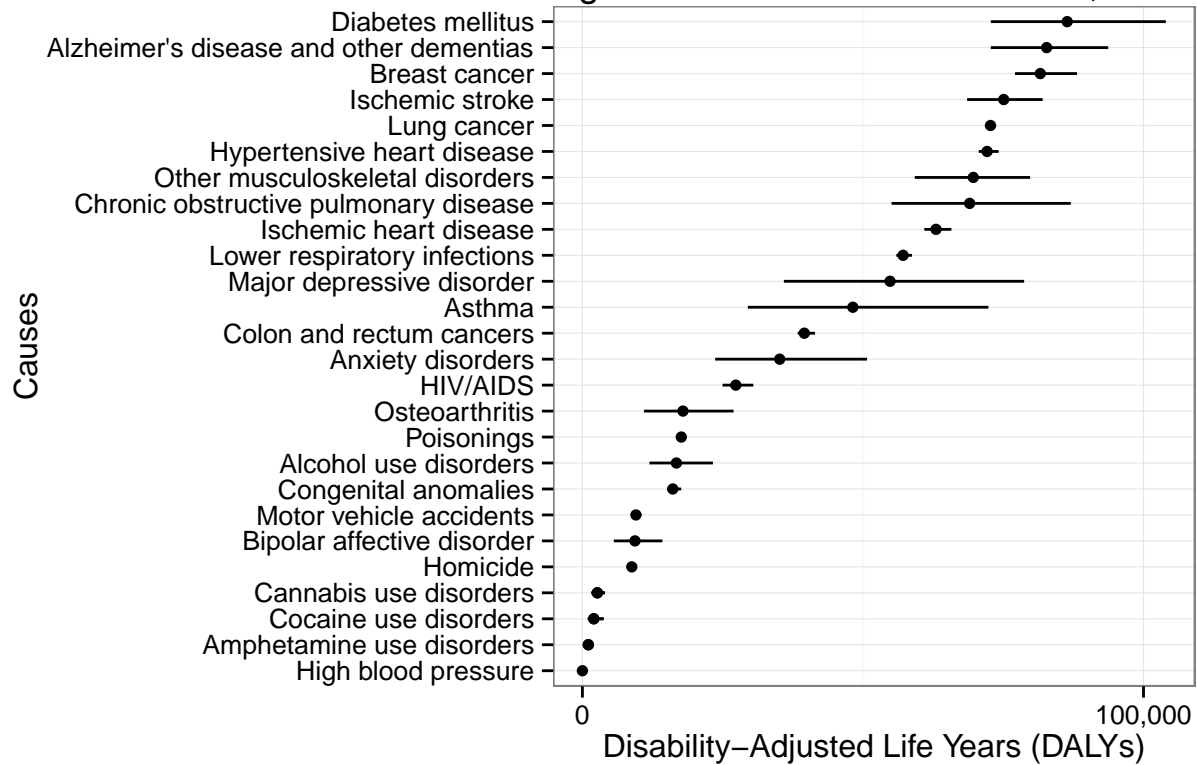
- Alcohol use disorders rises to the #4 slot
- Homicide and accidental deaths such as poisonings and motor vehicle accidents rise in rankings

## 2013 NYC DALY Estimates, Female

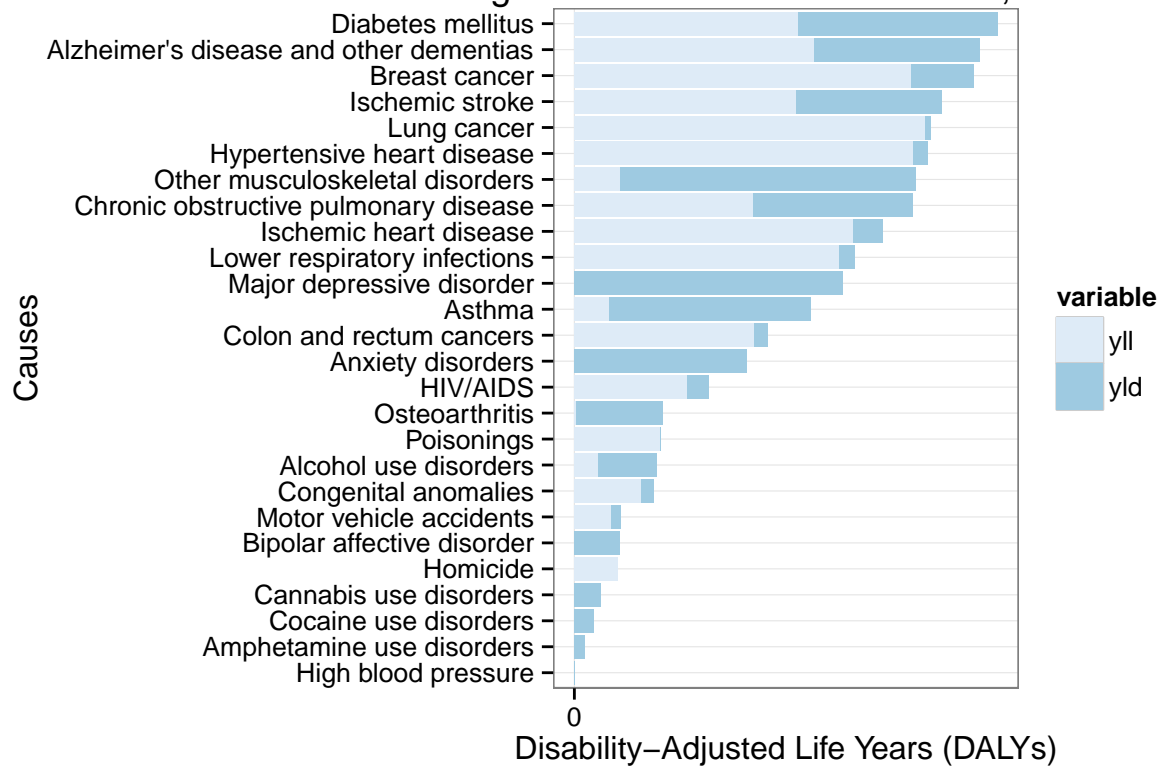
##		cause_name	sex	y11	yld
## 1		Diabetes mellitus	Female	45571.5997	40825.23391
## 2	Alzheimer's disease and other dementias		Female	48947.6106	33785.89475
## 3		Breast cancer	Female	68867.0554	12738.79793
## 4		Ischemic stroke	Female	45405.9854	29685.22751
## 5		Lung cancer	Female	71564.1269	1169.53195
## 6		Hypertensive heart disease	Female	69216.1387	2904.19435
## 7	Other musculoskeletal disorders		Female	9329.0754	60339.85786
## 8	Chronic obstructive pulmonary disease		Female	36529.1052	32488.23499
## 9		Ischemic heart disease	Female	56958.4560	6060.01617
## 10	Lower respiratory infections		Female	53989.4085	3160.54100
## 11	Major depressive disorder		Female	0.0000	54831.68020
## 12		Asthma	Female	6997.3548	41199.75113
## 13	Colon and rectum cancers		Female	36779.5345	2768.38346
## 14		Anxiety disorders	Female	0.0000	35162.99685
## 15		HIV/AIDS	Female	23046.6859	4293.50298
## 16		Osteoarthritis	Female	335.5308	17584.57596
## 17		Poisonings	Female	17545.9474	80.98334
## 18		Alcohol use disorders	Female	4899.8441	11853.64796
## 19		Congenital anomalies	Female	13549.7404	2562.67983
## 20	Motor vehicle accidents		Female	7564.3877	1972.10646
## 21	Bipolar affective disorder		Female	0.0000	9371.47498
## 22		Homicide	Female	8800.4627	NA
## 23		Cannabis use disorders	Female	0.0000	2665.14650
## 24		Cannabis use disorders	Female	0.0000	2665.14650
## 25		Cocaine use disorders	Female	0.0000	2027.48004
## 26		Cocaine use disorders	Female	0.0000	2027.48004
## 27		Amphetamine use disorders	Female	0.0000	1052.18778
## 28		Amphetamine use disorders	Female	0.0000	1052.18778
## 29		High blood pressure	Female	0.0000	0.00000
##	yld_upper	yld_lower	daly	daly_upper	daly_lower
## 1	58405.5971	27218.019398	86396.834	103977.197	72789.6191
## 2	44756.9110	23835.232988	82733.505	93704.522	72782.8436
## 3	19278.9232	8233.448706	81605.853	88145.979	77100.5041
## 4	36617.6754	23157.764263	75091.213	82023.661	68563.7496
## 5	2118.4816	502.029026	72733.659	73682.608	72066.1559
## 6	4970.8132	1420.023201	72120.333	74186.952	70636.1619
## 7	70460.4202	49901.402016	69668.933	79789.496	59230.4774
## 8	50513.2517	18570.170568	69017.340	87042.357	55099.2758
## 9	8802.7843	3980.275681	63018.472	65761.240	60938.7317
## 10	4752.9500	1957.482259	57149.949	58742.358	55946.8907
## 11	78719.1199	35904.137465	54831.680	78719.120	35904.1375
## 12	65355.6246	22484.566452	48197.106	72352.979	29481.9213
## 13	4666.7635	1586.510706	39547.918	41446.298	38366.0452
## 14	50724.5194	23659.814445	35162.997	50724.519	23659.8144
## 15	7413.6195	1930.630841	27340.189	30460.305	24977.3167
## 16	26604.5852	10655.116785	17920.107	26940.116	10990.6476
## 17	241.0352	5.402819	17626.931	17786.983	17551.3502
## 18	18362.8776	7045.605530	16753.492	23262.722	11945.4497
## 19	4069.5302	1525.962762	16112.420	17619.271	15075.7031
## 20	2969.1424	1247.026528	9536.494	10533.530	8811.4142
## 21	14254.0978	5597.765905	9371.475	14254.098	5597.7659

## 22	NA	NA	8800.463	NA	NA
## 23	4031.9495	1615.898924	2665.147	4031.950	1615.8989
## 24	4031.9495	1615.898924	2665.147	4031.950	1615.8989
## 25	3788.7970	960.159246	2027.480	3788.797	960.1592
## 26	3788.7970	960.159246	2027.480	3788.797	960.1592
## 27	1870.3378	507.700071	1052.188	1870.338	507.7001
## 28	1870.3378	507.700071	1052.188	1870.338	507.7001
## 29	0.0000	0.000000	0.000	0.000	0.0000

### Leading Causes of DALYs in Females, NYC 20



### Leading Causes of DALYs in Females, NYC 2013



- Breast cancer makes the top 3
- Alzheimer's disease and other dementias ranks very high
- Drug-related disorders get pushed to the bottom

## Prevalence-Based YLD Approach

Raw results for this approach can be found under the `results` directory under the filename `nyc_daly_prevalence.csv`. The file can be opened in Excel and manipulated with a pivot table for aggregation and stratification purposes.

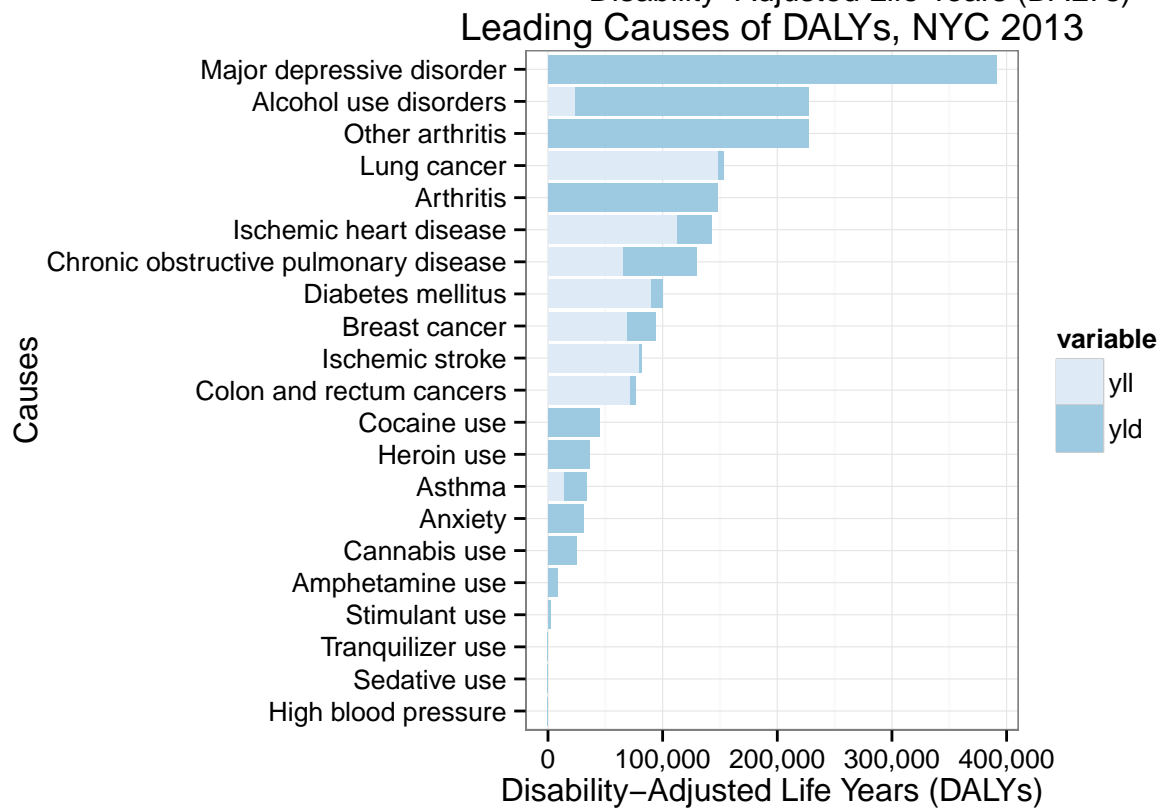
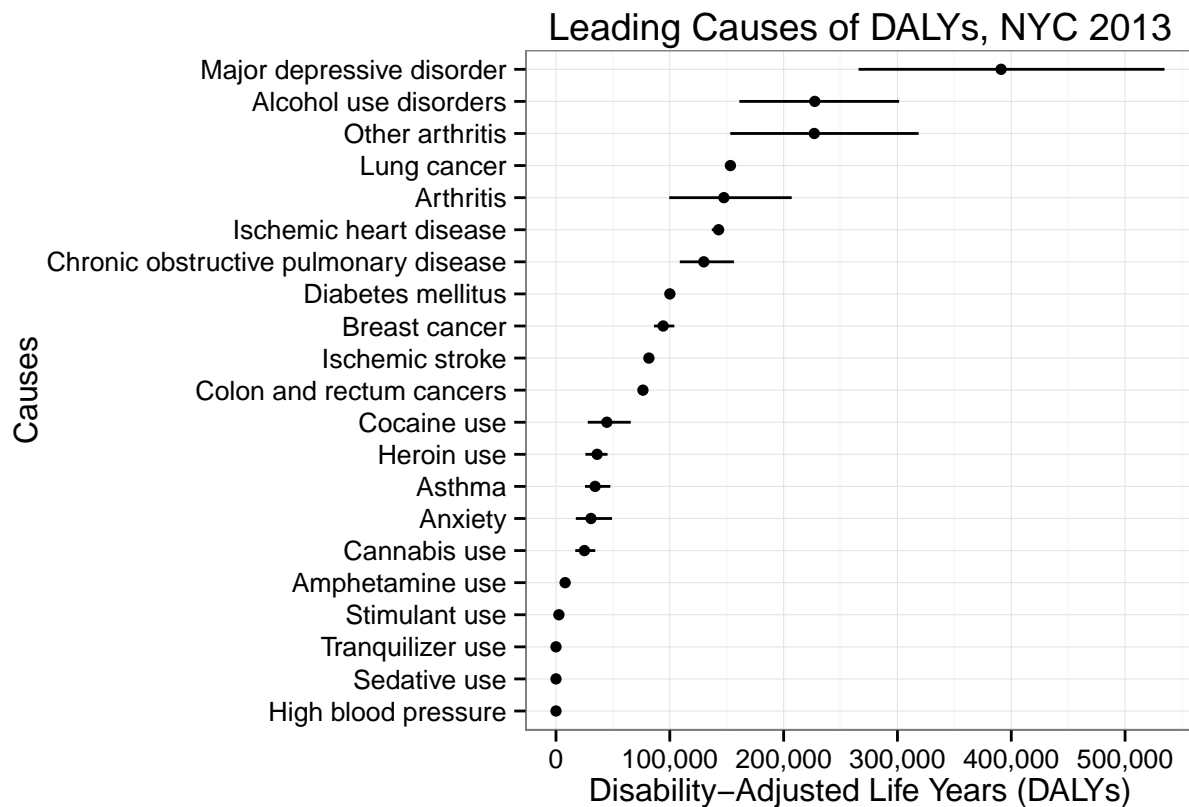
### 2013 NYC DALY Estimates, Total

##		cause_name	y11	yld	yld_upper
## 1		Major depressive disorder	NA	391052.610	534646.723
## 2		Alcohol use disorders	23367.44	203982.931	278110.749
## 3		Other arthritis	NA	226917.872	318617.560
## 4		Lung cancer	148321.18	4937.436	6902.334
## 5		Arthritis	NA	147503.216	207110.680
## 6		Ischemic heart disease	112699.36	30185.820	34498.080
## 7	Chronic obstructive pulmonary disease		65616.66	64252.608	90689.879
## 8		Diabetes mellitus	89921.86	10119.135	12142.962
## 9		Breast cancer	69366.71	24768.618	34625.517
## 10		Ischemic stroke	79787.16	1819.986	3206.642
## 11		Colon and rectum cancers	71913.23	4471.446	6250.899
## 12		Cocaine use	NA	44665.457	65691.483
## 13		Heroin use	NA	36138.504	45271.793
## 14		Asthma	14317.43	20058.084	33430.140
## 15		Anxiety	NA	30752.130	49203.408
## 16		Cannabis use	NA	24990.840	34561.800
## 17		Amphetamine use	NA	8049.876	11972.195
## 18		Stimulant use	NA	2548.660	3790.500
## 19		High blood pressure	NA	0.000	0.000
## 20		Sedative use	NA	0.000	0.000
## 21		Tranquilizer use	NA	0.000	0.000
##	yld_lower	daly	daly_upper	daly_lower	
## 1	265843.756	391052.610	534646.72	265843.756	
## 2	137741.051	227350.374	301478.19	161108.494	
## 3	153091.852	226917.872	318617.56	153091.852	
## 4	3342.006	153258.618	155223.52	151663.188	
## 5	99514.156	147503.216	207110.68	99514.156	
## 6	24196.570	142885.183	147197.44	136895.933	
## 7	43169.721	129869.264	156306.54	108786.377	
## 8	8095.308	100040.994	102064.82	98017.167	
## 9	16765.153	94135.331	103992.23	86131.866	
## 10	953.326	81607.144	82993.80	80740.484	
## 11	3026.591	76384.673	78164.13	74939.818	
## 12	27915.910	44665.457	65691.48	27915.910	
## 13	25877.650	36138.504	45271.79	25877.650	
## 14	11143.380	34375.510	47747.57	25460.806	
## 15	17426.207	30752.130	49203.41	17426.207	
## 16	16939.080	24990.840	34561.80	16939.080	
## 17	4902.899	8049.876	11972.19	4902.899	
## 18	1552.300	2548.660	3790.50	1552.300	
## 19	0.000	0.000	0.00	0.000	
## 20	0.000	0.000	0.00	0.000	
## 21	0.000	0.000	0.00	0.000	

- Major depressive disorder ranks number one, beating out the number two slot by almost twice the

number of DALYs However, DALY estimates appear to be unstable, taking a wide range of possible values.

- Not enough information to calculate DALY estimates for **sedative use, stimulant use, tranquilizer use**.

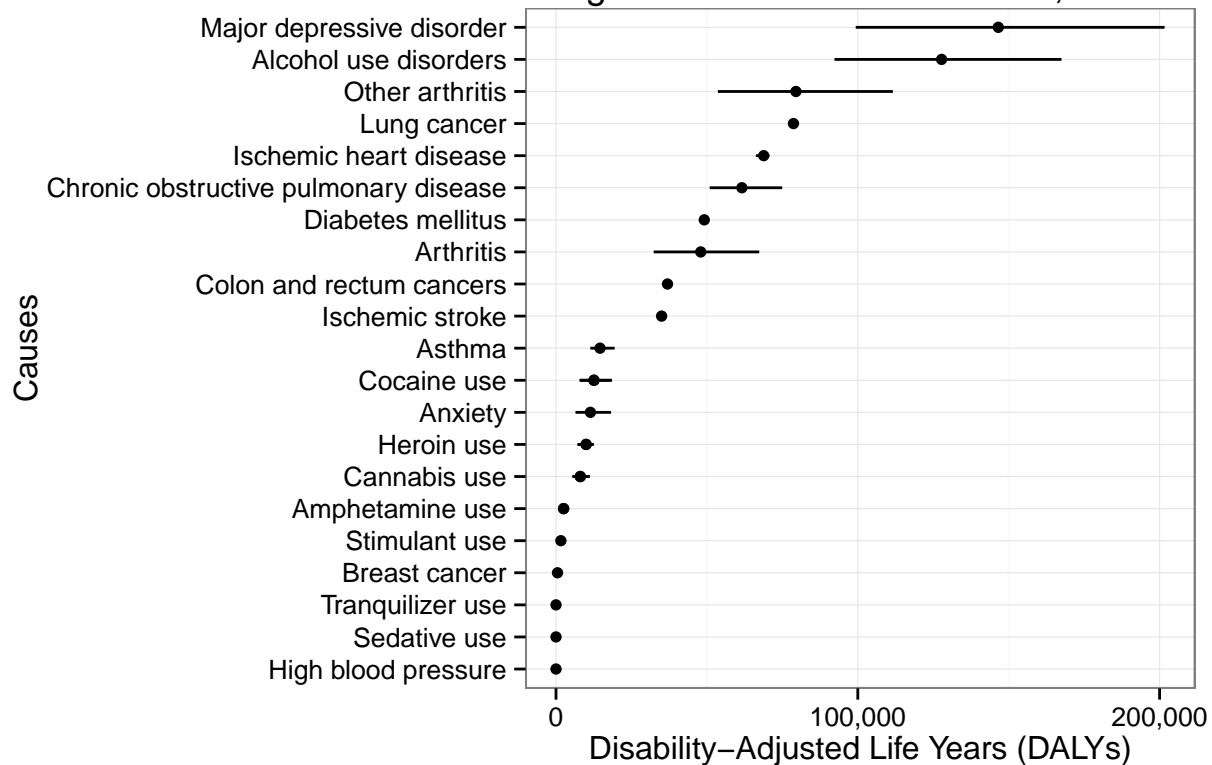


# 2013 NYC DALY Estimates, Male

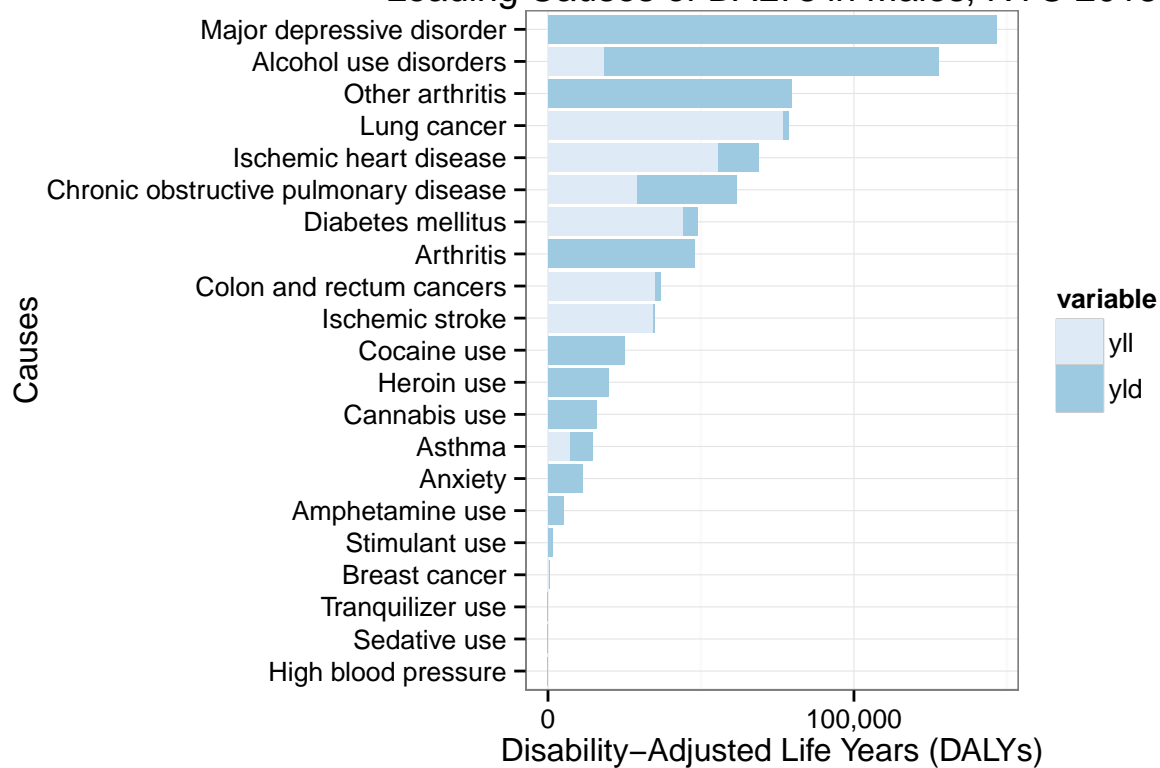
##		cause_name	sex	yll	yld
## 1		Major depressive disorder	Male	NA	146547.662
## 2		Alcohol use disorders	Male	18467.5988	109295.729
## 3		Other arthritis	Male	NA	79497.292
## 4		Lung cancer	Male	76757.0552	1925.994
## 5		Ischemic heart disease	Male	55740.9066	13079.052
## 6	Chronic obstructive pulmonary disease		Male	29087.5511	32495.040
## 7		Diabetes mellitus	Male	44350.2597	4769.880
## 8		Arthritis	Male	NA	47958.372
## 9		Colon and rectum cancers	Male	35103.8723	1835.148
## 10		Ischemic stroke	Male	34381.1722	607.635
## 11		Asthma	Male	7320.0714	7268.832
## 12		Cocaine use	Male	NA	12568.070
## 13		Cocaine use	Male	NA	12568.070
## 14		Anxiety	Male	NA	11398.980
## 15		Heroin use	Male	NA	9979.689
## 16		Heroin use	Male	NA	9979.689
## 17		Cannabis use	Male	NA	8053.920
## 18		Cannabis use	Male	NA	8053.920
## 19		Amphetamine use	Male	NA	2514.454
## 20		Amphetamine use	Male	NA	2514.454
## 21		Stimulant use	Male	NA	1609.680
## 22		Breast cancer	Male	499.6573	0.000
## 23		High blood pressure	Male	NA	0.000
## 24		Sedative use	Male	NA	0.000
## 25		Tranquilizer use	Male	NA	0.000
##	yld_upper	yld_lower	daly	daly_upper	daly_lower
## 1	201639.650	99306.914	146547.6620	201639.6500	99306.9140
## 2	149014.023	73802.786	127763.3281	167481.6215	92270.3850
## 3	111622.910	53633.447	79497.2920	111622.9100	53633.4470
## 4	2692.461	1303.649	78683.0492	79449.5162	78060.7042
## 5	14947.488	10484.002	68819.9586	70688.3946	66224.9086
## 6	45865.395	21832.605	61582.5911	74952.9461	50920.1561
## 7	5723.856	3815.904	49120.1397	50074.1157	48166.1637
## 8	67338.810	32355.477	47958.3720	67338.8100	32355.4770
## 9	2565.462	1242.158	36939.0203	37669.3343	36346.0303
## 10	1070.595	318.285	34988.8072	35451.7672	34699.4572
## 11	12114.720	4038.240	14588.9034	19434.7914	11358.3114
## 12	18484.422	7855.044	12568.0700	18484.4221	7855.0437
## 13	18484.422	7855.044	12568.0700	18484.4221	7855.0437
## 14	18238.368	6459.422	11398.9800	18238.3680	6459.4220
## 15	12501.857	7146.143	9979.6893	12501.8572	7146.1425
## 16	12501.857	7146.143	9979.6893	12501.8572	7146.1425
## 17	11138.400	5459.040	8053.9200	11138.4000	5459.0400
## 18	11138.400	5459.040	8053.9200	11138.4000	5459.0400
## 19	3739.628	1531.466	2514.4543	3739.6275	1531.4665
## 20	3739.628	1531.466	2514.4543	3739.6275	1531.4665
## 21	2394.000	980.400	1609.6800	2394.0000	980.4000
## 22	0.000	0.000	499.6573	499.6573	499.6573
## 23	0.000	0.000	0.0000	0.0000	0.0000
## 24	0.000	0.000	0.0000	0.0000	0.0000
## 25	0.000	0.000	0.0000	0.0000	0.0000



### Leading Causes of DALYs in Males, NYC 2013



### Leading Causes of DALYs in Males, NYC 2013

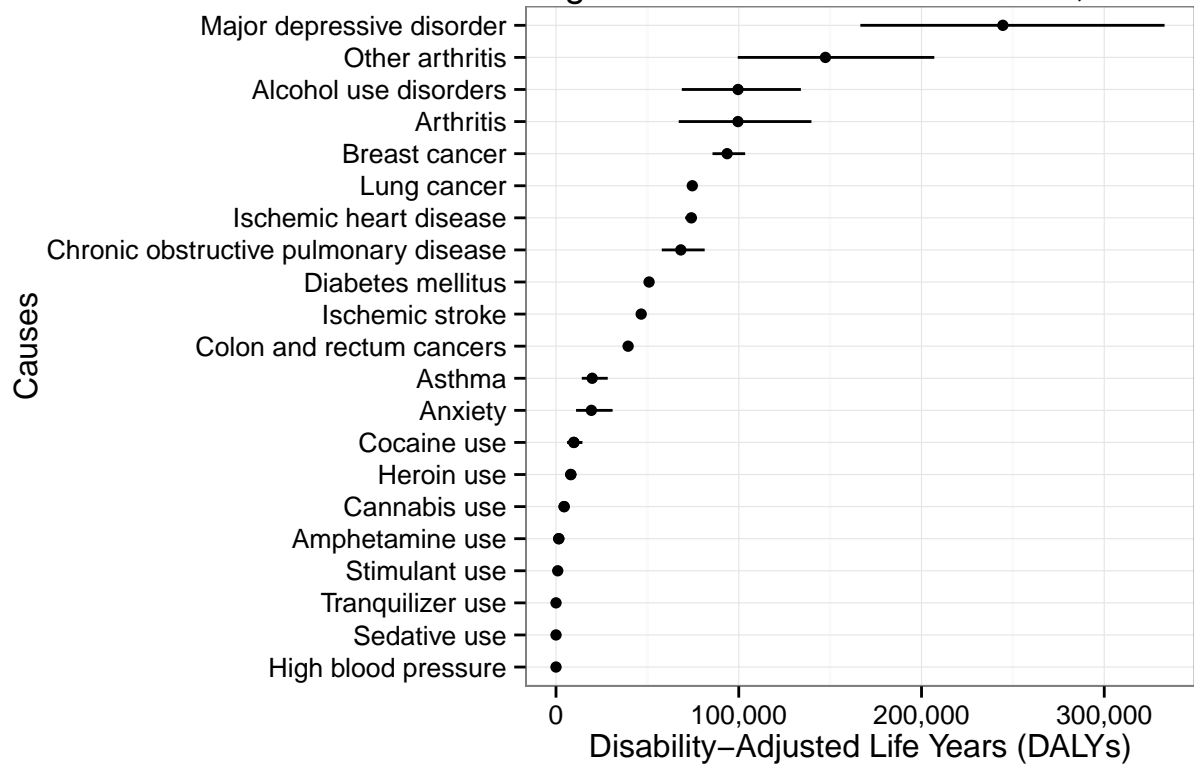


- Alcohol use disorders rises in proportion to major depressive disorder

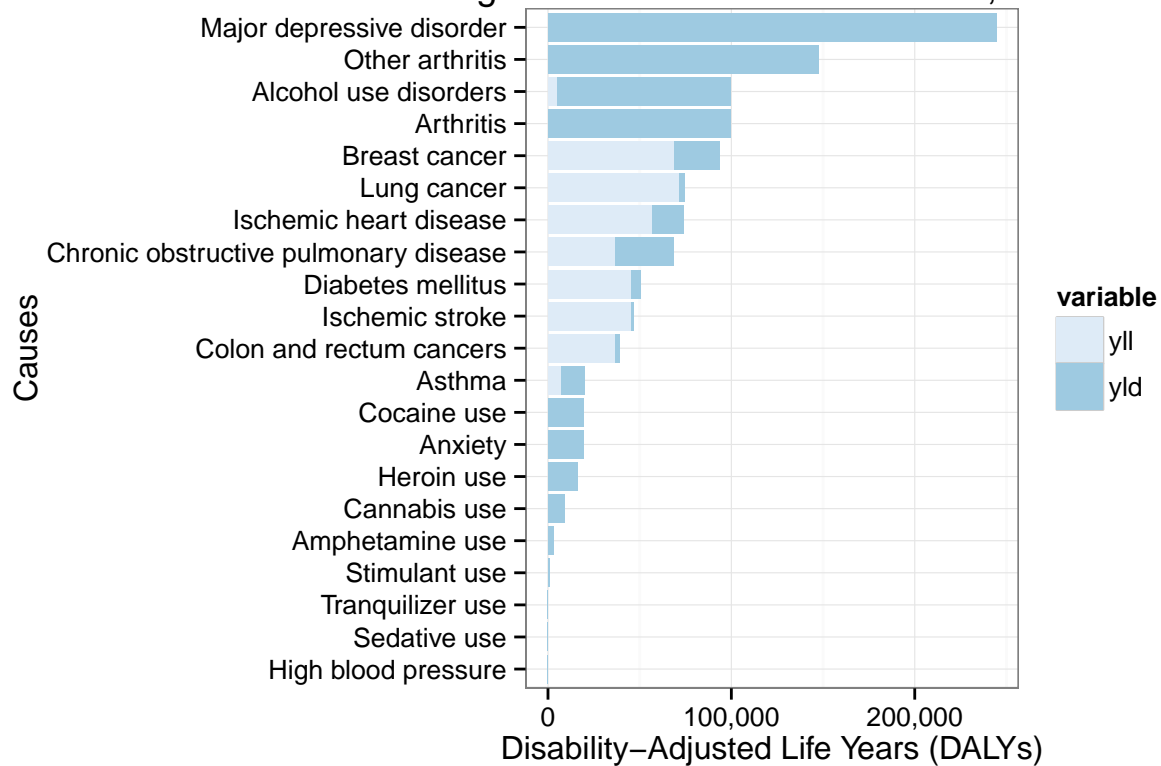
# 2013 NYC DALY Estimates, Female

##		cause_name	sex	y11	yld
## 1		Major depressive disorder	Female	NA	244504.948
## 2		Other arthritis	Female	NA	147420.580
## 3		Alcohol use disorders	Female	4899.844	94687.202
## 4		Arthritis	Female	NA	99544.844
## 5		Breast cancer	Female	68867.055	24768.618
## 6		Lung cancer	Female	71564.127	3011.442
## 7		Ischemic heart disease	Female	56958.456	17106.768
## 8	Chronic obstructive pulmonary disease	Female	36529.105	31757.568	
## 9		Diabetes mellitus	Female	45571.600	5349.255
## 10		Ischemic stroke	Female	45405.985	1212.351
## 11		Colon and rectum cancers	Female	36809.355	2636.298
## 12		Asthma	Female	6997.355	12789.252
## 13		Anxiety	Female	NA	19353.150
## 14		Cocaine use	Female	NA	9764.658
## 15		Cocaine use	Female	NA	9764.658
## 16		Heroin use	Female	NA	8089.563
## 17		Heroin use	Female	NA	8089.563
## 18		Cannabis use	Female	NA	4441.500
## 19		Cannabis use	Female	NA	4441.500
## 20		Amphetamine use	Female	NA	1510.483
## 21		Amphetamine use	Female	NA	1510.483
## 22		Stimulant use	Female	NA	938.980
## 23		High blood pressure	Female	NA	0.000
## 24		Sedative use	Female	NA	0.000
## 25		Tranquilizer use	Female	NA	0.000
##	yld_upper	yld_lower	daly	daly_upper	daly_lower
## 1	333007.073	166536.8420	244504.948	333007.07	166536.8420
## 2	206994.650	99458.4050	147420.580	206994.65	99458.4050
## 3	129096.726	63938.2652	99587.046	133996.57	68838.1093
## 4	139771.870	67158.6790	99544.844	139771.87	67158.6790
## 5	34625.517	16765.1530	93635.673	103492.57	85632.2084
## 6	4209.873	2038.3570	74575.569	75774.00	73602.4839
## 7	19550.592	13712.5680	74065.224	76509.05	70671.0240
## 8	44824.484	21337.1160	68286.673	81353.59	57866.2212
## 9	6419.106	4279.4040	50920.855	51990.71	49851.0037
## 10	2136.047	635.0410	46618.336	47542.03	46041.0264
## 11	3685.437	1784.4330	39445.653	40494.79	38593.7875
## 12	21315.420	7105.1400	19786.607	28312.77	14102.4948
## 13	30965.040	10966.7850	19353.150	30965.04	10966.7850
## 14	14361.319	6102.9115	9764.658	14361.32	6102.9115
## 15	14361.319	6102.9115	9764.658	14361.32	6102.9115
## 16	10134.039	5792.6824	8089.563	10134.04	5792.6824
## 17	10134.039	5792.6824	8089.563	10134.04	5792.6824
## 18	6142.500	3010.5000	4441.500	6142.50	3010.5000
## 19	6142.500	3010.5000	4441.500	6142.50	3010.5000
## 20	2246.470	919.9828	1510.483	2246.47	919.9828
## 21	2246.470	919.9828	1510.483	2246.47	919.9828
## 22	1396.500	571.9000	938.980	1396.50	571.9000
## 23	0.000	0.0000	0.000	0.00	0.0000
## 24	0.000	0.0000	0.000	0.00	0.0000
## 25	0.000	0.0000	0.000	0.00	0.0000

### Leading Causes of DALYs in Females, NYC 2013

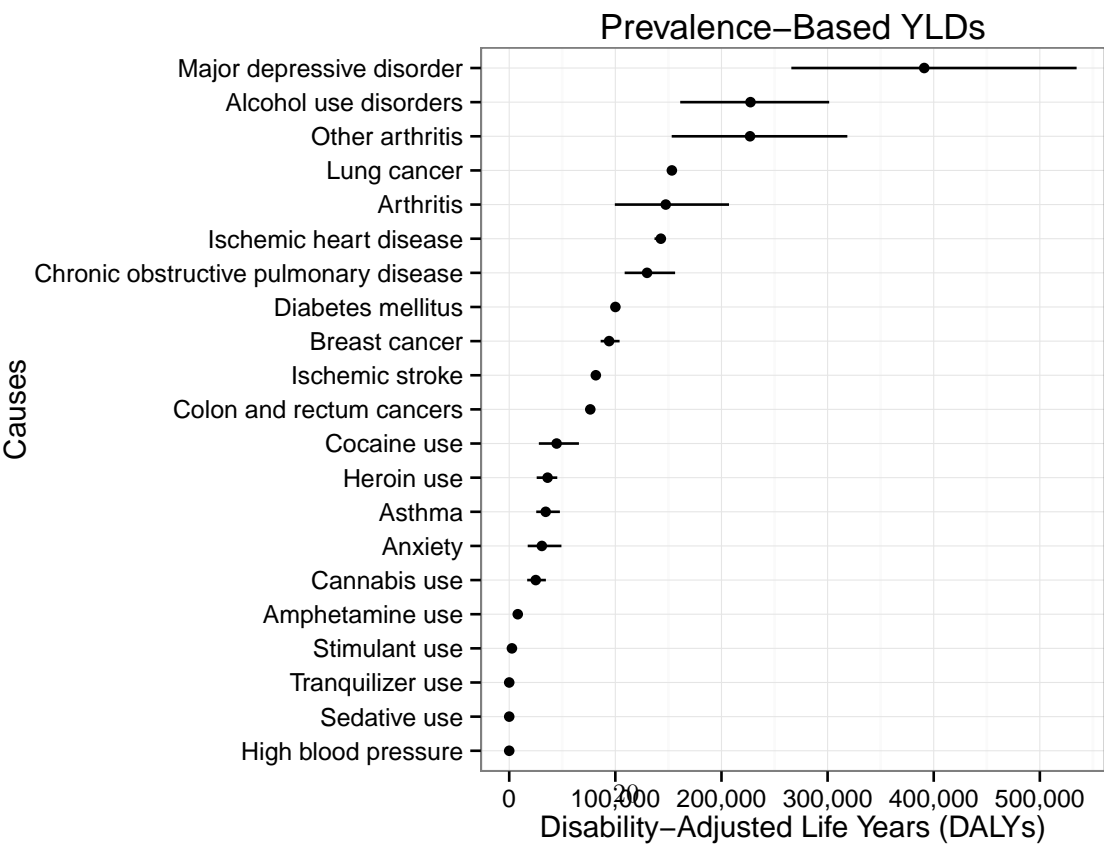
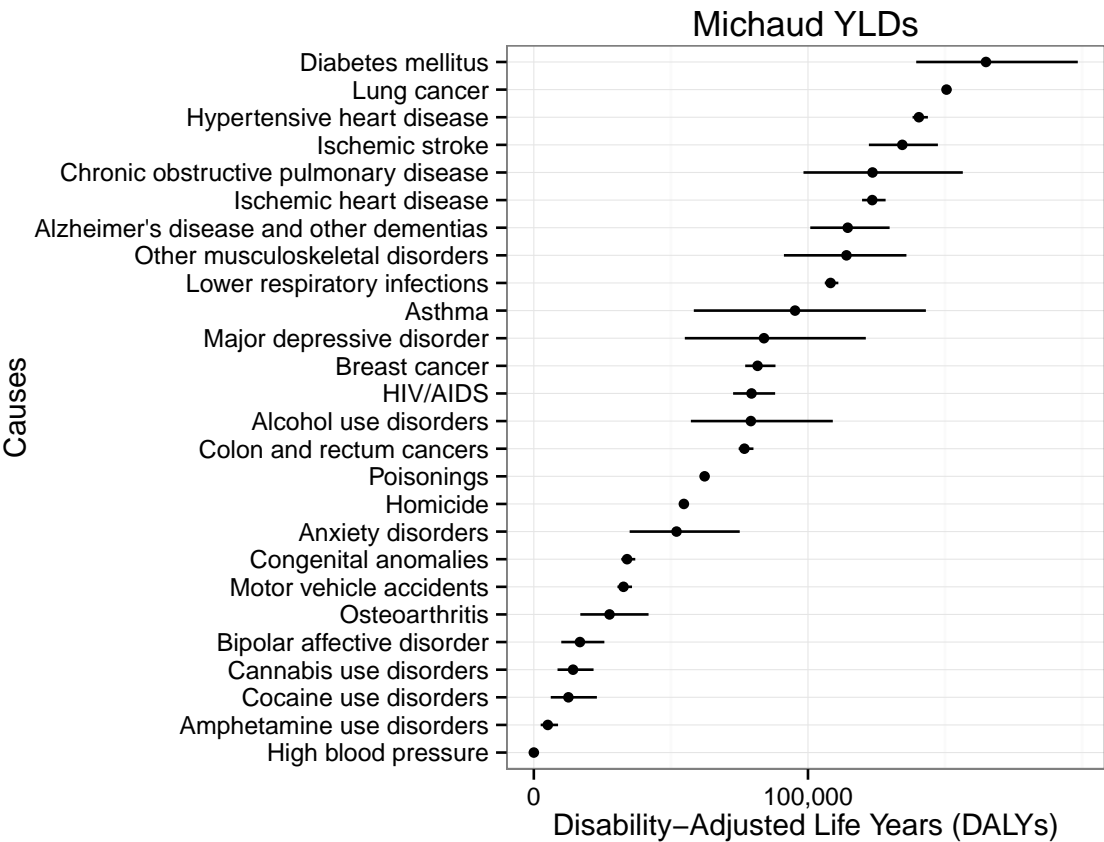


### Leading Causes of DALYs in Females, NYC 2013

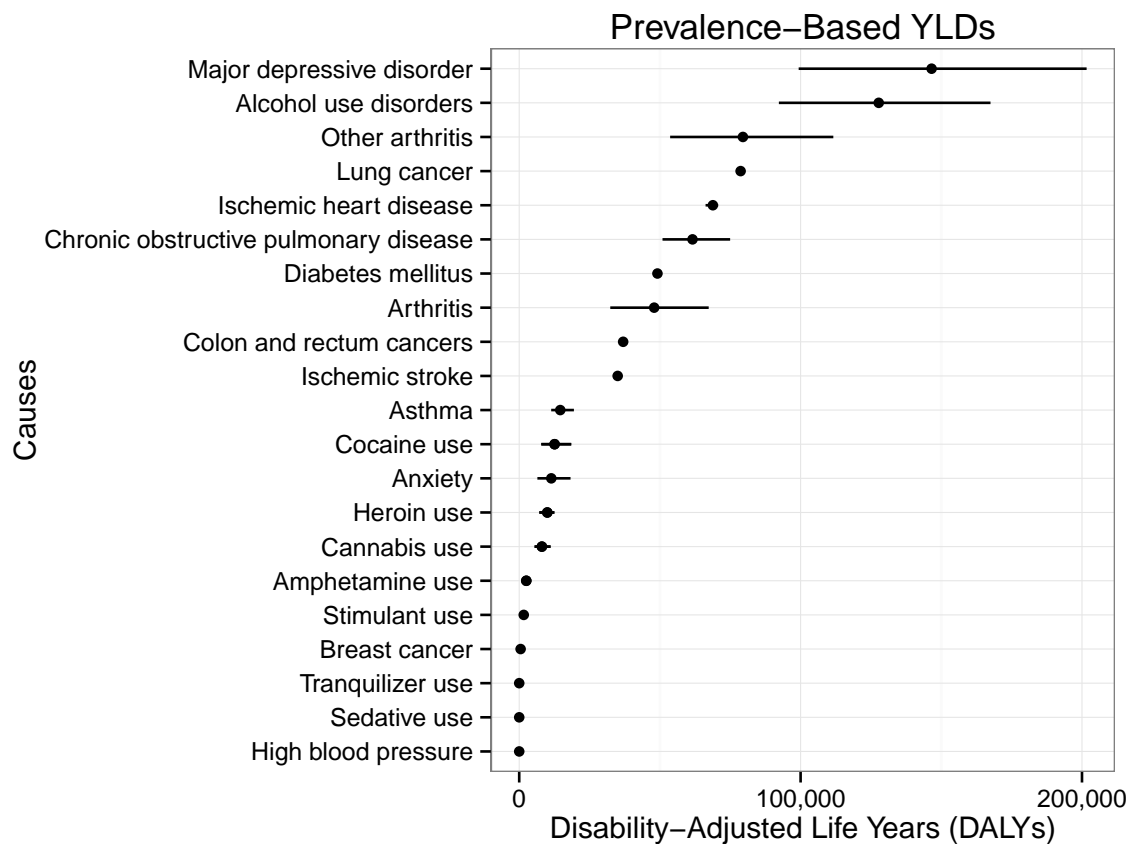
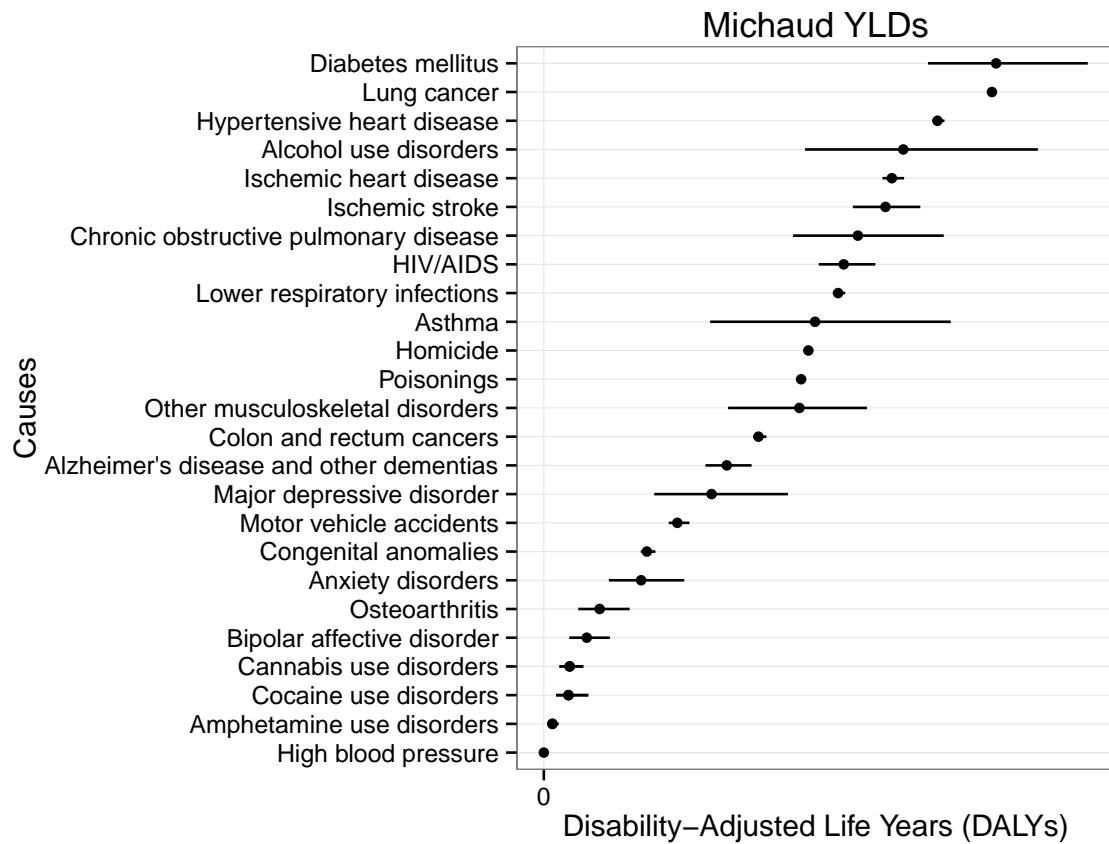


Michaud YLDs vs. Prevalence-Based YLDs: Side-by-Side Comparison

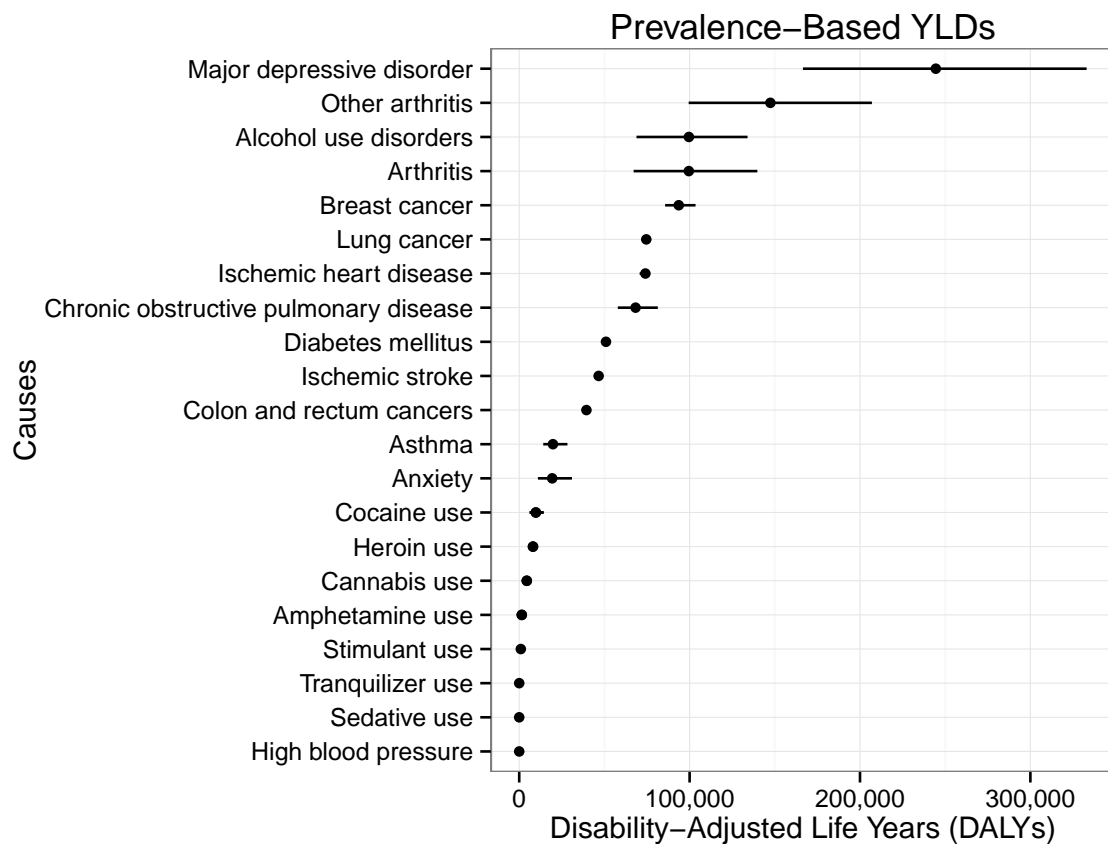
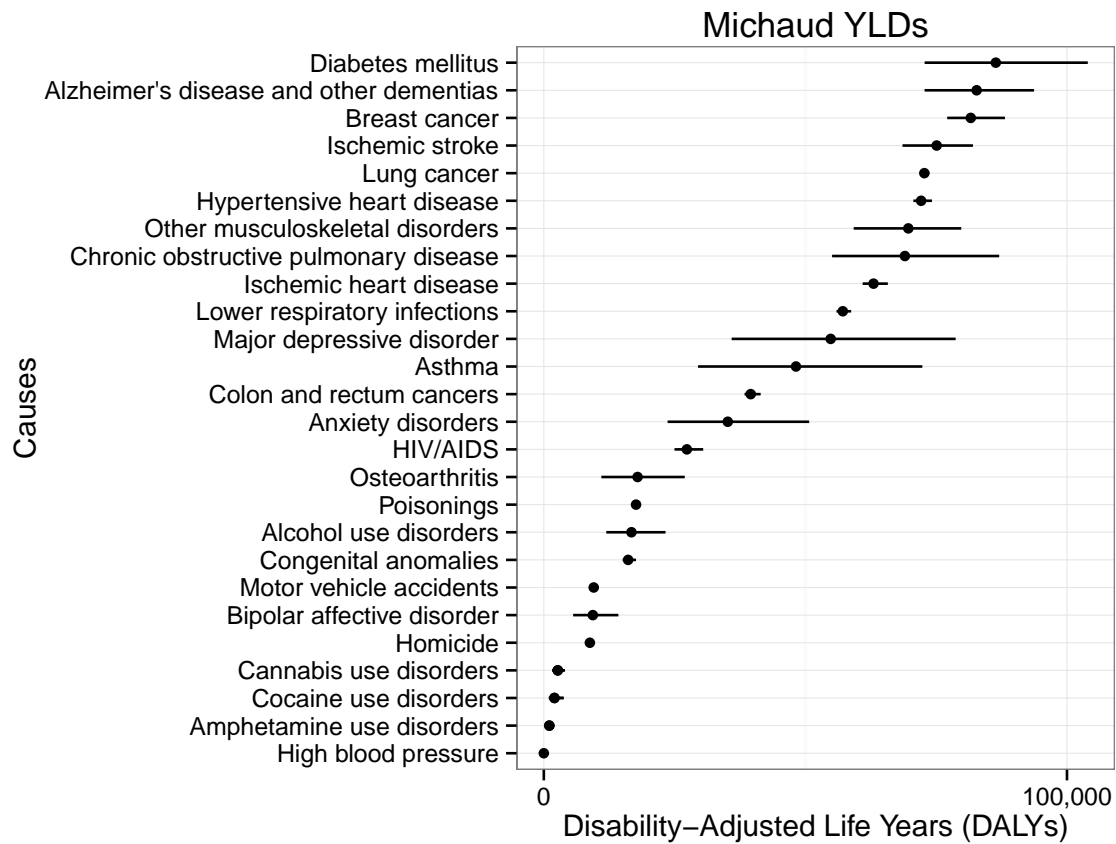
Total



Male



Female



## Disease Conditions with Small Sample Sizes

##	cause_name	sequae	sex	age
## 67	Ischemic heart disease	Ischemic heart disease	Male	20-39
## 70	Ischemic heart disease	Ischemic heart disease	Female	20-39
## 101	Major depressive disorder	moderate depression	Male	60+
## 105	Major depressive disorder	moderately severe depression	Male	20-39
## 106	Major depressive disorder	moderately severe depression	Male	40-59
## 107	Major depressive disorder	moderately severe depression	Male	60+
## 125	Major depressive disorder	severe depression	Male	20-39
## 126	Major depressive disorder	severe depression	Male	40-59
## 127	Major depressive disorder	severe depression	Male	60+
## 128	Major depressive disorder	severe depression	Female	20-39
## 130	Major depressive disorder	severe depression	Female	60+
## 139	Ischemic stroke	Ischemic stroke	Male	20-39
## 140	Ischemic stroke	Ischemic stroke	Male	40-59
## 141	Ischemic stroke	Ischemic stroke	Male	60+
## 142	Ischemic stroke	Ischemic stroke	Female	20-39

## Discussion

The magnitude of the DALY scores should be interpreted and reported with caution. Due to the instability of NYC prevalence estimates and the standard errors of disability weights and national YLL/YLD rates, DALY estimates for each condition can assume a wide range of values, changing how one disease ranks against the others. For this reason, DALY magnitudes obtained via Michaud approach and the Prevalence-based YLDs cannot be directly compared.

Furthermore, summation of prevalence YLDs across all causes can result in overestimation of the total average severity-weighted health state prevalence because of comorbidity between conditions ([Mathers, 2006](#)).

Over-reporting of some conditions due to misclassification (e.g. where symptoms such as joint pain are labeled as osteoarthritis or occasional wheezing as asthma), under-reporting of undiagnosed conditions (e.g. most mental health problems), and lack of information on condition severity (resulting in high prevalences due to inclusion of very minor conditions or minor symptoms) may also contribute to biased DALY estimates.

## References

- Jiang, Yongwen, and Jana Earl Hesser. "Using Disability-Adjusted Life Years to Assess the Burden of Disease and Injury in Rhode Island." *Public Health Reports* 127, no. 3 (2012): 293–303.
- Lozano, Rafael, Mohsen Naghavi, Kyle Foreman, Stephen Lim, Kenji Shibuya, Victor Aboyans, Jerry Abraham, et al. "Global and Regional Mortality from 235 Causes of Death for 20 Age Groups in 1990 and 2010: A Systematic Analysis for the Global Burden of Disease Study 2010." *The Lancet* 380, no. 9859 (December 15, 2012): 2095–2128. doi:10.1016/S0140-6736(12)61728-0.
- Michaud, Catherine M, Matthew T McKenna, Stephen Begg, Niels Tomijima, Meghna Majmudar, Maria T Bulzacchelli, Shahul Ebrahim, et al. "The Burden of Disease and Injury in the United States 1996." *Population Health Metrics* 4 (October 18, 2006): 11. doi:10.1186/1478-7954-4-11.
- Schroeder, S Andrew. "Incidence, Prevalence, and Hybrid Approaches to Calculating Disability-Adjusted Life Years." *Population Health Metrics* 10 (September 12, 2012): 19. doi:10.1186/1478-7954-10-19.
- U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, and Center for Behavioral Health Statistics and Quality. "Results from the 2012 NSDUH: Summary of

National Findings, SAMHSA, CBHSQ.” Accessed April 18, 2015. <http://archive.samhsa.gov/data/NSDUH/2012SummNatFindDetTables/NationalFindings/NSDUHresults2012.htm>. Üstün, T. B., J. L. Ayuso-Mateos, S. Chatterji, C. Mathers, and C. J. L. Murray. “Global Burden of Depressive Disorders in the Year 2000.” *The British Journal of Psychiatry* 184, no. 5 (May 1, 2004): 386–92. [doi:10.1192/bjp.184.5.386](https://doi.org/10.1192/bjp.184.5.386).