MINNESOTA 10x10

Project Update

People with serious mental illnesses are at greater risk of premature death than the general population. Minnesota 10x10 seeks to address this disparity.

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Project partners

- Allina Health
- HealthPartners Medical Group
- Medica
- Mental Health Minnesota
- The Minnesota Department of Health
- The Minnesota Department of Human Services
- The University of Minnesota

Introduction

In 2009, Minnesota 10x10 got underway with the goal of reducing the median years of life lost for people with serious mental illnesses (SMI) by 10 years within 10 years.[1]

To achieve this goal, a number of activities were undertaken focused on educating, engaging, and activating populations, groups, and agencies.

Now coming on 10 years in, we are pausing to review the data, look for early results, and reflect on what we are learning.

Background

According to numerous studies, people with serious mental illnesses (SMI) are at greater risk of premature death than the general population. This is largely due to complications from untreated, preventable chronic illnesses such as obesity, diabetes, hypertension, and cardiovascular disease, which are aggravated by limited health choices associated with poverty, including poor nutrition, lack of exercise, and smoking.[2] Obesity and sedentary behavior are major risk factors for cardiovascular disease, diabetes, and reduced life expectancy. Over half of adults with self-reported diagnosis of schizophrenia, bipolar disorder, or depression are obese, while fewer than 20 percent of people with schizophrenia engage in regular moderate exercise, and people with schizophrenia consume fewer fruits and vegetables and more calories and saturated fats than the general population.[3]

Minnesota responds

Following the 2006, 2007, and 2009 publication by the Substance Abuse and Mental Health Services Administration of reports[4,5,6] highlighting the early mortality of people with SMI, a group of Minnesota psychiatric leaders felt a strong need to see if this applied to their patients.

To investigate, the leaders created a broad-based public/private workgroup. The workgroup included representatives from:

- The University of Minnesota
- Optum
- The Minnesota Department of Human Services
- The Minnesota Department of Health
- Allina
- Mental Health Minnesota
- HealthPartners

The earlier methodology was replicated for Minnesota. The data showed the median of years of life lost in Minnesota was 24 and the primary causes of death and the number of years lost were:

- Heart diseases (27 years of life lost)
- Unintentional injury (18)
- COPD (15)
- Cancer (15).

Based upon the Substance Abuse and Mental Health Services Administration recommendations and the Minnesota data, the workgroup created a best-practice bundle of modifiable risk factors. These risk factors were posted on the Minnesota Department of Human Services (DHS) website and then worked on by a host of advocacy groups, community mental health centers, multispecialty groups, specialty providers/societies, health plans, residential treatment centers, group homes, and patients/families. The factors included:

- Annual physical with primary care,
- BMI <30
- No tobacco use
- No high risk drinking/drug use
- BP<=140/90*
- LDL<=129
- If does not have diabetes, Fasting Blood Sugar (FBS) <=125
- If has diabetes, HGB A1C <8.

Based on this information, in 2010 the workgroup set a goal of reducing the median years of life lost by 10 years within 10 years (Minnesota 10x10).[7] by engaging patients so these risk factors return to healthy zones.

*The following numbers were updated as the evidence and guidelines changed over time. The initial unhealthy numbers were LDL> 100; BP ≥ 131/81; FBS ≥ 126; Hgb A1C ≥ 8.

Activities

 Minnesota 10x10's primary strategy consisted of educating, engaging, and activating populations/groups/agencies including: consumers/families, providers (mental Health and primary care), advocates, community mental health centers (and their leaders), case managers, Assertive Community Treatment (ACT) teams, health plans, Minnesota Department of Health/DHS, outpatient mental health professions, hospitals with psychiatric units, and the media.

Generally each group/entity/agency were encouraged to voluntarily work on this issue and reach out through multiple channels to engage patients/families and other stakeholders/professions in their domains. The only mandated actions involved Assertive Community Treatment (ACT) teams who participated in two separate year-long collaboratives, and were required to submit resulting data to DHS' Mental Health Information Systems.

Other activities included:

- Health plans educating via newsletters, using telephonic care managers and engage patient/families, and using claims data to measure compliance recommended primary care physicians visits (and lab draws).
- Minnesota NAMI utilizing web communication and embedding in classes.
- The Mental Health Association of Minnesota encouraged individuals via their website, consumer advocates, conferences, and Steps to Wellness handouts.
- Andrew's residence (large group home) ran a nutrition program, exercise program and tracked Minnesota 10x10 measures.
- Clinical "Pearls," which are summaries of the problem with recommended actions, were distributed to primary care physicians at Health Partners (with a list of their patients with SMI).
- Minnesota Psychiatric Society promoted the initiative on websites and in conferences.
- Psychiatric units in hospitals embedded Minnesota 10x10 approach into a best practice white paper on transitions, and this approach was integrated into the work of a one-year collaborative designed to reduce re-admissions.
- Minnesota 10x10 was embedded in routine discharge bundles. This meant measuring and reporting for the afore-mentioned best-practice bundle of modifiable risk factors at discharge.
- Minnesota participated in a Tobacco Policy Academy sponsored by SMHSA to address the issue of the high percentage of adults with SMI who smoke or use tobacco. This led to work with the American Lung Association and the Minnesota Department of Health to focus attention and
- customizing the smoking prevention work and materials for adults with SMI.
- A number of the health care delivery systems developed tools and processes to monitor provider performance as a quality improvement measure.

Results

Optimal bundle

An early and important success is that Health Partners Medical Group (HPMG), embedded Minnesota 10x10 in routine discharge bundles with promising results. The percentage of people with SMI achieving the optimal bundle of:

- - Annual exam by PCP
- - BMI <30
- - No tobacco use
- - BP <130/80
- - LDL <100
- - Fasting blood sugar <125 or
-   Hg A1C <8
- No high risk drinking/drug use

went from 5.7 percent to 15.2 percent in June of 2015.
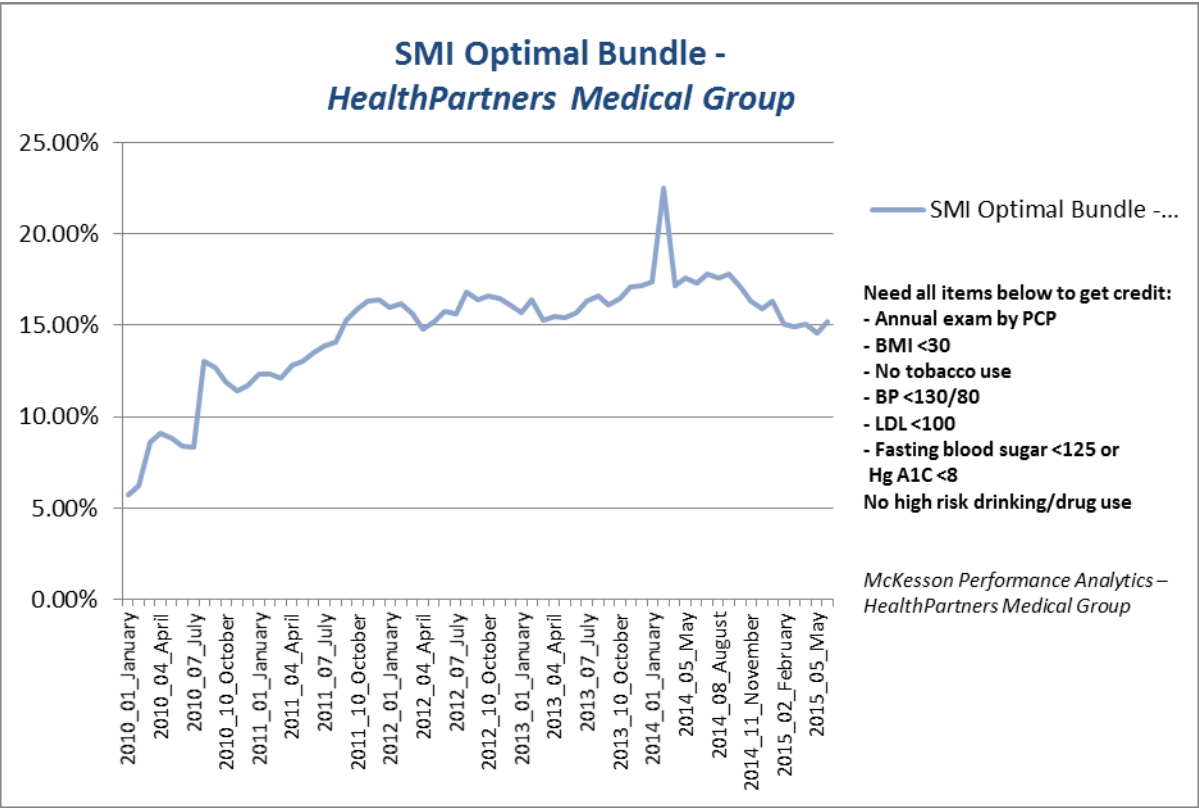
However, HPMG's efforts have not been widely duplicated in other clinical systems.

A new look at the data

While it is too soon to measure the work of 10x10, the new data does reinforce the urgency of the problem and offers us some new directions.

A fresh analysis of the data for 2008 – 2012, when compared to 2003 – 2007, found that the median age of death for people with serious mental illness and over 18 enrolled in Minnesota Health Care Programs showed no change.

- **2008 – 2012 median age of death for people with SMI: 58 years of age.**
- **Years of life lost, people with SMI compared to people without SMI: 25 years**

For both sampling periods, patients with bipolar affective disorders die the youngest (30 median years of life lost) with schizoaffective disorders being intermediate (24 median years of life lost), and schizophrenia having the least years of life lost (17 years). Generally, causes of death parallel that of the general population; however, people with SMI are succumbing sooner. Suicide and accidental deaths were higher, especially for those with bipolar disorder.

The top six causes of death for people with SMI were:

- **Heart disease**
- **Cancer**
- **Unintentional injury**
- **COPD**
- **Suicide**
- **Diabetes**

As opposed to the first round of analysis, the 2008 – 2012 data also looked at results by specific diagnosis. The most frequent causes of death for people with bipolar affective disorders were consistent and continue to be unintentional injuries, tobacco usage, substance use disorders and possibly obesity. People with schizophrenia not only die later than those with bipolar disorders, their deaths are more related to typical chronic diseases that lead to the death of non-SMI population (although 15 years earlier) including cardiovascular disease, cancer, and COPD. People with schizoaffective disorders had causes more consistent with schizophrenia. These findings suggest that difference tactics/interventions are required for different conditions and their health impact.

See the tables in Appendix A for in depth comparisons and discussion by diagnosis, gender, and race/ethnicity.

Conclusion

Given the data and our experience implementing the program:

- While we made less progress than we hoped, these condition-specific findings may lead to more targeted (and hopefully successful) interventions.
- One startling finding from the Minnesota 10x10 collaborative was how frequently readmissions were for medical reasons, and how inpatient psychiatric units need to take responsibility for treating routine medical problems AND more reliably communicating and handing off issues[8] to primary care.
- Our initial intent was to reduce median age of death for the SMI population by 10 years within 10 years (10x10). We were confident in the strategies to effect mortality health measures, but were certainly naïve about potential rate of change with such short timelines.
- We assumed incorrectly that we could treat serious mental illnesses as one homogeneous group and then focus on stratifying causes of heart disease, accidents, injuries, etc. and utilizing interventions for each of them based upon evidence and literature.
- In reality, people who have Bipolar Affective Disorder are dying considerably younger, and the leading cause of death is unintentional injuries. This suggests that interventions may need to be developed that focus on preventing or nipping manic episodes in the bud, including impulsivity, and substance use disorder comorbidities, while folks with schizophrenia need to focus on preventing and ameliorating chronic medical diseases.
- Two additional opportunities were identified. The first is to build on the promising work with ACT teams as well as the large multispecialty groups.
- The development of Behavioral Health Homes and Certified Behavioral Health Clinics in the past few years offers the potential to improve outcomes. However, there remains a small number of these integrated care delivery systems available throughout Minnesota.
- We naively anticipated that the MDs (primary care physicians, psychiatrist, ACT teams) would routinely commit measure and report the bundle data (like in Diamond/Minnesota Community Measurement). This was not the reality.
- We also hoped that between Substance Abuse and Mental Health Services Administration, National Quality Forum, and the Centers for Medicare and Medicaid Services there would be a standard unifying national quality bundle in this area, but the reality is that this will not be occurring in the foreseeable future.
- It is up to us in Minnesota to engage our community to intensify our actions and pursue funding and support to get the bundle measurement outcomes broadly and publicly displayed in Minnesota via Minnesota Community Measurement.

Countless articles end with the concept, "further research is needed." However, it is now well established that the population with SMI is dying early. Therefore, the authors feel what is needed is a great deal of urgency in building on these early efforts. What is poignant and urgent is the fact that 2,326 Minnesotan's died prematurely during our data collection period. Delays in developing successful tactic has palpable implications.

Appendix A: Data

Methods

The data for analysis for this study came from information from death certificates from the Minnesota Department of Health and from claims records for adults who were covered under one of the public health care programs. These included Medicaid (known as Medical Assistance in Minnesota), General Assistance Medical Care or Minnesota Care. The comparison population in the analysis consisted of adults who were 18 or older when they died during a 5-year period between the years of 2008 through 2012 and were enrolled in a Minnesota Health Care Program (MHCP) sometime during the 3 years prior to their death. A similar analysis was conducted for adults who died in the previous 5-year period between 2003 and 2007.

The target population for analysis was adults who had a diagnosis of schizophrenia, schizoaffective or bipolar diagnosis when receiving a mental health service covered under MHCP within 3 years of their death. Diagnoses for the target population were pulled from the ICD-9 billing diagnoses associated with the MHCP claims for both inpatient and non-inpatient mental health services. The classification of schizophrenia was based on ICD-9 codes in the 295 range, excluding the codes in the 295.7 range for schizoaffective diagnoses. The bipolar diagnoses included the ICD-9 diagnoses in the 296.4, 296.5, 296.6, 296.7 and 296.8 ranges. The comparison population for the target population excluded those adults who were included in the target population.

Information used in the analysis from MHCP claims included: gender, race, Hispanic ethnicity indicator, ICD-9 diagnoses and date of birth. Data used in the analysis from death records included: date of death, manner of death and cause of death. The underlying cause of death for analysis was based on derived measure called CODMORT, which is a classification grouping of individual ICD codes from the death certificates. The analysis further grouped the CODMORT into larger categories for general summarizations of the underlying cause of death. These major groupings are used by the Minnesota Department of Health and are consistent with CDC categories.

The target population of adults with an SMI diagnosis during the 3 years prior to their death was split into four groups: 1) adults with only schizophrenia diagnoses; 2) adults with only schizoaffective diagnosis; 3) adults with only bipolar diagnosis; or 4) adults with some combination of schizophrenia, schizoaffective or bipolar diagnoses during the 3-year period before their death. The analyses of the diagnostic specific group focused only on those adults who had only one of the three specific diagnostic groupings.

Analysis

The analysis included comparison of age at death for the target population with SMI, including the four diagnostic sub-groups, compared to the non-target population of adults in MHCP. The comparison included the variables of gender and race. In addition to age at death, the analysis compared the major cause of death from death certificate information.

A secondary analysis was conducted on possible three health risk factors that might help explain differences in age at death as well as cause of death. This analysis included examining the 3 years of MHCP medical claims prior to death for diagnoses that were related: 1) to tobacco or nicotine use; 2) obesity or BMIs 30 or higher; and 3) alcohol or drug diagnoses. Although this analysis was trying to identify health risk factors, it would only identify only the risk factors that had actually received a diagnosis and therefore probably undercount the clients with total risk factors.

Figure 1:

2008-2012 by whether MHCP clients who were 18 and over at time of death had an SMI diagnosis 3 years prior

Population	Gender	Number of deaths	Percent by gender	Median age at death	Mean age at death	SMI years of life lost compared to non-SMI population in median age at death
Non-serious mental Illness (SMI)	Female	35,202	63%	86	81.6	
	Male	21,025	37%	76	71.6	
	Total	56,227	100%	83	77.9	
SMI- schizophrenia, Schizoaffective or bipolar diagnoses	Female	1,241	53%	62	62.5	-24
	Male	1,085	47%	55	54.8	-21
	Total	2,326	100%	58	58.9	-25
Schizophrenia only	Female	368	48%	72	70.63	-14
	Male	394	52%	60	60.26	-16
	Total	762	100%	66	65.26	-17
Schizoaffective only	Female	145	58%	62	63.03	-24
	Male	104	42%	54	52.88	-22
	Total	249	100%	59	58.80	-24
Bipolar only	Female	477	57%	55	57.51	-31
	Male	356	43%	51	51.43	-25
	Total	833	100%	53	54.91	-30
SMI mixed diagnoses	Female	251	52%	60	59.95	-26
	Male	231	48%	52	51.33	-24
	Total	482	100%	56	55.82	-27
Total	Female	36,443	62%	86	80.99	
	Male	22,110	38%	74	70.76	
	Total	58,553	100%	83	77.13	

Figure 1 contains the totals for the target population of adults with a SMI diagnosis including the diagnostic sub-groups and the comparison population. A total of 58,553 adults who were enrolled in a MHCP during the 3 years prior to their death died during the 5-year period of 2008-2012. Of this population, 2,262 adults had one of the SMI diagnoses during the 3-year period prior to death. The target population with SMI had the following distribution: 762 with schizophrenia diagnoses only; 249 with schizoaffective diagnoses only; 833 with bipolar diagnoses only; and 482 with a combination of more than one of the SMI diagnoses. This left a comparison group of 56,227 adults who did met the target population criteria of not having a SMI diagnosis during the 3 years prior to death.

The SMI population has a more even distribution in gender (Female 53 percent) for the population who died compared to the MHCP non-SMI comparison population (Female 63 percent). The average years of life lost based on median age at death was 25 years for the entire population with SMI. There was variation in the average years of life lost depending on the diagnostic grouping with adults with bipolar diagnoses having the greatest loss (30 years lost) compared to the lowest group, adults with schizophrenia only (17 years lost).

Figure 2:

Percent of deaths and median age at death by major cause of death during CY 2003 – 2012 for adults in Minnesota health care programs (MHCP) by whether adult had a SMI diagnosis within 3 years of death comparison between 5 year periods

	Top 6 major cause of death for adults with SMI diagnoses	Non-SMI diagnoses			SMI diagnoses		
		2003-2007	2008-2012	Change	2003-2007	2008-2012	Change
Percent of deaths (order by top 6 causes for SMI 2008-2012)	Total % of deaths in Top 6	50%	48%	-1.9%	60%	62%	2.0%
	Heart disease	19.6%	17.2%	-2.4%	18.3%	15.4%	-2.9%
	Cancer	15.8%	16.5%	0.7%	14.3%	14.6%	0.3%
	Unintentional injury	4.4%	4.5%	0.2%	9.3%	13.0%	3.7%
	COPD	5.5%	5.9%	0.4%	6.1%	8.1%	2.0%
	Suicide	1.0%	0.8%	-0.2%	7.5%	5.9%	-1.6%
	Diabetes	4.1%	3.6%	-0.6%	4.0%	4.5%	0.5%
Median age at death	**Overall**	**83.0**	**83.0**	**0.0**	**58.0**	**58.0**	**0.0**
	Heart disease	86.0	86.0	0.0	59.0	57.0	-2.0
	Cancer	72.0	71.0	-1.0	60.0	62.0	2.0
	Unintentional injury	55.0	59.5	4.5	45.0	44.0	-1.0
	COPD	80.0	81.0	1.0	67.0	65.0	-2.0
	Suicide	37.5	42.0	4.5	40.0	38.5	-1.5
	Diabetes	80.0	80.0	0.0	61.0	61.0	0.0

Figure 2 provides a comparison of the difference between the population of adults with SMI vs adults without SMI diagnoses covered under MHCP in causes of death and median age of death. The figure contains the comparison for two 5-year periods: deaths during the 2003-2007 period and deaths during the 2008-2012 period. Overall, there was no change in the median age of death for both the adults with SMI diagnoses (median age=58 for both time periods) and adults without a SMI diagnosis (median age=83 for both time periods). This shows a consistent 25-year loss of potential years of life for adults with SMI for the two time periods. In a previous study (Trangle et al) of the same population for 2003-2007, there was reported a 24 years of potential life loss between the SMI and entire MHCP population, which included the SMI population. This analysis excludes the population with SMI from the MHCP comparison population. This change in the comparison population accounts the one year difference in years lost (24 vs 25) from the previous study.

Figure 2 also lists the top six causes of death for adults with SMI during both time periods. While the median age of death did not change across the two time periods, the median age of death decreased (younger) for the five leading causes of death. For both time periods, heart disease was the leading cause of death for the adults with SMI, although the percent of deaths dropped from 18.3 percent in the earlier 5-year period to 15.4 percent during the latest time period. Cancer was the second leading cause at a little over 14 percent for both time periods. The third leading cause of death, unintentional injury, showed a large jump from 9.3 to 13 percent of deaths over the two periods. The median age of death also dropped from 45 to 44 years of age over time, while for the non-SMI population the average age of death increased from 55 to 59.5 years of age.

Across the time periods, the rank order and percent of deaths due to Chronic obstructive pulmonary disease (COPD) and suicide changed. The percent of deaths due to COPD increased from 6.1 to 8.1 percent, while the percent of deaths due to suicide dropped from 7.5 to 5.9 percent over time.

Figure 3:

Percent of deaths and median age at death by major cause of death during CY 2003 – 2012 based on Minnesota Department of Health death certificate by which SMI diagnoses the person had within 3 years of death comparison between 5-year periods

	Top 6 major cause of death for adults with SMI diagnoses	Population by diagnoses								
		Schizophrenia only			Schizoaffective only			Bipolar only		
		5 Year period			5 Year period			5 Year period		
		2003-2007	2008-2012	Change	2003-2007	2008-2012	Change	2003-2007	2008-2012	Change
Percent of deaths (order by top 6 causes for SMI 2008-2012)	Total % of deaths in top 6	59%	60%	0.6%	58%	62%	3.4%	59%	62%	2.5%
	Heart disease	20.2%	16.3%	-4.0%	18.6%	17.3%	-1.3%	15.6%	14.5%	-1.1%
	Cancer	15.0%	18.6%	3.6%	15.6%	15.7%	0.0%	11.7%	11.6%	0.0%
	Unintentional injury	5.1%	6.7%	1.6%	5.6%	8.8%	3.2%	14.8%	19.0%	4.2%
	COPD	8.6%	10.0%	1.4%	8.3%	8.8%	0.5%	3.4%	5.2%	1.7%
	Suicide	5.8%	3.8%	-2.0%	5.0%	5.2%	0.2%	10.0%	8.0%	-2.0%
	Diabetes	4.5%	4.5%	-0.1%	5.3%	6.0%	0.7%	3.8%	3.6%	-0.2%
Median age at death	**Overall**	**66.0**	**66.0**	**0.0**	**59.0**	**59.0**	**0.0**	**52.0**	**53.0**	**1.0**
	Heart disease	65.0	61.0	-4.0	57.0	55.0	-2.0	56.0	55.0	-1.0
	Cancer	61.5	64.0	2.5	56.0	60.0	4.0	60.0	58.0	-2.0
	Unintentional injury	52.0	54.0	2.0	46.0	47.0	1.0	42.0	41.0	-1.0
	COPD	67.0	68.0	1.0	75.0	66.5	-8.5	64.0	65.0	1.0
	Suicide	35.0	42.0	7.0	45.0	40.0	-5.0	41.0	40.0	-1.0
	Diabetes	73.0	62.0	-11.0	61.0	62.0	1.0	58.5	65.0	6.5

Figure 3 provides the comparison of the changes across the two time periods for each of the SMI diagnostic groups for the six leading causes of death. The figure shows the percent of causes of death and median age at death for each of the diagnoses groups: schizophrenia, schizoaffective and bipolar diagnostic groups. Adults were only included in each of these groups if they had only one of the three diagnostic groups during the 3-year period before their death. For adults with schizophrenia, there was no change in the age at death of 66. For adults with schizoaffective diagnoses, the age at death remained the same (59). The youngest age of death was for adults with bipolar diagnoses with a slight increase in age at death from 52 to 53 across the two time periods. All three groups showed an increase in unintentional injury as a cause of death across time periods. However, for adults with bipolar diagnoses unintentional injury became the leading cause of death for the latest time period. The median age at death for unintentional injury was the youngest for the latest time period for adults with bipolar at 41 years of age. The age of suicide for the population with bipolar was only a year younger at 40 years of age.

While adults with schizophrenia showed a decrease in the percent dying due to heart disease from 20.2 to 16.3 percent, the median age of death also dropped from 65 to 61 years of age. Cancer became the leading cause of death during the second time period at 18.6 percent overtaking heart disease. However, the age of cancer causes deaths increased from 61.5 to 64 years for adults with schizophrenia. While the percent of death due to diabetes for adults with schizophrenia did not change across the two time periods (4.5 percent of deaths), the median age at death decreased from 73 to 62 years of age over the period.

Figure 4:

Percent of deaths and median age at death by major cause during CY 2008 – 2012 based on Minnesota Department of Health death certificate for adults in MHCP by whether adult had an SMI diagnosis within 3 years of death. Major causes of death listed from highest percent of deaths for adults with SMI.

	Top 6 major causes of death for adults with SMI diagnoses	Population by diagnoses							
		Non-SMI diagnoses				SMI diagnoses			
		Gender				Gender			
		Female	Male	Total	Rank	Female	Male	Total	Rank
Percent of deaths (rank Is among top 6 causes for SMI)	Total % of deaths in top 6	45%	54%	48%		57%	66%	62%	
	Heart disease	17.2%	17.1%	17.2%	1	13.3%	17.8%	15.4%	1
	Cancer	14.5%	19.7%	16.5%	2	16.0%	13.1%	14.6%	2
	Unintentional injury	3.7%	5.9%	4.5%	6	10.2%	16.3%	13.0%	3
	COPD	5.7%	6.3%	5.9%	4	8.6%	7.5%	8.1%	4
	Suicide	0.4%	1.5%	0.8%	12	4.4%	7.6%	5.9%	5
	Diabetes	3.4%	3.8%	3.6%	7	5.0%	4.0%	4.5%	6
Median age at death (rank is youngest to oldest in 6 causes)	**Overall**	**86.0**	**76.0**	**83.0**		**62.0**	**55.0**	**58.0**	
	Heart Disease	89.0	80.0	86.0	6	64.0	54.0	57.0	3
	Cancer	74.0	68.0	71.0	3	63.5	59.0	62.0	5
	Unintentional injury	82.0	52.0	59.5	2	45.5	44.0	44.0	2
	COPD	82.0	79.0	81.0	5	65.0	65.0	65.0	6
	Suicide	41.0	43.0	42.0	1	43.0	33.0	38.5	1
	Diabetes	83.0	73.0	80.0	4	65.0	56.0	61.0	4

Figure 4. In examining the difference in years of life lost between adults with SMI diagnoses and those without for CY 2008-2012, the major causes of death were reviewed. The major causes of death were groupings of the detailed causes from death certificates into 19 groupings of underlying causes of death, including a Residual category that combined a variety of causes including the undefined. **Figure 5** provides a summary from the top six underlying causes of death (excluding the Residual category) for adults with SMI diagnoses. These top six causes accounted for 62 percent of all deaths among the population with SMI diagnoses compared to 48 percent for those without SMI diagnoses. The top three causes for adults with SMI diagnoses were heart disease (15.4 percent), cancer (14.6 percent) and Unintentional injury (13.0 percent). Suicide was the fifth leading cause at 5.9 percent of the deaths for those with SMI compared to 0.8 percent of deaths for adults without SMI. However, suicide had the youngest overall age of death for adults with SMI diagnoses at a median age of 38.5 years of age. The next youngest age of death was 44 years of age due to Unintentional injury.

A couple of patterns show up in Figure 5 that help to explain the early mortality rate among adults with a SMI. heart disease and cancer are the top 2 causes of death for both adults with and without SMI and the percentages of causes of death are not strikingly different although slightly lower for adults with SMI (for both heart disease and cancer 30 percent for adults with SMI compared to 33.6 percent for adults without SMI). However for the leading 2 causes, the median age of death is much younger for adults with SMI. For heart disease the median age of death is 57 for adults with SMI compared to 86 for adults without SMI. For cancer the median age of death is 62 for adults with SMI compared to 71 for adults without SMI.

Another major difference between the populations is the much higher causes of death and age at death due to unintentional injury. The unintentional injury accounted for 13 percent of deaths for the population with SMI with a median age of death of 44 compared to only 4.5 percent of deaths and at a median age of 59.5 for those without SMI.

Figure 5:

Percent of deaths and median age at death by major cause of death during CY 2008 – 2012 by which SMI diagnoses the person had within 3 years of death.

	Top 6 major cause of death for adults with SMI diagnoses	Schizophrenia only			Schizoaffective only			Bipolar only		
		Gender			Gender			Gender		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
Percent of deaths (rank Is among top 6 causes for SMI)	Total % of deaths in top 6	54%	65%	60%	58%	67%	62%	58%	67%	62%
	Heart disease	13.6%	18.8%	16.3%	17.9%	16.3%	17.3%	11.9%	18.0%	14.5%
	Cancer	20.9%	16.5%	18.6%	16.6%	14.4%	15.7%	13.0%	9.8%	11.6%
	Unintentional injury	4.9%	8.4%	6.7%	4.1%	15.4%	8.8%	15.5%	23.6%	19.0%
	COPD	8.7%	11.2%	10.0%	8.3%	9.6%	8.8%	6.5%	3.4%	5.2%
	Suicide	1.6%	5.8%	3.8%	4.1%	6.7%	5.2%	7.1%	9.3%	8.0%
	Diabetes	4.3%	4.6%	4.5%	6.9%	4.8%	6.0%	4.0%	3.1%	3.6%
Median age at death (Rank is youngest to oldest)	**Overall**	**72.0**	**60.0**	**66.0**	**62.0**	**54.0**	**59.0**	**55.0**	**51.0**	**53.0**
	Heart disease	74.5	56.5	61.0	56.5	54.0	55.0	61.0	52.0	55.0
	Cancer	69.0	62.0	64.0	61.5	59.0	60.0	60.0	57.0	58.0
	Unintentional injury	53.5	54.0	54.0	56.0	46.0	47.0	40.5	41.5	41.0
	COPD	71.5	66.0	68.0	67.0	65.5	66.5	64.0	68.0	65.0
	Suicide	52.0	40.0	42.0	52.0	27.0	40.0	40.0	37.0	40.0
	Diabetes	74.0	56.5	62.0	63.5	61.0	62.0	72.0	60.0	65.0

In **Figure 5** we examined if there were any differences in cause of death and age at death due to diagnoses among the population with any SMI diagnoses. This figure analyzes the differences in gender and diagnostic groupings (schizophrenia, schizoaffective, or bipolar) by percent of deaths and median age at death. For the population with bipolar only diagnoses, the leading cause for both females (15.5 percent) and males (23.6 percent) was Unintentional injury with young ages of death (females 40.5 years and males 41.5 years). For females, this cause of death was triple the percent (15.5 percent) than those females with only schizophrenia (4.9 percent) and schizoaffective (4.1 percent) diagnoses. The age at death for those with bipolar diagnoses due to unintentional injury was 13 years younger than for both females and males with schizophrenia.

In general, the pattern regarding heart disease and cancer is that females were more likely to die from cancer while the males are more likely to die from heart disease. However, the females with schizophrenia showed a much wider difference (20.9 percent from cancer and 13.6 percent from heart disease) than the other diagnostic groupings. However the age at death for females with schizophrenia for both cancer (69 years) and heart disease (74.5 years) was for heart disease at least 12 years higher and for cancer at least 6 years higher than for females with other diagnoses. For males with schizophrenia the pattern was similar but with much smaller differences between diagnoses.

The next analyses was to attempt to find any support for underlying risk factors for these causes of early mortality due to these causes of death. The risk factors that were considered were: 1) having a tobacco or nicotine diagnosis; 2) having a diagnosis indicating obesity or a BMI above 30; or 3) having a substance abuse diagnosis, excluding tobacco/nicotine. The analysis involved examining claims for the 3 years prior to death to see if the adult had any of these diagnoses. For the following three figures, if a person had at least one of these diagnoses during the 3 year period they were counted in the risk group.

Appendix B: Literature review

New research continues to be published reinforcing the need for Minnesota 10x10. Pertinent new literature highlights that:

- Schizophrenia is underreported as a cause of death
- Patients with bipolar affective disorders die earlier than other patients with SMI
- Substance use disorders and use of atypical antipsychotics are significant contributors to early mortality.

Poldednak[9] utilized the National Center for Health Statistics Multiple Cause of Death database to highlight the difficulty of accurately attributing the cause of death as well as trends of death for patients with schizophrenia. The annual death rate per 100,000 for patients with schizophrenia listed as the underlying cause was small, fluctuated over time, and declined from 0.22 in 1999 to 0.13 in 2010. When he included all deaths with mention of schizophrenia, the rates increased to 14.1 percent in 1999 and declined to 10.5 percent in 2010. This decline was slower than the decline in deaths for the general population such that the proportion of US resident's death attributed to schizophrenia increased from 0.1863 percent in 1999 to 0.2739 in 2010. Most common causes of death included cardiovascular disease (27.9 percent ages 15-64 and 36.3 percent for ages 65+), followed by Neoplasms, external causes and respiratory diseases, Endocrine diseases especially in males 15 to 64. When Poldednak looked at schizoaffective psychosis as the underlying cause of death, the numbers were small (14-38/year) with only 30 deaths between 1999-2010. Death rates with mention of schizoaffective psychosis increased from 0.097 in 1999 to 0.174 in 2010.

In 2014 Laursen[10] et al's review on early mortality in schizophrenia summarized a number of studies when he stated that the lives of persons with schizophrenia are between 10-25 years shorter than the general population (Demark-11.2 years shorter; Sweden - 12 years shorter for males 15 years shorter for females; Israel – 12 years shorter; UK – 14.6 years shorter; Finland – 10-15 years shorter. Another Finnish follow-up[11] showed that in 1996 life expectancy at age 20 was 25 years shorter and 22.5 years shorter in 2006. Laursen's review puts the lifetime risk of suicide between 4-10 percent with the highest risk in the first year after involvement with the mental health system.

Ramsey et al noted that the odds of mortality for patients with lifetime manic spectrum episodes for patients after 26 year follow-up showed higher mortality than same age cohorts (age 30-44 years at baseline OR=1.39, 45 percent CI=[1.00, 193] and for 45-64 years at baseline OR=1.41, 95 percent CI[1.02, 1.95]). There was no such significant correlation for the 65 or greater at baseline. This data showed significantly higher prevalence of both alcohol and nonalcoholic drug abuse/dependence in those with greater mortality and no statistically increased rate of substance abuse/dependence in bipolar spectrum patients with normal mortality.[12]

Osby found that mortality for patients with bipolar is about 2 times higher, suicide rate 10 times higher than the general population in Sweden followed from1973 to 1995. Suicide mortality is especially high in the first year post diagnosis.[13]

Murray-Thomas et al analyzed a large database (General Practice Research Data Base in UK 4/97-1/2001 consisting of 183,392 antipsychotic users [115,491 typical; 67.901 atypical]; 193,920 patients with schizophrenia, bipolar, dementia who did not use antipsychotics; 544,726 general population controls). They showed that risk of all-cause mortality, cardiac mortality and sudden cardiac death was highest with patients who used atypical antipsychotics followed by typical antipsychotics, followed by the above referred psychiatric patients who did not use antipsychotics and was lowered in the general population.[14]

Appendix C: References

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