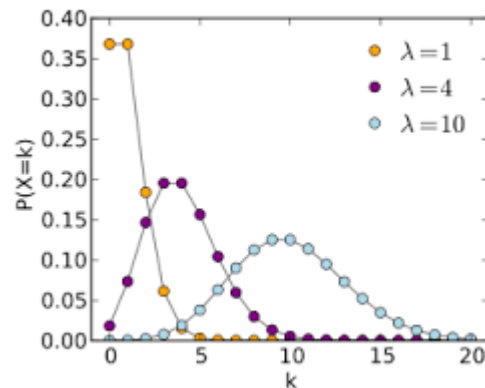


SaTScan

Aglomerados no Espaço-Tempo

Modelo Discreto de Poisson



ESTATÍSTICA DE VARREDURA NO ESPAÇO-TEMPO

- ✓ **Agregação Espaço-Temporal de Doenças** → expressão de processos contagiosos. Utilizadas prioritariamente na investigação de doenças transmissíveis ou infecciosas de etiologia desconhecida.
- ✓ **Agregação Espaço-Temporal** → tem sido aplicada também no estudo de algumas neoplasias.
- ✓ **Outros Usos** → avaliar o impacto de programas de prevenção, sugerir padrões de disseminação de doenças transmissíveis, monitorar a ocorrência de doenças infecciosas em ambiente hospitalar.

ESTATÍSTICA DE VARREDURA NO ESPAÇO-TEMPO

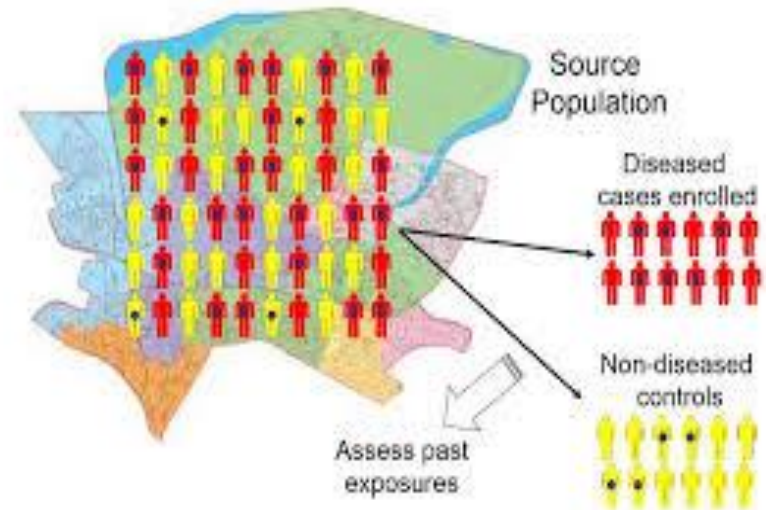
- ✓ **Janela de Varredura** → cilindro com uma **base** geográfica circular ou elíptica, e com **altura** correspondente ao tempo.
- ✓ A **base** é definida exatamente como para a estatística de varredura espacial, e as **alturas** refletem o período de tempo dos aglomerados potenciais.
- ✓ **Janela Cilíndrica** → movida no espaço e no tempo para cada possível localização e tamanho geográfico. Cada possível período de tempo também é visitado.
- ✓ **Análises Espaço-Temporais** → n^0 de casos deve ser estratificado pelo **tempo (data do diagnóstico)**.

ESTATÍSTICA DE VARREDURA NO ESPAÇO-TEMPO

- ✓ São criados infinitos número de **cilindros sobrepostos** de diferentes tamanhos e formatos, cobrindo a região de estudo.
- ✓ **Cada cilindro reflete um possível aglomerado.**
- ✓ Usada para a **análise retrospectiva simples (dados históricos)** ou para a **vigilância prospectiva**: as análises são repetidas, por exemplo, todos os dias, semanas, meses ou anos.

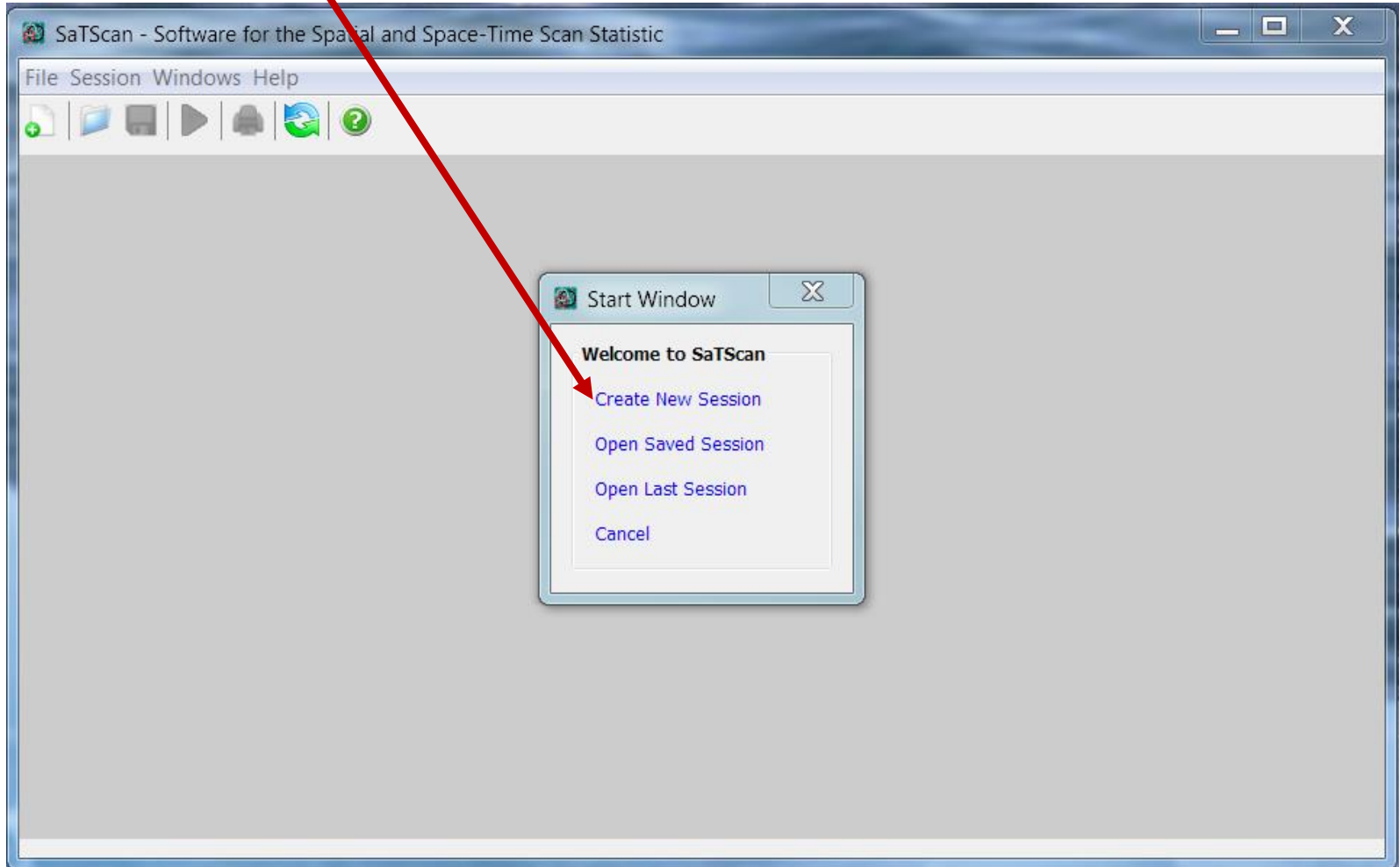
MODELO DISCRETO DE POISSON

- ✓ Usado quando a população de base reflete uma certa **massa em risco**: por exemplo, **pessoas-tempo** vivendo em uma área.
- ✓ Os **casos** são incluídos como parte da **contagem da população**.



ESTATÍSTICA DE VARREDURA NO ESPAÇO-TEMPO

Abrir o SaTScan e importar os arquivos de **casos**, de **população** e de **coordenadas**.



Tab "Input"

Importar o arquivo de

casos:

'cancer_mex_cas.xls'

Clicar no botão: "Case File" (Import File Wizard).

Selecionar as colunas, conforme figura - agora iremos incluir o tempo (ano)!

Escolher o diretório e Importar.

Import File Wizard

Display SaTScan Variables For: discrete Poisson model

| SaTScan Variable | Source File Variable |
|-----------------------|----------------------|
| Location ID | Local |
| Number of Cases | caso |
| Date/Time (optional) | ano |
| Covariate1 (optional) | gr_idade |
| Covariate2 (optional) | sexo |
| Covariate3 (optional) | unassigned |

Clear

| Generated Id # | One Count # | Local | caso | ano | gr_idade |
|----------------|-------------|------------|------|------|----------|
| location2 | 1 | Grant | 1 | 1977 | 2 |
| location3 | 1 | SanJuan | 1 | 1974 | 8 |
| location4 | 1 | Bernalillo | 1 | 1977 | 13 |
| location5 | 1 | DonaAna | 1 | 1977 | 14 |
| location6 | 1 | Union | 1 | 1977 | 16 |
| location7 | 1 | Sandoval | 1 | 1977 | 11 |

= Column is not actually defined in file but can be used as SaTScan variable.

< Previous Next >

Tab "Input"

Definir o
"Time
Precision"
em Ano e
fixar o
"Study
Period"
entre 1973
e 1991.

The screenshot shows the 'Input' tab of a software interface. It contains several sections for file selection and configuration:

- Case File:** A text box containing the path `5ATSCAN\SaTScan_EspacoTemporal\bancos_aula_14\Cases.cas` and a browse button (...).
- Control File:** A text box with the label `(Bernoulli Model)` and a browse button (...).
- Study Period:** A section with two date pickers. The **Start Date** is set to Year: 1973, Month: 1, Day: 1. The **End Date** is set to Year: 1991, Month: 12, Day: 31.
- Population File:** A text box with the label `(Poisson Model)` and a browse button (...).
- Coordinates File:** A text box and a browse button (...).
- Grid File:** A text box with the label `(optional)` and a browse button (...).
- Time Precision:** A group box containing radio buttons for `None`, `Year` (selected), `Month`, and `Day`. There is also a `Generic` option.
- Coordinates:** A group box containing radio buttons for `Cartesian` and `Lat/Long` (selected).

At the bottom right, there is a button labeled `Advanced >>`. Two red arrows originate from the text on the left: one points to the 'Time Precision' group box, and the other points to the 'Study Period' date pickers.

Tab "Input"

Importação
do arquivo
de
população:
'cancer_me
x_pop.xls'.

Input Analysis Output

Case File: SATSCAN\SaTScan_EspacoTemporal\bancos_aula_14\Cases.cas ...

Control File: (Bernoulli Model) ...

Study Period

Start Date: Year: 1973 Month: 1 Day: 1 End Date: Year: 1991 Month: 12 Day: 31

Population File: (Poisson Model) ...

Coordinates File: ...

Grid File: (optional) ...

Time Precision

None Year
 Month Day
 Generic

Coordinates

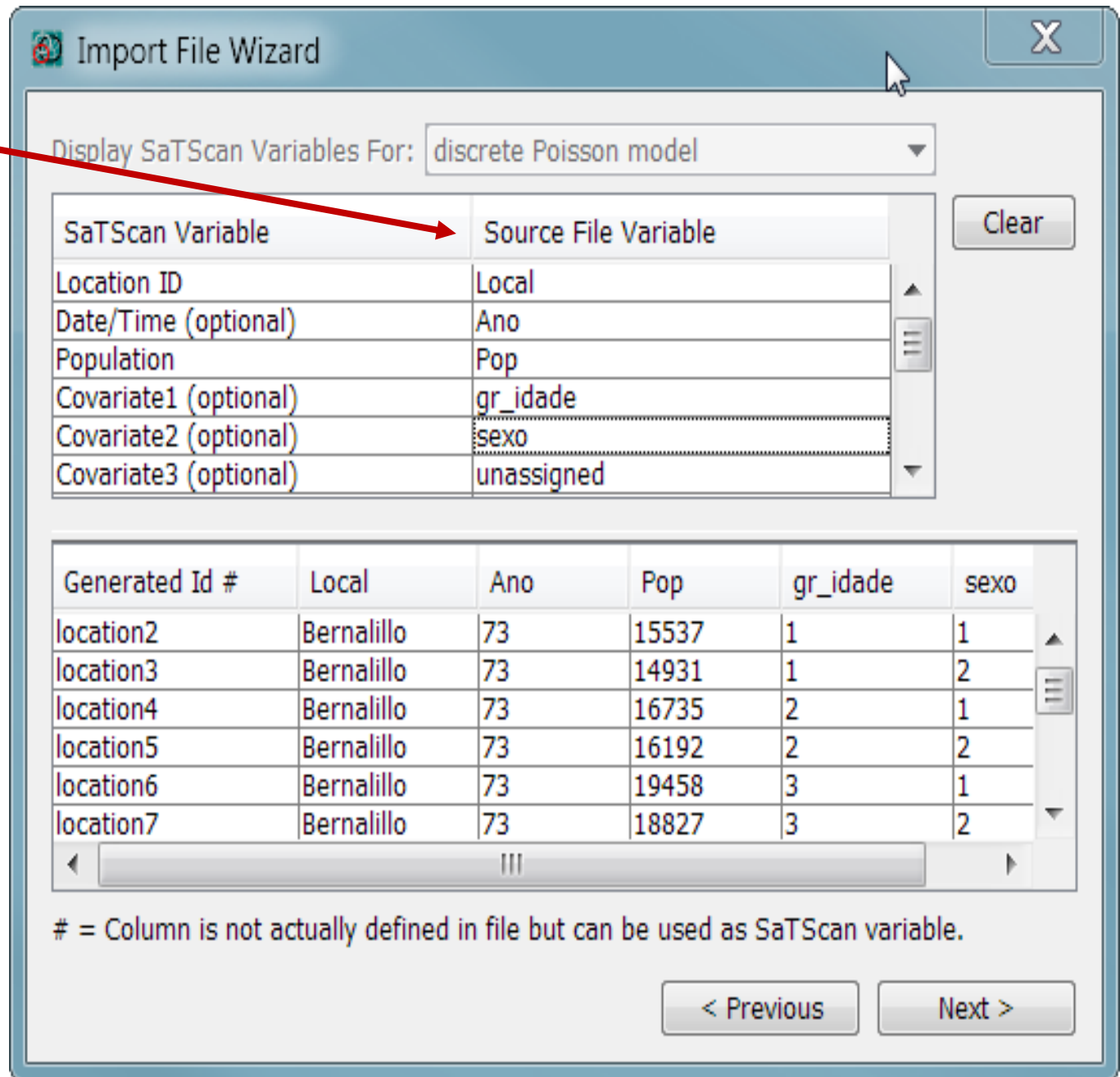
Cartesian
 Lat/Long

Advanced >>

Definir os campos necessários. Depois, clicar em “Next >”

(Usar os botões “Next>” e “<Previous” para navegar).

Escolher o diretório onde será criado o arquivo e Importar.



Import File Wizard

Display SaTScan Variables For: discrete Poisson model

| SaTScan Variable | Source File Variable |
|-----------------------|----------------------|
| Location ID | Local |
| Date/Time (optional) | Ano |
| Population | Pop |
| Covariate1 (optional) | gr_idade |
| Covariate2 (optional) | sexo |
| Covariate3 (optional) | unassigned |

Clear

| Generated Id # | Local | Ano | Pop | gr_idade | sexo |
|----------------|------------|-----|-------|----------|------|
| location2 | Bernalillo | 73 | 15537 | 1 | 1 |
| location3 | Bernalillo | 73 | 14931 | 1 | 2 |
| location4 | Bernalillo | 73 | 16735 | 2 | 1 |
| location5 | Bernalillo | 73 | 16192 | 2 | 2 |
| location6 | Bernalillo | 73 | 19458 | 3 | 1 |
| location7 | Bernalillo | 73 | 18827 | 3 | 2 |

= Column is not actually defined in file but can be used as SaTScan variable.

< Previous Next >

Tab "Input"

Importação do arquivo de coordenadas: 'cancer_mex_geo.xls'.

Escolher o tipo de coordenadas (no caso, cartesianas) adequado.

The screenshot shows the 'Input' tab of a software interface. It contains the following elements:

- Case File:** A text box containing the path `\\ATSCAN\SaTScan_EspacoTemporal\bancos_aula_14\Cases.cas` and a browse button (...).
- Control File:** A text box containing `(Bernoulli Model)` and a browse button (...).
- Study Period:** A section with two date pickers. The 'Start Date' is set to Year: 1973, Month: 1, Day: 1. The 'End Date' is set to Year: 1991, Month: 12, Day: 31.
- Population File:** A text box containing the path `\\ATSCAN\SaTScan_EspacoTemporal\bancos_aula_14\Population.pop` and a browse button (...).
- Coordinates File:** An empty text box and a browse button (...).
- Grid File:** An empty text box and a browse button (...).
- Time Precision:** A group box containing radio buttons for `None`, `Year` (selected), `Month`, `Day`, and `Generic`.
- Coordinates:** A group box containing radio buttons for `Cartesian` (selected) and `Lat/Long`.
- Advanced >>** A button at the bottom right.

Red arrows from the text on the left point to the browse buttons for the 'Coordinates File' and 'Case File' fields, and to the 'Cartesian' radio button in the 'Coordinates' group box.

Tab "Input"

Importação do arquivo de coordenadas: 'cancer_mex_geo.xls'.

Definir os campos necessários.

Escolher o diretório e Importar.

Import File Wizard

Display SaTScan Variables For: Cartesian (x, y) Coordinates

| SaTScan Variable | Source File Variable |
|------------------|----------------------|
| Location ID | Local |
| X | coordx |
| Y | coordy |
| Z1 (optional) | unassigned |
| Z2 (optional) | unassigned |
| Z3 (optional) | unassigned |

| Generated Id # | Local | coordx | coordy |
|----------------|------------|--------|--------|
| location2 | Bernalillo | 66 | 102 |
| location3 | Catron | 8 | 57 |
| location4 | Chaves | 126 | 47 |
| location5 | Colfax | 123 | 162 |
| location6 | Curry | 161 | 79 |
| location7 | DeBaca | 132 | 82 |

= Column is not actually defined in file but can be used as SaTScan variable.

< Previous Next >

Tab "Input"

LAYOUT FINAL

The screenshot displays the 'Input' tab of a software application. The interface includes a window title bar with standard minimize and close buttons. Below the title bar are three tabs: 'Input', 'Analysis', and 'Output'. The 'Input' tab is active and contains several sections of controls:

- Case File:** A text box containing the path `3ATSCAN\SaTScan_EspacoTemporal\bancos_aula_14\Cases.cas` and a browse button (...).
- Control File:** A text box containing the text `(Bernoulli Model)` and a browse button (...).
- Time Precision:** A group box containing four radio buttons: None, Year, Month, and Day. A Generic option is also present below the others.
- Study Period:** A group box containing two date pickers. The 'Start Date' is set to Year: 1973, Month: 1, Day: 1. The 'End Date' is set to Year: 1991, Month: 12, Day: 31.
- Population File:** A text box containing the path `\TSCAN\SaTScan_EspacoTemporal\bancos_aula_14\Population.pop` and a browse button (...).
- Coordinates File:** A text box containing the path `:CAN\SaTScan_EspacoTemporal\bancos_aula_14\Coordinates.geo` and a browse button (...).
- Grid File:** A text box containing the text `(optional)` and a browse button (...).
- Coordinates:** A group box containing two radio buttons: Cartesian and Lat/Long.

At the bottom right of the 'Input' tab, there is a button labeled 'Advanced >>'.

Tab “Analysis”

Rodar a análise espaço-temporal

Para o modelo discreto de Poisson e

Áreas com Altas Taxas.

The screenshot shows a software window titled 'Analysis' with three tabs: 'Input', 'Analysis', and 'Output'. The 'Analysis' tab is active and contains several sections of options:

- Type of Analysis:**
 - Retrospective Analyses:
 - Purely Spatial
 - Purely Temporal
 - Space-Time
 - Seasonal
 - Spatial Variation in Temporal Trends
 - Prospective Analyses:
 - Purely Temporal
 - Space-Time
- Probability Model:**
 - Discrete Scan Statistics:
 - Poisson
 - Bernoulli
 - Space-Time Permutation
 - Multinomial
 - Ordinal
 - Exponential
 - Normal
 - Continuous Scan Statistics:
 - Poisson ...
- Scan For Areas With:**
 - High Rates
 - Low Rates
 - High or Low Rates
- Time Aggregation:**
 - Units: Year, Month, Day
 - Length: Years

An 'Advanced >>' button is located at the bottom right of the window.

Tab “Analysis”

Na aba
‘Temporal Window’,
definir o:

‘Tamanho Máximo do Cluster Temporal’.

Advanced Analysis Features

Space and Time Adjustments Inference Border Analysis Power Evaluation

Spatial Window Temporal Window Cluster Restrictions

Maximum Temporal Cluster Size

is 50.0 percent of the study period ($\leq 90\%$, default = 50%)

is 1 years

Minimum Temporal Cluster Size

1 years

Include Purely Spatial Clusters (Temporal Size = 100%)

Flexible Temporal Window Definition

Include only windows with:

Start time in range: 2000 1 1 to 2000 12 31

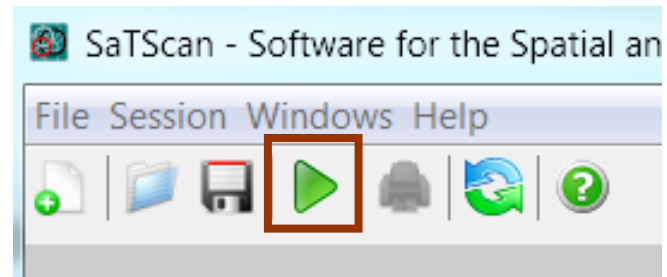
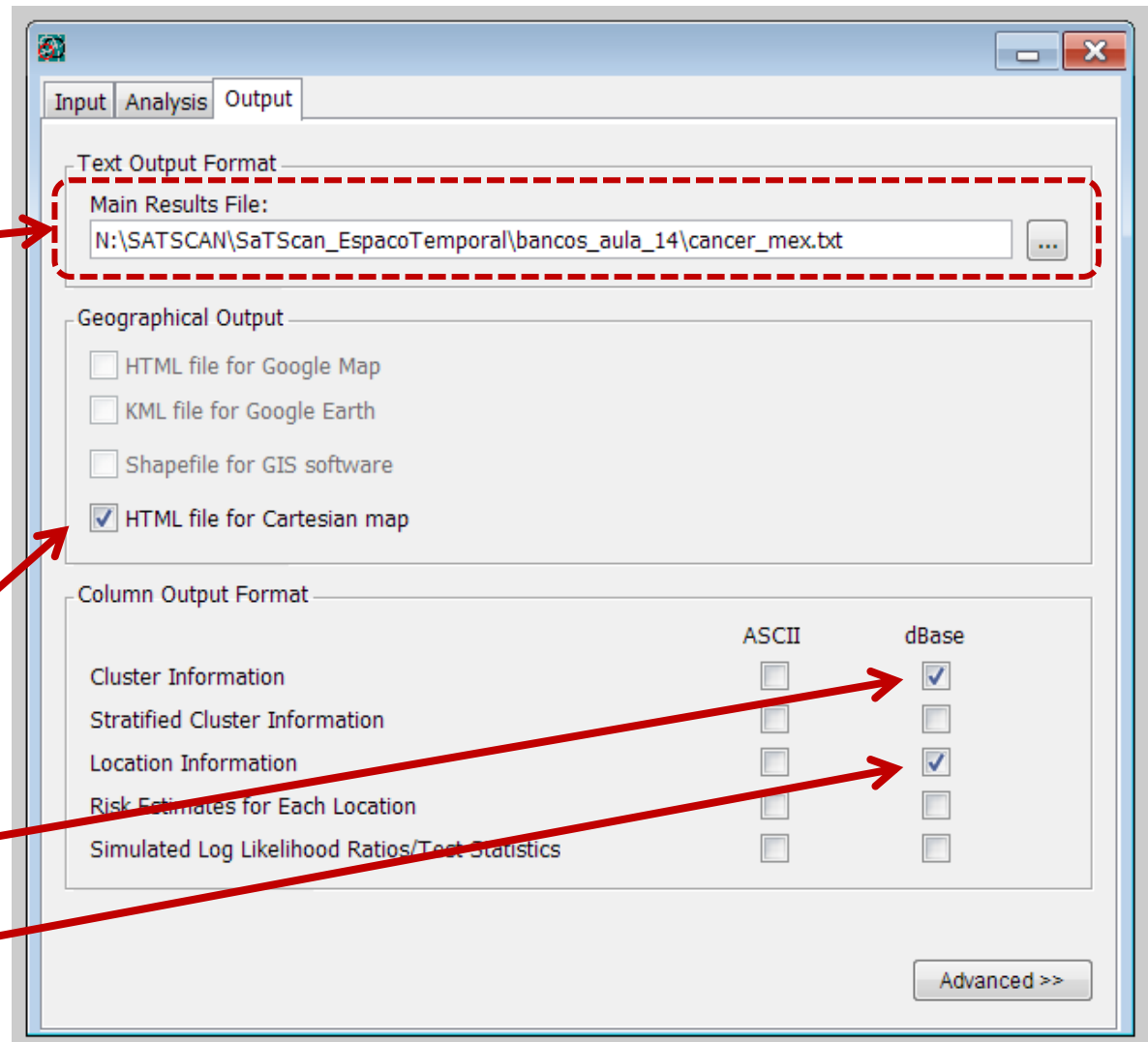
End time in range: 2000 1 1 to 2000 12 31

Set Defaults Close

Tab “Output”

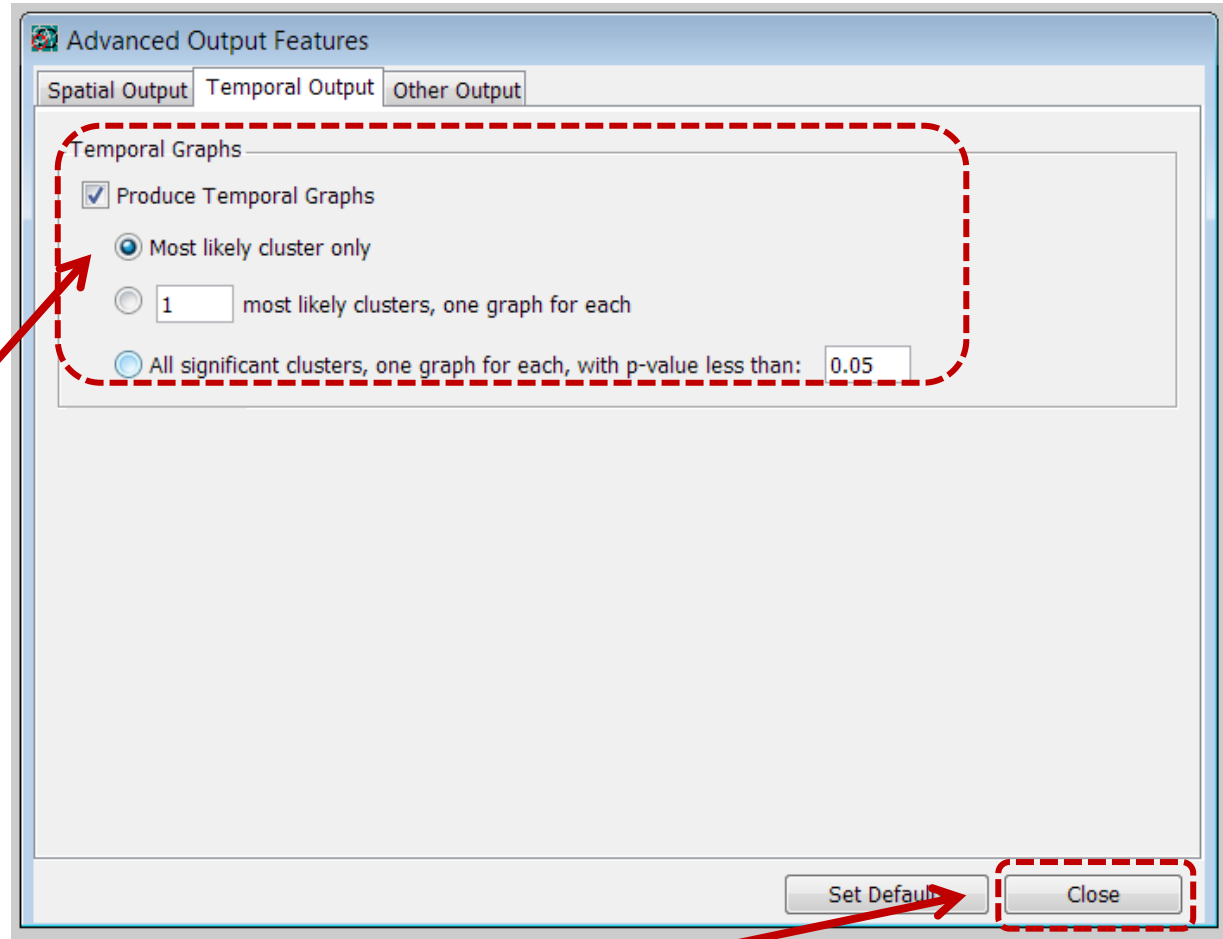
Escolher um nome e um diretório para incluir o arquivo do resultado.

Selecionar as opções “HTML file...”, “Cluster information” e “Location Information”, em extensão .dbf (dBase).

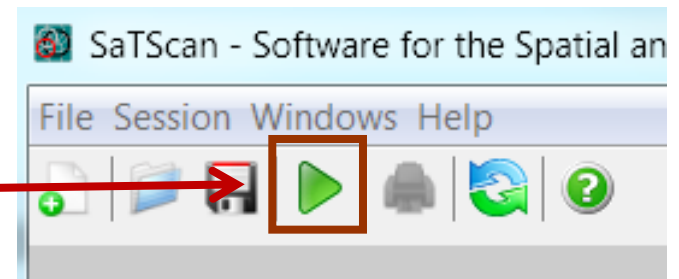


Tab “Output”

Em ‘Advanced’,
escolher a aba
‘Temporal
Output’ para
Produzir
Gráficos
Temporais,
conforme a
figura.

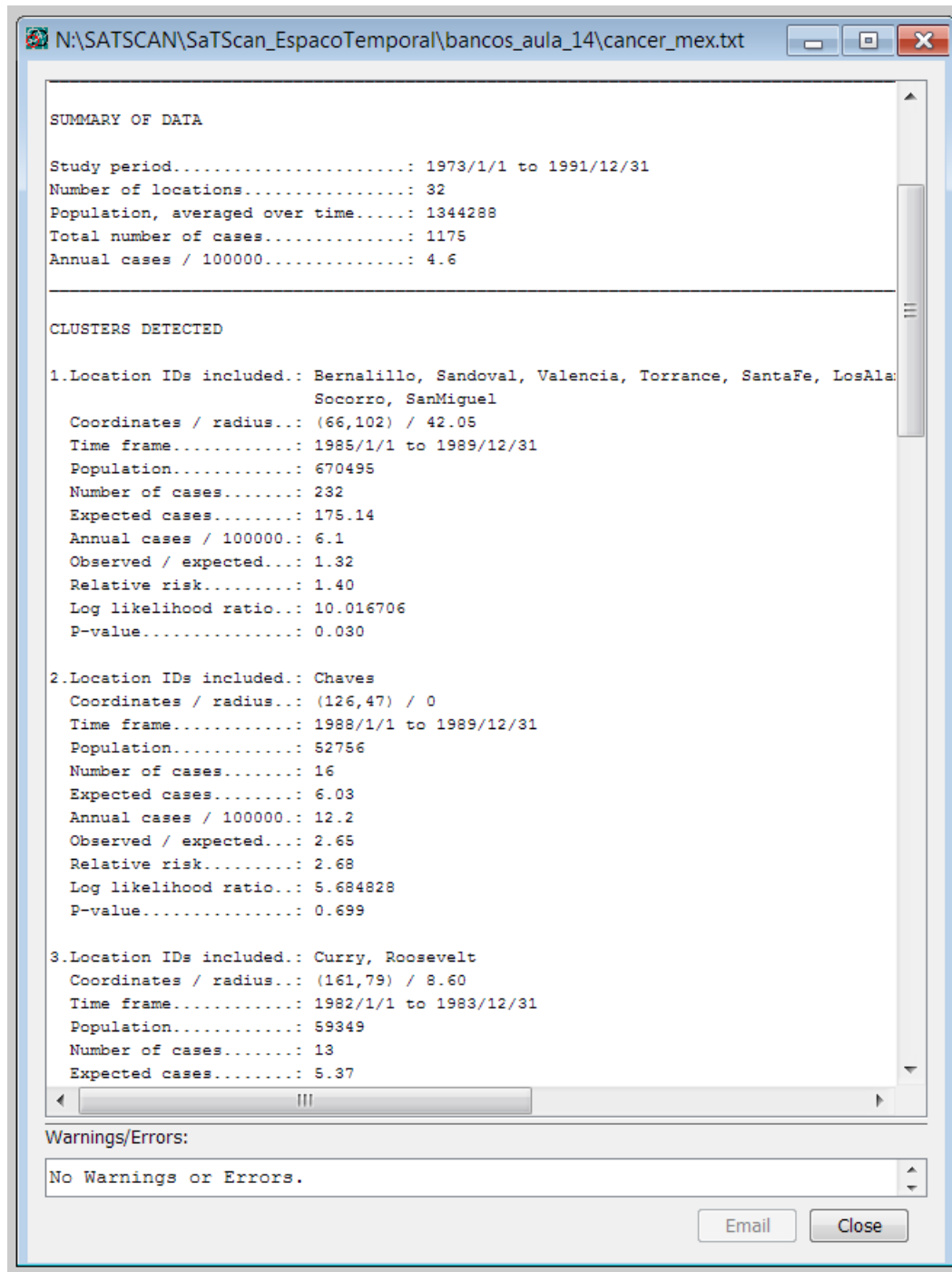


Clicar em **Close**
e depois rodar
no botão ‘**Run**’.



**Resultados
obtidos: são
diferentes em
relação aos
obtidos com o
uso da opção
“análise
puramente
espacial” ???**

**No que
diferem??**



The screenshot shows a text file window titled "N:\SATSCAN\SaTScan_EspacoTemporal\bancos_aula_14\cancer_mex.txt". The content is as follows:

```
SUMMARY OF DATA

Study period.....: 1973/1/1 to 1991/12/31
Number of locations.....: 32
Population, averaged over time.....: 1344288
Total number of cases.....: 1175
Annual cases / 100000.....: 4.6

CLUSTERS DETECTED

1.Location IDs included.: Bernalillo, Sandoval, Valencia, Torrance, SantaFe, LosAla
Socorro, SanMiguel
Coordinates / radius..: (66,102) / 42.05
Time frame.....: 1985/1/1 to 1989/12/31
Population.....: 670495
Number of cases.....: 232
Expected cases.....: 175.14
Annual cases / 100000.: 6.1
Observed / expected...: 1.32
Relative risk.....: 1.40
Log likelihood ratio..: 10.016706
P-value.....: 0.030

2.Location IDs included.: Chaves
Coordinates / radius..: (126,47) / 0
Time frame.....: 1988/1/1 to 1989/12/31
Population.....: 52756
Number of cases.....: 16
Expected cases.....: 6.03
Annual cases / 100000.: 12.2
Observed / expected...: 2.65
Relative risk.....: 2.68
Log likelihood ratio..: 5.684828
P-value.....: 0.699

3.Location IDs included.: Curry, Roosevelt
Coordinates / radius..: (161,79) / 8.60
Time frame.....: 1982/1/1 to 1983/12/31
Population.....: 59349
Number of cases.....: 13
Expected cases.....: 5.37

Warnings/Errors:
No Warnings or Errors.
```

Buttons for "Email" and "Close" are visible at the bottom right of the window.

COMPARAÇÃO DOS RESULTADOS OBTIDOS - OPÇÕES:

“PURAMENTE ESPACIAL” e “ESPAÇO-TEMPORAL”



SUMMARY OF DATA

Study period.....: 1973/1/1 to 1991/12/31
Number of locations.....: 32
Total population.....: 1344288
Total number of cases.....: 1175
Annual cases / 100000.....: 4.6

MOST LIKELY CLUSTER

1.Location IDs included.: Bernalillo, Sandoval, Valencia,
Torrance, SantaFe, LosAlamos, Socorro,
SanMiguel
Coordinates / radius...: (66,102) / 42.05
Population.....: 670495
Number of cases.....: 642
Expected cases.....: 581.86
Annual cases / 100000.: 5.1
Observed / expected...: 1.10
Relative risk.....: 1.23
Log likelihood ratio...: 6.163801
P-value.....: 0.023

SECONDARY CLUSTERS

2.Location IDs included.: Chaves
Coordinates / radius...: (126,47) / 0
Population.....: 52756
Number of cases.....: 64
Expected cases.....: 52.26
Annual cases / 100000.: 5.6
Observed / expected...: 1.22

Warnings/Errors:
No Warnings or Errors.

Email Close



N:\SATSCAN\SaTScan_EspacoTemporal\bancos_aula_14\c... [Minimize] [Maximize] [Close]

SUMMARY OF DATA

Study period.....: 1973/1/1 to 1991/12/31
Number of locations.....: 32
Population, averaged over time.....: 1344288
Total number of cases.....: 1175
Annual cases / 100000.....: 4.6

CLUSTERS DETECTED

1.Location IDs included.: Bernalillo, Sandoval, Valencia, Torrance, Santa
Socorro, SanMiguel
Coordinates / radius...: (66,102) / 42.05
Time frame.....: 1985/1/1 to 1989/12/31
Population.....: 670495
Number of cases.....: 232
Expected cases.....: 175.14
Annual cases / 100000.: 6.1
Observed / expected...: 1.32
Relative risk.....: 1.40
Log likelihood ratio...: 10.016706
P-value.....: 0.030

2.Location IDs included.: Chaves
Coordinates / radius...: (126,47) / 0
Time frame.....: 1988/1/1 to 1989/12/31
Population.....: 52756
Number of cases.....: 16
Expected cases.....: 6.03
Annual cases / 100000.: 12.2
Observed / expected...: 2.65
Relative risk.....: 2.60

Warnings/Errors:
No Warnings or Errors.

Email

REFERÊNCIAS BIBLIOGRÁFICAS

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- ✓ Kulldorff M. SaTScan - Use Guide for version 9.6. Disponível em: <<http://www.satscan.org>>. Acessado em: 21/02/2019.
- ✓ Kulldorff M. SaTScan – Manual do Usuário para a versão 9.4. Disponível em: <<https://www.satscan.org/techdoc.html>>. Manual traduzido para o português (Alessandra Cristina Guedes Pellini). Acessado em: 21/02/2019.