Question 5: The following data show the recovery from various disabilities in two nursing homes. Two sets of data are presented. The first set shows the disabilities of the patients at admission to the nursing home, using variables that start with "u", standing for "unable". The recovery from the disabilities is also shown in variables that start with "r". Compare the performance of these two nursing homes using distribution switch method.

```
SELECT ID
      ,cast([Age] as float) as Age
      ,Iif ([Sex]='M', 1, 0) AS [Male]
      ,[NursingHome]
      ,cast([uEat] as int) as uEat
      ,cast(uSit as int) as uSit
      ,cast(uGroom as int) as uGroom
      ,cast(uToilet as int) as uToilet
      ,cast(uBathe as int) as uBathe
      ,cast(uWalk as int) as uWalk
      ,cast(uDress as int) as uDress
      ,cast(uBowel as int) as uBowel
      ,cast(uUrine as int) as uUrine
      ,cast(nRecovery as int) as Recovered
  INTO #Nurse_Cast
  FROM [dbo].[NursingHomeCompare_q5] --(212523 rows affected)

SELECT * FROM #Nurse_Cast

--Grouping age and Finding probability
SELECT
    Case when Age < 25 then 'AgeGroup1-25'
         when Age >= 25 AND Age < 50 then 'AgeGroup25-50'
         when Age >= 50 AND Age < 75 then 'AgeGroup50-75'
         when Age >= 75 then 'AgeGroup75-100' END as AgeGroup
      ,[Male]
      ,[NursingHome]
      ,[uEat]
      ,[uSit]
      ,[uGroom]
      ,[uToilet]
      ,[uBathe]
      ,[uWalk]
      ,[uDress]
      ,[uBowel]
      ,[uUrine]
      ,sum(Recovered) as Recovered
      ,count(Recovered) as Num_Patients --Total Number of patients recovered
      ,case when ((sum(uEat) + sum(uSit) + sum(uGroom) + sum(uToilet) + sum(uBathe)
      + sum(uWalk) + sum(uDress) + sum(uBowel) + sum(uUrine)) = 0) then 0  -- To avoid negative
denominator
      else cast(cast(sum(Recovered) as float)/(sum(uEat) + sum(uSit) + sum(uGroom) + sum(uToilet) +
sum(uBathe)
      + sum(uWalk) + sum(uDress) + sum(uBowel) + sum(uUrine)) as decimal(4,2)) end as Probability
  Into #Nursing_Home
  FROM #Nurse_Cast
  where age > 0 and age < 100 -- Removing impossible cases
  Group by Age, Male, uEat, uSit, uGroom, uToilet, uBathe, uWalk, uDress, uBowel, uUrine, NursingHome;
--(4763 rows affected)

Select TOP 10 * FROM #Nursing_Home
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	AgeGroup	Male	NursingHome	uEat	uSit	uGroom	uToilet	uBathe	uWalk	uDress	uBowel	uUrine	Recovered	Num_Patients	Probability
1	AgeGroup50-75	1	A	0	0	1	0	1	1	0	1	1	311	92	0.68
2	AgeGroup75-100	1	B	0	0	1	1	1	0	1	0	1	16	112	0.03
3	AgeGroup50-75	1	B	1	0	1	1	1	1	0	0	1	0	1	0.00
4	AgeGroup75-100	0	A	0	0	1	1	1	0	1	0	0	1	1	0.25
5	AgeGroup75-100	1	A	1	1	1	1	1	1	0	1	0	29	5	0.83
6	AgeGroup75-100	1	A	0	0	1	0	1	0	0	1	1	215	82	0.66
7	AgeGroup75-100	1	A	0	0	1	1	0	1	0	0	1	0	1	0.00
8	AgeGroup75-100	1	A	0	0	1	1	1	1	1	1	1	3284	705	0.67
9	AgeGroup25-50	1	B	0	0	0	1	0	0	0	0	0	1	3	0.33
10	AgeGroup75-100	1	B	1	0	1	1	1	0	1	1	1	0	4	0.00

```
--Calculating pattern of care for Nursing home A:
SELECT [AgeGroup] as AgeGroup1
      ,[Male] as Male1
      ,[uEat] as [uEat1]
      ,[uSit] as [uSit1]
      ,[uGroom] as [uGroom1]
      ,[uToilet] as [uToilet1]
      ,[uBathe] as [uBathe1]
      ,[uWalk] as [uWalk1]
      ,[uDress] as [uDress1]
      ,[uBowel] as [uBowel1]
      ,[uUrine] as [uUrine1]
      ,MAX(Recovered) as Recovered1
      ,MAX(Num_Patients) as Num_Patients1
      ,MAX(probability) as prob1
INTO #Nurse_A
FROM #Nursing_Home
WHERE NursingHome='A'
GROUP BY [AgeGroup], [Male], [uEat],[uSit], [uGroom],
         [uToilet], [uBathe], [uWalk], [uDress], [uBowel], [uUrine] --(884 rows affected)

--Calculating pattern of care for Nursing home B:
SELECT [AgeGroup] as AgeGroup2
      ,[Male] as Male2
      ,[uEat] as [uEat2]
      ,[uSit] as [uSit2]
      ,[uGroom] as [uGroom2]
      ,[uToilet] as [uToilet2]
      ,[uBathe] as [uBathe2]
      ,[uWalk] as [uWalk2]
      ,[uDress] as [uDress2]
      ,[uBowel] as [uBowel2]
      ,[uUrine] as [uUrine2]
      ,MAX(Recovered) as Recovered2
      ,MAX(Num_Patients) as Num_Patients2
      ,MAX(probability) as prob2
INTO #Nurse_B
FROM #Nursing_Home
WHERE NursingHome='B'
GROUP BY [AgeGroup], [Male], [uEat],[uSit], [uGroom],
         [uToilet], [uBathe], [uWalk], [uDress], [uBowel], [uUrine]--(785 rows affected)

SELECT TOP 10 * FROM #Nurse_B

-- Matching A and B nursing homes on common strata--
SELECT CASE When [AgeGroup1] IS null Then [AgeGroup2] Else [AgeGroup1] END as [AgeGroup1]
    , CASE When [Male1] IS null Then [Male2] Else [Male1] END as[Sex1]
    , CASE When [uEat1] IS null Then [uEat2] Else [uEat1] END as[uEat1]
    , CASE When [uSit1] IS null Then [uSit2] Else [uSit1] END as[uSit1]
    , CASE When [uGroom1] IS null Then [uGroom2] Else [uGroom1] END as[uGroom1]
    , CASE When [uToilet1] IS null Then [uToilet2] Else [uToilet1] END as [uToilet1]
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    , CASE When [uBathe1] IS null Then [uBathe2] Else [uBathe1] END as [uBathe1]
    , CASE When [uWalk1] IS null Then [uWalk2] Else [uWalk1] END as [uWalk1]
    , CASE When [uDress1] IS null Then [uDress2] Else [uDress1] END as [uDress1]
    , CASE When [uBowel1] IS null Then [uBowel2] Else [uBowel1] END as [uBowel1]
    , CASE When [uUrine1] IS null Then [uUrine2] Else [uUrine1] END as [uUrine1]
    , CASE WHEN Recovered1 IS NULL Then null Else Recovered1 END AS Recovered1
    , CASE WHEN Num_Patients1 IS NULL Then null Else Num_Patients1 END AS Num_Patients1
    , CASE When Prob1 IS null Then 0 Else Prob1 END AS Prob1
    , CASE When [AgeGroup2] IS null Then [AgeGroup1] Else [AgeGroup2] END as [AgeGroup2]
    , CASE When [Male2] IS null Then [Male1] Else [Male2] END AS [Sex2]
    , CASE When [uEat2] IS null Then [uEat1] Else [uEat2] END as[uEat2]
    , CASE When [uSit2] IS null Then [uSit1] Else [uSit2] END as[uSit2]
    , CASE When [uGroom2] IS null Then [uGroom1] Else [uGroom2] END as[uGroom2]
    , CASE When [uToilet2] IS null Then [uToilet1] Else [uToilet2] END as [uToilet2]
    , CASE When [uBathe2] IS null Then [uBathe1] Else [uBathe2] END as [uBathe2]
    , CASE When [uWalk2] IS null Then [uWalk1] Else [uWalk2] END as [uWalk2]
    , CASE When [uDress2] IS null Then [uDress1] Else [uDress2] END as [uDress2]
    , CASE When [uBowel2] IS null Then [uBowel1] Else [uBowel2] END as [uBowel2]
    , CASE When [uUrine2] IS null Then [uUrine1] Else [uUrine2] END as [uUrine2]
    , CASE WHEN Recovered2 IS NULL Then null Else Recovered2 END AS Recovered2
    , CASE WHEN Num_Patients2 IS NULL Then null Else Num_Patients2 END AS Num_Patients2
    , CASE When Prob2 IS null Then 0 Else Prob2 END AS Prob2
INTO #Match
FROM #Nurse_A Full Join #Nurse_B on [AgeGroup1] = [AgeGroup2] and [Male1] = [Male2] and [uEat1] =
[uEat2]
and [uSit1] = [uSit2] and [uGroom1] = [uGroom2] and [uToilet1] = [uToilet2] and [uBathe1] = [uBathe2]
and [uWalk1] = [uWalk2] and [uDress1] = [uDress2] and [uBowel1] = [uBowel2] and [uUrine1] = [uUrine2] -
-(989 rows affected)

SELECT top 10 * FROM #Match

--Removing All the cases that doesn't exist in one or rarely exists in another nursing home
--Removing patients who are less likely to have comorbidities
DELETE from #Match WHERE (Num_Patients1 <= 2  and Num_Patients2 is NULL)
or (Num_Patients2 <= 2 and Num_Patients1 is NULL) --(305 rows affected)

--Finding remaining unmatched strata
SELECT * FROM #Match WHERE Recovered1 is NULL or Recovered2 is NULL
ORDER BY AgeGroup1, sex1, uEat1, uSit1, uGroom1,uToilet1,uBathe1, uWalk1,uDress1,uBowel1,uUrine1
-- (4 rows affected)

-- Calculating synthetic cases for missing Recovered1 and Recovered2
SELECT
     [AgeGroup1] AS [AgeGroup]
    ,[Sex1] AS [Sex]
    ,[uEat1]   AS [uEat]
    ,[uSit1]   AS [uSit]
    ,[uGroom1] AS [uGroom]
    ,[uToilet1] AS [uToilet]
    ,[uBathe1]  AS [uBathe]
    ,[uWalk1]   AS [uWalk]
    ,[uDress1]  AS [uDress]
    ,[uBowel1]  AS [uBowel]
    ,[uUrine1]  AS [uUrine]
    ,Prob1
    ,CASE WHEN Recovered1 IS NULL
        THEN
            CASE WHEN (SELECT AVG(Recovered) FROM #Nursing_Home WHERE NursingHome='A') = 0 THEN 0
            WHEN (AgeGroup1 = 'AgeGroup25-50' and Sex1 = 1 and uToilet1 = 1 and uBathe1 = 1 and uDress1
= 1 and uEat1 = 0 and uSit1 = 0 and ugroom1 = 0 and uWalk1 = 0 and
                    uBowel1 = 0 and uUrine1 = 0) THEN
(SELECT Avg(Recovered) FROM #Nursing_Home INNER JOIN #Match ON uBathe1 =uBathe2 and uDress1=uDress2
WHERE #Nursing_Home.NursingHome='A')
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*(SELECT Avg(Recovered) FROM #Nursing_Home INNER JOIN #Match ON uToilet1=uToilet2 WHERE
#Nursing_Home.NursingHome='A')
                /(SELECT AVG(Recovered) FROM #Nursing_Home WHERE NursingHome='A')
            END
        ELSE Recovered1 END AS Recovered1
    ,Prob2
    ,CASE WHEN Recovered2 IS NULL
        THEN
            CASE WHEN (SELECT AVG(Recovered) FROM #Nursing_Home WHERE NursingHome='B') = 0 THEN 0
            WHEN (AgeGroup2 = 'AgeGroup25-50' and Sex2 = 0 and uBathe2 = 1 and uWalk2 = 1  and uDress2
= 1 and uToilet2 = 0  and uEat2 = 0 and uSit2 = 0 and uGroom2 = 0 and
                    uBowel2 = 0 and uUrine2 = 0) THEN
(SELECT Avg(Recovered) FROM #Nursing_Home INNER JOIN #Match ON  uBathe1=uBathe2 and uDress1=uDress2
WHERE #Nursing_Home.NursingHome='B')
*(SELECT Avg(Recovered) FROM #Nursing_Home INNER JOIN #Match ON uWalk1=uWalk2 WHERE
#Nursing_Home.NursingHome='B')
/(SELECT AVG(Recovered) FROM #Nursing_Home WHERE NursingHome='B')
WHEN (AgeGroup2 = 'AgeGroup25-50' and Sex2 = 1 and uGroom2 = 1 and uToilet2 = 1 and uBathe2 = 1 and
uDress2 = 1 and uBowel2 = 1 and uEat2 = 0 and uSit2 = 0 and uWalk2 = 0  and uUrine2 = 0) THEN
(SELECT Avg(Recovered) FROM #Nursing_Home INNER JOIN #Match ON uBathe1 =uBathe2 and uDress1=uDress2
WHERE #Nursing_Home.NursingHome='B')
*(SELECT Avg(Recovered) FROM #Nursing_Home INNER JOIN #Match ON  uGroom1=uGroom2 and uBowel1=uBowel2
WHERE #Nursing_Home.NursingHome='B')
*(SELECT Avg(Recovered) FROM #Nursing_Home INNER JOIN #Match ON uToilet1=uToilet2 WHERE
#Nursing_Home.NursingHome='B')
/(SELECT AVG(Recovered) FROM #Nursing_Home WHERE NursingHome='B')
WHEN (AgeGroup2 = 'AgeGroup75-100' and Sex2 = 1 and uGroom2 = 1 and uToilet2 = 1 and uDress2 = 1  and
uEat2 = 0 and uSit2 = 0 and uBathe2 = 0 and uWalk2 = 0 and uBowel2 = 0 and uUrine2 = 0) THEN
(SELECT Avg(Recovered) FROM #Nursing_Home INNER JOIN #Match ON  uGroom1=uGroom2 and uDress1=uDress2
WHERE #Nursing_Home.NursingHome='B')
*(SELECT Avg(Recovered) FROM #Nursing_Home INNER JOIN #Match ON uToilet1=uToilet2 WHERE
#Nursing_Home.NursingHome='B')/(SELECT AVG(Recovered) FROM #Nursing_Home WHERE NursingHome='B')
            END
        ELSE Recovered2 END AS Recovered2
 INTO #AllMatched
 FROM #Match --(684 rows affected)

 SELECT top 10 * from #AllMatched

 SELECT * FROM #AllMatched WHERE Recovered1 is NULL or Recovered2 is NULL --0 rows
```

	AgeGroup	Sex	uEat	uSit	uGroom	uToilet	uBathe	uWalk	uDress	uBowel	uUrine	Prob1	Recovered1	Prob2	Recovered2
1	AgeGroup1-25	0	0	0	0	0	0	0	0	0	0	0.00	0	0.00	0
2	AgeGroup1-25	0	0	0	0	0	1	0	0	0	0	0.50	1	0.00	0
3	AgeGroup1-25	0	0	0	0	0	1	1	0	0	0	0.50	1	0.00	0
4	AgeGroup1-25	0	1	1	1	1	1	1	1	1	1	1.00	9	0.00	0
5	AgeGroup1-25	1	0	0	0	0	0	0	0	0	0	0.00	0	0.00	0
6	AgeGroup1-25	1	0	0	0	0	0	1	0	0	0	0.80	4	0.14	1
7	AgeGroup1-25	1	0	0	0	0	1	0	0	0	0	1.00	1	1.00	1
8	AgeGroup1-25	1	0	0	0	0	1	1	0	0	0	0.67	4	0.00	0
9	AgeGroup1-25	1	0	0	1	0	1	0	0	0	0	1.00	4	0.00	0
10	AgeGroup1-25	1	0	0	1	0	1	1	0	0	0	0.56	10	0.00	0

```
--Performance of A-- better by itself
SELECT Round(SUM(Prob1*Recovered1),2) As [Recovered disabilities of  Nursing Home A Patients by Nursing
Home A] --70030.86
, Round(SUM(Prob2*Recovered1),2) As [Recovered Disabilities of Nursing Home B Patients in Nursing Home
A] --5458.88
FROM #AllMatched
```

	Recovered disabilities of Nursing Home A Patients by Nursing Home A	Recovered Disabilities of Nursing Home B Patients in Nursing Home A
1	70030.86	5458.88

```
--Performance of B-- better at Peer's Nursing Home A better
SELECT Round(SUM(Prob2*Recovered2),2) As [Recovered disabilities of Nursing Home A Patients by Nursing
Home A] --862.59
, Round(SUM(Prob1*Recovered2),2) As [Recovered Disabilities of Nursing Home B Patients in Nursing Home
A] --4362.75
FROM #AllMatched
```

	Recovered disabilities of Nursing Home A Patients by Nursing Home A	Recovered Disabilities of Nursing Home B Patients in Nursing Home A
1	862.59	4362.75

```
--Comparing Recovery rates--
SELECT SUM(Prob1*Recovered2) / Sum(Prob1*Recovered1) as Recovery_Rate
FROM #AllMatched --0.0623 chance patients of Nursing home A recovered by Nursing Home A

SELECT SUM(Prob2*Recovered1) / Sum(Prob2*Recovered2) as Recovery_Rate
FROM #AllMatched --6.328 chance patients of Nursing home B recovered by Nursing Home B
```

Result: Patients of nursing home B have a better chance of recovering when seeking treatment in Nursing Home A compared to their own facility. Nursing Home A does a better job recovering disabilities in patients in from Nursing Home A and B.