

# 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, se
- 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.

However, we should note that since the DALY estimations are not inclusive of all disease conditions, we will not be able to report our findings as the “top X conditions contributing to DALYs.” Instead, we can only report mental health DALYs in reference to other highly prevalent chronic diseases.

## 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%

## Estimation of Major Depressive Disorder Using PHQ-9

Prevalence estimates for 2-week depression was obtained for 2013 NYCHANES. While 2-week depression prevalence would lead to underestimation of 1-year depression, the use of PHQ-9 scores can also overestimate both MDD and any depressive disorder due to its low positive predictive value (~55%) for PHQ-9 scores below 10, the cutoff between mild and moderate depression ([Kroenke, 2002](#)). To adjust for this in the prevalence-based YLD approach, we did not consider PHQ-9 scores below 10 and assumed - from expert opinion - that only half of those with PHQ-9 scores above 10 were actually diagnosed with MDD.

## Sensitivity Analysis

In order to validate the Michaud approach, we will use 2005 NYC mortality estimates from the previous DOHMH to test the stability of our DALY rankings. However, since age-weighting is no longer used by the 2010 GBD due to ethical concerns, we suspect the magnitude of 2013 NYC DALYs to be slightly higher than that of the 2005 NYC DALYs.

## 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`, `yll`, `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

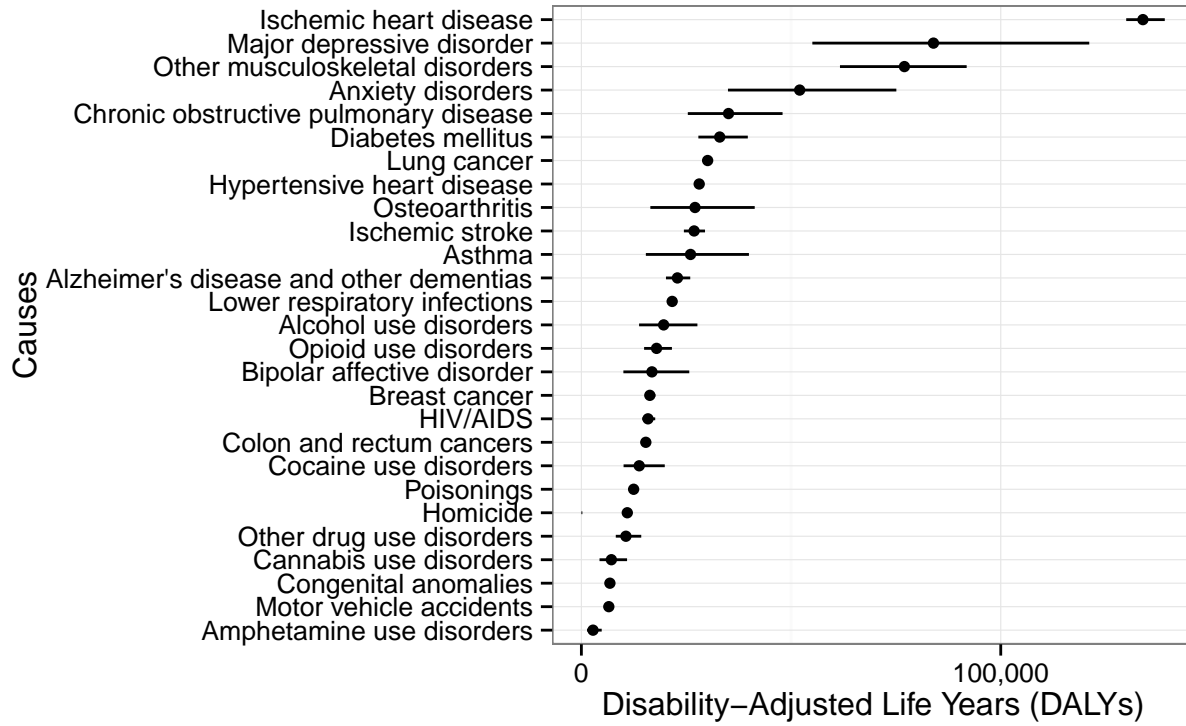
Raw results for this approach can be found under the `results` directory under the filename `nyc_daly_michaud.csv`. The file can be opened in Excel and manipulated with a pivot table for aggregation and stratification purposes.

### 2013 NYC DALY Estimates, Total

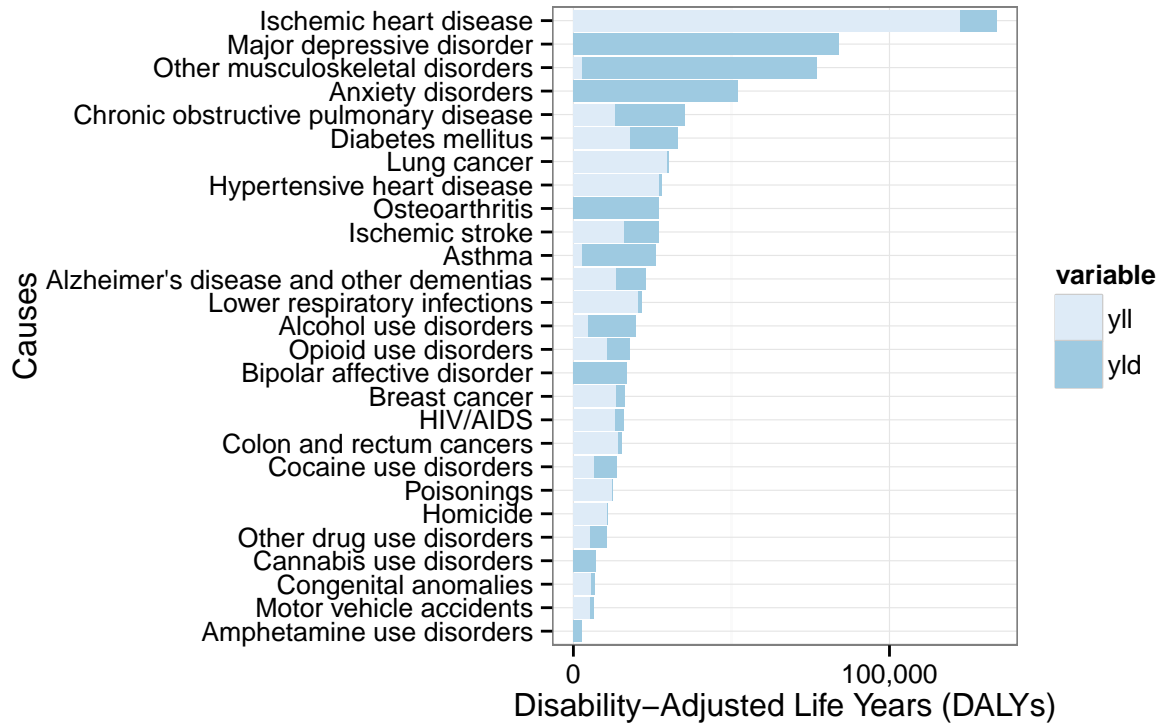
cause_name	daly	daly_lower	daly_upper	yll	yld	yld_lower	yld_upper
Ischemic heart disease	133895	129915	139112	122326	11569	7589	16786
Major depressive disorder	83953	55076	121100	0	83953	55076	121100
Other musculoskeletal disorders	77027	61660	91872	2837	74190	58823	89035
Anxiety disorders	52051	34951	75105	0	52051	34951	75105
Chronic obstructive pulmonary disease	35083	25374	47970	13123	21960	12251	34847
Diabetes mellitus	32985	27896	39684	17984	15001	9912	21700
Lung cancer	30107	29869	30449	29658	449	211	791
Hypertensive heart disease	28092	27630	28749	27201	891	429	1549
Osteoarthritis	27097	16445	41330	129	26968	16316	41201
Ischemic stroke	26881	24443	29478	15957	10924	8485	13521
Asthma	26025	15373	39953	2863	23162	12510	37090
Alzheimer's disease and other dementias	22899	20168	25956	13613	9286	6555	12343
Lower respiratory infections	21649	21225	22215	20554	1095	671	1661
Alcohol use disorders	19615	13757	27665	4673	14942	9083	22992
Opioid use disorders	17925	14953	21588	10654	7272	4299	10935
Bipolar affective disorder	16820	10012	25727	0	16820	10012	25727
Breast cancer	16321	15420	17629	13773	2548	1647	3856
HIV/AIDS	15881	14539	17604	13117	2764	1422	4487
Colon and rectum cancers	15362	14944	16022	14377	985	567	1645
Cocaine use disorders	13792	10059	19883	6738	7054	3321	13145
Poisonings	12459	12400	12573	12390	69	10	182
Homicide	10945	0	0	10945	0	0	0
Other drug use disorders	10619	8202	14273	5373	5245	2829	8900
Cannabis use disorders	7151	4321	10890	0	7151	4321	10890

cause_name	daly	daly_lower	daly_upper	yll	yld	yld_lower	yld_upper
Congenital anomalies	6801	6383	7400	5752	1049	631	1648
Motor vehicle accidents	6542	6100	7163	5318	1224	783	1846
Amphetamine use disorders	2773	1347	4845	0	2773	1347	4845

Selected Causes of Dalys,  
NYC 2013



Selected Causes of Dalys,  
NYC 2013

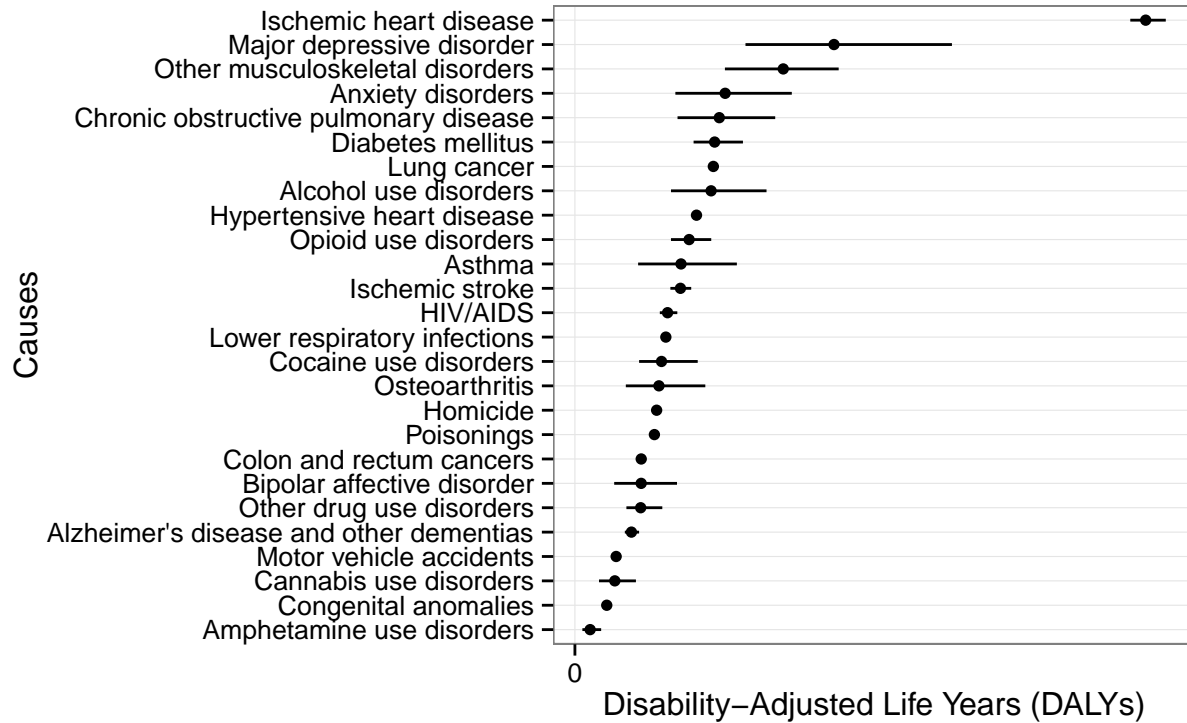


2013 NYC DALY Estimates, Male

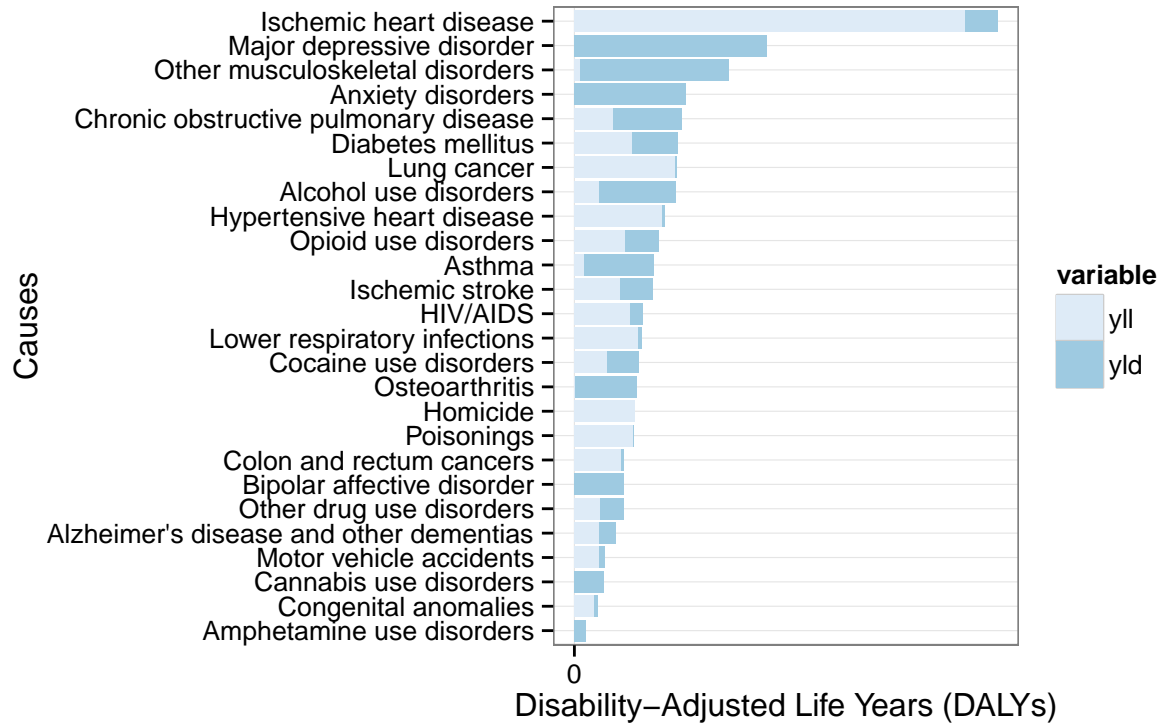
cause_name	daly	daly_lower	daly_upper	yll	yld	yld_lower	yld_upper
Ischemic heart disease	64158	62425	66417	59171	4986	3254	7246
Major depressive disorder	29122	19172	42380	0	29122	19172	42380
Other musculoskeletal disorders	23417	16861	29650	971	22446	15890	28679
Anxiety disorders	16888	11291	24380	0	16888	11291	24380
Chronic obstructive pulmonary disease	16229	11535	22514	5818	10412	5717	16696
Diabetes mellitus	15706	13338	18889	8870	6836	4468	10019
Lung cancer	15560	15456	15713	15346	215	110	367
Alcohol use disorders	15308	10799	21536	3694	11614	7105	17842
Hypertensive heart disease	13668	13503	13912	13357	310	145	555
Opioid use disorders	12837	10797	15324	7701	5136	3096	7623
Asthma	11927	7105	18203	1464	10463	5641	16739
Ischemic stroke	11863	10730	13073	6876	4987	3854	6197
HIV/AIDS	10413	9543	11512	8508	1906	1036	3004
Lower respiratory infections	10219	10035	10466	9756	463	279	710
Cocaine use disorders	9734	7214	13805	4910	4824	2304	8895
Osteoarthritis	9445	5722	14658	62	9384	5661	14597
Homicide	9185	NA	NA	9185	NA	NA	NA
Poisonings	8934	8890	9015	8881	53	9	134
Colon and rectum cancers	7452	7271	7733	7021	432	250	712
Bipolar affective disorder	7449	4414	11473	0	7449	4414	11473
Other drug use disorders	7393	5789	9823	3874	3519	1914	5948
Alzheimer's disease and other dementias	6352	5612	7215	3823	2529	1788	3391
Motor vehicle accidents	4634	4338	5057	3805	830	533	1252
Cannabis use disorders	4486	2705	6858	0	4486	2705	6858
Congenital anomalies	3579	3367	3877	3042	537	325	834
Amphetamine use disorders	1711	839	2950	0	1711	839	2950



Selected Causes of DALYs in Males,  
NYC 2013



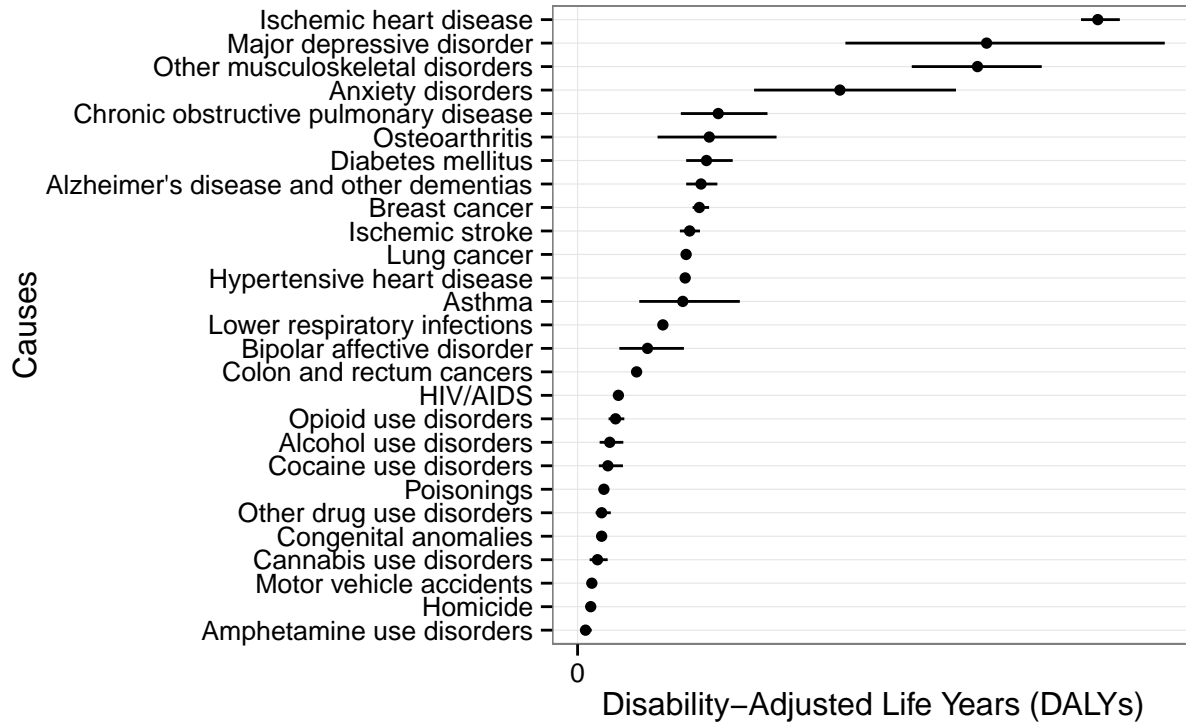
Selected Causes of DALYs in Males,  
NYC 2013



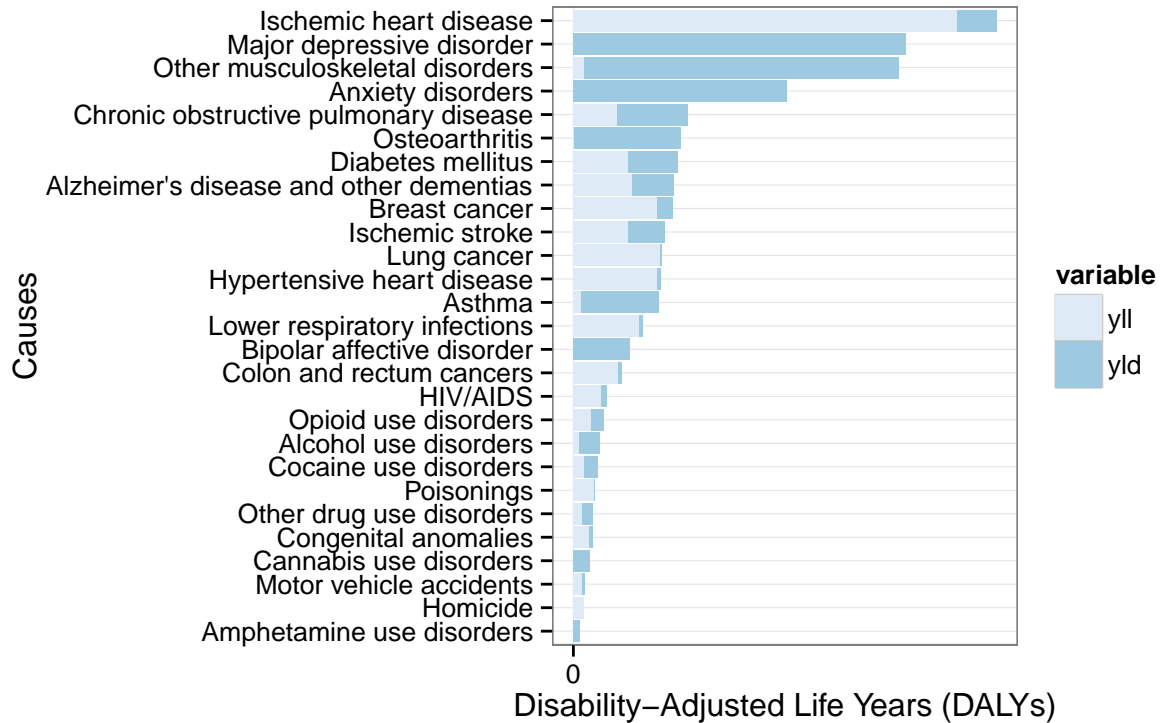
2013 NYC DALY Estimates, Female

cause_name	daly	daly_lower	daly_upper	yll	yld	yld_lower	yld_upper
Ischemic heart disease	69737	67490	72695	63155	6582	4335	9540
Major depressive disorder	54832	35904	78719	0	54832	35904	78719
Other musculoskeletal disorders	53609	44799	62223	1866	51743	42933	60357
Anxiety disorders	35163	23660	50725	0	35163	23660	50725
Chronic obstructive pulmonary disease	18854	13840	25457	7306	11548	6534	18151
Osteoarthritis	17652	10722	26672	67	17585	10655	26605
Diabetes mellitus	17279	14558	20795	9114	8165	5444	11681
Alzheimer's disease and other dementias	16547	14557	18741	9790	6757	4767	8951
Breast cancer	16321	15420	17629	13773	2548	1647	3856
Ischemic stroke	15018	13713	16405	9081	5937	4632	7324
Lung cancer	14547	14413	14737	14313	234	100	424
Hypertensive heart disease	14424	14127	14837	13843	581	284	994
Asthma	14099	8268	21750	1399	12699	6869	20350
Lower respiratory infections	11430	11189	11748	10798	632	391	951
Bipolar affective disorder	9371	5598	14254	0	9371	5598	14254
Colon and rectum cancers	7910	7673	8289	7356	554	317	933
HIV/AIDS	5468	4995	6092	4609	859	386	1483
Opioid use disorders	5088	4156	6264	2953	2135	1203	3311
Alcohol use disorders	4307	2958	6129	980	3327	1978	5149
Cocaine use disorders	4058	2845	6078	1828	2230	1017	4250
Poisonings	3525	3510	3557	3509	16	1	48
Other drug use disorders	3225	2413	4450	1499	1726	915	2951
Congenital anomalies	3222	3015	3524	2710	513	305	814
Cannabis use disorders	2665	1616	4032	0	2665	1616	4032
Motor vehicle accidents	1907	1762	2107	1513	394	249	594
Homicide	1760	NA	NA	1760	NA	NA	NA
Amphetamine use disorders	1062	508	1895	0	1062	508	1895

Selected Causes of DALYs in Females,  
NYC 2013



Selected Causes of DALYs in Females,  
NYC 2013

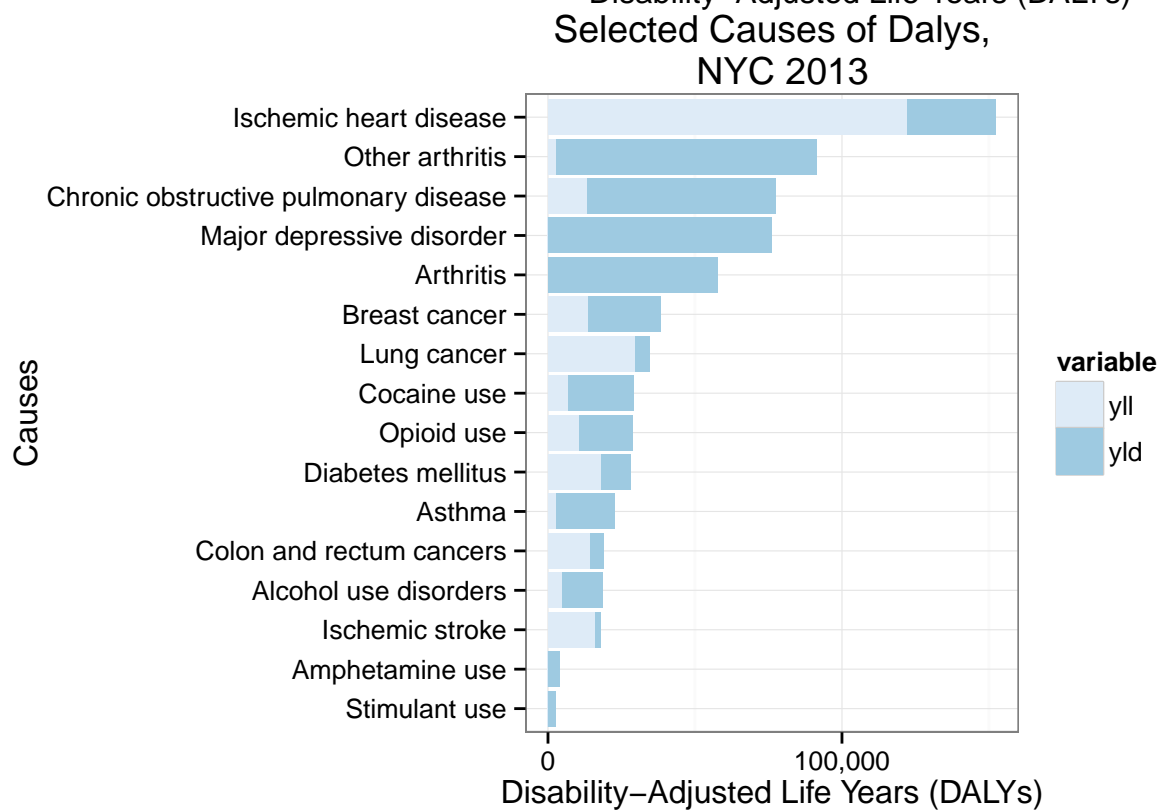
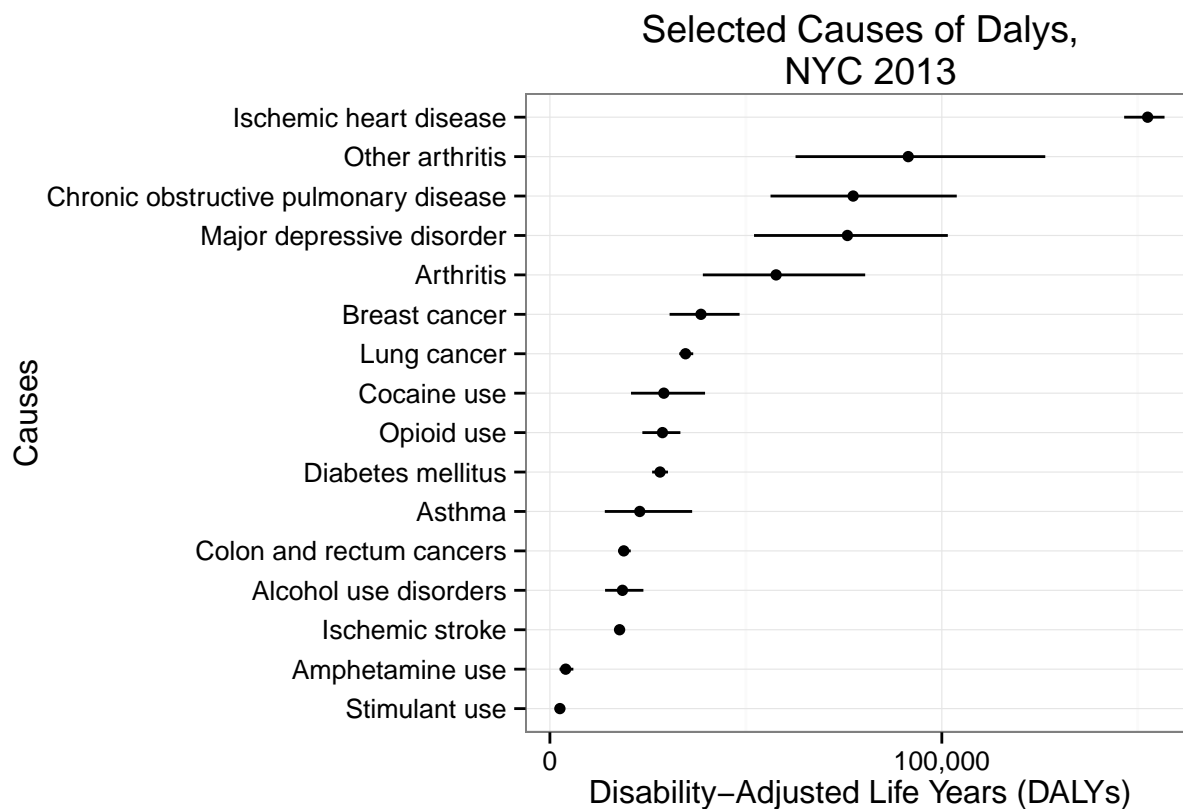


## Prevalence-Based YLD Approach

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.

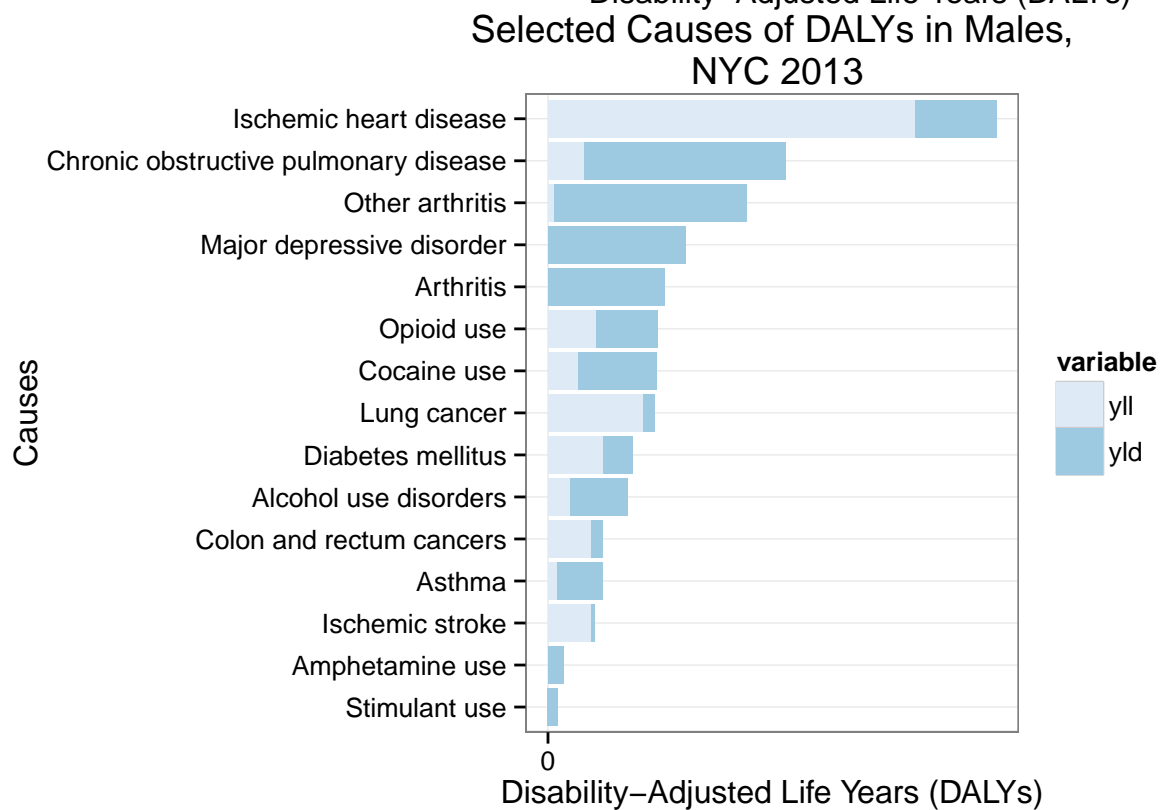
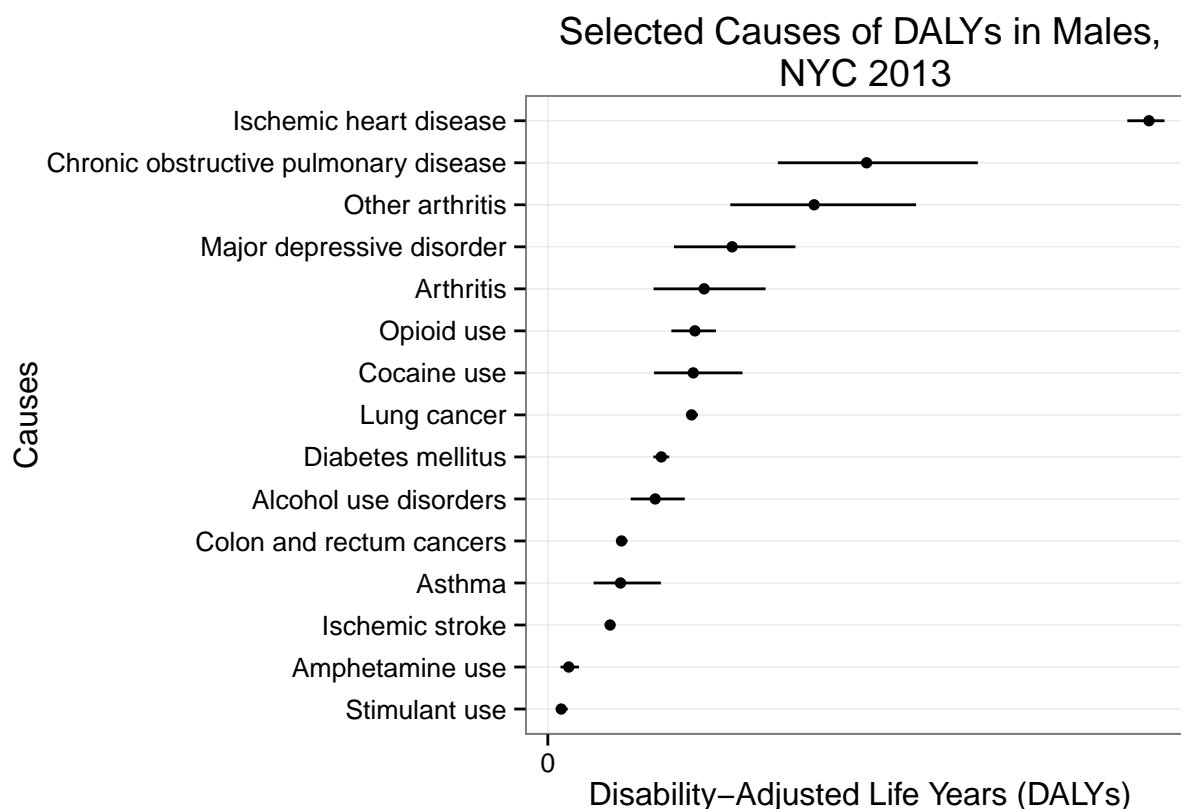
### 2013 NYC DALY Estimates, Total

cause_name	daly	daly_lower	daly_upper	yll	yld	yld_lower	yld_upper
Ischemic heart disease	152512	146523	156824	122326	30186	24197	34498
Other arthritis	91428	62675	126398	2837	88591	59838	123561
Chronic obstructive pulmonary disease	77376	56293	103813	13123	64253	43170	90690
Major depressive disorder	75910	52087	101535	0	75910	52087	101535
Arthritis	57716	39025	80447	129	57587	38896	80319
Breast cancer	38542	30539	48399	13773	24769	16765	34626
Lung cancer	34602	33006	36567	29664	4937	3342	6902
Cocaine use	29071	20696	39584	6738	22333	13958	32846
Opioid use	28723	23593	33290	10654	18069	12939	22636
Diabetes mellitus	28104	26080	30127	17984	10119	8095	12143
Asthma	22922	14007	36294	2863	20058	11143	33430
Colon and rectum cancers	18848	17403	20628	14377	4471	3027	6251
Alcohol use disorders	18514	14079	23858	4673	13840	9405	19184
Ischemic stroke	17777	16911	19164	15957	1820	953	3207
Amphetamine use	4025	2451	5986	0	4025	2451	5986
Stimulant use	2549	1552	3790	0	2549	1552	3790



2013 NYC DALY Estimates, Male

cause_name	daly	daly_lower	daly_upper	yll	yld	yld_lower	yld_upper
Ischemic heart disease	72250	69655	74119	59171	13079	10484	14947
Chronic obstructive pulmonary disease	38313	27650	51683	5818	32495	21833	45865
Other arthritis	32008	21934	44259	971	31037	20963	43288
Major depressive disorder	22152	15159	29756	NA	22152	15159	29756
Arthritis	18785	12708	26176	62	18723	12647	26114
Opioid use	17681	14847	20203	7701	9980	7146	12502
Cocaine use	17478	12765	23394	4910	12568	7855	18484
Lung cancer	17277	16655	18044	15351	1926	1304	2692
Diabetes mellitus	13640	12686	14594	8870	4770	3816	5724
Alcohol use disorders	12907	9955	16465	3694	9214	6261	12771
Colon and rectum cancers	8856	8263	9586	7021	1835	1242	2565
Asthma	8733	5502	13579	1464	7269	4038	12115
Ischemic stroke	7484	7195	7947	6876	608	318	1071
Amphetamine use	2514	1531	3740	NA	2514	1531	3740
Stimulant use	1610	980	2394	NA	1610	980	2394

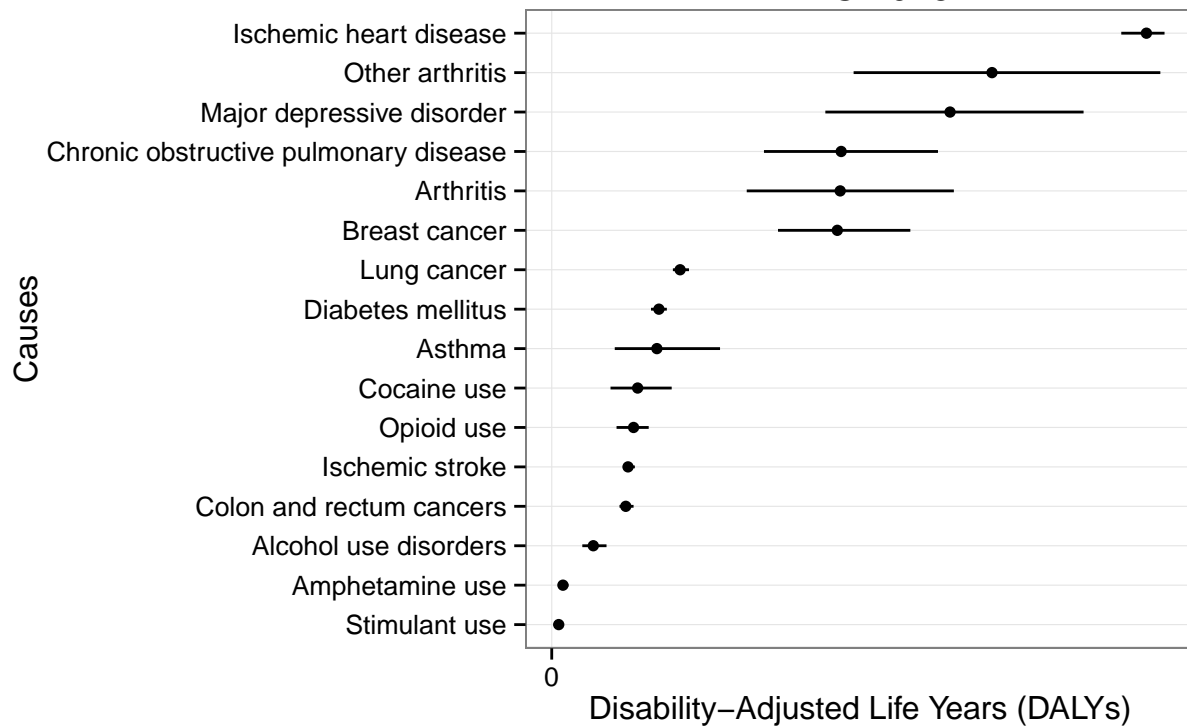


2013 NYC DALY Estimates, Female

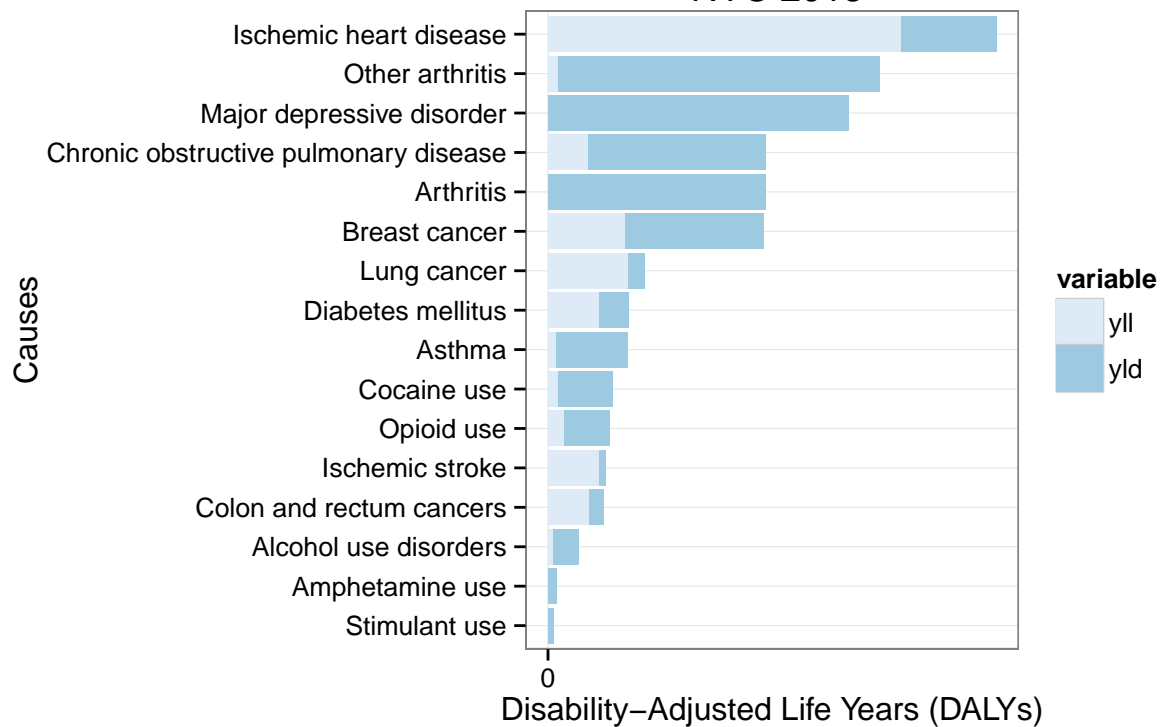
cause_name	daly	daly_lower	daly_upper	yll	yld	yld_lower	yld_upper
Ischemic heart disease	80262	76867	82705	63155	17107	13713	19551
Other arthritis	59420	40740	82139	1866	57555	38875	80274
Major depressive disorder	53758	36928	71779	NA	53758	36928	71779
Chronic obstructive pulmonary disease	39063	28643	52130	7306	31758	21337	44824
Arthritis	38931	26317	54271	67	38863	26250	54204
Breast cancer	38542	30539	48399	13773	24769	16765	34626
Lung cancer	17324	16351	18523	14313	3011	2038	4210
Diabetes mellitus	14464	13394	15533	9114	5349	4279	6419
Asthma	14189	8505	22715	1399	12789	7105	21315
Cocaine use	11593	7931	16189	1828	9765	6103	14361
Opioid use	11042	8745	13087	2953	8090	5793	10134
Ischemic stroke	10294	9716	11217	9081	1212	635	2136
Colon and rectum cancers	9992	9140	11041	7356	2636	1784	3685
Alcohol use disorders	5607	4124	7393	980	4627	3144	6413
Amphetamine use	1510	920	2246	NA	1510	920	2246
Stimulant use	939	572	1396	NA	939	572	1396



Selected Causes of DALYs in Females,  
NYC 2013

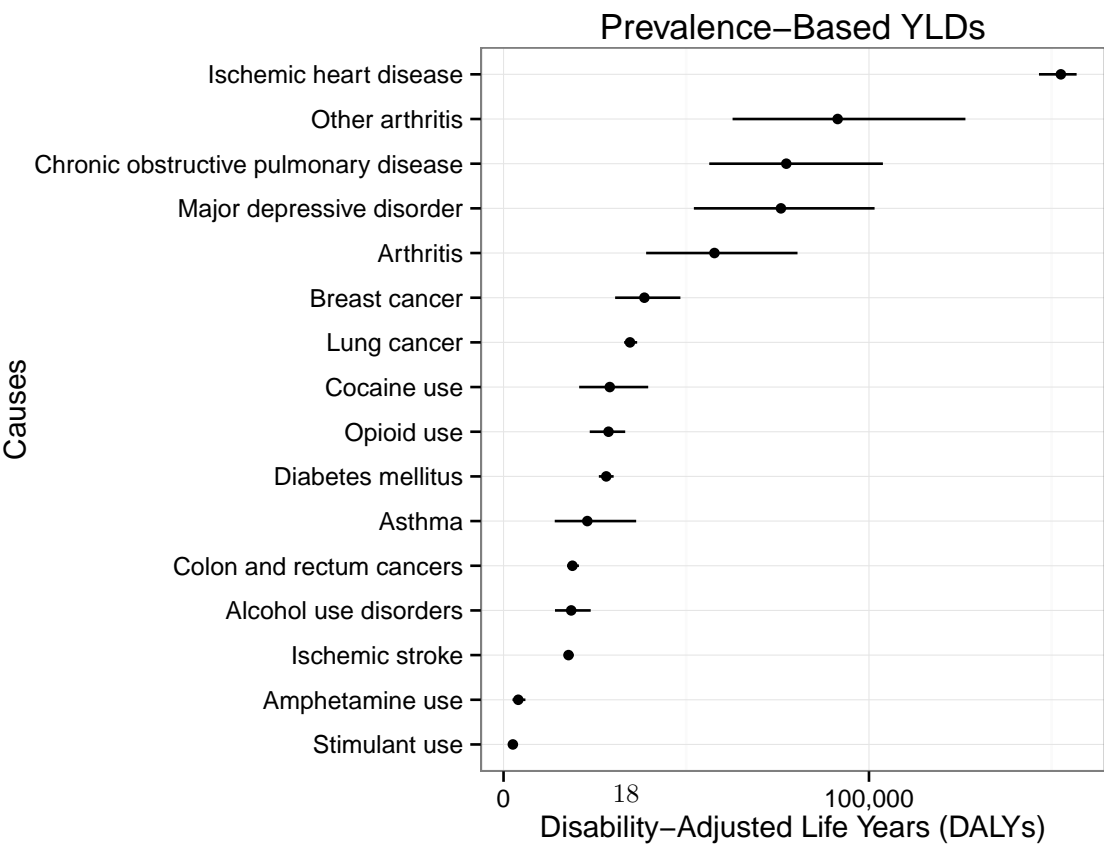
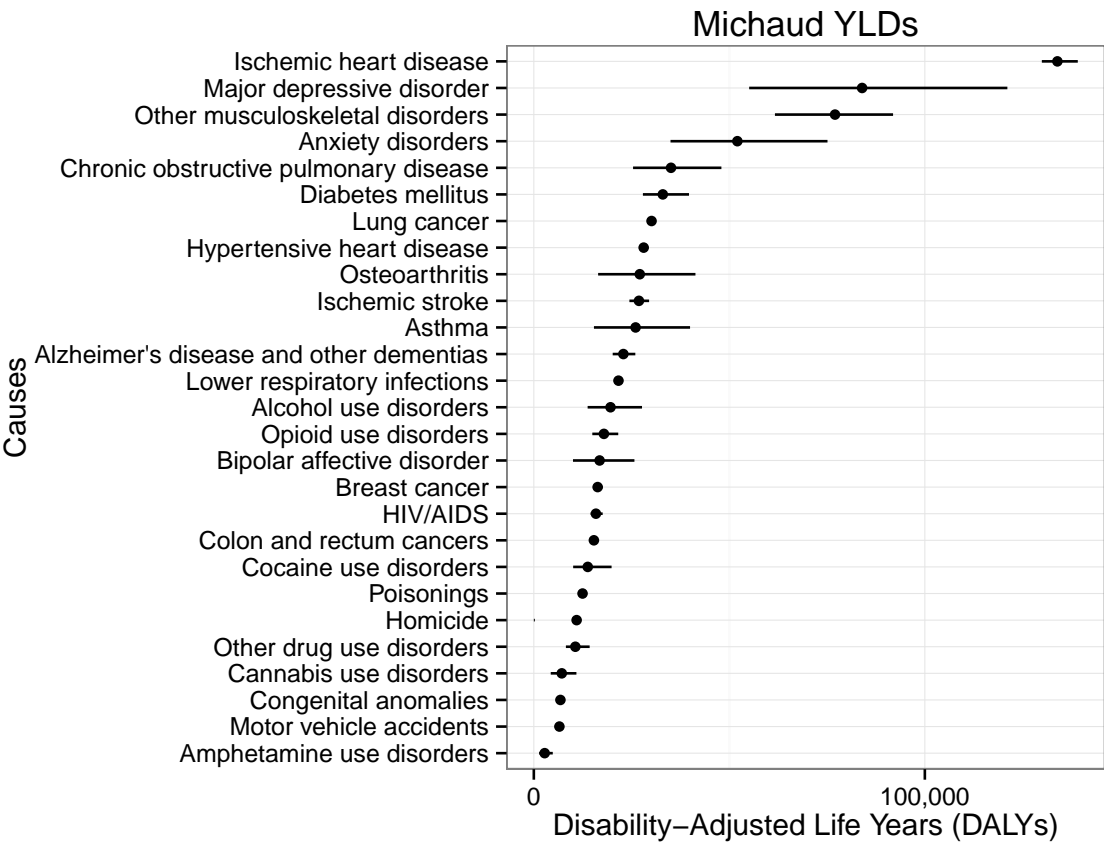


Selected Causes of DALYs in Females,  
NYC 2013

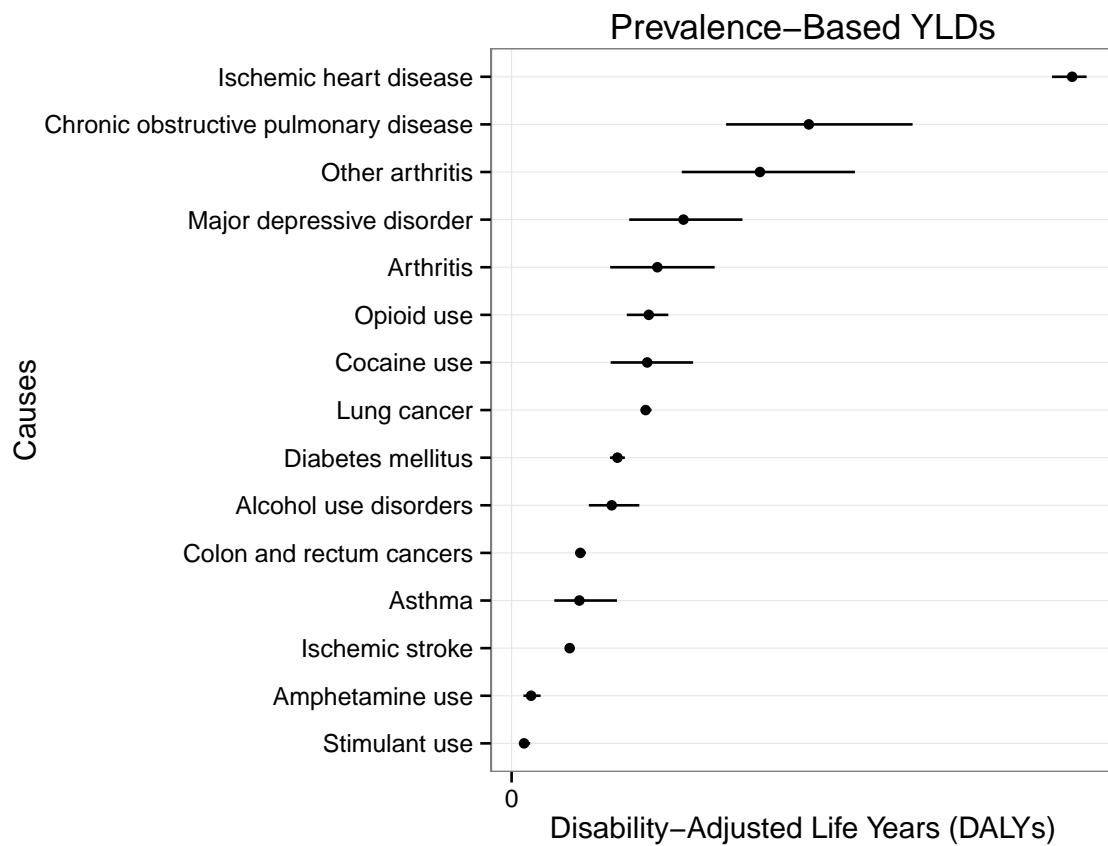
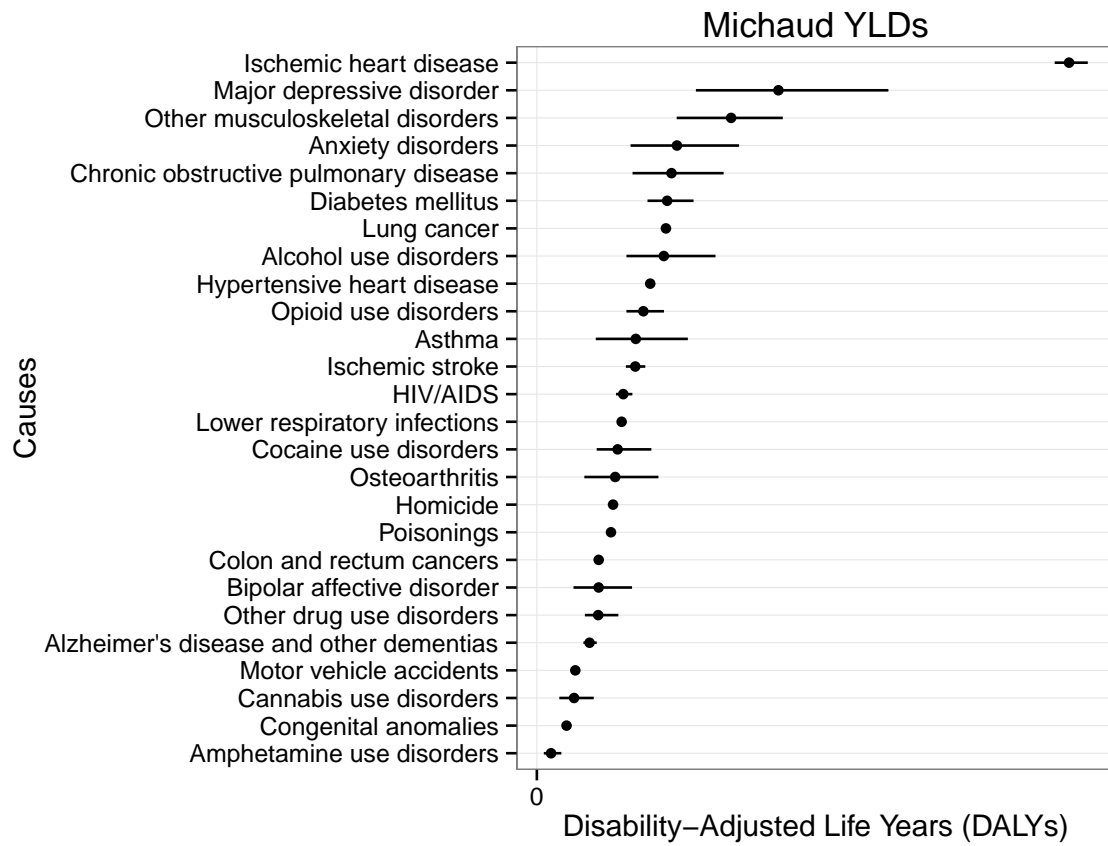


Michaud YLDs vs. Prevalence-Based YLDs: Side-by-Side Comparison

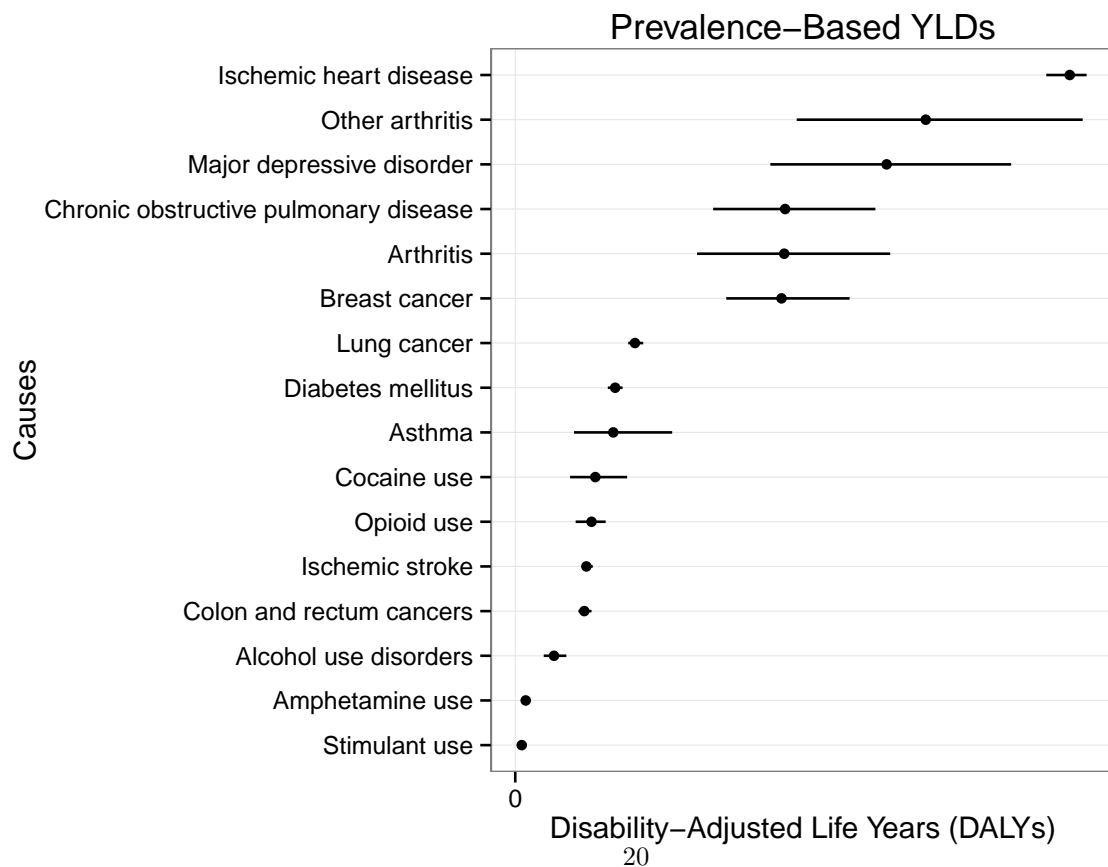
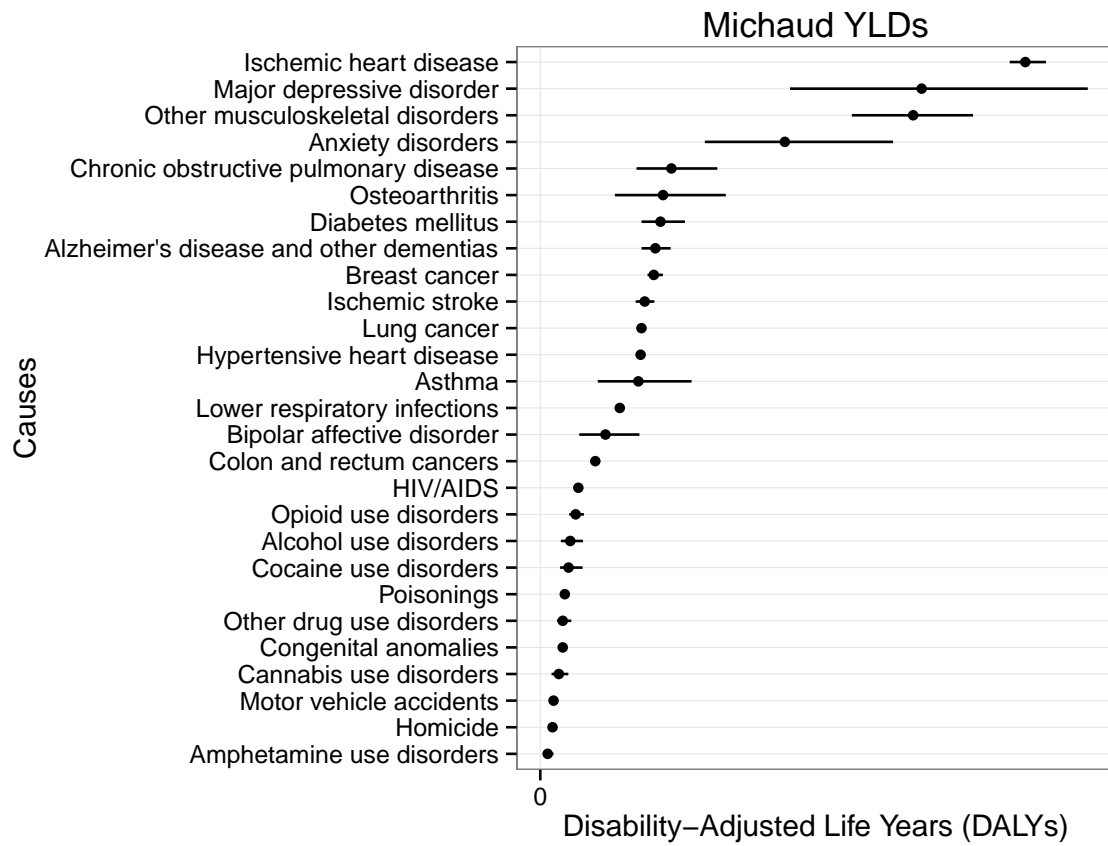
Total



Male



Female



## Disease Conditions with Small Sample Sizes

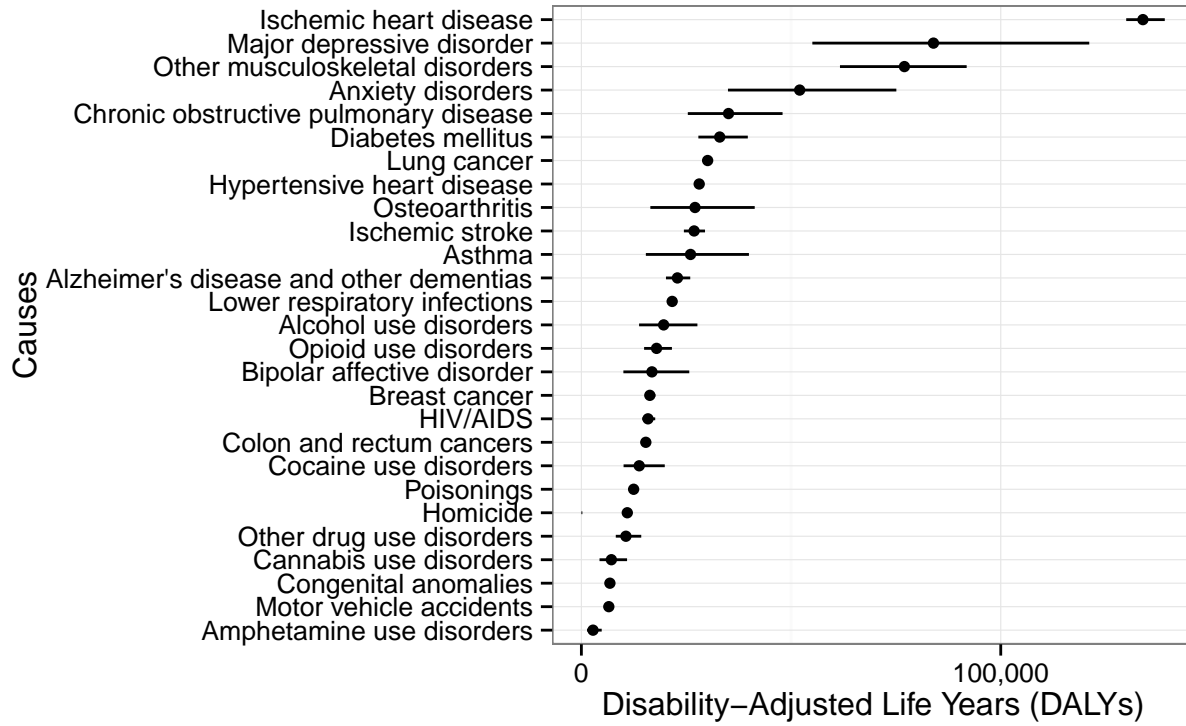
	cause_name	seqlae	sex	age
21	Breast cancer	Breast cancer	Male	20-39
22	Breast cancer	Breast cancer	Male	40-59
23	Breast cancer	Breast cancer	Male	60+
24	Breast cancer	Breast cancer	Female	20-39
32	Cocaine use disorders	Cocaine use	Female	60+
33	Colon and rectum cancers	Colon and rectum cancers	Male	20-39
34	Colon and rectum cancers	Colon and rectum cancers	Male	40-59
35	Colon and rectum cancers	Colon and rectum cancers	Male	60+
36	Colon and rectum cancers	Colon and rectum cancers	Female	20-39
37	Colon and rectum cancers	Colon and rectum cancers	Female	40-59
38	Colon and rectum cancers	Colon and rectum cancers	Female	60+
51	Opioid use disorders	Heroin use	Male	20-39
52	Opioid use disorders	Heroin use	Male	40-59
53	Opioid use disorders	Heroin use	Male	60+
54	Opioid use disorders	Heroin use	Female	20-39
55	Opioid use disorders	Heroin use	Female	40-59
56	Opioid use disorders	Heroin use	Female	60+
57	Ischemic heart disease	Ischemic heart disease	Male	20-39
60	Ischemic heart disease	Ischemic heart disease	Female	20-39
63	Lung cancer	Lung	Male	20-39
64	Lung cancer	Lung	Male	40-59
65	Lung cancer	Lung	Male	60+
66	Lung cancer	Lung	Female	20-39
67	Lung cancer	Lung	Female	40-59
68	Lung cancer	Lung	Female	60+
69	Amphetamine use disorders	Methamphetamine use	Male	20-39
70	Amphetamine use disorders	Methamphetamine use	Male	40-59
71	Amphetamine use disorders	Methamphetamine use	Male	60+
72	Amphetamine use disorders	Methamphetamine use	Female	20-39
73	Amphetamine use disorders	Methamphetamine use	Female	40-59
74	Amphetamine use disorders	Methamphetamine use	Female	60+
97	Other musculoskeletal disorders	Other arthritis	Male	20-39
119	Ischemic stroke	Ischemic stroke	Male	20-39
120	Ischemic stroke	Ischemic stroke	Male	40-59
121	Ischemic stroke	Ischemic stroke	Male	60+
122	Ischemic stroke	Ischemic stroke	Female	20-39

## Sensitivity Analysis

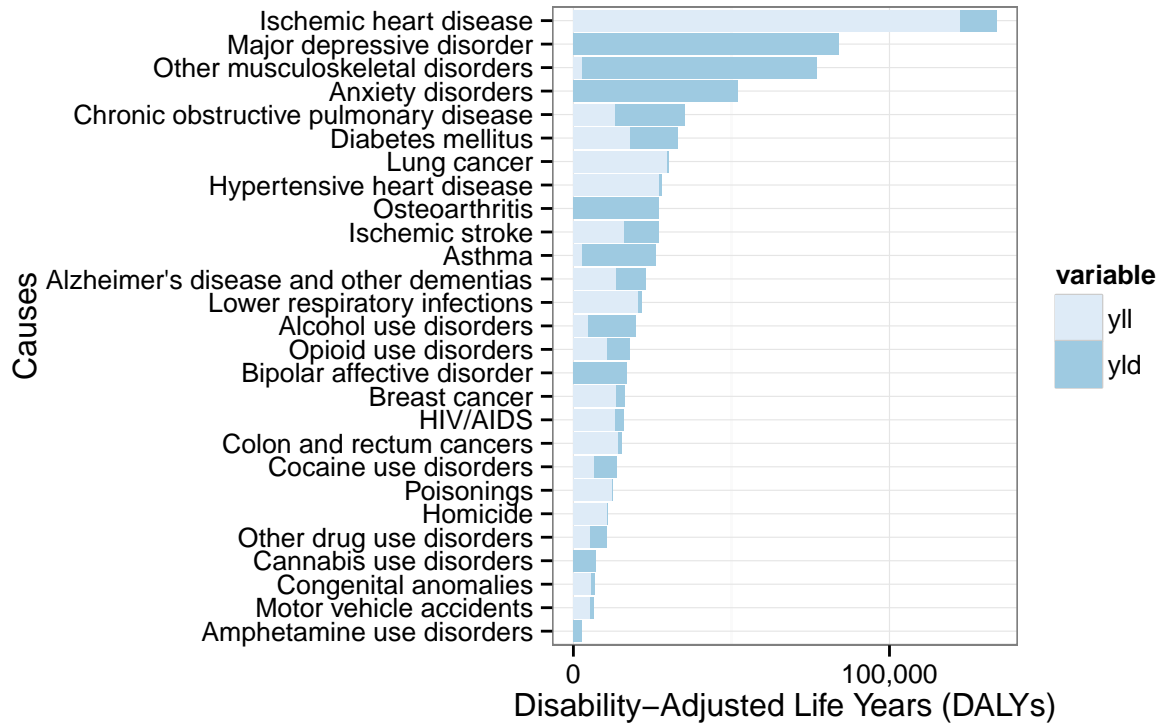
cause_name	daly	daly_lower	daly_upper	yll	yld	yld_lower	yld_upper
Ischemic heart disease	133895	129915	139112	122326	11569	7589	16786
Major depressive disorder	83953	55076	121100	0	83953	55076	121100
Other musculoskeletal disorders	77027	61660	91872	2837	74190	58823	89035
Anxiety disorders	52051	34951	75105	0	52051	34951	75105
Chronic obstructive pulmonary disease	35083	25374	47970	13123	21960	12251	34847
Diabetes mellitus	32985	27896	39684	17984	15001	9912	21700
Lung cancer	30107	29869	30449	29658	449	211	791

cause_name	daly	daly_lower	daly_upper	yll	yld	yld_lower	yld_upper
Hypertensive heart disease	28092	27630	28749	27201	891	429	1549
Osteoarthritis	27097	16445	41330	129	26968	16316	41201
Ischemic stroke	26881	24443	29478	15957	10924	8485	13521
Asthma	26025	15373	39953	2863	23162	12510	37090
Alzheimer's disease and other dementias	22899	20168	25956	13613	9286	6555	12343
Lower respiratory infections	21649	21225	22215	20554	1095	671	1661
Alcohol use disorders	19615	13757	27665	4673	14942	9083	22992
Opioid use disorders	17925	14953	21588	10654	7272	4299	10935
Bipolar affective disorder	16820	10012	25727	0	16820	10012	25727
Breast cancer	16321	15420	17629	13773	2548	1647	3856
HIV/AIDS	15881	14539	17604	13117	2764	1422	4487
Colon and rectum cancers	15362	14944	16022	14377	985	567	1645
Cocaine use disorders	13792	10059	19883	6738	7054	3321	13145
Poisonings	12459	12400	12573	12390	69	10	182
Homicide	10945	0	0	10945	0	0	0
Other drug use disorders	10619	8202	14273	5373	5245	2829	8900
Cannabis use disorders	7151	4321	10890	0	7151	4321	10890
Congenital anomalies	6801	6383	7400	5752	1049	631	1648
Motor vehicle accidents	6542	6100	7163	5318	1224	783	1846
Amphetamine use disorders	2773	1347	4845	0	2773	1347	4845

Selected Causes of Dalys,  
NYC 2005



Selected Causes of Dalys,  
NYC 2005

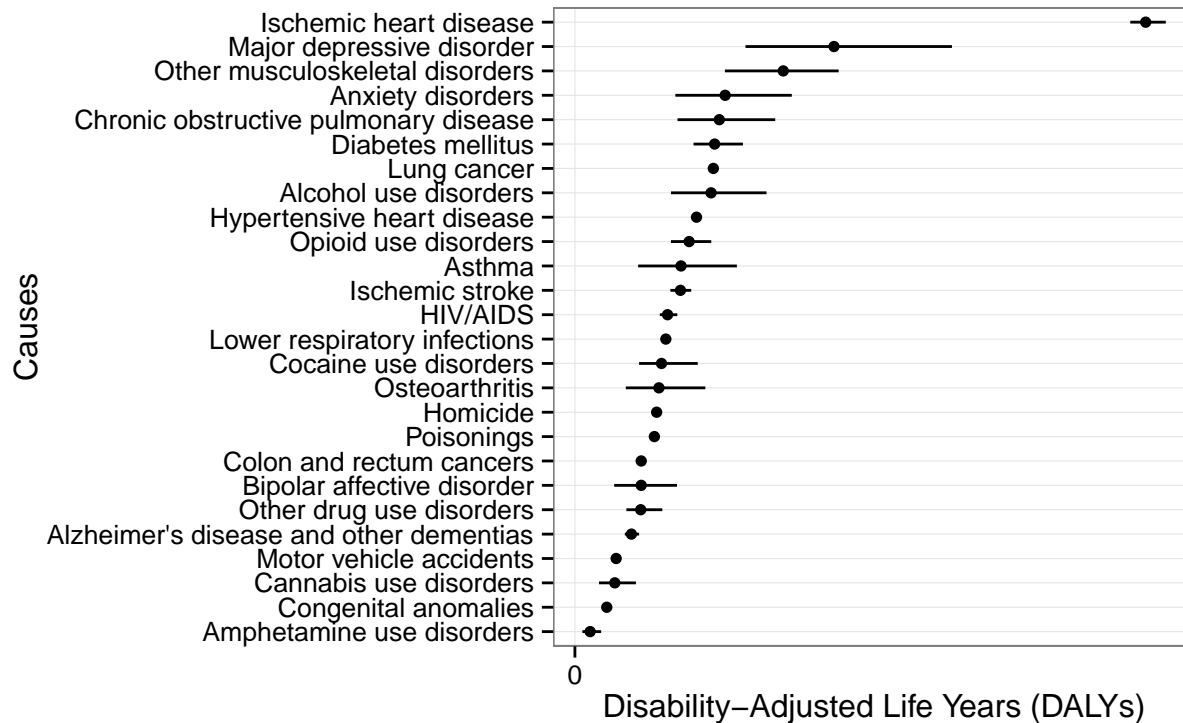


2005 NYC DALY Estimates, Male

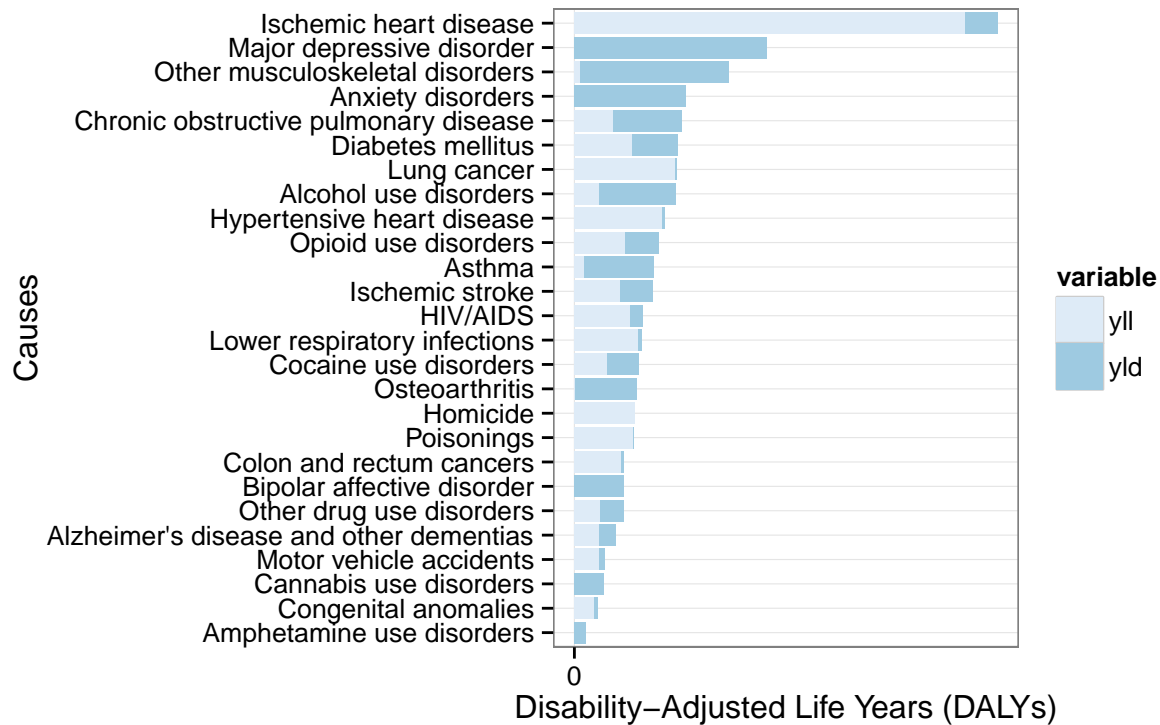
cause_name	daly	daly_lower	daly_upper	yll	yld	yld_lower	yld_upper
Ischemic heart disease	64158	62425	66417	59171	4986	3254	7246
Major depressive disorder	29122	19172	42380	0	29122	19172	42380
Other musculoskeletal disorders	23417	16861	29650	971	22446	15890	28679
Anxiety disorders	16888	11291	24380	0	16888	11291	24380
Chronic obstructive pulmonary disease	16229	11535	22514	5818	10412	5717	16696
Diabetes mellitus	15706	13338	18889	8870	6836	4468	10019
Lung cancer	15560	15456	15713	15346	215	110	367
Alcohol use disorders	15308	10799	21536	3694	11614	7105	17842
Hypertensive heart disease	13668	13503	13912	13357	310	145	555
Opioid use disorders	12837	10797	15324	7701	5136	3096	7623
Asthma	11927	7105	18203	1464	10463	5641	16739
Ischemic stroke	11863	10730	13073	6876	4987	3854	6197
HIV/AIDS	10413	9543	11512	8508	1906	1036	3004
Lower respiratory infections	10219	10035	10466	9756	463	279	710
Cocaine use disorders	9734	7214	13805	4910	4824	2304	8895
Osteoarthritis	9445	5722	14658	62	9384	5661	14597
Homicide	9185	NA	NA	9185	NA	NA	NA
Poisonings	8934	8890	9015	8881	53	9	134
Colon and rectum cancers	7452	7271	7733	7021	432	250	712
Bipolar affective disorder	7449	4414	11473	0	7449	4414	11473
Other drug use disorders	7393	5789	9823	3874	3519	1914	5948
Alzheimer's disease and other dementias	6352	5612	7215	3823	2529	1788	3391
Motor vehicle accidents	4634	4338	5057	3805	830	533	1252
Cannabis use disorders	4486	2705	6858	0	4486	2705	6858
Congenital anomalies	3579	3367	3877	3042	537	325	834
Amphetamine use disorders	1711	839	2950	0	1711	839	2950



Selected Causes of DALYs in Males,  
NYC 2005



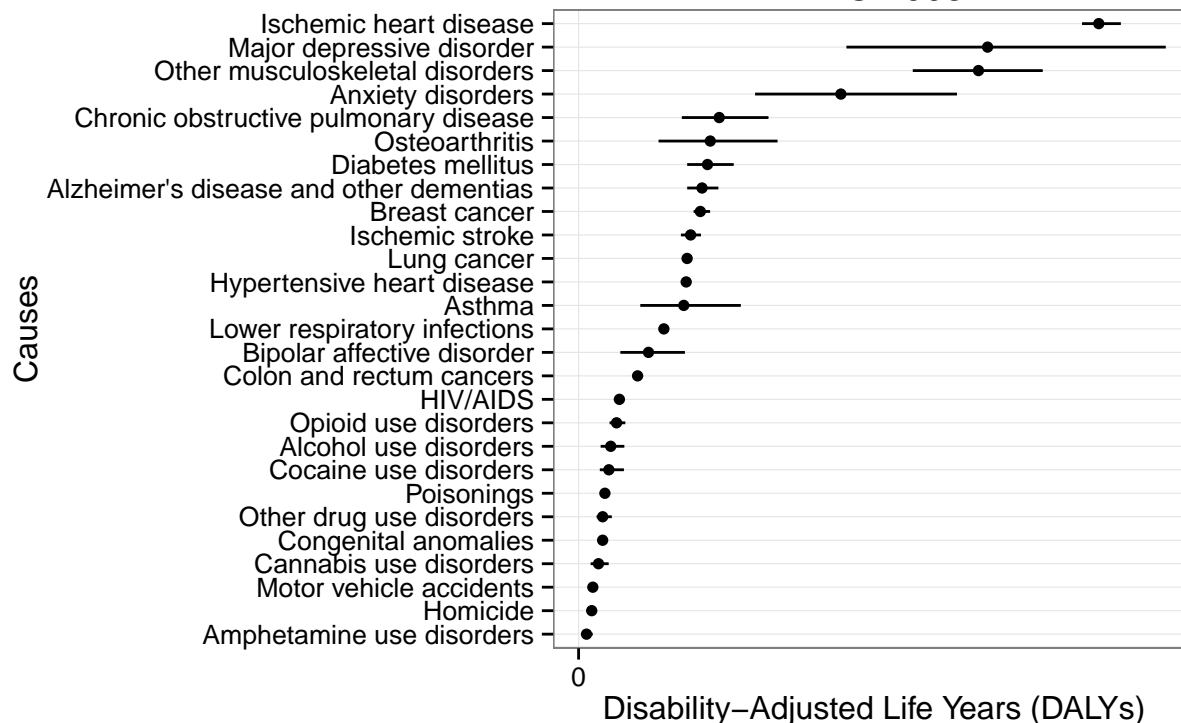
Selected Causes of DALYs in Males,  
NYC 2005



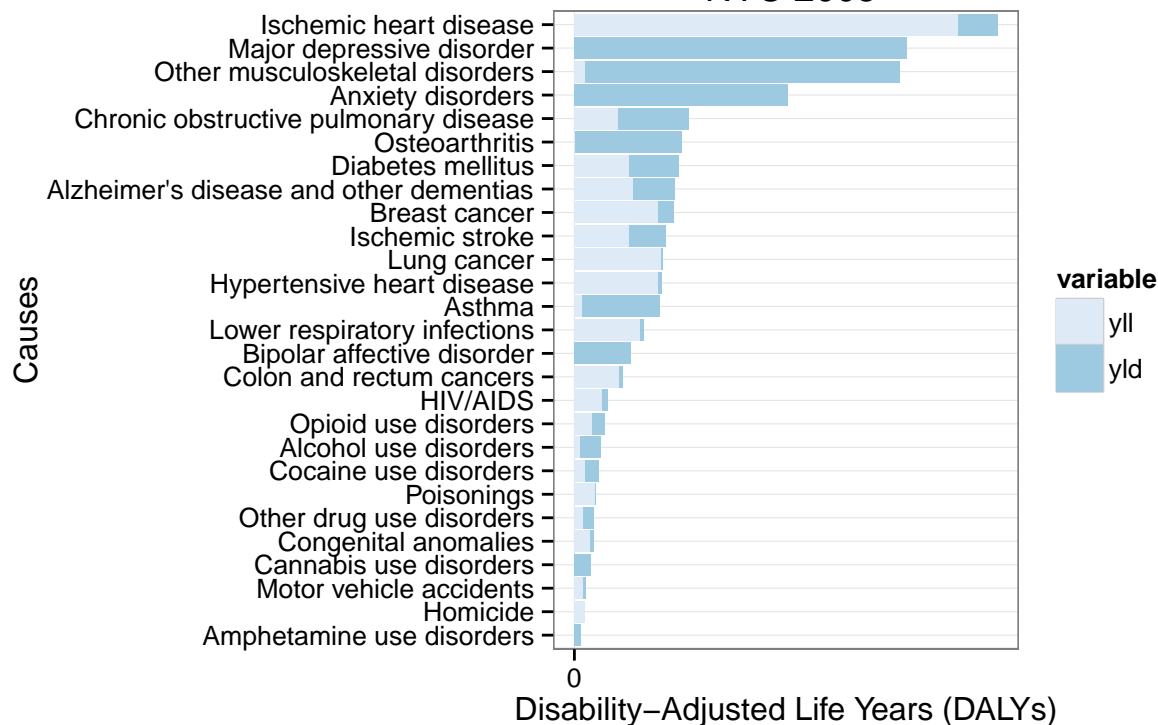
2005 NYC DALY Estimates, Female

cause_name	daly	daly_lower	daly_upper	yll	yld	yld_lower	yld_upper
Ischemic heart disease	69737	67490	72695	63155	6582	4335	9540
Major depressive disorder	54832	35904	78719	0	54832	35904	78719
Other musculoskeletal disorders	53609	44799	62223	1866	51743	42933	60357
Anxiety disorders	35163	23660	50725	0	35163	23660	50725
Chronic obstructive pulmonary disease	18854	13840	25457	7306	11548	6534	18151
Osteoarthritis	17652	10722	26672	67	17585	10655	26605
Diabetes mellitus	17279	14558	20795	9114	8165	5444	11681
Alzheimer's disease and other dementias	16547	14557	18741	9790	6757	4767	8951
Breast cancer	16321	15420	17629	13773	2548	1647	3856
Ischemic stroke	15018	13713	16405	9081	5937	4632	7324
Lung cancer	14547	14413	14737	14313	234	100	424
Hypertensive heart disease	14424	14127	14837	13843	581	284	994
Asthma	14099	8268	21750	1399	12699	6869	20350
Lower respiratory infections	11430	11189	11748	10798	632	391	951
Bipolar affective disorder	9371	5598	14254	0	9371	5598	14254
Colon and rectum cancers	7910	7673	8289	7356	554	317	933
HIV/AIDS	5468	4995	6092	4609	859	386	1483
Opioid use disorders	5088	4156	6264	2953	2135	1203	3311
Alcohol use disorders	4307	2958	6129	980	3327	1978	5149
Cocaine use disorders	4058	2845	6078	1828	2230	1017	4250
Poisonings	3525	3510	3557	3509	16	1	48
Other drug use disorders	3225	2413	4450	1499	1726	915	2951
Congenital anomalies	3222	3015	3524	2710	513	305	814
Cannabis use disorders	2665	1616	4032	0	2665	1616	4032
Motor vehicle accidents	1907	1762	2107	1513	394	249	594
Homicide	1760	NA	NA	1760	NA	NA	NA
Amphetamine use disorders	1062	508	1895	0	1062	508	1895

Selected Causes of DALYs in Females,  
NYC 2005



Selected Causes of DALYs in Females,  
NYC 2005



## Discussion

### Limitations

There are key limitations to this analysis. First and foremost, the magnitude of the DALY scores should be interpreted and reported with caution. Due to the small sample size of NYC prevalence estimates and the uncertainty around disability weights and national YLL/YLD rates for some conditions, DALY estimates can assume a wide range of values, changing how one condition ranks against the others (for example, **alcohol use disorders** and **diabetes mellitus**). For this reason, DALY magnitudes obtained via Michaud approach and the Prevalence-based YLDs cannot be directly compared.

Moreover, the accuracy of DALY estimations suffers from potential biases introduced in the data collection and computation processes. For example, comorbidities with respect to chronic diseases means that DALY estimates based on Vital Statistics mortality counts are overestimating the contribution of YLLs. 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.

In order to convey the uncertainty around our estimates, we visualize the range of values that NYC DALY estimates can take for each condition.

### Sensitivity Analysis

NYC DALY rankings and magnitudes using the Michaud approach are fairly consistent using both 2005 and 2013 NYC mortality counts. Moreover, the Michaud approach implemented in this analysis replicated the 2005 NYC DALY estimates from the previous NYC DOHMH study, producing comparable rankings. However, since age-weighting is no longer used due to ethical concerns, the 2013 NYC DALYs are slightly larger in magnitude. Recommendations for future work include running simulations to test the stability of DALY rankings for an even wider range of assumptions.

## 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.
- Kroenke, Kurt, and Robert L. Spitzer. "The PHQ-9: A New Depression Diagnostic and Severity Measure." *Psychiatric Annals* 32, no. 9 (2002): 509–15.
- 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).