

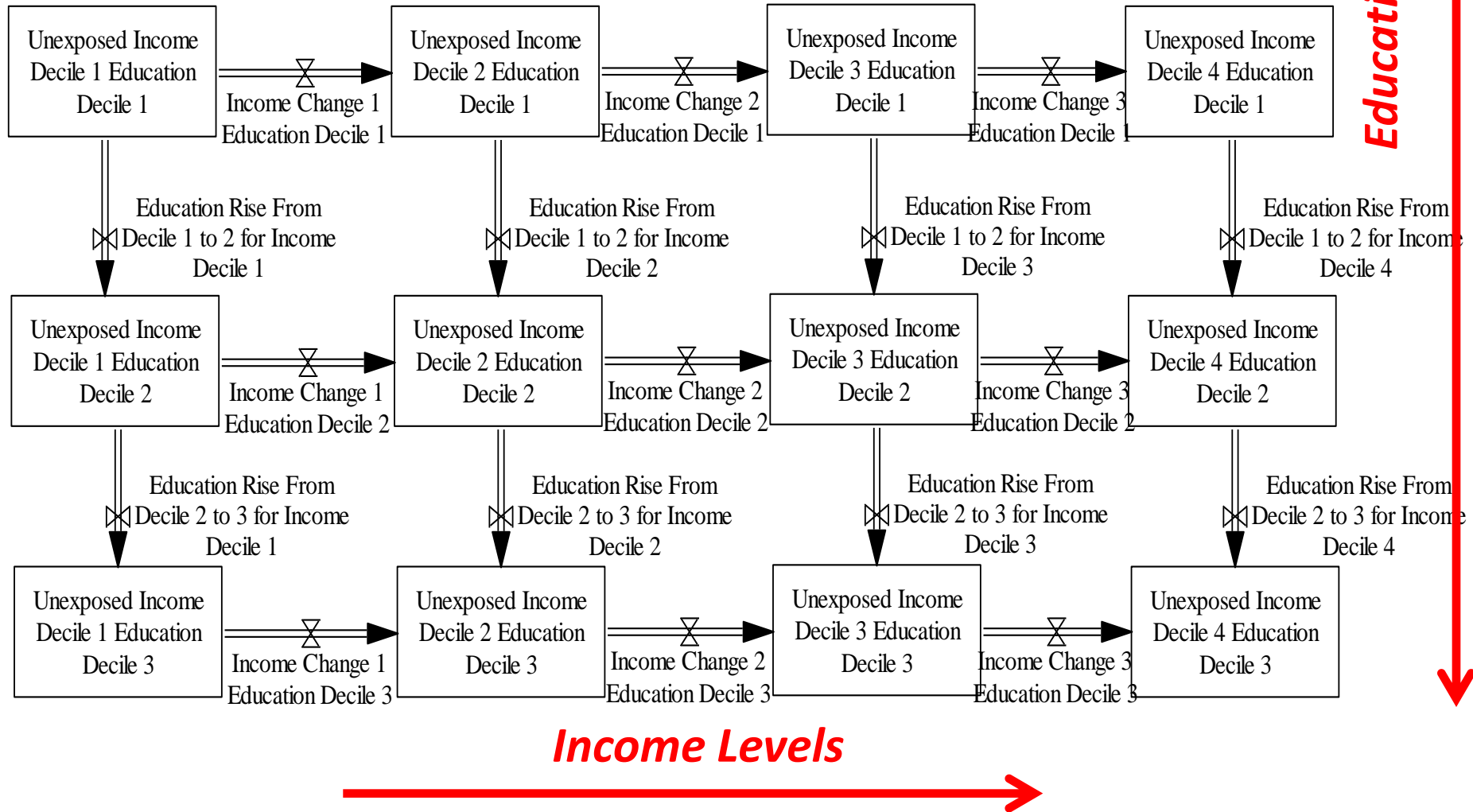
Subscribing in Vensim 2:
Subscript Introduction, Selection,
Progression & Mapping, Subranging

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CMPT 858

March 22, 2011

A Common Pattern in Aggregate Models: Lattice Structure

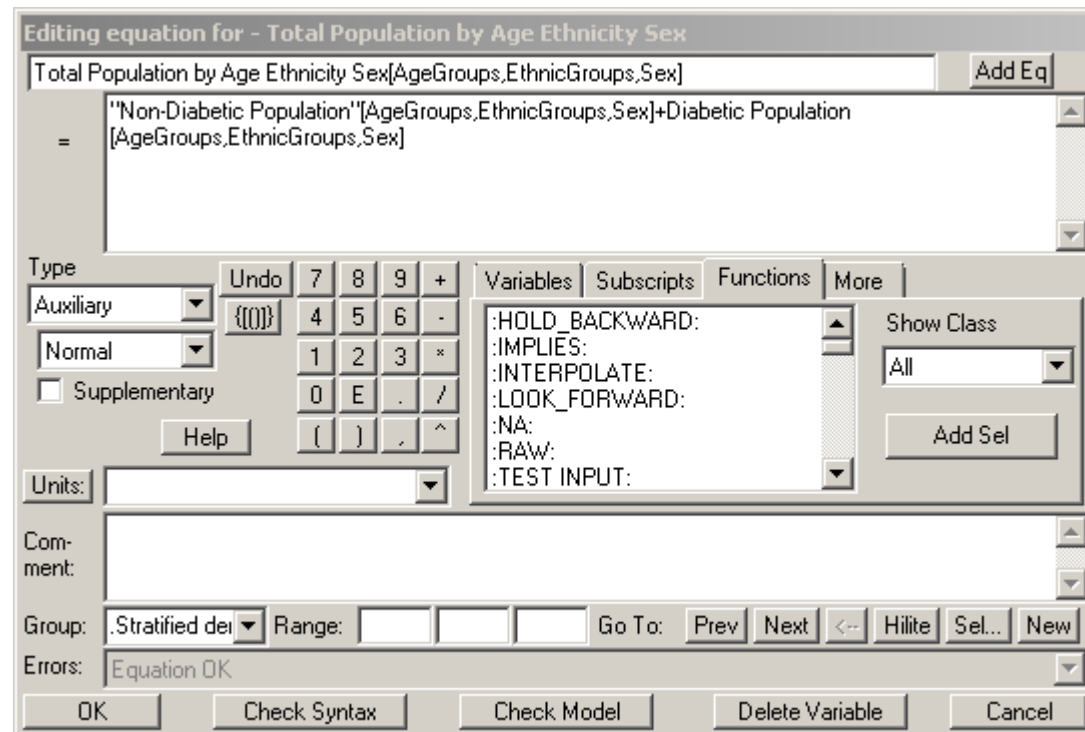


Recall: A Means to Simplification: Subscripting

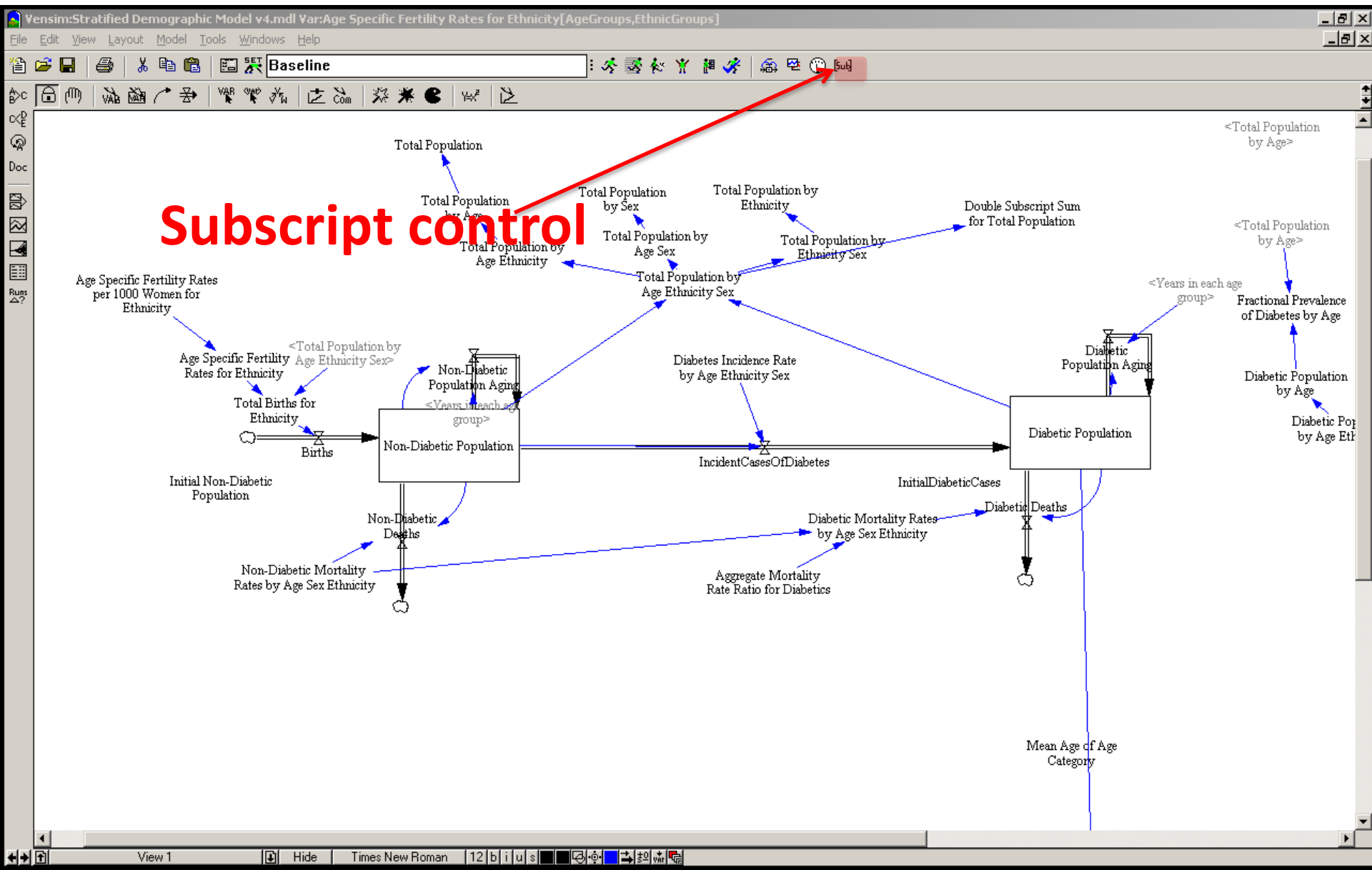
- We can simplify “lattice structure” by “subscripting” the structure by (discrete) properties
- This structure is then replicated for every subscript combination
- We can perform operations to create aggregate totals from this disaggregated data

Recall: Reading a Subscripted Equation

Suggestion: Read as follows “variable Total Population for a specific age group (member of AgeGroups), ethnic group (member of EthnicGroups) and sex (member of Sex) is just the sum of the non-diabetic population for that same age, ethnic & sex group and of the diabetic population for that same age, ethnic & sex group



Recall: Vensim Model



Subscript Control Interface

The screenshot displays the Vensim software interface for a model titled "Stratified Demographic Model v4.mdl". The main window shows a stock-and-flow diagram with a central stock labeled "Diabetic Population".

The "Subscript Control" dialog box is open, showing the following configuration:

- AgeGroups: 17/17
- EthnicGroups: 2/2
- Sex: 2/2

The "Available Elements" list includes age groups from "AgeGroup0to4" to "AgeGroup80plus". The "Selected Elements" list contains all these age groups. Buttons for ">>" and "<<" are visible between the lists, along with "Clear Selected" and "Simple" buttons.

The diagram shows the "Diabetic Population" stock with an inflow "Diabetic Population Aging" and an outflow "Diabetic Deaths". A "Mean Age of Age Category" stock is also shown. Annotations with blue arrows point to various elements:

- "Total Population" points to the top of the diagram.
- "<Total Population by Age>" points to the "Diabetic Population" stock.
- "<Years in each age group>" points to the "Diabetic Population Aging" inflow.
- "Fractional Prevalence of Diabetes by Age" points to the "Diabetic Population" stock.
- "Diabetic Population by Age" points to the "Diabetic Population" stock.
- "Diabetic Pop by Age Eth" points to the "Diabetic Population" stock.

The Vensim interface includes a menu bar (File, Edit, View, Insert, Model, Tools, Windows, Help), a toolbar with icons for simulation and editing, and a status bar at the bottom.

Subscript Control Interface

The screenshot shows the Vensim software interface with the Subscript Control dialog box open. The dialog box has three tabs: "AgeGroups 17/17", "EthnicGroups 2/2", and "Sex 2/2". The "AgeGroups" tab is active, showing a list of "Available Elements" and a "Selected Elements" list. The "Selected Elements" list is highlighted in red and contains the following age groups: AgeGroup0to4, AgeGroup5to9, AgeGroup10to14, AgeGroup15to19, AgeGroup20to24, AgeGroup25to29, AgeGroup30to34, AgeGroup35to39, AgeGroup40to44, AgeGroup45to49, AgeGroup50to54, AgeGroup55to59, AgeGroup60to64, AgeGroup65to69, AgeGroup70to74, AgeGroup75to79, and AgeGroup80plus. A red arrow points from the text below to this list. The background shows a portion of a Vensim model diagram with various stock and flow variables, including "Total Population", "Diabetic Population", and "Diabetic Deaths".

The elements in this pane are those that will be shown in graphs & tables

Subscript Control Interface

The screenshot displays the Vensim software interface for a model titled "Stratified Demographic Model v4.mdl". The "Subscript Control" dialog box is open, showing controls for "AgeGroups 17/17", "EthnicGroups 2/2", and "Sex 2/2". The "Available Elements" list on the left includes age groups from "AgeGroup0to4" to "AgeGroup80plus". The "Selected Elements" list on the right contains the same age groups. A red arrow points to the double arrow navigation buttons between these lists. The background shows a model diagram with a "Diabetic Population" stock and various flows like "Diabetic Deaths" and "Diabetic Population Aging".

These controls add or remove elements whose values should be displayed

A Key Piece of Functionality: "Subscript" Control

Vensim: Stratified Demographic Model v5.mdl Var: Fractional Prevalence of Diabetes by Age[AgeGroups]

File Edit View Insert Model Tools Windows Help

Baseline

Table

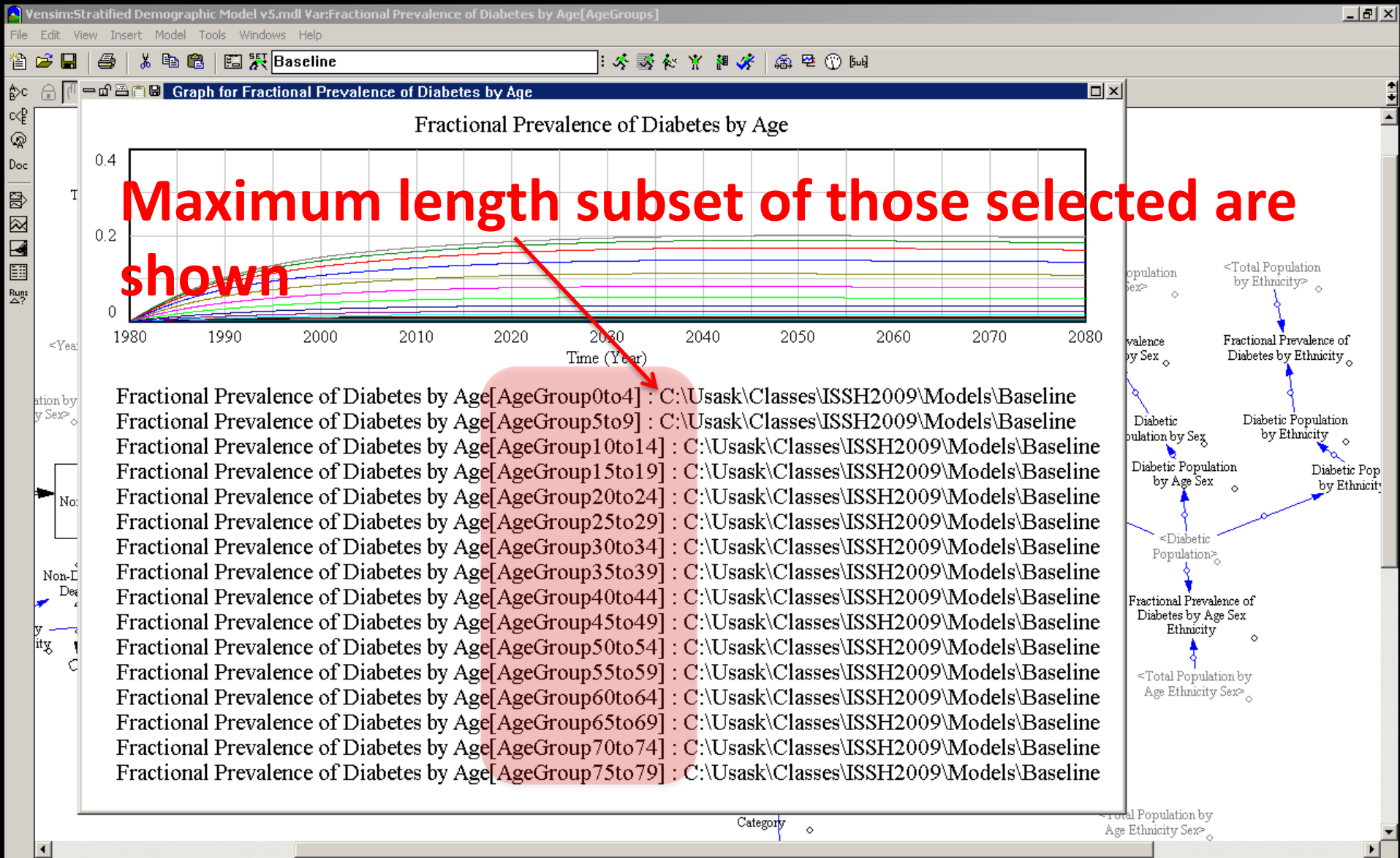
Time (Year)	1980.03	1980.06	1980.09	1980.13	1980.16	1980.19
"Fractional Prevalence of Diabetes by Age[AgeGroups]" Runs:	C:\USask\Classes\ISSH2009\Models\Baseline					
Fractional Prevalence of Diabetes by Age						
[AgeGroup0to4]	6.87952e-006	1.37199e-005	2.05213e-005	2.72837e-005	3.40073e-005	4.06921e-005
[AgeGroup5to9]	9.47196e-006	1.89247e-005	2.83582e-005	3.77723e-005	4.7167e-005	5.65422e-005
[AgeGroup10to14]	1.21989e-005	2.43771e-005	3.65346e-005	4.86715e-005	6.07877e-005	7.28832e-005
[AgeGroup15to19]	1.39985e-005	2.7984e-005	4.19564e-005	5.59156e-005	6.98615e-005	8.37942e-005
[AgeGroup20to24]	1.90117e-005	3.799e-005	5.6935e-005	7.58468e-005	9.47256e-005	0.00011357
[AgeGroup25to29]	2.4213e-005	4.83885e-005	7.25266e-005	9.66274e-005	0.000120691	0.00014471
[AgeGroup30to34]	3.52505e-005	7.04147e-005	0.000105493	0.000140486	0.000175395	0.00021021
[AgeGroup35to39]	5.82815e-005	0.000116368	0.000174262	0.000231963	0.000289473	0.00034679
[AgeGroup40to44]	9.63451e-005	0.000192348	0.00028801	0.000383333	0.000478318	0.00057296
[AgeGroup45to49]	0.000147738	0.00029501	0.000441815	0.000588155	0.000734031	0.00087944
[AgeGroup50to54]	0.000216076	0.000431486	0.00064623	0.000860312	0.0010	0.0012
[AgeGroup55to59]	0.000278772	0.00055689	0.000834355	0.0011	0.0013	0.0016
[AgeGroup60to64]	0.000340203	0.000679656	0.0010	0.0013	0.0016	0.0020
[AgeGroup65to69]	0.000401199	0.000801361	0.0012	0.0015	0.0019	0.0023
[AgeGroup70to74]	0.000441215	0.000881254	0.0013	0.0017	0.0021	0.0026
[AgeGroup75to79]	0.000467415	0.000933479	0.0013	0.0018	0.0023	0.0027
[AgeGroup80plus]	0.000437135	0.000872681	0.0013	0.0017	0.0021	0.0025

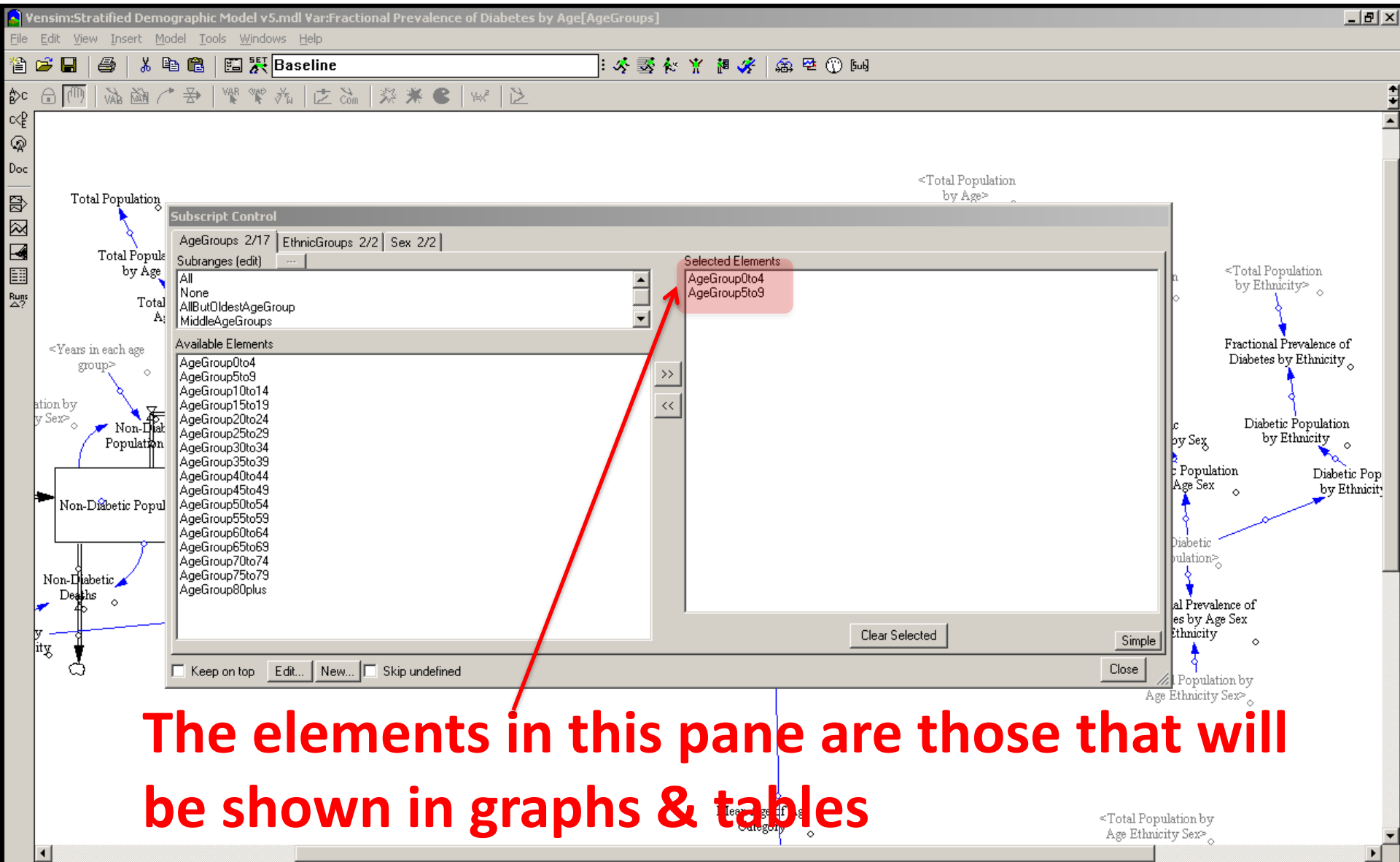
The selected subset of subscripts are shown (here All)

Mean Age of Age Category

<Total Population by Age Ethnicity Sex>

Subscript Control Interface





The elements in this pane are those that will be shown in graphs & tables

Subscripts: Tables

Vensim: Stratified Demographic Model v5.mdl Var: Fractional Prevalence of Diabetes by Age[AgeGroups]

File Edit View Insert Model Tools Windows Help

Baseline

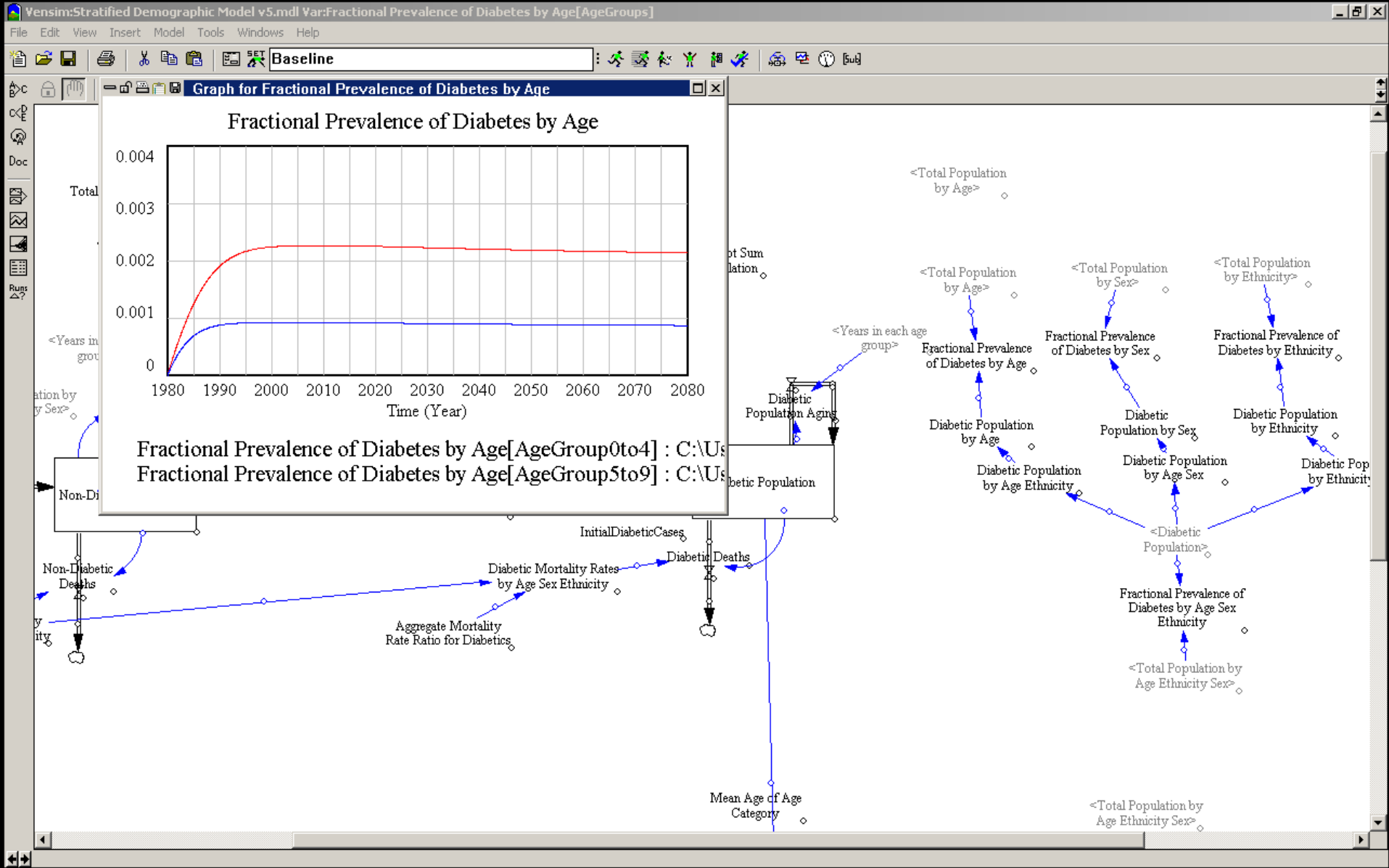
Time (Year)	1980	1980.03	1980.06	1980.09	1980.13	1980.16
"Fractional Prevalence of Diabetes by Age[AgeGroups]" Runs:						
Fractional Prevalence of Diabetes by Age						
[AgeGroup0to4]	0	6.87952e-006	1.37199e-005	2.05213e-005	2.72837e-005	3.40073e-005
[AgeGroup5to9]	0	9.47196e-006	1.89247e-005	2.83582e-005	3.77723e-005	4.7167e-005

The selected subset of subscripts are shown

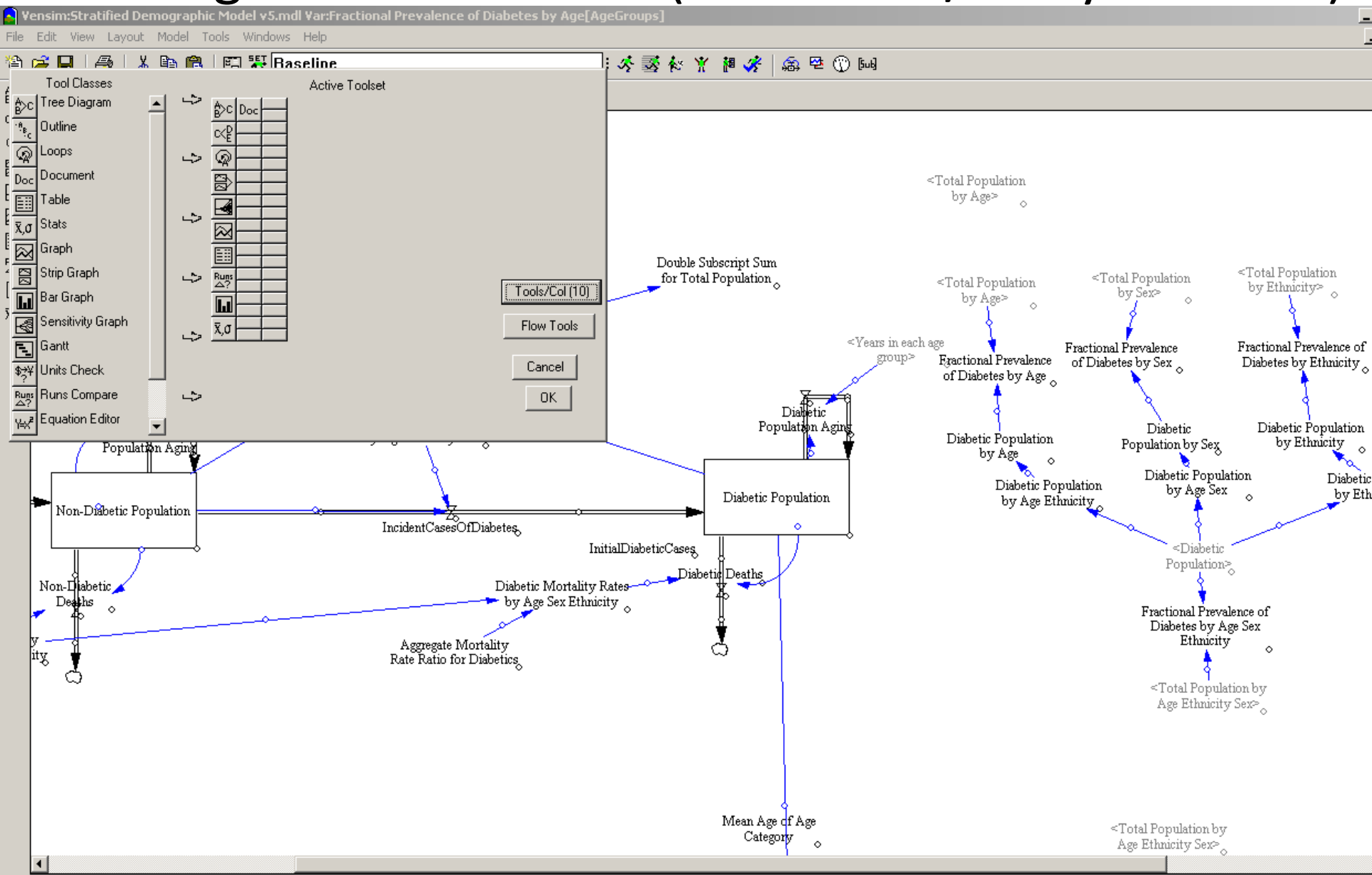
Mean Age of Age Category

<Total Population by Age Ethnicity Sex>

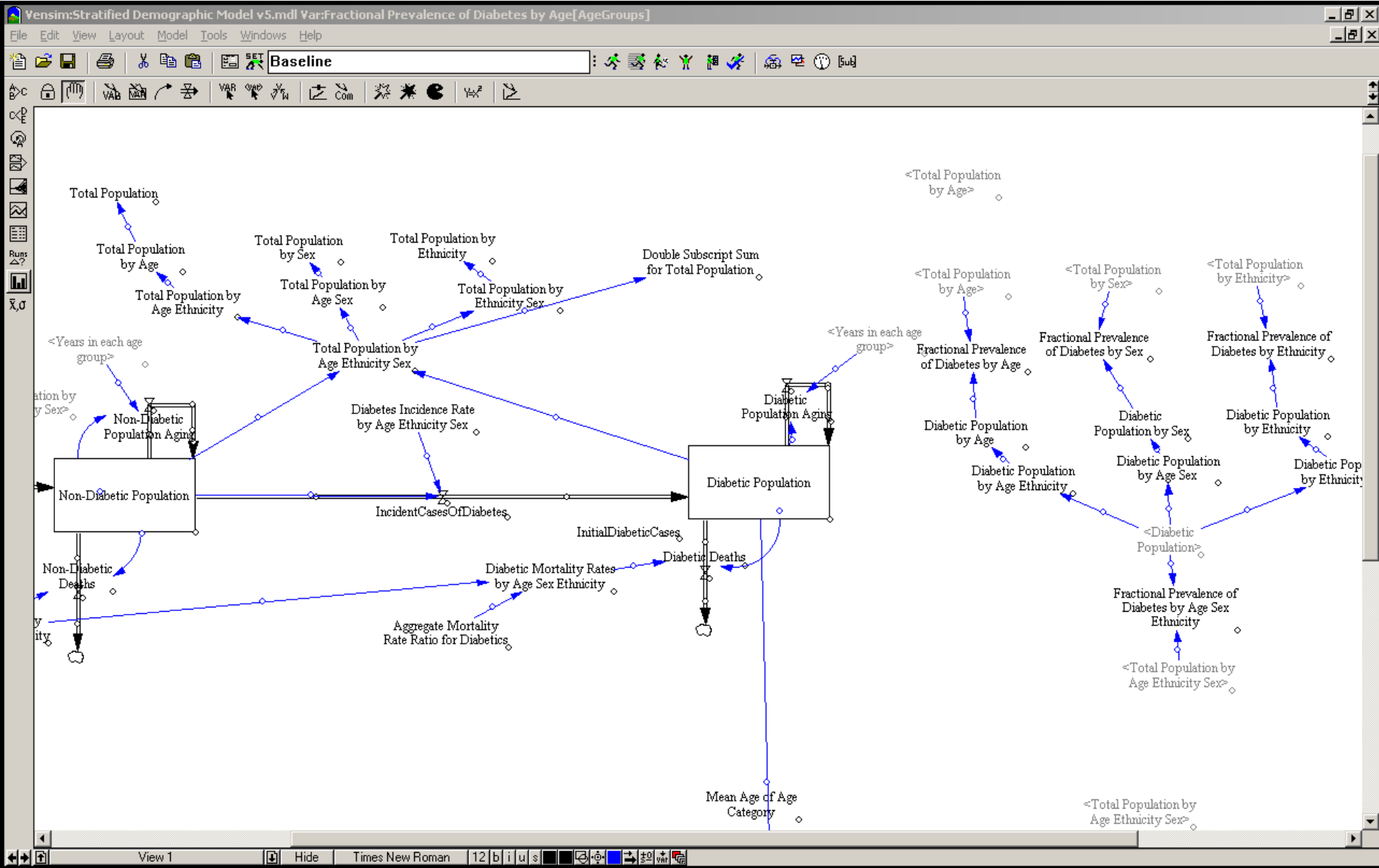
Subscripts: Graphs



Choosing Additional Tools (from Tools/Analysis Menu)



Histogram Tool



Displaying over Subscripts at the End

Vensim: Stratified Demographic Model v5.mdl Var: Fractional Prevalence of Diabetes by Age[AgeGroups]

File Edit View Layout Model Tools Windows Help

Baseline

Bar Graph Options

At Time: Start End Special Select
 Time: 0
 As time-graph

As Histogram Across: Off Time Subs Sims
 Cumulative Hide Outliers

Orientation: Vertical Horizontal

Histogram Settings: Y-Min: Y-Max: #Bars: 10
 PDF Scaling Min: Max:

Sort Order: No Sorting
 Fonts: Normal Small
 Background: Foreground:

Label: Bar Graph

OK Cancel

<Years in each age group>
 Total Population by Age Ethnicity Sex
 Diabetes Incidence Rate by Age Ethnicity Sex
 IncidentCasesOfDiabetes
 Non-Diabetic Population
 Non-Diabetic Population Aging
 Non-Diabetic Deaths
 Diabetic Population
 Diabetic Population Aging
 InitialDiabeticCases
 Diabetic Deaths
 Diabetic Mortality Rates by Age Sex Ethnicity
 Aggregate Mortality Rate Ratio for Diabetics
 Mean Age of Age Category

Double Subscript Sum for Total Population

<Total Population by Age>
 <Total Population by Sex>
 <Total Population by Ethnicity>
 Fractional Prevalence of Diabetes by Age
 Fractional Prevalence of Diabetes by Sex
 Fractional Prevalence of Diabetes by Ethnicity
 Diabetic Population by Age
 Diabetic Population by Sex
 Diabetic Population by Ethnicity
 Diabetic Population by Age Sex
 Diabetic Population by Age Ethnicity
 Diabetic by Eth
 <Diabetic Population>
 Fractional Prevalence of Diabetes by Age Sex Ethnicity
 <Total Population by Age Ethnicity Sex>

In Control Panel, Select "All"

The screenshot displays the Vensim software interface for a model titled "Stratified Demographic Model v5.mdl". The main window shows a causal loop diagram with various nodes and arrows. A "Subscript Control" dialog box is open in the foreground, allowing the user to select subranges for different elements. The dialog has three tabs: "AgeGroups 2/17", "EthnicGroups 2/2", and "Sex 2/2". The "AgeGroups" tab is active, showing a list of "Available Elements" (AgeGroup0to4 through AgeGroup80plus) and a "Selected Elements" list (AgeGroup0to4, AgeGroup5to9). The "Subranges (edit)" list contains "All", "None", "AllButOldestAgeGroup", and "MiddleAgeGroups". The "All" option is currently selected. At the bottom of the dialog, there are buttons for "Keep on top", "Edit...", "New...", "Skip undefined", "Clear Selected", "Simple", and "Close".

Select all

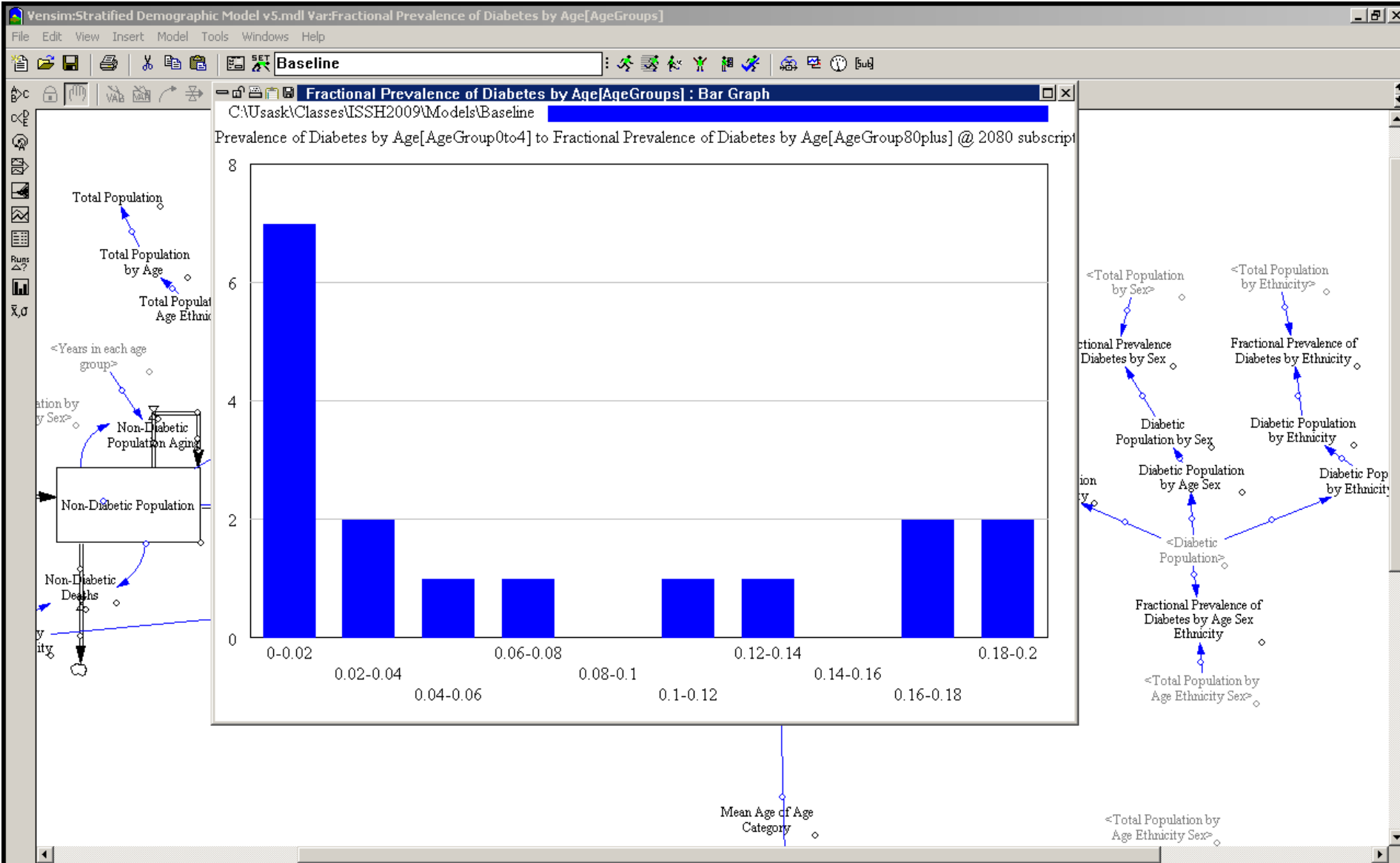
The screenshot displays the Vensim software interface for a model titled "Vensim:Stratified Demographic Model v5.mdl". The main window shows a complex model diagram with various nodes and arrows. A "Subscript Control" dialog box is open, showing the following details:

- AgeGroups: 17/17
- EthnicGroups: 2/2
- Sex: 2/2
- Subranges (edit): All
- Available Elements: AgeGroup0to4, AgeGroup5to9, AgeGroup10to14, AgeGroup15to19, AgeGroup20to24, AgeGroup25to29, AgeGroup30to34, AgeGroup35to39, AgeGroup40to44, AgeGroup45to49, AgeGroup50to54, AgeGroup55to59, AgeGroup60to64, AgeGroup65to69, AgeGroup70to74, AgeGroup75to79, AgeGroup80plus
- Selected Elements: AgeGroup0to4, AgeGroup5to9, AgeGroup10to14, AgeGroup15to19, AgeGroup20to24, AgeGroup25to29, AgeGroup30to34, AgeGroup35to39, AgeGroup40to44, AgeGroup45to49, AgeGroup50to54, AgeGroup55to59, AgeGroup60to64, AgeGroup65to69, AgeGroup70to74, AgeGroup75to79, AgeGroup80plus

The dialog box also includes buttons for "Clear Selected", "Simple", and "Close", and checkboxes for "Keep on top", "Edit...", "New...", and "Skip undefined".

The background model diagram includes nodes such as "Total Population", "Total Population by Age", "Total Population by Ethnicity", "Fractional Prevalence of Diabetes by Ethnicity", "Diabetic Population by Ethnicity", "Diabetic Population by Age Sex", "Diabetic Population by Age Ethnicity Sex", "Mean Age of Age Category", "Non-Diabetic Population", "Non-Diabetic Deaths", and "Years in each age group".

Displaying Histogram Across Subscript Values



Setting Subscript

Wensim:Stratified Demographic Model v5.mdl Var:Fractional Prevalence of Diabetes by Age[AgeGroups]

File Edit View Layout Model Tools Windows Help

Baseline

Stats Options

Show Link
 Cause
 Use
 None

Causes
 Initial
 Normal

Show Types
 Level
 Auxiliary
 Data
 Initial
 Constant
 Lookup

Percentiles

Number Format
 Pretty (10M)
 Scientific (1.0E6)

Output font...

R square against 1st

Background

Foreground

Over
 Sensitivity
 Time
 Subs

At Time
 Special
 Start
 End

0

Label

Column width - First: Rest:

Activate on variable selection

OK Cancel

Non-Diabetic Population Aging
Diabetes Incidence Rate by Age Ethnicity Sex
Diabetic Population Aging
IncidentCasesOfDiabetes
InitialDiabeticCases
Diabetic Deaths
Diabetic Mortality Rates by Age Sex Ethnicity
Aggregate Mortality Rate Ratio for Diabetics
Mean Age of Age Category

<Total Population by Age>
<Total Population by Sex>
<Total Population by Ethnicity>
Fractional Prevalence of Diabetes by Age
Fractional Prevalence of Diabetes by Sex
Fractional Prevalence of Diabetes by Ethnicity
Diabetic Population by Age
Diabetic Population by Sex
Diabetic Population by Ethnicity
Diabetic Population by Age Ethnicity
Diabetic Population by Age Sex
Diabetic Population by Ethnicity
<Diabetic Population>
Fractional Prevalence of Diabetes by Age Sex Ethnicity
<Total Population by Age Ethnicity Sex>

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Displaying Statistics Across Subscripts

Vensim: Stratified Demographic Model v5.mdl Var: Fractional Prevalence of Diabetes by Age[AgeGroups]

File Edit View Insert Model Tools Windows Help

Baseline

Stats

Variable	Count	Min	Max	Mean	Median	StDev	(Norm)
"Fractional Prevalence of Diabetes by Age[AgeGroups]" results across subscripts	17	0.00086642	0.1955	0.0707	0.0360	0.0709	1.002

Non-Diabetic Population

Diabetic Population

Incident Cases of Diabetes

Initial Diabetic Cases

Diabetic Deaths

Diabetic Mortality Rates by Age Sex Ethnicity

Aggregate Mortality Rate Ratio for Diabetics

Non-Diabetic Deaths

Mean Age of Age Category

Prevalence of Diabetes by Sex

Diabetic Population by Sex

Diabetic Population by Ethnicity

Fractional Prevalence of Diabetes by Ethnicity

Fractional Prevalence of Diabetes by Age Sex Ethnicity

Total Population by Age Ethnicity Sex

Total Population by Ethnicity

Total Population by Age Ethnicity Sex

Subscript Control Interface

Vensim: Stratified Demographic Model v4.mdl Var: Age Specific Fertility Rates for Ethnicity [AgeGroups, EthnicGroups]

File Edit View Insert Model Tools Windows Help

Baseline

Subscript Control

AgeGroups 17/17 EthnicGroups 2/2 Sex 2/2

Subranges (edit)

Available Elements

- AgeGroup0to4
- AgeGroup5to9
- AgeGroup10to14
- AgeGroup15to19
- AgeGroup20to24
- AgeGroup25to29
- AgeGroup30to34
- AgeGroup35to39
- AgeGroup40to44
- AgeGroup45to49
- AgeGroup50to54
- AgeGroup55to59
- AgeGroup60to64
- AgeGroup65to69
- AgeGroup70to74
- AgeGroup75to79
- AgeGroup80plus

Selected Elements

- AgeGroup0to4
- AgeGroup5to9
- AgeGroup10to14
- AgeGroup15to19
- AgeGroup20to24
- AgeGroup25to29
- AgeGroup30to34
- AgeGroup35to39
- AgeGroup40to44
- AgeGroup45to49
- AgeGroup50to54
- AgeGroup55to59
- AgeGroup60to64
- AgeGroup65to69
- AgeGroup70to74
- AgeGroup75to79
- AgeGroup80plus

Clear Selected Simple

Keep on top Skip undefined

Age Specific Fer per 1000 Wo Ethnicit

Total Population

Total Population

Total Population by

Diabetic Population

Diabetic Deaths

Diabetic Population Aging

<Total Population by Age>

<Total Population by Age>

<Years in each age group>

Fractional Prevalence of Diabetes by Age

Diabetic Population by Age

Diabetic Pop by Age Eth

Mean Age of Age Category

Can use this button to introduce a new Subscript (i.e. stratification dimension)

Defining a New Subscript's Elements

Editing equation for - Income

Income Add Eq

: HighestQuartileIncome, SecondHighestQuartile, ThirdHighestQuartile, FourthHighestQuartile

Type: Subscript

Normal Supplementary

Help

Units:

Comment:

Group: .Stratified del Range: Go To: Prev Next <-- Hilite Sel... New

Errors: Equation Modified

OK Check Syntax Check Model Delete Variable Cancel

Variables Subscripts Functions More

Choose Variable... Inputs

Undo	7	8	9	+
{ }	4	5	6	-
	1	2	3	*
	0	E	.	/
	()	.	^

New Subscript Appears in Subscript Control

The screenshot displays the Vensim software interface for a model titled "Vensim:Stratified Demographic Model v5.mdl". The main window shows a stock-and-flow diagram with various nodes and arrows. A "Subscript Control" dialog box is open, listing subscripts for "AgeGroups", "EthnicGroups", "Income", and "Sex". The "Income" subscript is currently selected, and its subscripts are listed as "HighestQuartileIncome", "SecondHighestQuartile", "ThirdHighestQuartile", and "FourthHighestQuartile".

The "Subscript Control" dialog box includes the following elements:

- Buttons for "All", "None", and "Full" to manage the list of subscripts.
- Options for "Keep on top", "Edit...", "New...", "Skip undefined", and "Close".

The background diagram shows a complex model structure with nodes such as "Total Population", "Non-Diabetic Population", "Diabetic Population", and "Mean Age of Age Category".

Edit Subscript

The screenshot displays the Vensim software interface for editing a subscript. The 'Subscript Control' dialog box is open, showing a list of 'Available Elements' (AgeGroup0to4 through AgeGroup80plus) and a 'Selected Elements' list. The 'Edit...' button at the bottom left of the dialog is highlighted with a red box and a red arrow. The background shows a stock-and-flow diagram with a 'Diabetic Population' stock and various flows like 'Diabetic Deaths' and 'Diabetic Population Aging'. Labels like '<Total Population by Age>' and '<Years in each age group>' are visible.

Can use this button to edit the a subscript (e.g. to add or remove elements)

Example Subscripted Stock: Youngest

Editing equation for - Non-Diabetic Population (1/3)

"Non-Diabetic Population"[AgeGroup0to4,EthnicGroups,Sex] 1 Del

= INTEG (Births[EthnicGroups,Sex]-IncidentCasesOfDiabetes[AgeGroup0to4,EthnicGroups,Sex] - "Non-Diabetic Deaths"[AgeGroup0to4,EthnicGroups,Sex] - "Non-Diabetic Population Aging"[AgeGroup0to4,EthnicGroups,Sex]

Initial Value "Initial Non-Diabetic Population"[AgeGroup0to4,EthnicGroups,Sex]

Type Level Normal Supplementary Help

Units:

Comment: **Must consider birth flow in and aging to next higher age group**

Group: .Stratified del Range: Go To: Prev Next Hilite Sel... New

Errors: Equation OK

OK Check Syntax Check Model Delete Variable Cancel

For Middle Age Categories

Editing equation for - Non-Diabetic Population (2/3)

"Non-Diabetic Population"[MiddleAgeGroups,EthnicGroups,Sex] 2 Del

= INTEG [-IncidentCasesOfDiabetes[MiddleAgeGroups,EthnicGroups,Sex] - "Non-Diabetic Deaths"[MiddleAgeGroups,EthnicGroups,Sex] + "Non-Diabetic Population Aging"[PreviousAgeGroup,EthnicGroups,Sex] - "Non-Diabetic Population Aging"[MiddleAgeGroups,EthnicGroups,Sex]

Initial Value "Initial Non-Diabetic Population"[MiddleAgeGroups,EthnicGroups,Sex]

Type Level Normal Supplementary Help

Undo 7 8 9 + 4 5 6 - 1 2 3 * 0 E . / () . ^

Variables Subscripts Functions More

Choose Variable... Inputs

Non-Diabetic Population
Births
IncidentCasesOfDiabetes
Non-Diabetic Deaths
Non-Diabetic Population Aging

Units:

Comment:

Group: Stratified del Range: Go To: Prev Next <- Hilite Sel... New

Errors: Equation Modified

OK Check Syntax Check Model Delete Variable Cancel

Uses
"subscript
mapping"
to find
previous
age
Category
to this

Must Consider both aging in (from
previous category & aging out)

For Oldest Age Category

Editing equation for - Non-Diabetic Population (3/3)

"Non-Diabetic Population"[AgeGroup80plus,EthnicGroups,Sex] 3 Del

= INTEG (

-IncidentCasesOfDiabetes[AgeGroup80plus,EthnicGroups,Sex]
- "Non-Diabetic Deaths"[AgeGroup80plus,EthnicGroups,Sex] + "Non-Diabetic Population Aging"
[AgeGroup75to79,EthnicGroups,Sex]

Initial Value "Initial Non-Diabetic Population"[AgeGroup80plus,EthnicGroups,Sex]

Type Level Normal Supplementary Help

Units:

Comment: **Must consider aging in , but there is no aging out**

Group: .Stratified del Range: Go To: Prev Next <-- Hilite Sel... New

Errors: Equation Modified

OK Check Syntax Check Model Delete Variable Cancel

Variables Subscripts Functions More

Choose Variable... Inputs

Non-Diabetic Population
Births
IncidentCasesOfDiabetes
Non-Diabetic Deaths
Non-Diabetic Population Aging

Previous age category is hard-coded

Finding the Mapping

Vensim: Stratified Demographic Model v5.mdl Var: Non-Diabetic Population[AgeGroups,EthnicGroups,Sex]

File Edit View Layout Model Tools Windows Help

Editing equation for - Non-Diabetic Population (1/3)

"Non-Diabetic Population"[AgeGroup0to4,EthnicGroups,Sex] 1 Del

INTEG (Births[EthnicGroups,Sex]-IncidentCasesOfDiabetes[AgeGroup0to4,EthnicGroups,Sex] - "Non-Diabetic Deaths"[AgeGroup0to4,EthnicGroups,Sex] - "Non-Diabetic Population Aging"[AgeGroup0to4,EthnicGroups,Sex])

Initial Value "Initial Non-Diabetic Population"[AgeGroup0to4,EthnicGroups,Sex]

Type Level Normal Supplementary Help

Variables Subscripts Functions More

Choose Variable... Inputs

Non-Diabetic Population
Births
IncidentCasesOfDiabetes
Non-Diabetic Deaths
Non-Diabetic Population Aging

Units:

Comment:

Group: .Stratified dei Range: Go To: Prev Next Hilite SEL New

Errors: Equation OK

OK Check Syntax Check Model Delete Variable Cancel

Diagram Labels:

- Initial Non-Diabetic Population
- Births
- Non-Diabetic Mortality Rates by Age Sex Ethnicity
- Non-Diabetic Deaths
- Non-Diabetic Population
- IncidentCasesOfDiabetes
- Diabetic Population
- InitialDiabeticCases
- Diabetic Mortality Rates by Age Sex Ethnicity
- Aggregate Mortality Rate Ratio for Diabetics
- Diabetic Deaths
- Mean Age of Age Category
- Diabetic Population Aging
- Total Population by Sex
- Total Population by Age Sex
- Total Population by Ethnicity
- Total Population by Ethnicity Sex
- Double Subscript Sum for Total Population
- Diabetes Incidence Rate by Age Ethnicity Sex
- <Years in each age group>
- <Total Population by Age>
- Fractional Prevalence of Diabetes by Age
- Diabetic Population by Age
- Diabetic Pop by Age Eth

View 1 Hide Times New Roman 12 | b | i | u | s

Finding among Variables

Wensim:Stratified Demographic Model v5.mdl Var:Non-Diabetic Population[AgeGroups,EthnicGroups,Sex]

File Edit View Layout Model Tools Windows Help

Editing equation for - Non-Diabetic Population (1/3)

"Non-Diabetic Population"[AgeGroup0to4,EthnicGroups,Sex]

= INTEG (Births[EthnicGroups,Sex]-IncidentCasesOfDiabetes[AgeGroup0to4,EthnicGroups,Sex] - Diabetic Deaths[AgeGroup0to4,EthnicGroups,Sex] - "Non-Diabetic Population Aging"[AgeGroup0to4,EthnicGroups,Sex])

Initial Value "Initial Non-Diabetic Population"[AgeGroup0to4,EthnicGroups,Sex]

Type Level Normal Supplementary Help

Variables Subscripts Func Choose Variable...

Non-Diabetic Population Births IncidentCasesOfDiabetes Non-Diabetic Deaths Non-Diabetic Population Aging

Modify Equation for

- Double Subscript Sum for Total Population
- EthnicGroups
- FINAL TIME
- Fractional Prevalence of Diabetes by Age
- Fractional Prevalence of Diabetes by Age Sex Ethnicity
- Fractional Prevalence of Diabetes by Ethnicity
- Fractional Prevalence of Diabetes by Sex
- IncidentCasesOfDiabetes
- Income
- Initial Non-Diabetic Population
- INITIAL TIME
- InitialDiabeticCases
- Mean Age of Age Category
- MiddleAgeGroups
- Model Diabetic Population By Sex
- Model Diabetic Population By Sex Ethnicity
- Mortality for Youngest Group
- Mortality Hazard Age Coefficient in Exponent
- Non-Diabetic Deaths
- Non-Diabetic Mortality Rates by Age Sex Ethnicity
- Non-Diabetic Population
- Non-Diabetic Population Aging
- PreviousAgeGroup

Name or Pattern previ

OK Check Syntax Check Model De Exact Cancel

The diagram illustrates the flow of individuals between two population states: Non-Diabetic Population and Diabetic Population. The Non-Diabetic Population stock is influenced by Births (inflow) and Non-Diabetic Deaths (outflow). It transitions to the Diabetic Population stock through IncidentCasesOfDiabetes (inflow). The Diabetic Population stock is influenced by InitialDiabeticCases (inflow) and Diabetic Deaths (outflow). It also transitions back to the Non-Diabetic Population stock through Non-Diabetic Deaths (outflow). The diagram also shows the flow of Mortality Rates by Age Sex Ethnicity, which are used to calculate the flows. The Mean Age of Age Category is also shown as a variable.

Initial Non-Diabetic Population

Non-Diabetic Population

Diabetic Population

Births

IncidentCasesOfDiabetes

InitialDiabeticCases

Non-Diabetic Deaths

Diabetic Deaths

Non-Diabetic Mortality Rates by Age Sex Ethnicity

Diabetic Mortality Rates by Age Sex Ethnicity

Aggregate Mortality Rate Ratio for Diabetics

Mean Age of Age Category

<Total Population by Age>

<Total Population by Age>

Fractional Prevalence of Diabetes by Age

Diabetic Population by Age

Diabetic Pop by Age Eth

View 1 Hide Times New Roman 12 | b i u s

MiddleAgeGroup Subranges (In Subscript Control)

The screenshot displays the Vensim software interface for a model named "Stratified Demographic Model v5.mdl". The main window shows a stock-and-flow diagram with the following elements:

- Total Population** (stock)
- <Total Population by Age>** (stock)
- <Total Population by Age>** (stock)
- <Years in each age group>** (stock)
- Fractional Prevalence of Diabetes by Age** (stock)
- Diabetic Population by Age** (stock)
- Diabetic Pop. by Age Eth** (stock)

The **Subscript Control** dialog box is open, showing the following configuration:

- AgeGroups:** 17/17
- EthnicGroups:** 2/2
- Income:** 1/4
- Sex:** 2/2

The dialog box contains two lists of elements:

Available Elements	Selected Elements
All	AgeGroup0to4
None	AgeGroup5to9
AllButOldestAgeGroup	AgeGroup10to14
MiddleAgeGroups	AgeGroup15to19
AgeGroup0to4	AgeGroup20to24
AgeGroup5to9	AgeGroup25to29
AgeGroup10to14	AgeGroup30to34
AgeGroup15to19	AgeGroup35to39
AgeGroup20to24	AgeGroup40to44
AgeGroup25to29	AgeGroup45to49
AgeGroup30to34	AgeGroup50to54
AgeGroup35to39	AgeGroup55to59
AgeGroup40to44	AgeGroup60to64
AgeGroup45to49	AgeGroup65to69
AgeGroup50to54	AgeGroup70to74
AgeGroup55to59	AgeGroup75to79
AgeGroup60to64	AgeGroup80plus
AgeGroup65to69	
AgeGroup70to74	
AgeGroup75to79	
AgeGroup80plus	

Buttons at the bottom of the dialog include: **Keep on top** (unchecked), **Edit...**, **New...**, **Skip undefined** (unchecked), **Clear Selected**, **Simple**, and **Close**.

Blue arrows in the diagram point from the **Subscript Control** dialog to the **<Years in each age group>** stock and the **Diabetic Population by Age** stock.

At the bottom right of the Vensim window, the text **Mean Age of Age Category** is visible.

Finding Middle Age Group Subrange Definition

The image shows a Vensim software interface for a 'Stratified Demographic Model v5.mdl'. The main window displays a stock-and-flow diagram with two primary stocks: 'Non-Diabetic Population' and 'Diabetic Population'. 'Non-Diabetic Population' has an inflow from 'Births' and an outflow to 'Non-Diabetic Deaths'. 'Diabetic Population' has an inflow from 'IncidentCasesOfDiabetes' and an outflow to 'Diabetic Deaths'. A feedback loop exists where 'Diabetic Deaths' influences 'IncidentCasesOfDiabetes' through 'Diabetic Mortality Rates by Age Sex Ethnicity' and 'Aggregate Mortality Rate Ratio for Diabetics'. The 'Mean Age of Age Category' is also shown as a variable.

A 'Modify Equation for' dialog box is open, showing a list of variables. The variable 'MiddleAgeGroups' is selected. The dialog includes a search field with 'midd' and buttons for 'OK', 'Exact', and 'Cancel'. The background window shows the equation for 'Total Population' as $SUM(\text{Total Population by Age}[\text{AgeGroups!}])$.

On the right side, a partial view of the model's structure is visible, showing hierarchical relationships between variables like '<Total Population by Age>', 'Fractional Prevalence of Diabetes by Age', and 'Diabetic Population by Age'.

Subrange Definitions

Editing equation for - MiddleAgeGroups

MiddleAgeGroups Add Eq

AgeGroup5to9, AgeGroup10to14, AgeGroup15to19, AgeGroup20to24, AgeGroup25to29, AgeGroup30to34, AgeGroup35to39, AgeGroup40to44, AgeGroup45to49, AgeGroup50to54, AgeGroup55to59, AgeGroup60to64, AgeGroup65to69, AgeGroup70to74, AgeGroup75to79

Type

Subscript Undo {() } 7 8 9 + Variables Subscripts Functions More

Normal 4 5 6 - Range

Supplementary 1 2 3 * AgeGroups

Help 0 E . / AllButOldestAgeGroup

Units: () , ^ Income

MiddleAgeGroups

PreviousAgeGroup

Comment:

Group: Stratified def Range: Go To: Prev Next <- Hilite Sel... New

Errors: Equation OK

OK Check Syntax Check Model Delete Variable Cancel

Mapping Definition

Editing equation for - PreviousAgeGroup

PreviousAgeGroup Add Eq

: AgeGroup0to4, AgeGroup5to9, AgeGroup10to14, AgeGroup15to19, AgeGroup20to24, AgeGroup25to29, AgeGroup30to34, AgeGroup35to39, AgeGroup40to44, AgeGroup45to49, AgeGroup50to54, AgeGroup55to59, AgeGroup60to64, AgeGroup65to69, AgeGroup70to74 -> MiddleAgeGroups

Type: Subscript Undo {()} 7 8 9 + 4 5 6 - 1 2 3 * 0 E . / Help () , ^

Variables | Subscripts | Functions | More

Choose Variable... Inputs

Units:

Comment: AgeGroup0to4, AgeGroup5to9, AgeGroup10to14, AgeGroup15to19, AgeGroup20to24, AgeGroup25to29, AgeGroup30to34, AgeGroup35to39, AgeGroup40to44, AgeGroup45to49, AgeGroup50to54, AgeGroup55to59, AgeGroup60to64, AgeGroup65to69, AgeGroup70to74

Group: .Stratified del Range: Go To: Prev Next <- Hilite Sel... New

Errors: Equation OK

OK Check Syntax Check Model Delete Variable Cancel

Finding the Other Sex for a Given Sex

Editing equation for - OtherSex

OtherSex Add Eq

Female, Male -> Sex

Type

Subscript Undo {()} 7 8 9 + Variables Subscripts Functions More

Normal 4 5 6 - Range

Supplementary 1 2 3 *

Help 0 E . / ActivityGroup HostGroup MixingMatrixActivityGroup MixingMatrixHostGroup OtherSex Sex

() . ^

Units: ↓

Comment:

Group: .Garnett 2001 Range: Go To: Prev Next <-- HiLite Sel... New

Errors: Equation OK ↓

OK Check Syntax Check Model Delete Variable Cancel

Using the “Opposite Sex” In an Equation

Editing equation for - Mixing Matrix Elements rho

Mixing Matrix Elements rho[Sex,ActivityGroup,MixingMatrixActivityGroup,HostGroup,MixingMatri: Add Eq

=

[(1-Mixing Parameter Epsilon)*Activity and Host Group Discrepancy small delta
[ActivityGroup,MixingMatrixActivityGroup]+Mixing Parameter Epsilon*Fraction of Total Partnership
Changes for Activity Group[OtherSex,MixingMatrixActivityGroup,MixingMatrixHostGroup]]*Fraction of
Partnership Changes for Sex and Activity Group Represented in Host Group
[OtherSex,MixingMatrixActivityGroup,MixingMatrixHostGroup]

Type

Auxiliary Undo 7 8 9 + Variables Subscripts Functions More

Normal {{}} 4 5 6 - Range

Supplementary 1 2 3 *

Help 0 E . /

ActivityGroup
HostGroup
MixingMatrixActivityGroup
MixingMatrixHostGroup
OtherSex
Sex

Units: ▼

Com-
ment: ▼

Group: .Garnett 2001 ▼ Range: Go To: Prev Next ← Hilite Sel... New

Errors: Equation OK ▼

OK Check Syntax Check Model Delete Variable Cancel

Clever Ways of Defining Flows can lead to Fewer Equations

The screenshot shows a software window titled "Editing equation for - Uninfected People". The main text area contains the following equation:

$$\text{Uninfected People}[\text{AgeGroup}, \text{Ethnicity}] = \text{INTEG} \left(\begin{aligned} & \text{if then else}(\text{AgeGroup} = \text{AgeGroup0to4}, +\text{New Births}[\text{Ethnicity}], 0) + \text{Aging of Uninfected People} \\ & [\text{PreviousAgeGroup}, \text{Ethnicity}] - \text{Aging of Uninfected People} \\ & [\text{AgeGroup}, \text{Ethnicity}] + \text{Uninfected Immigrants}[\text{AgeGroup}, \text{Ethnicity}] - \text{Latent Infection} \\ & [\text{AgeGroup}, \text{Ethnicity}] - \text{"Non-TB Death of Uninfected"}[\text{AgeGroup}, \text{Ethnicity}] - \text{Vaccination} \\ & [\text{AgeGroup}, \text{Ethnicity}] + \text{Waning of Immunity}[\text{AgeGroup}, \text{Ethnicity}] \end{aligned} \right)$$

Below the equation, the "Initial Value" is set to "Initial Uninfected Population by Age and Ethnicity[AgeGroup,Ethnicity]".

The interface includes a "Type" section with a "Level" dropdown set to "Level", a "Normal" dropdown, and a "Supplementary" checkbox. A numeric keypad is visible with buttons for digits 0-9, symbols like {(), ., ^, /, *, -, +}, and a "Help" button.

On the right, there are tabs for "Variables", "Subscripts", "Functions", and "More". A "Choose Variable..." button is present, and a list of variables is shown: "Uninfected People", "Aging of Uninfected People", "Latent Infection", "New Births", "Non-TB Death of Uninfected", and "Uninfected Immigrants".

At the bottom, there is a "Group:" dropdown set to ".Age structur", a "Range:" field, a "Go To:" section with "Prev", "Next", and "<--" buttons, and "Hilite", "Sel...", and "New" buttons. The "Errors:" section shows "Equation OK".

At the very bottom, there are five buttons: "OK", "Check Syntax", "Check Model", "Delete Variable", and "Cancel".

Definition of Aging

Editing equation for - Aging of Uninfected People

Aging of Uninfected People[AgeGroup,Ethnicity] Add Eq

= Uninfected People[AgeGroup,Ethnicity]*Fraction of Age Category Leaving by Aging every Year [AgeGroup]

Type: Auxiliary Undo 7 8 9 + Variables Subscripts Functions More

Normal {() } 4 5 6 - Choose Variable... Inputs

Supplementary 1 2 3 * Fraction of Age Category Leaving by Aging every Year

Help 0 E . / Uninfected People

() . ^

Units: ↓

Comment: ↑ ↓

Group: .Age structur ↓ Range: Go To: Prev Next ← Hilite Sel... New

Errors: Equation OK ↓

OK Check Syntax Check Model Delete Variable Cancel

Fraction Leaving Each Year is Set to 0 for Oldest Age Group

Editing equation for - Fraction of Age Category Leaving by Aging every Year

Fraction of Age Category Leaving by Aging every Year[AgeGroup] Add Eq

= if then else(AgeGroup=AgeGroup80plus, 0, 1/Years in each Age Group[AgeGroup])

Type: Auxiliary Undo {()} 7 8 9 + Variables Subscripts Functions More

Normal 1 2 3 * Choose Variable... Inputs

Supplementary 0 E . / Years in each Age Group

Help () . ^

Units: Units

Comment: Comment

Group: .Age structur Range: Go To: Prev Next <-- Hilite Sel... New

Errors: Equation OK Errors

OK Check Syntax Check Model Delete Variable Cancel

“Previous Age Group” for Youngest Age Group is Oldest – So no Aging into Youngest Age Group

Editing equation for - PreviousAgeGroup

PreviousAgeGroup Add Eq

: AgeGroup80plus, AgeGroup0to4, AgeGroup5to9, AgeGroup10to14, AgeGroup15to19, AgeGroup20to24, AgeGroup25to29, AgeGroup30to34, AgeGroup35to39, AgeGroup40to44, AgeGroup45to49, AgeGroup50to54, AgeGroup55to59, AgeGroup60to64, AgeGroup65to69, AgeGroup70to74, AgeGroup75to79 -> AgeGroup

Type: Subscript, Normal, Supplementary

Undo {()} 7 8 9 + 4 5 6 - 1 2 3 * 0 E . / () , ^

Variables | Subscripts | Functions | More

Choose Variable... Inputs

Units:

Comment:

Group: .Age structur Range: Go To: Prev Next <- Hilite Sel... New

Errors: Equation OK

OK Check Syntax Check Model Delete Variable Cancel