Alberta Health Services

MetaDEx – from Data Dictionary to Complete Blaise Code Generation

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About PHR department

- Focused on population-based epidemiological research in the areas of cancer incidence, causes, survival, and prevention.
- Made up of PhD-level epidemiologists with their research teams, Statistical Analysis group and Data Support Unit (DSU).
- DSU designs all in-house surveys, other data collection and transformation tools.
- Two main data collection tools:
  - Cardiff TeleForm® - paper-based questionnaires.
  - Blaise ® - CAPI and CATI instruments.
- Blaise has been used since early 2000s

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Outline

- Background
- MetaDEx: Design
  - Data Dictionary object model
  - Metadata storage format
- MetaDEx: Implemetation & User Interface
  - Data Dictionary specification
  - Blaise specific parameters & code generation
  - Extensions and reports
- Conclusion

Background

- Growing volume and diversity of data
- Need for data documentation
- Data Standardization Initiative (DSI) was proposed in 2007
- Data Documentation Tool becomes a vital part of DSI
- MetaDEx was initially designed as Data Dictionary tool
- Later, it was extended to generating complete Blaise instrument code

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Main Features

- Developed in C#.NET with Visual Studio 2008
- Data stored in XML format
- Tool independent Data Dictionary specification
- Blaise parameters specification and code generator
- Data Dictionary part provides sufficient definition for unified access to the data and for data documentation purposes
- May be used in two-step Blaise instrument design process (Subject matter specialist -> IT specialist)
- Because no manual modifications in code needed, always keeps Data Dictionary, Blaise data model and actual data in sync

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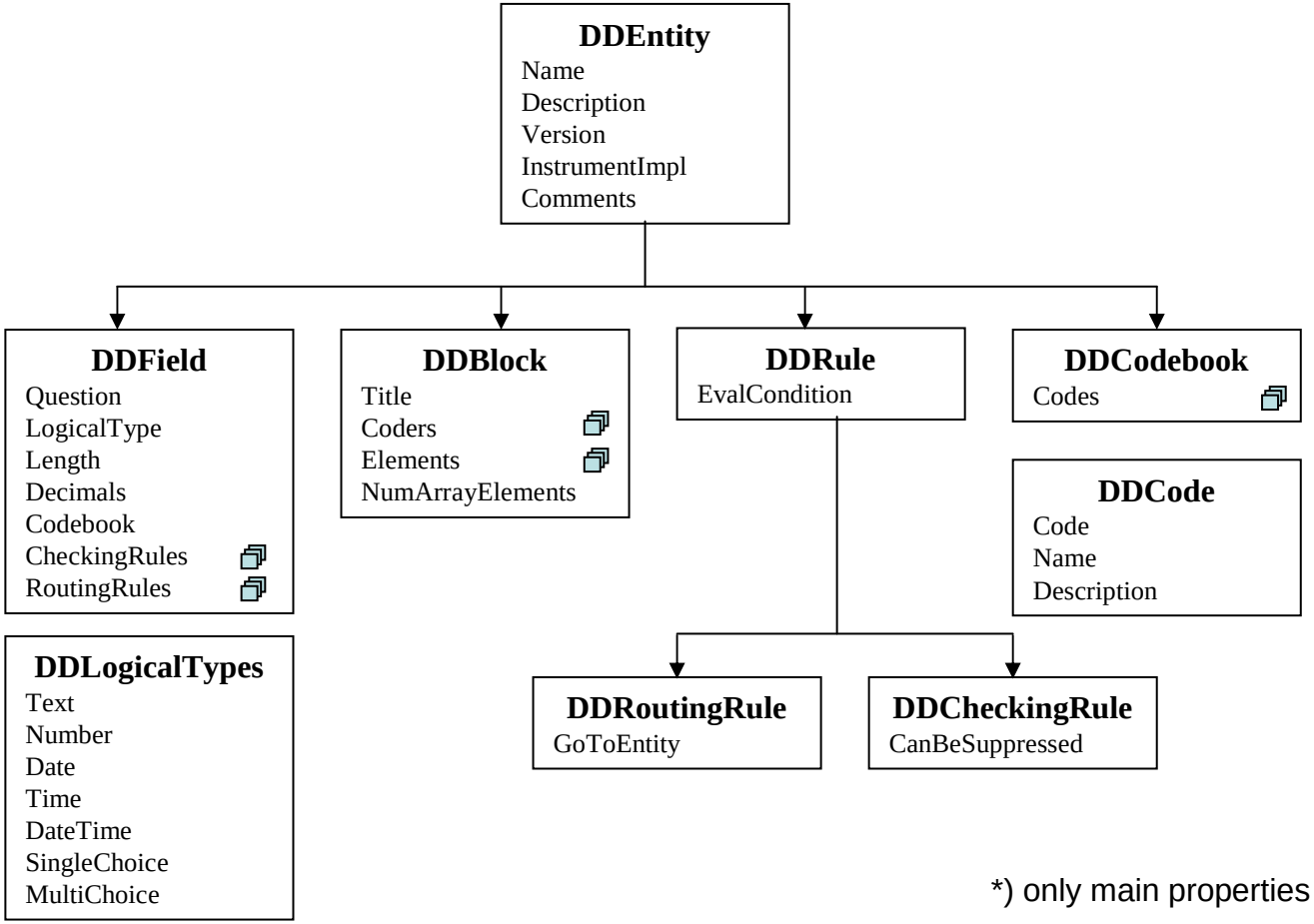
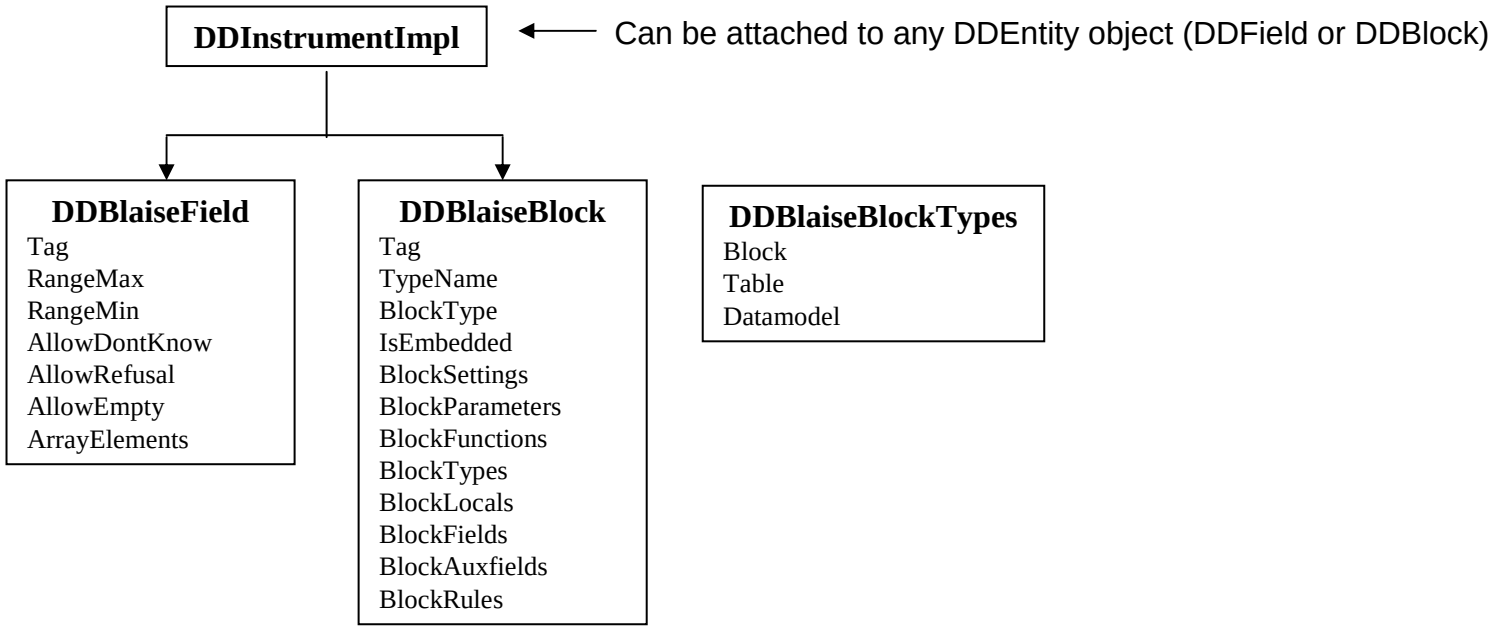
Object model – Data Dictionary



*) only main properties shown, methods not shown

Object model – Blaise implementation



*) only main properties shown, methods not shown

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XML storage (blocks and fields)


```
<DDEntity xsi:type="DDField" Name="B4_Breastfeed" LogicalType="SingleChoice" Coder="TYesNo" FldLength="2" Precision="0">
  <Description>B4. Did you breastfeed any of these babies?</Description>
  <ProgCode>B4. Did you breastfeed any of these babies?</ProgCode>
  <RoutingRules />
  <CheckingRules />
</DDEntity>
<DDEntity xsi:type="DDBlock" Name="B5_TblBreastfeed" NumElements="1" TypeName="BTblBreastfeed">
  <Description>B5. Breast Feeding Table</Description>
  <ProgCode>@BB5. Breast Feeding Table@B@/@/@RInterviewer: Ask her how old the baby was when she stopped breast feeding him/her. Enter 
  <InstrumentImpl xsi:type="DDBlaiseBlock">
    <BlockType>Table</BlockType>
    <BlockParameters>  IMPORT NTot : INTEGER</BlockParameters>
    <BlockLocals>  I : INTEGER</BlockLocals>
    <BlockRules>
      <string>  FOR I := 1 TO 20 DO</string>
      <string>    IF I &lt;= NTot THEN</string>
      <string>      BreastfeedTime[I]</string>
      <string>    ENDIF</string>
      <string>  ENDDO</string>
    </BlockRules>
  </InstrumentImpl>
  <Coders />
  <Elements>
    <DDEntity xsi:type="DDBlock" Name="BreastfeedTime" NumElements="20" TypeName="BBreastfeedTime">
      <Description>For each pregnancy, please indicate how long you breastfed the baby/babies:</Description>
      <ProgCode>For each pregnancy, please indicate how long you breastfeed the baby/babies:</ProgCode>
      <InstrumentImpl xsi:type="DDBlaiseBlock">
        <BlockType>Block</BlockType>
        <BlockRules>
          <string>  BFTime</string>
          <string>  BFUnits</string>
          <string>  SIGNAL</string>
          <string>  IF BFUnits = Years THEN</string>
          <string>    BFTime &lt;= 5 "Please check time and units. Probably, breastfeeding time can not be more than 5 years"</string>
          <string>  ENDIF  </string>
        </BlockRules>
      </InstrumentImpl>
      <Coders />
      <Elements>
        <DDEntity xsi:type="DDField" Name="BFTime" LogicalType="Number" FldLength="4" Precision="1">
          <Description>Total amount of time spent breast feeding the baby/babies</Description>
          <ProgCode>Pregnancy #^I@/Breastfeeding Time</ProgCode>
          <InstrumentImpl xsi:type="DDBlaiseField">
            <RangeMin>0.0</RangeMin>
            <RangeMax>99.0</RangeMax>
```

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XML storage (User Defined Types)

```
<DDCodingType Name="THighestGrade">
  <Description>Highest grade completed</Description>
  <Codes>
    <DDCodePair Code="1" Value="Grade5" Descriptor="Fifth grade or less" />
    <DDCodePair Code="2" Value="Grade6_8" Descriptor="Sixth to Eighth grade" />
    <DDCodePair Code="3" Value="Grade9_11" Descriptor="Ninth to Eleventh grade" />
    <DDCodePair Code="4" Value="HighSchool" Descriptor="High School Graduate or GED" />
    <DDCodePair Code="5" Value="PostHSTr" Descriptor="Post High School training other than College (vocational, technical, etc.)" />
    <DDCodePair Code="6" Value="SomeCol_Un" Descriptor="Some College/University" />
    <DDCodePair Code="7" Value="GrdCol_Un" Descriptor="Graduate from College/University" />
    <DDCodePair Code="8" Value="PostGrad" Descriptor="Post Graduate" />
    <DDCodePair Code="98" Value="DKnow" Descriptor="Don't know" />
    <DDCodePair Code="99" Value="Refused" Descriptor="Refused" />
  </Codes>
</DDCodingType>
<DDCodingType Name="TMarriedStatus">
  <Description>Married (Relationship) Status</Description>
  <Codes>
    <DDCodePair Code="1" Value="Married" Descriptor="Married" />
    <DDCodePair Code="2" Value="LivAsMarr" Descriptor="Living as married" />
    <DDCodePair Code="3" Value="Widowed" Descriptor="Widowed" />
    <DDCodePair Code="4" Value="Divorced" Descriptor="Divorced" />
    <DDCodePair Code="5" Value="Separated" Descriptor="Separated" />
    <DDCodePair Code="6" Value="Other" Descriptor="Other" />
  </Codes>
</DDCodingType>
<DDCodingType Name="TTimeLongUnits">
  <Description>Amount of time units</Description>
  <Codes>
    <DDCodePair Code="1" Value="Weeks" Descriptor="Weeks" />
    <DDCodePair Code="2" Value="Months" Descriptor="Months" />
    <DDCodePair Code="3" Value="Years" Descriptor="Years" />
    <DDCodePair Code="98" Value="DKnow" Descriptor="Don't know" />
    <DDCodePair Code="99" Value="Refused" Descriptor="Refused" />
  </Codes>
</DDCodingType>
```

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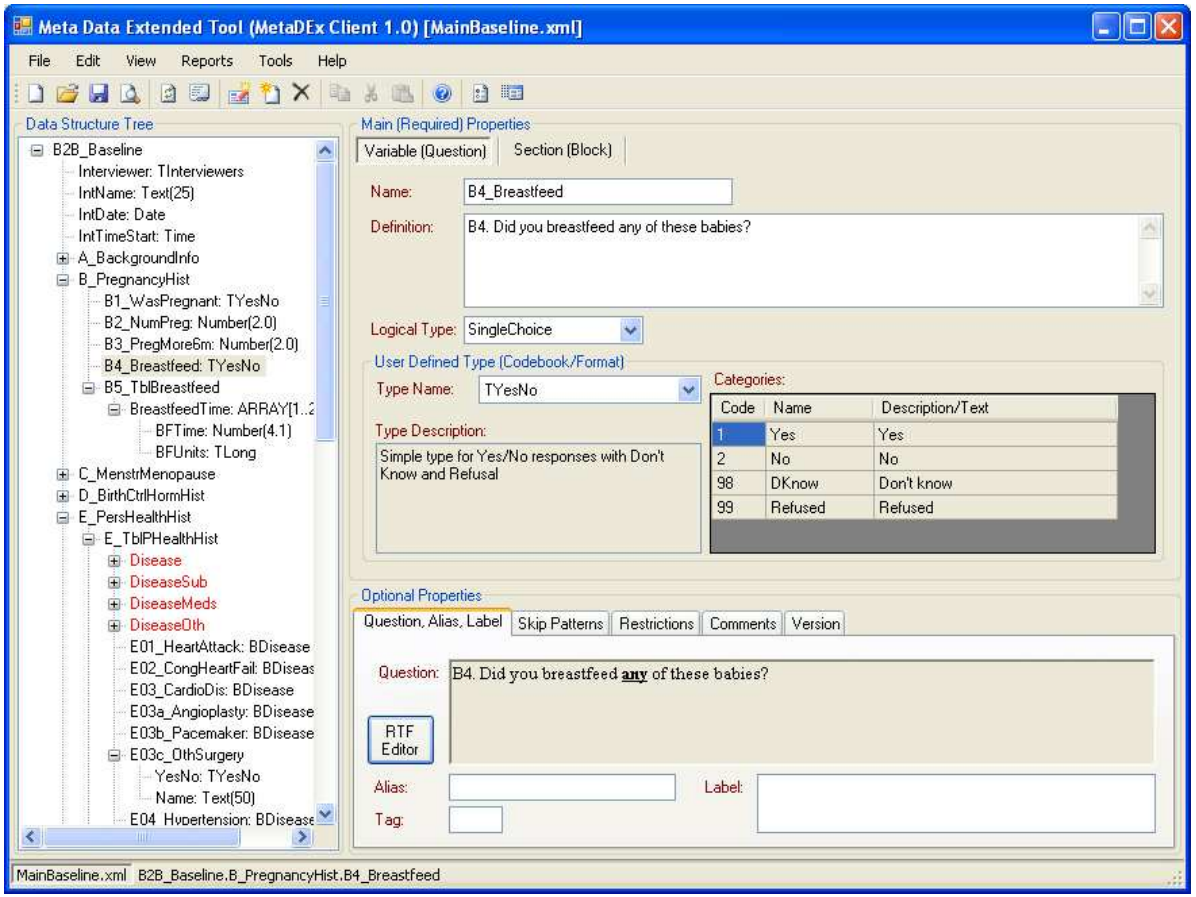
MetaDEx – Main Screen



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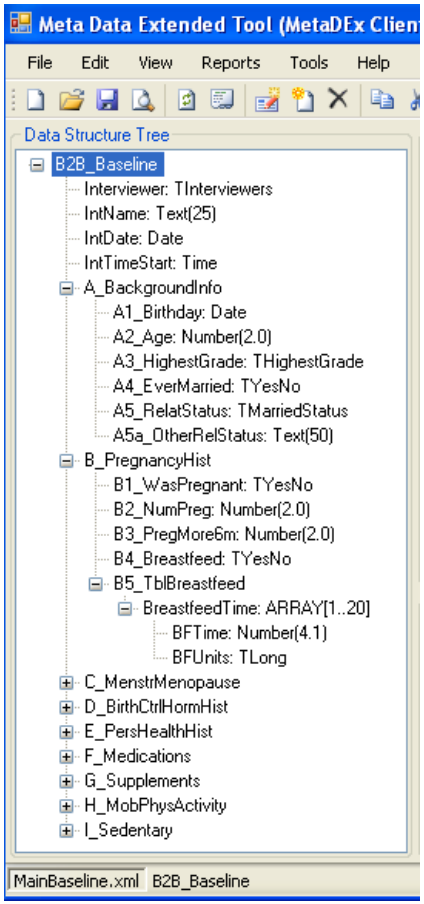
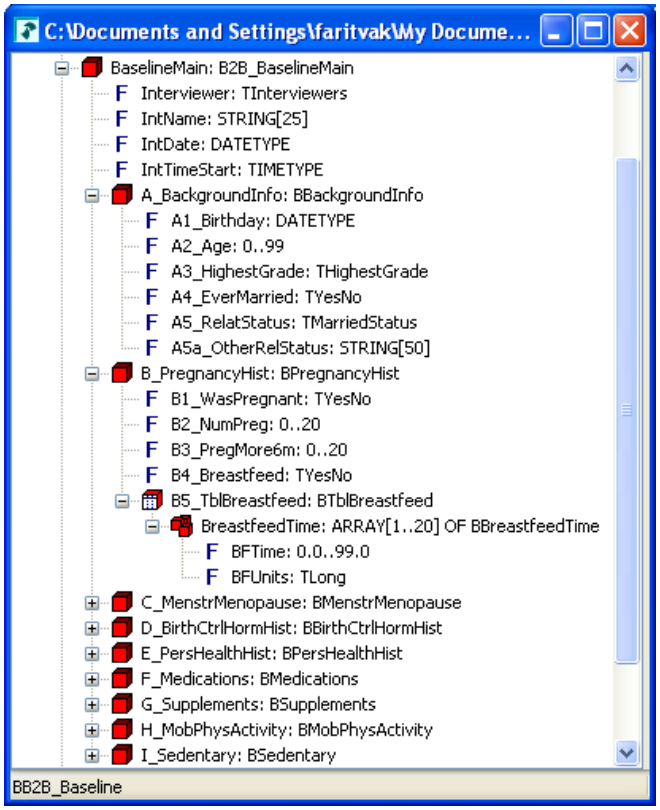
Data Structure representation





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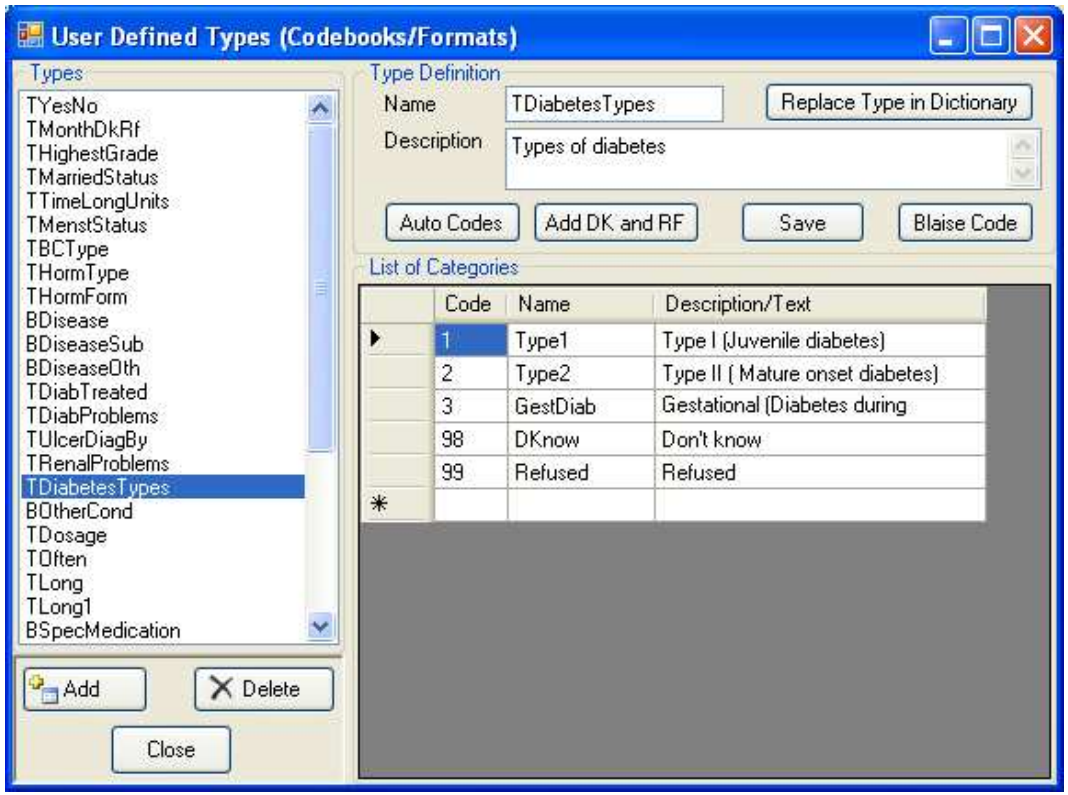
MetaDEx – User Defined Types



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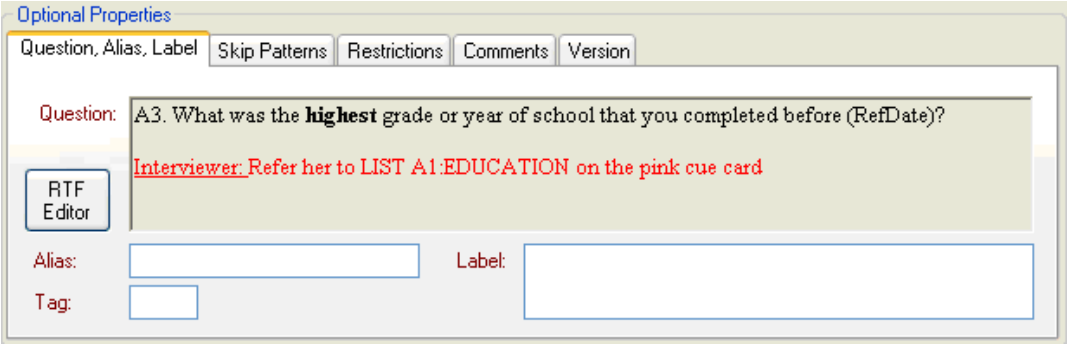
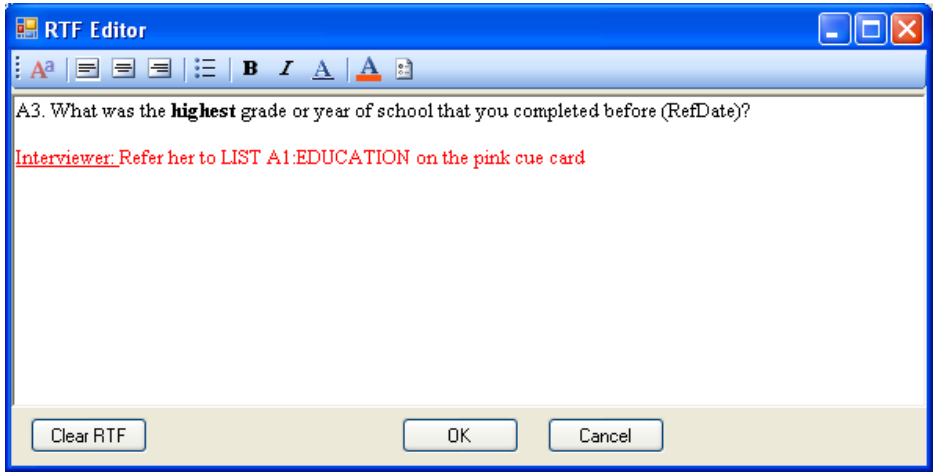
MetaDEx – Optional Properties





Question:

- Can be specified as RTF
- Simple RTF editor with Copy/Paste and formatting functions

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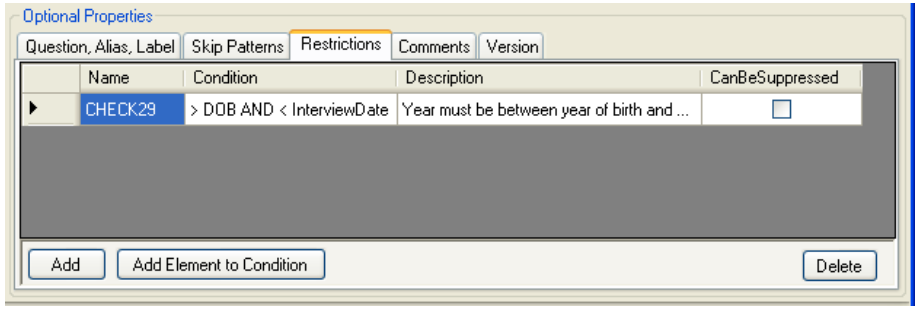
MetaDEx – Optional Properties

Skip patterns:

- Name (optional)
- Condition
- Description (optional)
- GoToElement



Restrictions:

- Name (optional)
- Condition
- Description (optional)
- CanBeSuppressed

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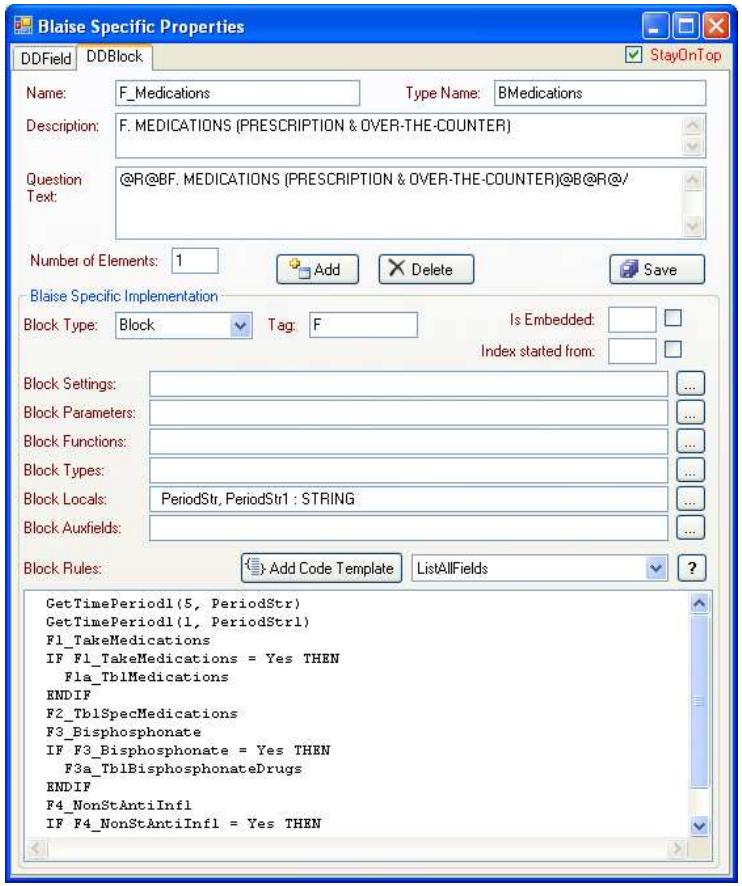
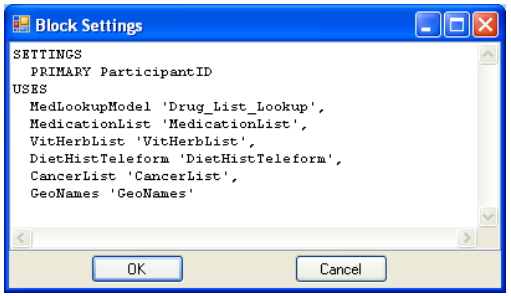
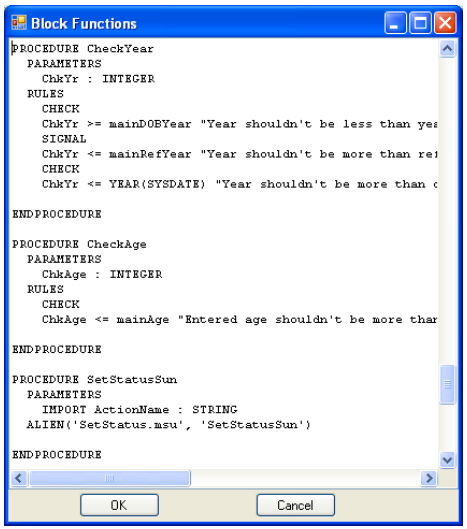
MetaDEx – Blaise Block Properties







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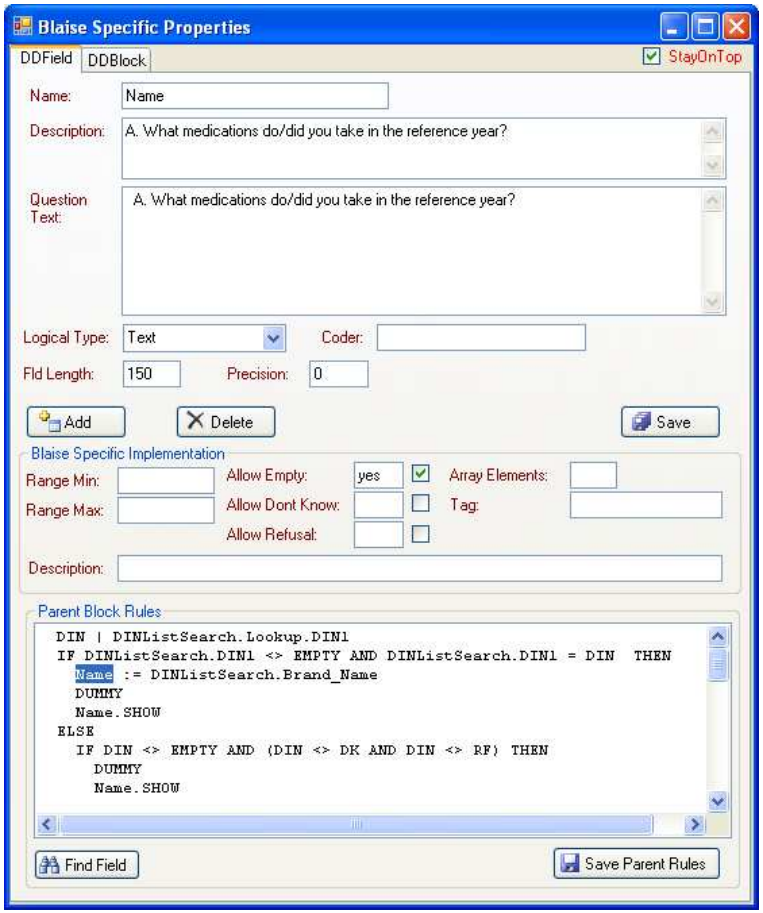
MetaDEx – Blaise Field Properties



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MetaDEx – Code Generation Form

Code Generation Form

Select Code Generation Procedure: GeneralBlaiseBlock ? Add User Type Definition

Blaise Source File: it\My Documents\ACB\B2B\BlaiseBaseline\B2BMain.inc Generate and Update Source File Generate

```
{****** BLOCK B2B_BaselineMain for B2B_Baseline ******}
{* First sections of B2B Baseline Questionnaire *}
BLOCK B2B_BaselineMain

TYPE
{***Simple type for Yes/No responses with Don't Know and Refusal***}
TYesNo = (
  Yes (1) "Yes",
  No (2) "No",
  DKnow (98) "Don't know",
  Refused (99) "Refused")

{***Months with DK and RF***}
TMonthDkRf = (
  Jan (1) "January",
  Feb (2) "February",
  Mar (3) "March",
  Apr (4) "April",
  May (5) "May",
  Jun (6) "June",
```

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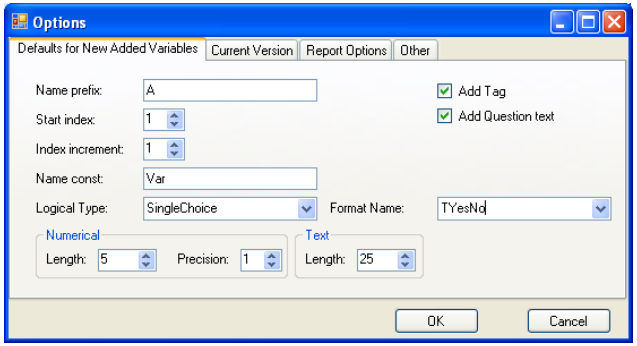
Entity Copy/Paste operations

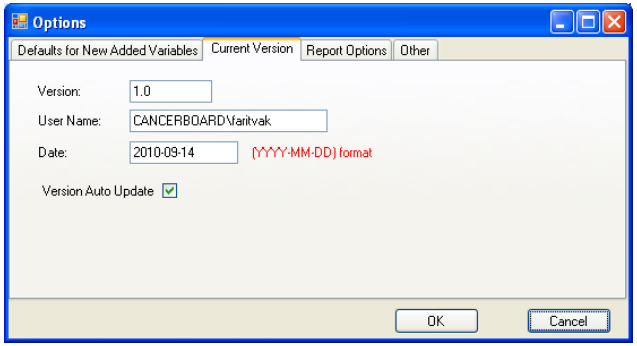
- Facilitates reusing questions or sections
- Implements Copy/Paste operations for any selected field or block between different surveys:
  - Copies entire definition
  - Automated check for name uniqueness
  - Special handling for User Defined Types
- With Cut/Paste operations implements move question/section within one survey

MetaDEx - Options



New fields generation template:

- Name prefix
- Auto incremented index
- Type
- Type details



Version information:

- Version
- User Name
- Date
- Auto update

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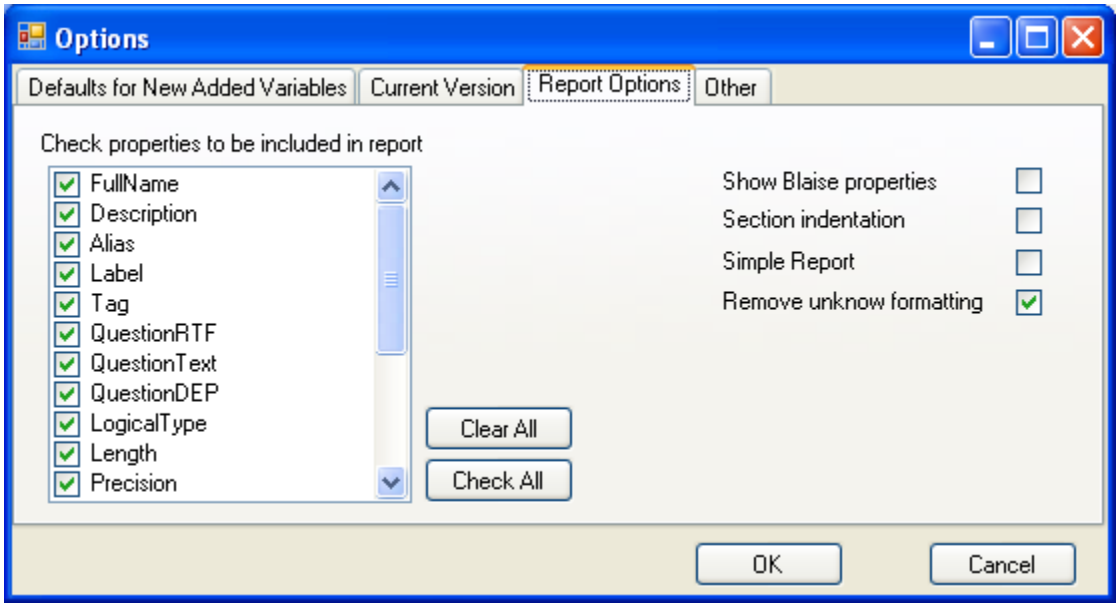
Reporting – Settings



Reporting – Full Report

HTML Report Browser

	Range:	0 .. 20
	Operational:	Required
6.3.	VARIABLE:	**B3_PregMore6m**
	Full Name:	B2B_Baseline.B_PregnancyHist.B3_PregMore6m
	Definition:	B3. Of all your pregnancies on or before RD, how many lasted six months or longer?
	Question(DEP):	B3. Of all your pregnancies on or before (^mainRefDateStr), how many lasted six months or longer?
	Log.Type:	Number
	Length:	2
	Precision:	0
	Range:	0 .. 20
	Operational:	Required
6.4.	VARIABLE:	**B4_Breastfeed**
	Full Name:	B2B_Baseline.B_PregnancyHist.B4_Breastfeed
	Definition:	B4. Did you breastfeed any of these babies?
	Question(DEP):	B4. Did you breastfeed any of these babies?
	Log.Type:	SingleChoice
	Operational:	Required
	Responses:	TYesNo
		Yes (Yes).....[1] No (No).....[2] DKnow (Don't know).....[98] Refused (Refused).....[99]
6.5.	SECTION:	**B5_TblBreastfeed**
	Full Name:	B2B_Baseline.B_PregnancyHist.B5_TblBreastfeed
	Definition:	B5. Breast Feeding Table
	Title(DEP):	**B5. Breast Feeding Table**
		Interviewer: Ask her how old the baby was when she stopped breast feeding him/her. Enter the number in the first field (BFTime) and days, weeks, months or years in the next field (BFUnits). Start with her first pregnancy and end with her most recent pregnancy. If appropriate, utilize the Life Events Calendar to help her remember when she breastfed.
6.5.1.	SECTION:	**BreastfeedTime**
	Full Name:	B2B_Baseline.B_PregnancyHist.B5_TblBreastfeed.BreastfeedTime
	NumElements:	20
	Definition:	For each pregnancy, please indicate how long you breastfed the baby/babies:
	Title(DEP):	For each pregnancy, please indicate how long you breastfeed the baby/babies:
6.5.1.1.	VARIABLE:	**BFTime**
	Full Name:	B2B_Baseline.B_PregnancyHist.B5_TblBreastfeed.BreastfeedTime.BFTime
	Definition:	Total amount of time spent breast feeding the baby/babies
	Question(DEP):	Pregnancy #^I Breastfeeding Time

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Reporting – Simple Plain Report

HTML Report Browser

				Refused.....[99]
5.4.	**A4_EverMarried**	A4. Before (^mainRefDateStr), have you ever been married or lived as married?	SingleChoice	Yes.....[1] No.....[2] DKnow.....[98] Refused.....[99]
5.5.	**A5_RelatStatus**	A5. What was your relationship status on (^mainRefDateStr)? Interviewer: Refer her to LIST A2:CURRENT RELATIONSHIP STATUS on the pink cue card	SingleChoice	Married.....[1] LivAsMarr.....[2] Widowed.....[3] Divorced.....[4] Separated.....[5] Other.....[6]
5.6.	**A5a_OtherRelStatus**	A5a. Other relationship status	Text(50)	
		6. **B_PregnancyHist**		
6.1.	**B1_WasPregnant**	In this section we will be asking you questions concerning your pregnancy history. This includes; all live births, stillbirths, miscarriages, abortions, and tubal, molar and other ectopic pregnancies. Interviewer: Refer her to LIST B1: PREGNANCY OUTCOMES on the pink cue card B1. Were you pregnant on (^mainRefDateStr)?	SingleChoice	Yes.....[1] No.....[2] DKnow.....[98] Refused.....[99]
6.2.	**B2_NumPreg**	B2. Before (^mainRefDateStr), how many times have you been pregnant (include pregnancy on Reference Date)? Interviewer: Refer her to LIST B1: PREGNANCY OUTCOMES on the pink cue card	Number(2.0)	
6.3.	**B3_PregMore6m**	B3. Of all your pregnancies on or before (^mainRefDateStr), how many lasted six months or longer?	Number(2.0)	
6.4.	**B4_Breastfeed**	B4. Did you breastfeed any of these babies?	SingleChoice	Yes.....[1] No.....[2] DKnow.....[98] Refused.....[99]
		6.5. **B5_TblBreastfeed**		
		6.5.1. **BreastfeedTime** : ARRAY[1..20]		
6.5.1.1.	**BFTime**	Pregnancy #^I Breastfeeding Time	Number(4.1)	
6.5.1.2.	**BFUnits**	Pregnancy #^I Time units	SingleChoice	days.....[1] weeks.....[2] months.....[3] years.....[4] DKnow.....[98] Refused.....[99]

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Extensions

- Load Blaise metadata utility:
  - Built on Blaise API
  - Create metadata definition in MetaDEx format
- Server data access tool:
  - Uses Data Dictionary in MetaDEx format
  - Provide unified access to the data on SQL Server
  - Field information and selection
  - Assign/Load field aliases
  - Create SQL Server view from user field selection

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Conclusion

- MetaDEx provides:
  - interface for comprehensive survey/data specification
  - complete Blaise instrument code generation
  - configurable Data Dictionary reporting
- MetaDEx was successfully used for design of more than 10 production Blaise instruments for different studies
- Several historical questionnaires was documented with MetaDEx and unified access to the data was provided
- We are still working on further improvements

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Contact Information

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Thank you

???Questions???