A SAS® Macro for 30-Year Cardiovascular Risk Prediction

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Abstract

Cardiovascular disease (CVD) is the leading cause of death globally, resulting in over 19 million deaths in 2020. It is critical to accurately predict both short-term (10-year) and long-term (30-year or lifetime) cardiovascular risk for earlier detection and intervention. While the 10-year cardiovascular risk prediction tool is commonly used in clinical practice, the use of 30-year risk prediction tool is limited partly because there is no automated program or application to assess predictions at a population-level. The original 30-year risk calculator was provided as four separated Excel forms to calculate 30-year cardiovascular risk for a single person depending on the predicted events (either hard CVD outcome or full ranges of CVD outcome) and body mass index (BMI) information availability. Specifically, to predict a hard CVD outcome (coronary death, myocardial infarction, fatal or non-fatal stroke), the cumulative incidence at each time point (1,053 rows) were provided separately for the models with BMI and without BMI.

To predict a full CVD outcome (hard CVD plus coronary insufficiency, angina pectoris, transient ischemic attack, intermittent claudication, or congestive heart failure), 1,340 rows of cumulative incidence at each time point were provided separately for the models with BMI and without BMI. They are not very intuitive to apply to a population in a systematic way. To address this gap, we developed a SAS macro to automate the predication calculations at a population level after importing a parameter file and population data including sex, systolic blood pressure, age, diabetes, smoking, treated hypertension, total cholesterol, high density lipoprotein cholesterol, or/and BMI. The macro is straightforward to use, which can produce 30-year risk of both hard CVD and full CVD outcomes with or without BMI. We believe the application of this macro will help develop a population level approach to assess 30-year CVD risk.

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1. Overview

Cardiovascular disease (CVD) refers to various conditions including heart failure, stroke, and heart disease among other conditions related to the heart and blood vessels. Globally, approximately 523 million people had CVD and an estimated 19 million deaths were due to CVD in 2020 (Coronado et al., 2022). It is a leading cause of death and responsible for roughly 32% of all global deaths (Roth et al., 2020; Tsao et al., 2022). Many studies identified CVD risk factors such as tobacco use, hypertension, high body mass index (BMI), and high glucose levels and type 2 diabetes to prevent and manage CVD risk (Kaneko et al., 2021; Jagannathan et al., 2019; Loretan et al., 2022; GBD 2019 Risk Factors Collaborators, 2020). Previous studies emphasized potential benefits of addressing these CVD risk factors at earlier age by calculating long-term CVD risk (An et al., 2023; Pencina et al., 2009). Our recent study showed that 30-year risk prediction tool further discriminate a subgroup of young adults with elevated observed CVD risk despite low estimated 10-year risk (An et al., 2023).

Pencina et al. (2009) developed the 30-year risk of CVD from the Framingham Heart Study. They used a modified Cox model and adjusted for competing risk of non-CVD death. The original 30-year risk calculator was provided as web-based tool (**Figure 1)** for a single person depending on the predicted events (Framingham Heart Study, n.d.). To align with the tool, four separated Excel forms to predict hard CVD (coronary death, myocardial infarction, stroke) or general CVD (coronary death, myocardial infarction, coronary insufficiency, angina, ischemic stroke, hemorrhagic stroke, transient ischemic attack, peripheral artery disease, heart failure) using the set of predictors with or without BMI were provided for download on the website (https://www.framinghamheartstudy.org/fhs-risk-functions/cardiovascular-disease-30-year-risk). Specifically, to predict a hard CVD outcome, two excel tables with 1,053 rows were used separately to provide the cumulative incidence at each time point depending on the availability of BMI(**Appendix 1&2**). To predict a full CVD outcome, two excel tables with 1,340 rows each were used to provide cumulative incidence at each time point separately for the models with BMI and without BMI (**Appendix 3&4**).

This is not very intuitive to apply to population data in a systematic way. To address this gap, we developed a SAS macro to automate the prediction calculations for each individual in a population dataset.

Figure 1: Web-based 30-year prediction model

Risk Factor Calculator: 30 Year Risk Factors

We acknowledge Mr. Aaron Vaneps and the Mayo Clinic Cardiovascular Health Clinic who provided the interactive risk calculator.

Sex: ◉ Male ○ Female

Systolic BP: 120

Age: 43

Diabetes: ☐

Smoker: ☐

Treated Hypertension: ☐

Total Cholesterol: 180

HDL Cholesterol: 66

BMI: 25

Lipids-Based Results

Your Risk of Full CVD:	%

2. Methods

We first downloaded four separated Excel forms from https://www.framinghamheartstudy.org/fhs-risk-functions/cardiovascular-disease-30-year-risk and then simplified and converted them into one SAS dataset – Risk_calculator_import.sas7bdat (**Figure 2**). After the cohort is read into the SAS dataset, each individual is looped into the prediction Macro one by one (**Figure 3)**. The algorithm of risk prediction is established (**Figure 4)**. During the prediction process, one step requires to get the values from the last row record. Given there is no built-in lead function in SAS, we used the trick - the SORT procedure by descending order, apply the LAG function to get the values from the last row, and PROC SORT by ascending order to switch the order back.

Figure 2: A subset of Risk_calculator_import.sas7bdat. 1,340 rows in total.

	CVD_No_BMI1	CVD_No_BMI2	HCVD_No_BMI1	HCVD_No_BMI2	CVD_BMI1	CVD_BMI2	HCVD_BMI1	HCVD_BM
1	0.999874296	1	0.9998922304	1	0.9998691086	1	0.9998866305	
2	0.999874296	0.9998744458	0.9998922304	0.999877285	0.9998691086	0.9998749999	0.9998866305	0.9998773
3	0.999874296	0.9997488648	0.9998922304	0.9997545439	0.9998691086	0.9997499748	0.9998866305	0.9997547
4	0.9997485187	0.9997488648	0.9997843997	0.9997545439	0.9997381236	0.9997499748	0.9997731818	0.9997547
5	0.999622704	0.9997488648	0.9996765369	0.9997545439	0.9996071077	0.9997499748	0.9996597075	0.9997547
6	0.999622704	0.9996231339	0.9996765369	0.9996316555	0.9996071077	0.9996248141	0.9996597075	0.9996319
7	0.9994968032	0.9996231339	0.9995685909	0.9996316555	0.9994759826	0.9996248141	0.999546127	0.9996319
8	0.9993708493	0.9996231339	0.9995685909	0.9995086641	0.9993448288	0.9996248141	0.999546127	0.9995090
9	0.9993708493	0.999497251	0.9995685909	0.9993855721	0.9993448288	0.9994994902	0.999546127	0.9993860
10	0.9993708493	0.9993712677	0.9994604741	0.9993855721	0.9993448288	0.9993740723	0.999432393	0.9993860
11	0.9992447048	0.9993712677	0.9994604741	0.9992623952	0.9992135021	0.9993740723	0.999432393	0.9992630
12	0.9992447048	0.9992451997	0.9993523329	0.9992623952	0.9992135021	0.9992485694	0.9993186175	0.9992630
13	0.9991185296	0.9992451997	0.9993523329	0.9991391727	0.9990821263	0.9992485694	0.9993186175	0.999139
14	0.9991185296	0.9991190873	0.9993523329	0.9990158557	0.9990821263	0.9991230232	0.9993186175	0.9990166
15	0.9991185296	0.9989928814	0.9992440219	0.9990158557	0.9990821263	0.9989973867	0.9992046867	0.9990166
16	0.9989921742	0.9989928814	0.9991356473	0.9990158557	0.9989505841	0.9989973867	0.9990907014	0.9990166
17	0.9988657567	0.9989928814	0.9990272209	0.9990158557	0.9988189883	0.9989973867	0.9989766543	0.9990166
18	0.9987392831	0.9989928814	0.9989186784	0.9990158557	0.9986873324	0.9989973867	0.9988625214	0.9990166
19	0.9986127039	0.9989928814	0.9989186784	0.9988920613	0.998555594	0.9989973867	0.9988625214	0.9988929
20	0.9986127039	0.9988662034	0.9989186784	0.9987682761	0.998555594	0.9988712567	0.9988625214	0.9987692
21	0.9986127039	0.998739535	0.9988100453	0.9987682761	0.998555594	0.9987451361	0.9987482468	0.9987692
22	0.998486005	0.998739535	0.9988100453	0.9986443376	0.998423702	0.9987451361	0.9987482468	0.9986454
23	0.9983592605	0.998739535	0.9987012945	0.9986443376	0.9982917726	0.9987451361	0.9986338516	0.9986454
24	0.9982325038	0.998739535	0.9985925383	0.9986443376	0.9981598314	0.9987451361	0.9985194506	0.9986454
25	0.9981056754	0.998739535	0.9985925383	0.9985202604	0.9980278094	0.9987451361	0.9985194506	0.9985214

Figure 3: Do loop to predict the risk one by one

```
%macro risk_calculator(cohort_size,inputdata,CumIncidence,outputdata);

 %do i = 1 %to &cohort_size.;/*cohort size*/
 data _30yr_risk;
 set &inputdata.;/*cohort data*/
 if _N_=&i.;
 /*creat linke variable in order to merge with calculator*/
 link=1;
 keep mrn gender age link risk_sbp risk_cholesterol risk_hdl current_tobacco risk_htn dm bmi;
 run;
```

Figure 4: Part of the algorithm to predict risk

```
proc sql;
create table _30yr_risk_v2 as
select a.*,b.*
from _30yr_risk as a full join &CumIncidence./*risk calculator 1340 rows with link and order variable*/ as b on a.link=b.link;
quit;

data _30yr_risk_v3;
set _30yr_risk_v2;
/*Create male flag for calculation*/
if gender="F" then male_flag=0;
else if gender='M' then male_flag=1;
else male_flag=.;

/*CVD_No_BMI*/
CVD_No_BMI_x_beta=0.34362*male_flag+2.63588*log(age)+1.8803*log(risk_sbp)+1.12673*log(risk_cholesterol)+(-0.90941)*log(risk_hdl)+0.59397*current_tobacco+0.5232*risk_htn+0.68602*dm;
CVD_No_BMI_dx_beta=0.48123*male_flag+3.39222*log(age)+1.39862*log(risk_sbp)+(-0.00439)*log(risk_cholesterol)+0.16081*log(risk_hdl)+0.99858*current_tobacco+0.19035*risk_htn+0.49756*dm;
CVD_No_BMI_exp_x_beta=exp(CVD_No_BMI_x_beta-21.29326612);
CVD_No_BMI_exp_dx_beta=exp(CVD_No_BMI_dx_beta-20.12840698);
CVD_No_BMI_acs=CVD_No_BMI1**CVD_No_BMI_exp_x_beta;
CVD_No_BMI_ads=CVD_No_BMI2**CVD_No_BMI_exp_dx_beta;
```

The complete Macro code can be downloaded from:
https://github.com/zmn0322/30-Year-CVD-Risk-Prediction

3. Working with Macro

3.1 Prepare a dataset with required predictors in the eligible study population
According to Pencina et al. (2009), the 30-year CVD prediction should only be conducted among individuals between 20 and 59 years old without history of CVD. In the import dataset, information of the predictors including gender, age, systolic blood pressure (SBP), use of antihypertensive treatment, smoking, diabetes mellitus (DM) is required. In addition, the individuals should either have information of total cholesterol and high-density lipoprotein cholesterol (HDL), or BMI to be able to calculate the 30-year CVD prediction.

3.2 Download
Download the Risk_calculator_import.sas7bdat from https://github.com/zmn0322/30-Year-CVD-Risk-Prediction and then save it in the local SAS.

3.3 Provide Macro parameter
The following parameters are required to be defined in the macro:

- Inputdata = the cohort data including sex, age, SBP, diabetes, smoking, and treated hypertension, with either total cholesterol and high density lipoprotein cholesterol or BMI, or all three.
  Cohort_size = the total number of persons in the inputdata.
- Outputdata = output dataset name for which the users want the 30-year cardiovascular risk predications to be saved.

3.4 Variable definition for the input data
The following variables are required in the input data:
- MRN = an unique ID.
- Gender = categorical variable having two values ‘M’ and ‘F’.
- Age = numeric variable ranging from 20 to 59.
- Risk_sbp = numeric variable - systolic blood pressure.
- Risk_cholesterol = numeric variable - total cholesterol.
- Risk_HDL = numeric variable - high density lipoprotein cholesterol.
- BMI = numeric variable - body mass index.
- DM = binary variable - diabetes mellitus.
- Current_tobacco = binary variable - smoking status.
- Risk_HTN = binary variable - use of antihypertensive treatment.

3.5 Potential computational issues

Due to the complexity of this algorithm, it may take a while to produce the risk predictions. The user could break the population data into some sub-datasets and then run the Macro separately.

4. Example

Users are required to have a similar dataset structure (**Table 1**) to start with.

Table 1: Five hypothetical individuals and their characteristics

Person ID	Gender	Age	Risk_SBP	Risk_Cholesterol	Risk_HDL	Current_Tobacco	Risk_HTN	DM	BMI
001	M	35	120	230.8	59	0	0	1	23
002	F	50.5	135.2	.	66	1	1	1	23.5
003	F	41	132.4	235	64	0	1	1	.
004		39.6	133	238.5	63.7	1	1	0	25.4
005	M	38	.	.	.	0	1	0	.

After defining the cohort_size, 30-year risk predictions are produced automatically by submitting:

%risk_calculator(inputdata=_sample,cohort_size=5,outputdata=RiskScore);

Table 2: Output data with four risk predictions for the five individuals

Person ID	CVD_No_BMI_risk_score	HCVD_No_BMI_risk_score	CVD_BMI_risk_score	HCVD_BMI_risk_score
001	0.25	0.19	0.27	0.19
002	.	.	0.72	0.58
003	0.44	0.27	.	.
004	.	.	.	.
005	.	.	.	.

With completed variable information, the macro produces all four risk scores for the first individual. Due to missing total cholesterol, the second individual doesn't have CVD and HCVD risk scores without BMI. The third individual doesn't have CVD and HCVD risk scores with BMI because the person is missing BMI. The fourth and fifth individuals do not have a any risk scores due to missing gender and missing lipids and BMI.

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Appendix 1: Underlying table (subset of data) for 30-Year HCVD prediction with BMI

NAME	COL1	_NAME_	COL2	acs**exp(x-mx)	log{i-1}-log{i}	_NAME_	COL3	ads**exp(dx-mdx)	askla{i}
_10001	0.24093	_30001	0.999887	0.999945985	0	_40001	1	1	5.40164E-05
_10002	0.243669	_30002	0.999887	0.999945985	0	_40002	0.999877	0.999921375	0
_10003	0.528405	_30003	0.999887	0.999945985	0.000113468	_40003	0.999755	0.99984273	0
_10004	0.550308	_30004	0.999773	0.999891929	0.000113506	_40004	0.999755	0.99984273	5.40489E-05
_10005	0.610542	_30005	0.99966	0.999837858	0	_40005	0.999755	0.99984273	5.40643E-05
_10006	0.66256	_30006	0.99966	0.999837858	0.000113626	_40006	0.999632	0.999763992	0
_10007	0.695413	_30007	0.999546	0.999783733	0	_40007	0.999632	0.999763992	5.41139E-05
_10008	0.780288	_30008	0.999546	0.999783733	0	_40008	0.999509	0.999685183	0
_10009	0.796715	_30009	0.999546	0.999783733	0.000113792	_40009	0.999386	0.999606307	0
_10010	0.985627	_30010	0.999432	0.999729531	0	_40010	0.999386	0.999606307	5.41817E-05
_10011	0.996578	_30011	0.999432	0.999729531	0.000113847	_40011	0.999263	0.999527373	0
_10012	1.089664	_30012	0.999319	0.999675306	0	_40012	0.999263	0.999527373	5.42004E-05
_10013	1.182751	_30013	0.999319	0.999675306	0	_40013	0.99914	0.999448406	0
_10014	1.253936	_30014	0.999319	0.999675306	0.000114015	_40014	0.999017	0.999369377	0
_10015	1.314168	_30015	0.999205	0.999621005	0.000114083	_40015	0.999017	0.999369377	5.4269E-05
_10016	1.327858	_30016	0.999091	0.999566674	0.000114157	_40016	0.999017	0.999369377	5.42982E-05
_10017	1.374402	_30017	0.998977	0.99951231	0.000114256	_40017	0.999017	0.999369377	5.43309E-05
_10018	1.418207	_30018	0.998863	0.999457902	0	_40018	0.999017	0.999369377	5.43751E-05
_10019	1.462012	_30019	0.998863	0.999457902	0	_40019	0.998893	0.999290028	0
_10020	1.494866	_30020	0.998863	0.999457902	0.000114411	_40020	0.998769	0.999210682	0
_10021	1.601643	_30021	0.998748	0.999403423	0	_40021	0.998769	0.999210682	5.44372E-05
_10022	1.612595	_30022	0.998748	0.999403423	0.000114545	_40022	0.998645	0.999131233	0
_10023	1.678302	_30023	0.998634	0.999348884	0.000114564	_40023	0.998645	0.999131233	5.44936E-05
_10024	1.790555	_30024	0.998519	0.999294338	1.11022E-16	_40024	0.998645	0.999131233	5.44996E-05

Appendix 2: Underlying table (subset of data) for 30-Year HCVD prediction without BMI

NAME	COL1	_NAME_	COL2	acs**exp(x-mx)	log{i-1}-log{i}	_NAME_	COL3	ads**exp(dx-mdx)	askla{i}
_10001	0.24093	_30001	0.999892	0.999935675	0	_40001	1	1	6.43269E-05
_10002	0.2436691	_30002	0.999892	0.999935675	0	_40002	0.999877	0.999929371	0
_10003	0.5284049	_30003	0.999892	0.999935675	0.000107848	_40003	0.999755	0.999858723	0
_10004	0.550308	_30004	0.999784	0.999871311	0.000107892	_40004	0.999755	0.999858723	6.4357E-05
_10005	0.6105415	_30005	0.999677	0.999806925	0	_40005	0.999755	0.999858723	6.4379E-05
_10006	0.6625604	_30006	0.999677	0.999806925	0.000107987	_40006	0.999632	0.999787987	0
_10007	0.6954132	_30007	0.999569	0.999742487	0	_40007	0.999632	0.999787987	6.44269E-05
_10008	0.7802882	_30008	0.999569	0.999742487	0	_40008	0.999509	0.999717188	0
_10009	0.7967155	_30009	0.999569	0.999742487	0.000108169	_40009	0.999386	0.999646327	0
_10010	0.9856266	_30010	0.99946	0.999677943	0	_40010	0.999386	0.999646327	6.45225E-05
_10011	0.9965777	_30011	0.99946	0.999677943	0.000108205	_40011	0.999262	0.999575414	0
_10012	1.0896641	_30012	0.999352	0.999613383	0	_40012	0.999262	0.999575414	6.45353E-05
_10013	1.1827512	_30013	0.999352	0.999613383	0	_40013	0.999139	0.99950447	0
_10014	1.2539358	_30014	0.999352	0.999613383	0.000108387	_40014	0.999016	0.999433469	0
_10015	1.3141684	_30015	0.999244	0.999548718	0.000108462	_40015	0.999016	0.999433469	6.46303E-05
_10016	1.3278584	_30016	0.999136	0.999484012	0.000108526	_40016	0.999016	0.999433469	6.46711E-05
_10017	1.3744018	_30017	0.999027	0.999419273	0.000108654	_40017	0.999016	0.999433469	6.47048E-05
_10018	1.4182075	_30018	0.998919	0.999354461	0	_40018	0.999016	0.999433469	6.47769E-05
_10019	1.4620117	_30019	0.998919	0.999354461	0	_40019	0.998892	0.999362189	0
_10020	1.4948658	_30020	0.998919	0.999354461	0.000108757	_40020	0.998768	0.99929091	0
_10021	1.6016429	_30021	0.99881	0.999289593	0	_40021	0.998768	0.99929091	6.48246E-05
_10022	1.6125947	_30022	0.99881	0.999289593	0.000108886	_40022	0.998644	0.99921954	0
_10023	1.6783025	_30023	0.998701	0.999224651	0.000108904	_40023	0.998644	0.99921954	6.48931E-05
_10024	1.7905552	_30024	0.998593	0.999159704	0	_40024	0.998644	0.99921954	6.48991E-05

Appendix 3: Underlying table (subset of data) for 30-Year CVD prediction with BMI

NAME	COL1
_10001	0.24093
_10002	0.243669
_10003	0.528405
_10004	0.550308
_10005	0.610542
_10006	0.66256
_10007	0.665299
_10008	0.695413
_10009	0.780288
_10010	0.796715
_10011	0.985627
_10012	0.996578
_10013	1.089664
_10014	1.182751
_10015	1.253936
_10016	1.314168
_10017	1.327858
_10018	1.374402
_10019	1.418207
_10020	1.462012
_10021	1.494866
_10022	1.519508
_10023	1.549623
_10024	1.601643

NAME	COL2	acs**exp(x-mx)	log{i-1}-log{i}
_30001	0.999869	0.999929861	0
_30002	0.999869	0.999929861	0
_30003	0.999869	0.999929861	0.000131011
_30004	0.999738	0.999859667	0.000131059
_30005	0.999607	0.999789452	0
_30006	0.999607	0.999789452	0.000131185
_30007	0.999476	0.999719175	0.000131231
_30008	0.999345	0.999648878	0
_30009	0.999345	0.999648878	0
_30010	0.999345	0.999648878	0.000131421
_30011	0.999214	0.999578483	0
_30012	0.999214	0.999578483	0.000131488
_30013	0.999082	0.999508059	-1.11131E-16
_30014	0.999082	0.999508059	1.11131E-16
_30015	0.999082	0.999508059	0.000131672
_30016	0.998951	0.999437541	0.000131743
_30017	0.998819	0.999366989	0.00013182
_30018	0.998687	0.999296401	0.00013192
_30019	0.998556	0.999225765	0
_30020	0.998556	0.999225765	0
_30021	0.998556	0.999225765	0.000132092
_30022	0.998424	0.999155042	0.000132146
_30023	0.998292	0.999084295	0.000132176
_30024	0.99816	0.999013537	0.000132274

NAME	COL3	ads**exp(dx-mdx)	askla{i}
_40001	1	1	7.014E-05
_40002	0.999875	0.999914075	0
_40003	0.99975	0.99982813	0
_40004	0.99975	0.99982813	7.018E-05
_40005	0.99975	0.99982813	7.021E-05
_40006	0.9996248	0.999742089	0
_40007	0.9996248	0.999742089	7.026E-05
_40008	0.9996248	0.999742089	7.028E-05
_40009	0.9994995	0.999655932	0
_40010	0.9993741	0.999569706	0
_40011	0.9993741	0.999569706	7.037E-05
_40012	0.9992486	0.999483419	0
_40013	0.9992486	0.999483419	7.039E-05
_40014	0.999123	0.999397099	-5.949E-17
_40015	0.9989974	0.999310713	5.948E-17
_40016	0.9989974	0.999310713	7.047E-05
_40017	0.9989974	0.999310713	7.051E-05
_40018	0.9989974	0.999310713	7.054E-05
_40019	0.9989974	0.999310713	7.059E-05
_40020	0.9988713	0.999223985	0
_40021	0.9987451	0.99913726	0
_40022	0.9987451	0.99913726	7.066E-05
_40023	0.9987451	0.99913726	7.069E-05
_40024	0.9987451	0.99913726	7.07E-05

Appendix 4: Underlying table (subset of data) for 30-Year HCVD prediction without BMI

NAME	COL1
_10001	0.24093
_10002	0.243669
_10003	0.528405
_10004	0.550308
_10005	0.610542
_10006	0.66256
_10007	0.665299
_10008	0.695413
_10009	0.780288
_10010	0.796715
_10011	0.985627
_10012	0.996578
_10013	1.089664
_10014	1.182751
_10015	1.253936
_10016	1.314168
_10017	1.327858
_10018	1.374402
_10019	1.418207
_10020	1.462012
_10021	1.494866
_10022	1.519508
_10023	1.549623
_10024	1.601643

NAME	COL2	acs**exp(x-mx)	log{i-1}-log{i}
_30001	0.999874	0.999923372	0
_30002	0.999874	0.999923372	0
_30003	0.999874	0.999923372	0.000125801
_30004	0.999749	0.999846695	0.000125854
_30005	0.999623	0.999769992	0
_30006	0.999623	0.999769992	0.000125956
_30007	0.999497	0.999693233	0.000126025
_30008	0.999371	0.999616437	0
_30009	0.999371	0.999616437	0
_30010	0.999371	0.999616437	0.000126232
_30011	0.999245	0.999539522	0
_30012	0.999245	0.999539522	0.000126279
_30013	0.999119	0.999462584	0
_30014	0.999119	0.999462584	0
_30015	0.999119	0.999462584	0.000126475
_30016	0.998992	0.999385532	0.000126553
_30017	0.998866	0.999308438	0.000126625
_30018	0.998739	0.999231307	0.000126747
_30019	0.998613	0.999154107	0
_30020	0.998613	0.999154107	0
_30021	0.998613	0.999154107	0.000126883
_30022	0.998486	0.999076831	0.000126945
_30023	0.998359	0.998999523	0.000126973
_30024	0.998233	0.998922203	0.000127061

NAME	COL3	ads**exp(dx-mdx)	askla{i}
_40001	1	1	7.6631E-05
_40002	0.999874446	0.999923734	0
_40003	0.999748865	0.999847449	0
_40004	0.999748865	0.999847449	7.6668E-05
_40005	0.999748865	0.999847449	7.6694E-05
_40006	0.999623134	0.999771068	0
_40007	0.999623134	0.999771068	7.6745E-05
_40008	0.999623134	0.999771068	7.6781E-05
_40009	0.999497251	0.999694591	0
_40010	0.999371268	0.99961805	0
_40011	0.999371268	0.99961805	7.6889E-05
_40012	0.9992452	0.999541453	0
_40013	0.9992452	0.999541453	7.6906E-05
_40014	0.999119087	0.999464826	0
_40015	0.998992881	0.999388137	0
_40016	0.998992881	0.999388137	7.7008E-05
_40017	0.998992881	0.999388137	7.7049E-05
_40018	0.998992881	0.999388137	7.7087E-05
_40019	0.998992881	0.999388137	7.7155E-05
_40020	0.998866203	0.999311159	0
_40021	0.998739535	0.999234182	0
_40022	0.998739535	0.999234182	7.722E-05
_40023	0.998739535	0.999234182	7.7252E-05
_40024	0.998739535	0.999234182	7.7263E-05