Important Update to Mortality Analysis
Comparing Training Center and Community Placements

A previous analysis of mortality based on June 2014 data provided by the Department of Behavioral Health and Developmental Services implied results that were inconsistent with previous trends and methodologically incorrect. When this was pointed out to them, the DBHDS simply provided unanalyzed data in August of 2014 in preparation for the September Work Group. Although the updated data are also incomplete in important ways, there are compelling reasons for providing this updated analysis:

1. Comparative mortality rates between Training Center and community settings is one of the few early warning indicators of risk available given that the other Quality Improvement indicators are either not yet established or mature enough to provide results.
2. This comparative analysis, although limited by several considerations, reveals a statistically significant finding: those discharged to the community experienced double the mortality rate as those remaining in Training Centers.
3. This result warrants a more thorough and timely analysis as a guide to taking corrective action if these preliminary results are validated.

Data and Limitations

A full analysis should verify data accuracy and completeness with regard to several considerations. This preliminary analysis had to work around limitations in the data that were offered. The following list of considerations are followed by reasons to believe that this preliminary analysis should be a reasonable approximation of a full analysis:

1. Assure that the health risks of those who transitioned to the community are understood relative to those who remained in Training Centers before making any comparison.
    a. In this analysis, CVTC was dropped from the Training Center population baseline since it offers skilled nursing services to many who are at high-risk of dying.
    b. Of those remaining, all were originally Training Center residents, whether they transitioned or remained until the end of the data collection period.

   c. If anything, those remaining in Training Centers should be those most difficult to place in the community, hence those with inherently higher mortality risk.
2. Verify the accuracy of the census numbers for each Training Center and the population that transitioned into the community.
   a. The August Training Center census numbers tend to agree with those given previously by DBHDS.
   b. The August data set did not explicitly state the number of individuals transitioned to the community for each time period, so these numbers had to be inferred from decline Training Center census minus deaths during each period. The inferred community census numbers tended to be somewhat greater than those previously reported by DBHDS.
   c. It would improve the analysis if all census figures were available for each 6-month time period.
3. Verify that all deaths have been accounted for and properly attributed to the proper time period and to either a Training Center or community setting.
   a. The Settlement Agreement requires accurate tracking of those discharged from Training Centers who subsequently die. Thus, there is high confidence that DBHDS scrupulously tracked and reviewed all deaths among those discharged to the community.
   b. The number of deaths among the Training Center population is reported; however, if some residents in failing health were transferred to nursing homes where they subsequently died, the attribution might not have been made to the Training Center. This possibility is only speculation as there is no evidence that all deaths of Training Center residents were not in fact attributed to their Center of origin.
   c. It is important to report the time series of deaths not only by the location of the resident but also by the time of death. Irregularities in the time series of deaths might reveal specific high-risk periods, unexpected even by the standards of statistical fluctuation. This could draw attention to possible underlying causes. By contrast, some chance fluctuations might be shown to be simply random

events and prevent a great deal of effort being spent trying to find a causal mechanism that does not exist.

Training Center Mortality Rates

The August data set gave the yearly census for each Training Center from July of 2011 thru July 2014 along with the total number of deaths for each of the centers during the time period from October 2011 thru July 2014. Table 1 shows these census numbers, including an estimate of each Training Center's census for October 2011 obtained by linear interpolation. By accumulating the number of person-years for each of the periods between the census times, the column titled "person-years" gives the exposure for each Training Center over the period October 2011 thru July 2014. Dividing this exposure into the total number of deaths over that time period yields a mortality rate. Multiplying that rate by 1,000 gives the mortality rate per 1,000 individuals as shown in the last column.

Table 1. Training Center Censuses, Deaths, and Mortality Rates

Data from Sept 2014 WG materials:		Period of Tracking Deaths						
Training Center	Jul-11	Oct-11	Jul-12	Jul-13	Jul-14	Person-Years	Deaths	Mortality per 1,000
CVTC Census	381	371	342	301	288	883	41	46.4
SVTC	242	231	197	114	0	373	5	13.4
NVTC	157	156	153	135	106	380	12	31.5
SWVTC	181	179	173	156	144	447	10	22.4
SEVTC	123	118	104	84	75	257	3	11.7
Non-CVTC Census	703	684	627	489	325	1457	30	20.6
Total TC Census	1,084	1,055	969	790	613	2,340	71	30.3

Other DBHDS sources give 74 as having discharged between July 2013 and mid-June 2014 versus 145.
Oct - 11 census is interpolation between 2011 and 2012 census and agrees well with interpolation between July 2011 and January 2012 [from other DBHDS source].
Person-years is the average number of people exposed for the duration of exposure in years.
Finding: Mortality is twice as high at CVTC as other centers, but this is largely expected since 23% of CVTC's residents live in the Skilled Nursing Facility for those with the most challenging medical conditions.

Clearly, Central Virginia Training Center stands out among the other centers as exhibiting a much higher mortality rate as expected. Therefore, a fair comparison with the community would be to use the mortality rate for all of the other centers combined. This comparison would assume, of course, that CVTC does not discharge individuals who are expected to die into the community. Table 1 shows that the mortality rate for all four other centers is 20.6 per year per 1,000 residents, less than half that at CVTC during this time period. This difference has odds of less than a 1:900 of being a random event.

Community Mortality Rates

Since the August data did not list the census figures for those who transitioned into the community, these figures have to be inferred from the drop in Training Center census and the losses due to mortality. Table 2 shows that the estimated total census in Training Centers was 1,055 in October 2011. Subsequently, that census declined as residents were discharged or died and by July 2014 had dropped to 613.

Table 2. Estimated Cumulative Community Census and Mortality

	Period of Tracking Deaths						
Training Center	Oct-11	Jul-12	Jul-13	Jul-14	Person-Years	Deaths	Mortality per 1,000
Total TC Census	1,055	969	790	613		71	
Cumulative Deaths based on Time Passed	0	24	57	89		89	
Cumulative Community Census	0	62	209	353	439	18	41.0

Cumulative deaths are the number of deaths expected in each time period assuming a constant mortality rate.
(Community Census) = (Oct-11 TC Census) - (Current TC Census) - (Cumulative Deaths to Current Date)
Note the Settlement Agreement requires only about 300 transition slots by the end of FY2014 versus 353.

The August data gave the total number of deaths as 71 in Training Centers and 18 among those discharged to the community. This preliminary analysis assumes that residents in either setting constitute a fixed population of 1,055 that died at a uniform rate between October 2011 and July 2014. Although this implicitly assumes that the community and Training Center mortality rates are equal, the correction for inserting their respective different mortality rates would be entirely negligible in this preliminary analysis. The estimated community census is, therefore, the difference between the initial census and the sum of those remaining in Training Centers and those who died as shown in the bottom row of Table 2.

Finally, the number of deaths in the community divided by the number of person-years of exposure is the mortality rate, and when multiplied by 1,000, it yields the rate of 41.0 per year per 1,000 residents.

Comparison of Mortality Rates

The mortality rate in the community of 41.0 per 1,000 is almost exactly double that for those in all of the Training Centers except CVTC of 20.6 per 1,000. This is a remarkable difference, and is it statistically significant result. Applying Fisher's exact test to the 2x2 table made up

of person-years and numbers of deaths, the odds of this difference being the result of a random event is 1:40 against.

Unless there is some unrecognized difference between the population remaining in the four centers and those discharged to the community, the discharge process and new community placements have caused a large increase in mortality. The expected differences in these populations, however, would work counter to this finding:

1. One would expect those remaining in Training Centers to be more disabled and at risk, hence to have a higher mortality rate.
2. The community census obtained here by computing the residual appears to be somewhat larger than that found by comparison with other sources at intermediate time periods, but a larger census would diminish rather than increase the computed mortality for the community.

Discussion of Findings

Although this is a preliminary analysis and based on the limited data provided by DBHDS for the September Work Group, these data are sufficient to derive estimates of Training Center and community mortality rates for a population that initially all resided in Training Centers. Excluding the CVTC population from the estimation of mortality since it includes those at exceptional risk of dying, the estimated mortality in those transitioning to the community is double that of those who remained in Training Centers.

This remarkably higher mortality in the community might be partially explained simply by the risks of moving very vulnerable individuals into a new support system. However, a doubling of the mortality rate seems to be a very steep price to pay for this transition, and there is no assurance that this doubling will be a transient phenomenon.

These findings warrant a thorough mortality study to either validate or refute these preliminary findings.

If a thorough analysis bears out these preliminary findings, DBHDS needs to understand and reduce this greatly elevated mortality rate in the community as expeditiously as possible.