> library(cna)

> ZZ <- BMCPublicHealthDatawithoutDictionary

> names(ZZ)

[1] "CaseID" "no\_healthins" "NoHlthInsMV2" "NoHlth\_1\_LowTer" "NoHlth\_1\_HighTer" "pct\_college" "CollegeMV2" "Coll\_1\_LowTer" "Coll\_1\_HighTer" "pct\_transit" "TransitMV2" "Trans\_1\_LowTer"

[13] "Trans\_1\_HighTer" "pct\_service" "Serv\_Ter" "Serv\_1\_LowTer" "Serv\_1\_HighTer" "pct\_overcrowded1" "OverCr\_Ter" "OcerCr\_1\_Low" "OverCr\_1\_High" "limited\_engl" "LimEnglMV2" "LimEng\_1\_LowTer"

[25] "LimEng\_1\_HighTer" "ICE\_blacknh" "ICE\_BlkNH\_MV2" "ICEBLK\_1\_HighTer" "ICEBLK\_1\_LorTer" "ICE\_inc" "ICE.incMV2" "ICEInc\_1\_LowTer" "ICEinc\_1\_HighTer" "March18\_Rate" "MarchRateMV" "PersistenlyLowMarch"

[37] "April18\_Rate" "AprilRateMV" "PersistentlyLowApril" "May18\_Rate" "MayRateMV" "PersistentlyLowMay"

> #Persistently Low Solution - March

> subsetMV <- ZZ[, c(8,28,36)]

> names(subsetMV)

[1] "Coll\_1\_LowTer" "ICEBLK\_1\_HighTer" "PersistenlyLowMarch"

> output\_datasetS1\_CNA3 <- mvcna(subsetMV, con = .9, cov = .8, ordering = "PersistenlyLowMarch", suff.only = FALSE, strict = TRUE, maxstep=c(7,7,20))

> output\_datasetS1\_CNA3

--- Coincidence Analysis (CNA) ---

**Persistently Low Solutions**

Causal ordering (strict):

COLL\_1\_LOWTER, ICEBLK\_1\_HIGHTER < PERSISTENLYLOWMARCH

Atomic solution formulas:

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Outcome PERSISTENLYLOWMARCH=0:

solution consistency coverage complexity inus

COLL\_1\_LOWTER=0 <-> PERSISTENLYLOWMARCH=0 0.929 0.897 1 TRUE

Outcome PERSISTENLYLOWMARCH=1:

solution consistency coverage complexity inus

COLL\_1\_LOWTER=1\*ICEBLK\_1\_HIGHTER=0 <-> PERSISTENLYLOWMARCH=1 0.917 0.846 2 TRUE

Complex solution formulas:

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outcome solution consistency coverage complexity inus

PERSISTENLYLOWMARCH=0,PERSISTENLYLOWMARCH=1 (COLL\_1\_LOWTER=0 <-> PERSISTENLYLOWMARCH=0)\*(COLL\_1\_LOWTER=1\*ICEBLK\_1\_HIGHTER=0 <-> PERSISTENLYLOWMARCH=1) 0.917 0.846 3 TRUE

> subsetMV <- ZZ[, c(8,28,39)]

> names(subsetMV)

[1] "Coll\_1\_LowTer" "ICEBLK\_1\_HighTer" "PersistentlyLowApril"

> output\_datasetS1\_CNA3 <- mvcna(subsetMV, con = .9, cov = .8, ordering = "PersistentlyLowApril", suff.only = FALSE, strict = TRUE, maxstep=c(7,7,20))

> output\_datasetS1\_CNA3

--- Coincidence Analysis (CNA) ---

Causal ordering (strict):

COLL\_1\_LOWTER, ICEBLK\_1\_HIGHTER < PERSISTENTLYLOWAPRIL

Atomic solution formulas:

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Outcome PERSISTENTLYLOWAPRIL=0:

solution consistency coverage complexity inus

COLL\_1\_LOWTER=0 <-> PERSISTENTLYLOWAPRIL=0 0.929 0.897 1 TRUE

Outcome PERSISTENTLYLOWAPRIL=1:

solution consistency coverage complexity inus

COLL\_1\_LOWTER=1\*ICEBLK\_1\_HIGHTER=0 <-> PERSISTENTLYLOWAPRIL=1 0.917 0.846 2 TRUE

Complex solution formulas:

--------------------------

outcome solution consistency coverage complexity inus

PERSISTENTLYLOWAPRIL=0,PERSISTENTLYLOWAPRIL=1 (COLL\_1\_LOWTER=0 <-> PERSISTENTLYLOWAPRIL=0)\*(COLL\_1\_LOWTER=1\*ICEBLK\_1\_HIGHTER=0 <-> PERSISTENTLYLOWAPRIL=1) 0.917 0.846 3 TRUE

> subsetMV <- ZZ[, c(8,28,42)]

> names(subsetMV)

[1] "Coll\_1\_LowTer" "ICEBLK\_1\_HighTer" "PersistentlyLowMay"

> output\_datasetS1\_CNA3 <- mvcna(subsetMV, con = .9, cov = .8, ordering = "PersistentlyLowMay", suff.only = FALSE, strict = TRUE, maxstep=c(7,7,20))

> output\_datasetS1\_CNA3

--- Coincidence Analysis (CNA) ---

Causal ordering (strict):

COLL\_1\_LOWTER, ICEBLK\_1\_HIGHTER < PERSISTENTLYLOWMAY

Atomic solution formulas:

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Outcome PERSISTENTLYLOWMAY=0:

solution consistency coverage complexity inus

COLL\_1\_LOWTER=0 <-> PERSISTENTLYLOWMAY=0 0.929 0.897 1 TRUE

Outcome PERSISTENTLYLOWMAY=1:

solution consistency coverage complexity inus

COLL\_1\_LOWTER=1\*ICEBLK\_1\_HIGHTER=0 <-> PERSISTENTLYLOWMAY=1 0.917 0.846 2 TRUE

Complex solution formulas:

--------------------------

outcome solution consistency coverage complexity inus

PERSISTENTLYLOWMAY=0,PERSISTENTLYLOWMAY=1 (COLL\_1\_LOWTER=0 <-> PERSISTENTLYLOWMAY=0)\*(COLL\_1\_LOWTER=1\*ICEBLK\_1\_HIGHTER=0 <-> PERSISTENTLYLOWMAY=1) 0.917 0.846 3 TRUE

> subsetMV <- ZZ[, c(8,28,36)]

> names(subsetMV)

[1] "Coll\_1\_LowTer" "ICEBLK\_1\_HighTer" "PersistenlyLowMarch"

> output\_datasetS1\_CNA3 <- mvcna(subsetMV, con = .9, cov = .95, ordering = "PersistenlyLowMarch", suff.only = FALSE, strict = TRUE, maxstep=c(7,7,20))

> output\_datasetS1\_CNA3

--- Coincidence Analysis (CNA) ---

**Not Persistently Low Solutions**

Causal ordering (strict):

COLL\_1\_LOWTER, ICEBLK\_1\_HIGHTER < PERSISTENLYLOWMARCH

Atomic solution formulas:

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Outcome PERSISTENLYLOWMARCH=0:

solution consistency coverage complexity inus

COLL\_1\_LOWTER=0 + ICEBLK\_1\_HIGHTER=1 <-> PERSISTENLYLOWMARCH=0 0.933 0.966 2 TRUE

Complex solution formulas:

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Same as asf

> subsetMV <- ZZ[, c(8,28,39)]

> names(subsetMV)

[1] "Coll\_1\_LowTer" "ICEBLK\_1\_HighTer" "PersistentlyLowApril"

> output\_datasetS1\_CNA3 <- mvcna(subsetMV, con = .9, cov = .95, ordering = "PersistentlyLowApril", suff.only = FALSE, strict = TRUE, maxstep=c(7,7,20))

> output\_datasetS1\_CNA3

--- Coincidence Analysis (CNA) ---

Causal ordering (strict):

COLL\_1\_LOWTER, ICEBLK\_1\_HIGHTER < PERSISTENTLYLOWAPRIL

Atomic solution formulas:

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Outcome PERSISTENTLYLOWAPRIL=0:

solution consistency coverage complexity inus

COLL\_1\_LOWTER=0 + ICEBLK\_1\_HIGHTER=1 <-> PERSISTENTLYLOWAPRIL=0 0.933 0.966 2 TRUE

Complex solution formulas:

--------------------------

Same as asf

> subsetMV <- ZZ[, c(8,28,42)]

> names(subsetMV)

[1] "Coll\_1\_LowTer" "ICEBLK\_1\_HighTer" "PersistentlyLowMay"

> output\_datasetS1\_CNA3 <- mvcna(subsetMV, con = .9, cov = .95, ordering = "PersistentlyLowMay", suff.only = FALSE, strict = TRUE, maxstep=c(7,7,20))

> output\_datasetS1\_CNA3

--- Coincidence Analysis (CNA) ---

Causal ordering (strict):

COLL\_1\_LOWTER, ICEBLK\_1\_HIGHTER < PERSISTENTLYLOWMAY

Atomic solution formulas:

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Outcome PERSISTENTLYLOWMAY=0:

solution consistency coverage complexity inus

COLL\_1\_LOWTER=0 + ICEBLK\_1\_HIGHTER=1 <-> PERSISTENTLYLOWMAY=0 0.933 0.966 2 TRUE

Complex solution formulas:

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Same as asf

>