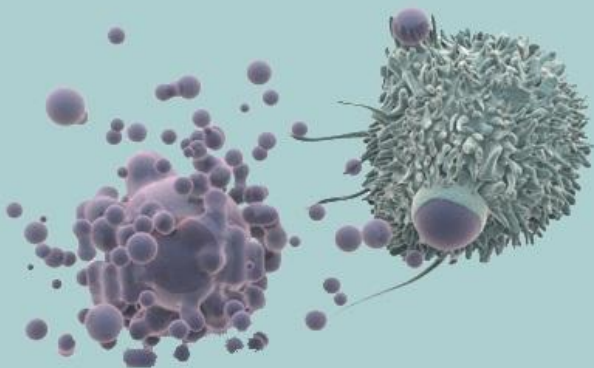


# Correlación Geográfica Entre Distintos Tipos De Cáncer En Chile

Seminario Bibliográfico MIM 2014



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**Alumno:**

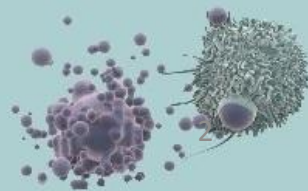
**Etiene Verdugo R.**

Santiago, 13 de Diciembre del 2014



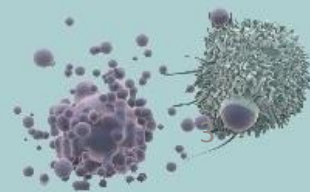
# Agenda

- Introducción
  - Objetivos
- Métodos revisados
- Resultados
- Discusión



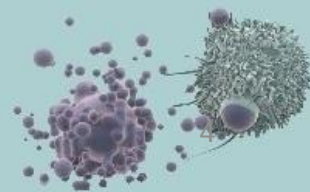
# Introducción

- Objetivo:
  - Investigar la correlación geográfica entre distintos tipos de cáncer en Chile.
  - ¿Qué tipos de cáncer están mas correlacionados?
    - ¿Hay factores comunes que puedan ser considerados en su prevención?
- Fuente de datos:
  - DEIS: Anuario de Estadísticas Vitales 2012.
    - Mortalidad
    - 28 tipos de cáncer



# Métodos

- Los métodos utilizados:
  1. Cálculo de tasas regionales de mortalidad
  2. Correlaciones entre pares de cáncer
    1. Matriz correlación de intensidades
  3. Gráfico de puntos
  4. Dendrograma
  
- Software R-Studio



# Resultados

## 1.- Calculo de tasas regionales de mortalidad:

Tasas Regionales De Cancer (todos los tipos) ordenadas, año 2012					
Región(año 2012)	N° Habitantes	Total de Casos	Tasa Observada (100.000 habitantes)	Ranking de mayor a menor	
Los Ríos	381.720	606	159	1	
Valparaíso	1.795.765	2760	154	2	
Magallanes y la Antártica Chilena	159.666	239	150	3	
Biobío	2.061.544	3047	148	4	
Araucanía	986.397	1457	148	5	
Arica y Parinacota	181.402	265	146	6	
Maule	1.023.686	1467	143	7	
Los Lagos	856.971	1187	139	8	
Coquimbo	739.153	985	133	9	
Metropolitana de Santiago	7.007.620	8898	127	10	
Antofagasta	588.130	741	126	11	
Libertador B. O'Higgins	900.163	1130	126	12	
Aysén	106.885	134	125	13	
Atacama	284.607	323	113	14	
Tarapacá	328.921	302	92	15	
<b>Total</b>	<b>17.420.630</b>	<b>23.541</b>			



# Resultados

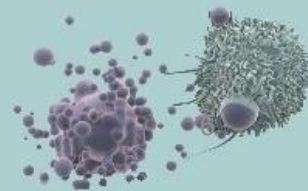
## 2.- Correlaciones:

*«La correlación indica la fuerza y la dirección de una relación lineal y proporcionalidad entre dos variables estadísticas»*

Dos variables están correlacionadas cuando los valores de una varían sistemáticamente con respecto a los valores de la otra.

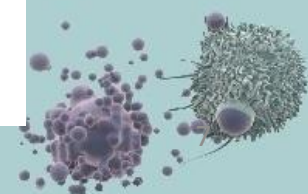
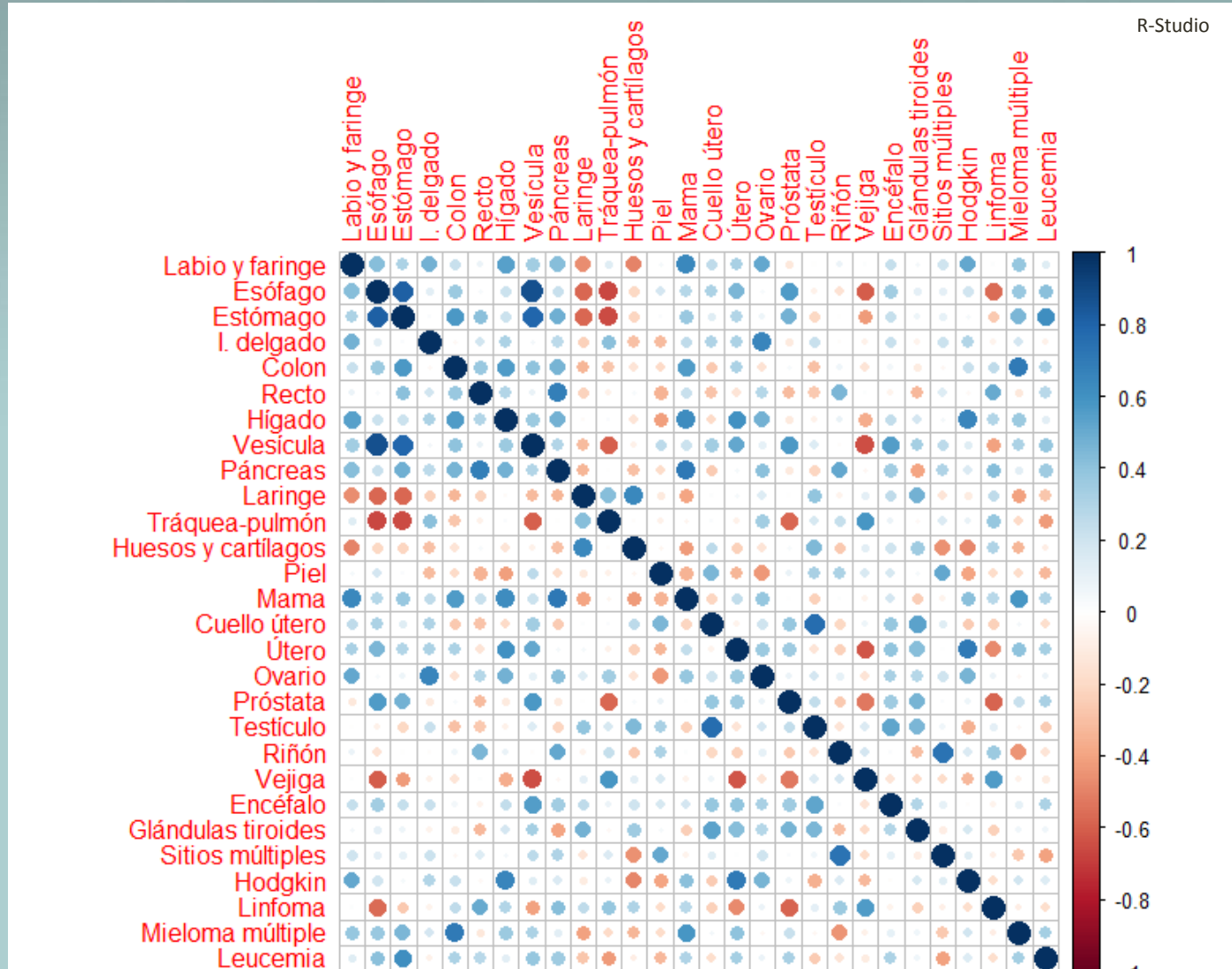
Coeficiente de correlación lineal :

$$-1 \leq r = \frac{\text{Cov}(X, Y)}{s_X s_Y} = \frac{\sum_{t=1}^n (X_t - \bar{X}) * (Y_t - \bar{Y})}{\sqrt{\sum_{t=1}^n (X_t - \bar{X})^2} * \sqrt{\sum_{t=1}^n (Y_t - \bar{Y})^2}} \leq +1$$



# Resultados

## 2.- Matriz correlación de intensidades

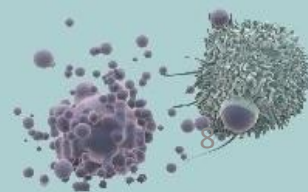


# Resultados

- Ranking correlaciones positiva y negativas

Correlaciones Positivas		
1	0.87857143	Esófago – Vesícula
2	0.81428571	Esófago – Estómago
3	0.792857143	Estómago – Vesícula
4	0.76813733	Cuello Útero – Testículo
5	0.739285714	Riñón – Sitios Múltiples
6	0.710714286	Páncreas – Mama

Correlaciones Negativas		
1	-0.66428571	Esófago – Pulmón
2	-0.657142857	Estómago – Pulmón
3	-0.65000000	Vesícula – Vejiga urinaria
4	-0.621428571	Útero – Vejiga urinaria
5	-0.60714286	Esófago – Vejiga urinaria
6	-0.60000000	Vesícula – Pulmón





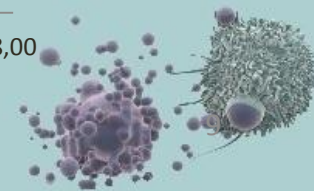
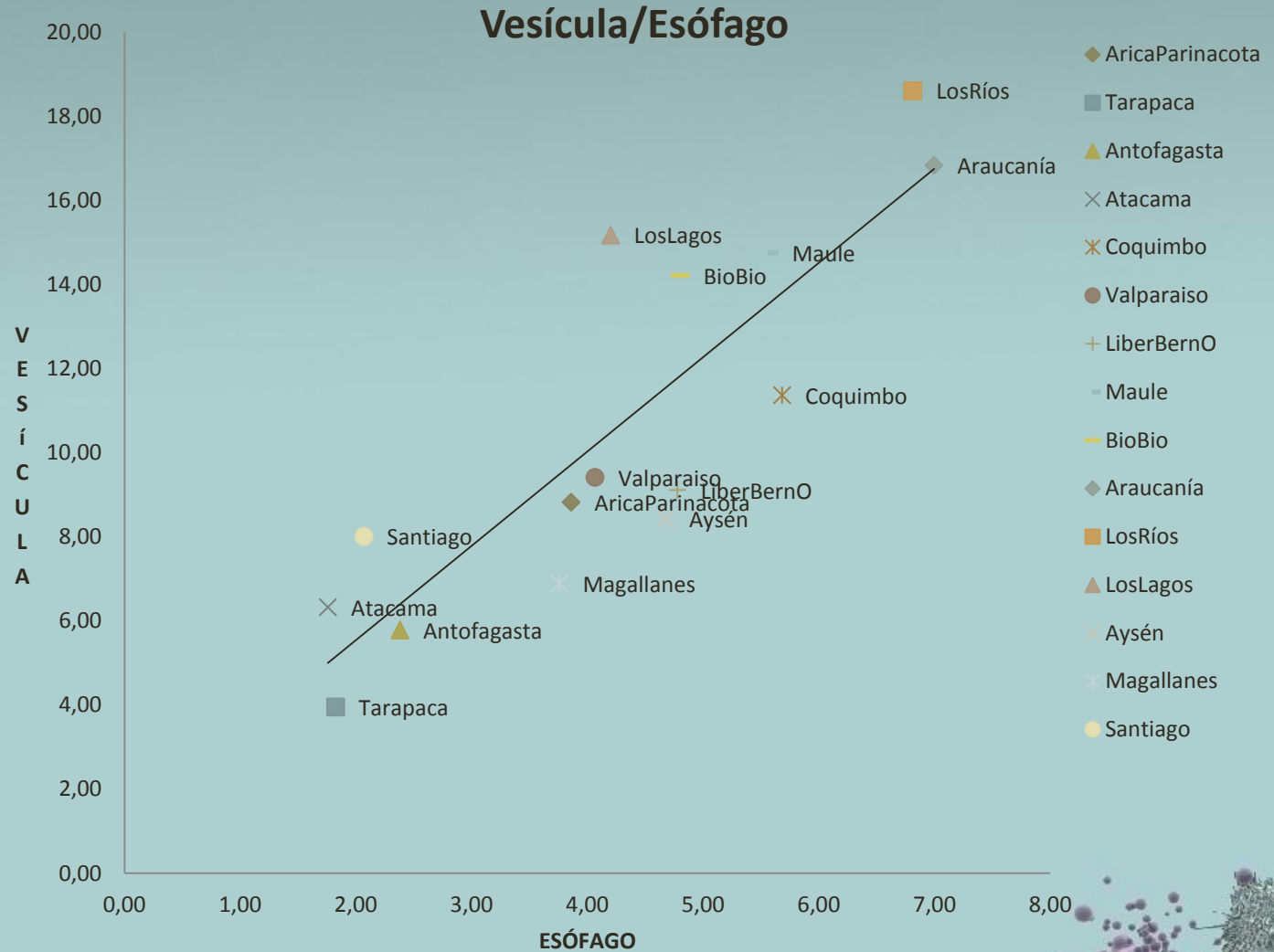
# Resultados

## 3.- Gráfico de puntos:

Región	Esófago	Vesícula
Arica	3,86	8,82
Tarapacá	1,82	3,95
Antofagasta	2,38	5,78
Atacama	1,76	6,32
Coquimbo	5,68	11,36
Valparaíso	4,07	9,41
LiberBernO	4,78	9,11
Maule	5,57	14,75
Biobío	4,80	14,21
Araucanía	7,00	16,83
Los Ríos	6,81	18,60
Los Lagos	4,20	15,17
Aysén	4,68	8,42
Magallanes	3,76	6,89
Santiago	2,07	8,01

Correlación

0.87857143



# Resultados

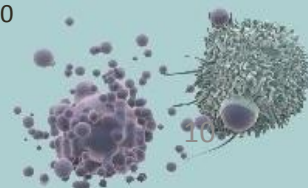
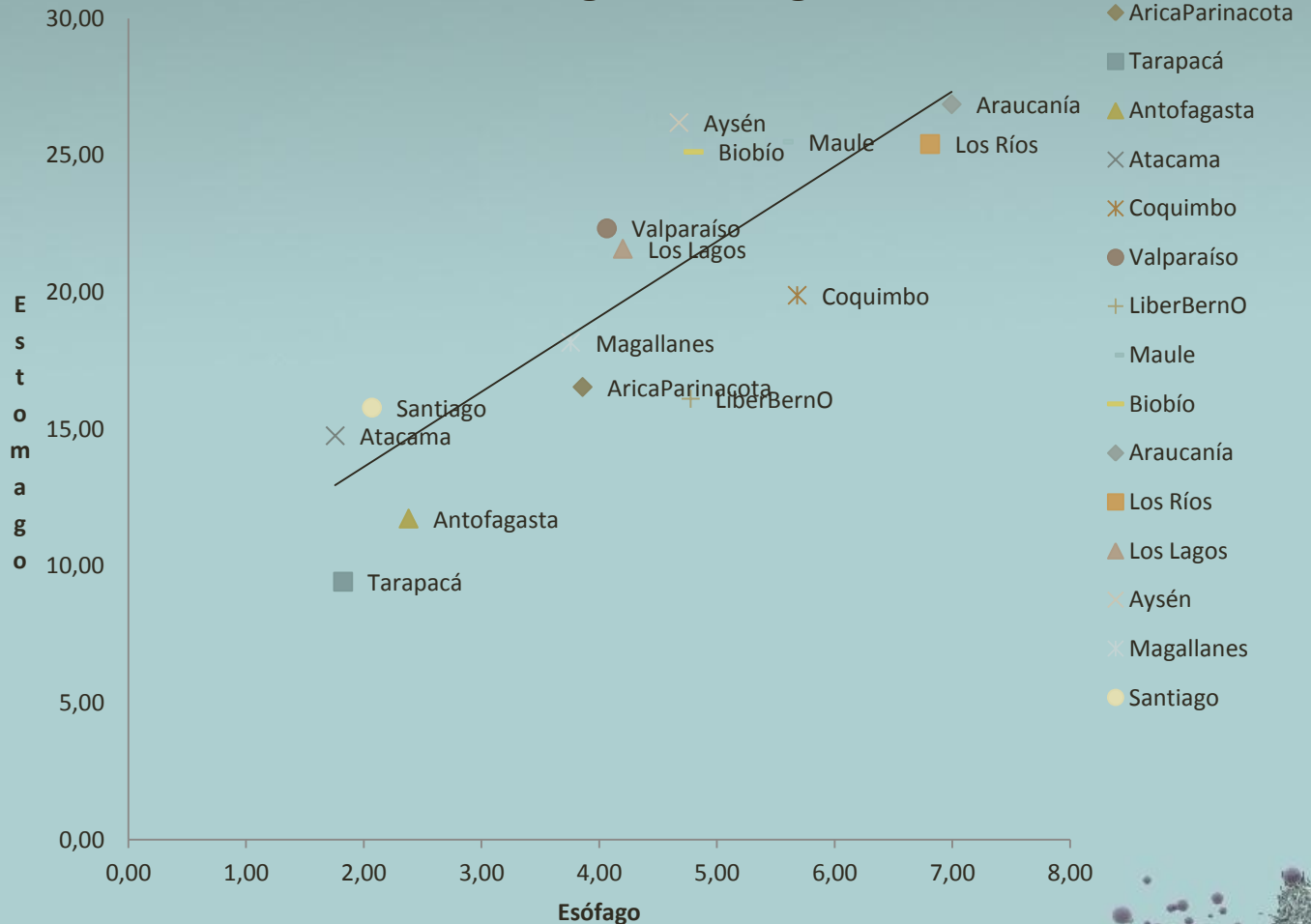
## 3.- Gráfico de puntos:

### Esófago/Estómago

Región	Esófago	Estómago
Arica	3,86	16,54
Tarapacá	1,82	9,42
Antofagasta	2,38	11,73
Atacama	1,76	14,76
Coquimbo	5,68	19,89
Valparaíso	4,07	22,33
LiberBernO	4,78	16,11
Maule	5,57	25,50
Biobío	4,80	25,13
Araucanía	7,00	26,87
Los Ríos	6,81	25,41
Los Lagos	4,20	21,59
Aysén	4,68	26,20
Magallanes	3,76	18,16
Santiago	2,07	15,78

Correlación

0.81428571



# Resultados

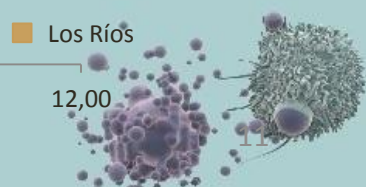
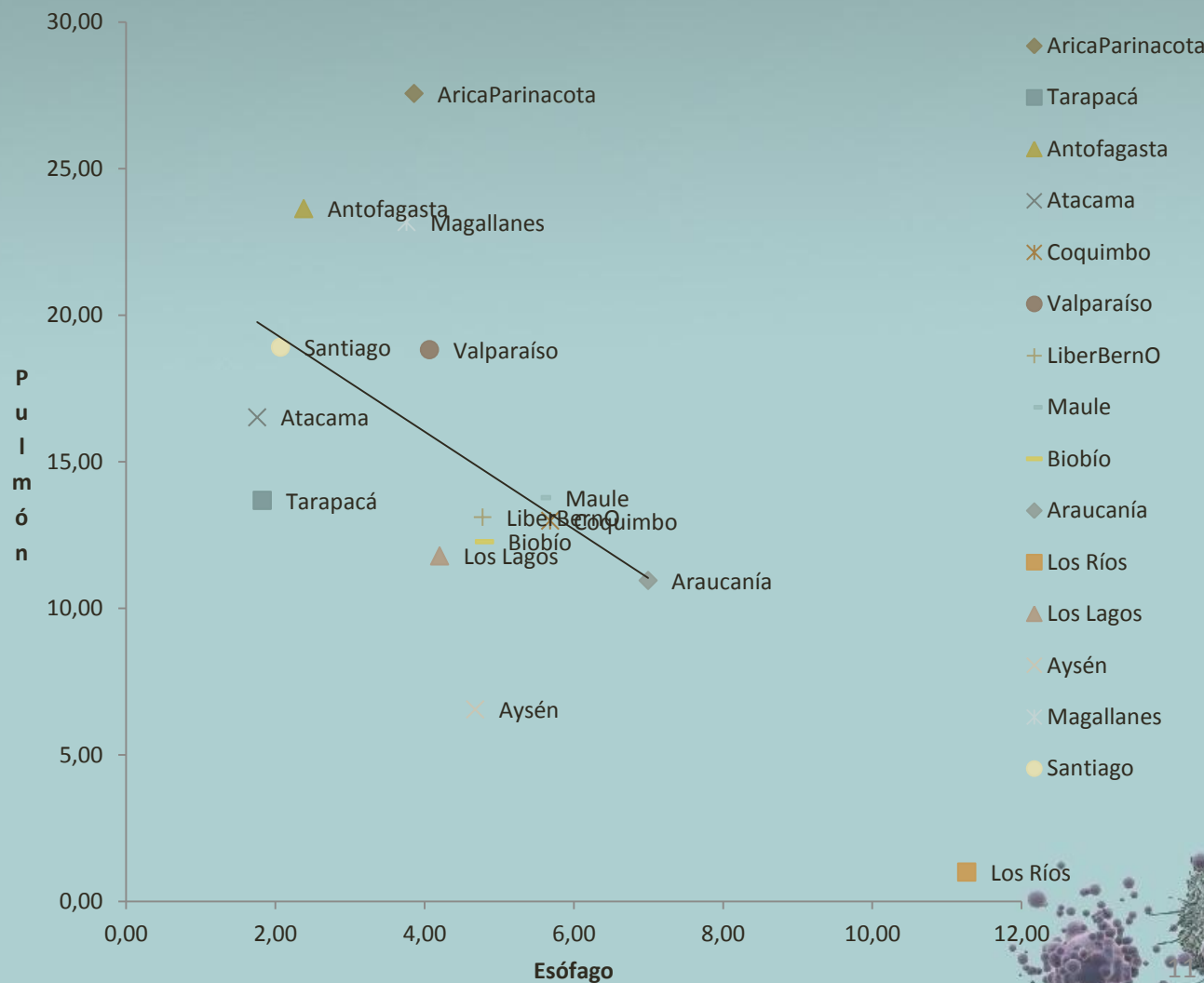
## 3.- Gráfico de puntos:

Región	Esófago	Pulmón
Arica	3,86	27,56
Tarapacá	1,82	13,68
Antofagasta	2,38	23,63
Atacama	1,76	16,51
Coquimbo	5,68	12,99
Valparaíso	4,07	18,82
LiberBernO	4,78	13,11
Maule	5,57	13,77
Biobío	4,80	12,27
Araucanía	7,00	10,95
Los Ríos	6,81	11,26
Los Lagos	4,20	11,79
Aysén	4,68	6,55
Magallanes	3,76	23,17
Santiago	2,07	18,91

Correlación

**-0.66428571**

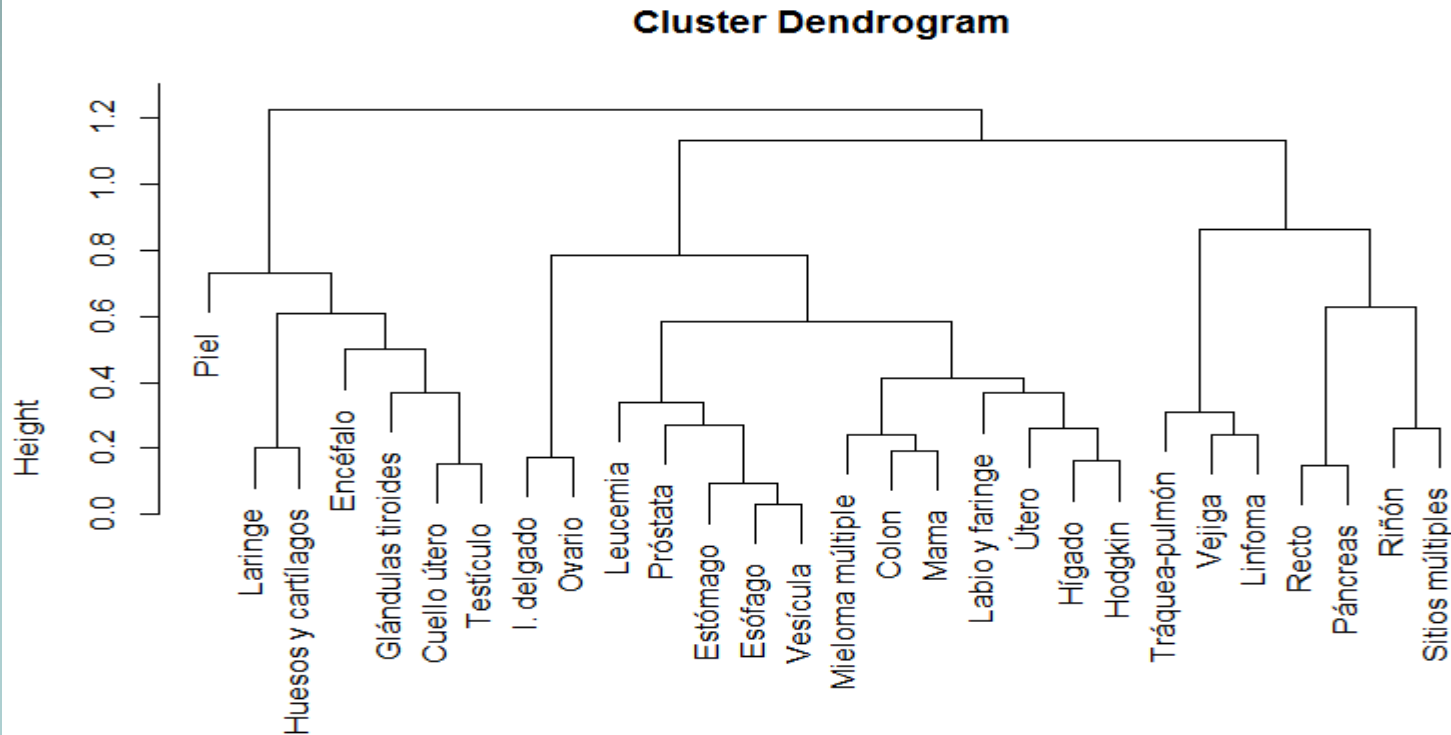
### Esófago/Pulmón



# Resultados

## 4.- Dendrograma

R-Studio



1	0.87857143	Esófago – Vesícula
2	0.81428571	Esófago – Estómago
3	0.792857143	Estómago – Vesícula
4	0.76813733	Cuello Útero – Testículo
5	0.739285714	Riñón – Sitios Múltiples

as.dist(1 - cor(correlaciones))  
hclust (\*, "average")

1	-0.66428571	Esófago – Pulmón
2	-0.657142857	Estómago – Pulmón
3	-0.65000000	Vesícula – Vejiga urinaria
4	-0.621428571	Útero – Vejiga urinaria
5	-0.60714286	Esófago – Vejiga urinaria



# Discusión y Conclusiones

- Factores de riesgo compartidos por los tipos de tumores con las correlaciones más altas(positivas):

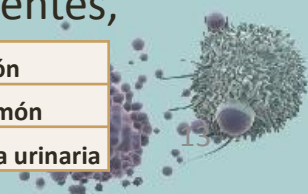
- Esófago** : **edad**, sexo masculino, reflujo, cigarrillo, **tabaco**, alcohol, **obesidad**, **alimentación**, tilosis.
- Vesícula biliar**: inflamación crónica, cálculos biliares, sexo femenino, **obesidad**, **edad**, grupos étnicos y geografía (A. Sur), quistes, anomalías en conductos biliares, pólipos, tifoidea (salmonella).
- Estomago**: sexo masculino, **edad**, **tabaco**, sobrepeso **obesidad**, **alimentación**, anemia, Raza o grupo étnico.

1	Esófago – Vesícula	U
2	Esófago – Estómago	
3	Estómago – Vesícula	

- Factores de riesgo compartidos por los tipos de tumores con las correlaciones más altas (negativas):

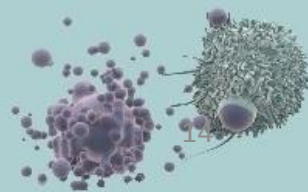
- Pulmón**: Humo de tabaco, puros(cigarros), áreas de trabajo (asbesto, uranio, **arsénico**, berilio, cadmio), productos de combustión diesel, antecedente personal o familiar
- Vejiga urinaria**: Fumar, áreas de trabajo(goma, cuero, textiles, productos para pinturas, compañías de imprenta), pintores, estilistas, maquinistas, raza blanca, edad, sexo masculino, genes y antecedentes, **arsénico**, no beber suficientes líquidos.

1	Esófago – Pulmón
2	Estómago – Pulmón
3	Vesícula – Vejiga urinaria

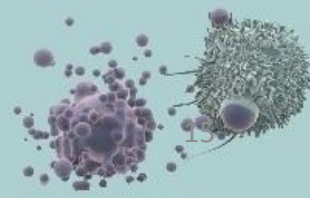


# Bibliografía

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- <http://www.cancer.org/espanol/cancer/>
- <http://es.wikipedia.org/wiki/Correlaci%C3%B3n>
- <http://m.monografias.com/trabajos84/correlacion/correlacion.shtml>
- <http://www.data-recovery-software.net/es/?GGLAW219>



# Discusión



# Discusión

V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28			
1	1.042500000	0.317857143	0.47212239	0.22857143	0.08928571	0.55000000	0.34642857	0.425000000	-0.460714286	0.139285714	-0.49642857	0.04285714	<b>0.646428571</b>	0.250000000	0.321428571	0.51428571	-0.121428571	-0.007315594	0.085714286	0.01785714	0.23775679	0.05486695	0.200000000	0.51282259	0.01428571	0.38571429	0.13214286			
2	0.425000000	<b>1.0814285714</b>	0.12210062	0.36071429	0.03571429	0.21071429	<b>0.87857143</b>	0.225000000	<b>-0.578571429</b>	<b>-0.664285714</b>	-0.20714286	0.18214286	0.289285714	0.31428571	0.453571429	0.03214286	0.564285714	-0.076813733	-0.153571429	<b>-0.60714286</b>	0.34017511	0.11339170	0.117857143	0.19943101	<b>-0.56428571</b>	0.37857143	0.41071429			
3	0.317857143	<b>0.81428571</b>	10.02035010	0.575000000	0.41785714	0.21071429	<b>0.79285714</b>	0.482142857	<b>-0.575000000</b>	<b>-0.657142857</b>	-0.21071429	0.02857143	0.371428571	0.13571429	0.292857143	0.075000000	0.478571429	-0.204836623	-0.003571429	-0.42142857	0.23775679	0.07315594	0.103571429	0.04477023	-0.26428571	0.450000000	<b>0.61785714</b>			
4	0.472122388	0.12210062	0.020350103	1	-0.03663019	0.19129097	0.31746161	0.05698029	0.264551338	-0.231991174	0.415142100	-0.297111500	-0.31746161	0.252341276	0.30525154	0.313391585	<b>0.65120329</b>	-0.113960576	0.223428725	-0.016280082	-0.07733039	0.22759717	-0.06002563	0.219781112	0.29499072	-0.06919035	0.18722095	-0.07326037		
5	0.228571429	0.36071429	0.575000000	-0.03663019		10.37142857	0.56428571	0.400000000	0.467857143	-0.339285714	-0.278571429	-0.150000000	-0.19642857	0.567857143	-0.26071429	0.314285714	-0.15357143	0.032142857	-0.299939340	0.060714286	-0.150000000	0.05852475	-0.10973390	-0.046428571	0.22385113	0.25714286	<b>0.70714286</b>	0.31785714		
6	0.089285714	0.03571429	0.417857143	0.19129097	0.37142857	10.29642857	0.09285714	<b>0.685714286</b>	-0.225000000	-0.075000000	0.03571429	-0.350000000	0.221428571	-0.28214286	-0.150000000	0.28214286	-0.310714286	-0.267019169	0.450000000	0.01071429	-0.06949814	-0.32920171	0.142857143	-0.03256016	0.50357143	-0.12142857	0.275000000			
7	0.550000000	0.21071429	0.210714286	0.31746161	0.56428571	0.29642857	10.36785714	0.478571429	-0.021428571	0.028571429	-0.150000000	-0.41785714	0.625000000	-0.19285714	<b>0.600000000</b>	0.475000000	-0.110714286	-0.073155937	0.092857143	-0.36071429	0.24141459	0.18654764	0.057142857	<b>0.65527331</b>	0.29285714	0.36071429	0.125000000			
8	0.346428571	<b>0.87857143</b>	<b>0.792857143</b>	0.05698029	0.400000000	0.09285714	0.36785714		10.300000000	-0.314285714	<b>-0.600000000</b>	-0.07857143	0.26428571	0.214285714	0.34285714	0.510714286	0.100000000	<b>0.575000000</b>	0.142654076	-0.017857143	<b>-0.650000000</b>	<b>0.55598512</b>	0.33285951	0.260714286	0.13024066	-0.40357143	0.31428571	0.38571429		
9	0.425000000	0.225000000	0.482142857	0.26455134	0.46785714	<b>0.68571429</b>	0.47857143	0.300000000		1	-0.332142857	-0.003571429	-0.29642857	-0.18214286	<b>0.710714286</b>	-0.25357143	0.042857143	0.41428571	-0.114285714	-0.219647810	0.514285714	-0.04642857	0.34017511	-0.39504206	0.303571429	0.15466078	0.42142857	0.12857143	0.350000000	
10	0.460714286	<b>-0.57857143</b>	<b>-0.575000000</b>	-0.23199117	-0.33928571	-0.225000000	-0.02142857	-0.31428571	-0.332142857	10.428571429	<b>0.64642857</b>	-0.11071429	-0.400000000	0.01785714	0.046428571	0.14285714	-0.003571429	0.391384261	-0.064285714	0.11428571	0.25238798	0.47185579	-0.146428571	-0.10582054	0.25357143	-0.40357143	-0.27857143			
11	0.139285714	<b>-0.66428571</b>	<b>-0.657142857</b>	0.415142100	-0.27857143	-0.075000000	0.02857143	<b>-0.600000000</b>	-0.003571429	0.428571429		1	-0.01428571	-0.07142857	-0.053571429	0.02857143	-0.071428571	<b>0.34285714</b>	<b>-0.578571429</b>	0.179232045	0.235714286	0.09361047	0.157142857	0.09361047	0.38571429	-0.19642857	-0.42142857			
12	-0.496428571	-0.20714286	-0.210714286	-0.297111500	-0.150000000	0.03571429	-0.150000000	-0.07857143	-0.296428571	<b>0.646428571</b>	-0.014285714		1	0.05714286	-0.421428571	0.26071429	-0.235714286	-0.14642857	0.039285714	0.446251214	-0.260714286	0.12142857	0.20117883	0.35114850	-0.453571429	-0.48026243	0.30357143	-0.33214286	-0.09285714	
13	0.042857143	0.18214286	0.028571429	-0.31746161	-0.19642857	-0.350000000	-0.41785714	0.26428571	-0.182142857	-0.110714286	-0.071428571	-0.05714286		1	-0.346428571	0.45357143	-0.339285714	-0.43214286	0.092857143	0.329201715	0.310714286	0.16071429	0.17557425	0.04023577	0.517857143	-0.39072198	-0.18928571	-0.18928571	-0.325000000	
14	<b>0.646428571</b>	0.28928571	0.371428571	0.25234128	0.56785714	0.22142857	0.625000000	0.21428571	<b>0.710714286</b>	-0.400000000	-0.053571429	-0.42142857	-0.34642857		1	-0.21071429	0.242857143	0.38214286	0.007142857	-0.237756794	0.010714286	-0.06785714	0.18288984	-0.24507239	-0.067857143	0.41921212	0.27857143	<b>0.58571429</b>	0.30357143	
15	0.250000000	0.31428571	0.135714286	0.30525154	-0.26071429	-0.28214286	-0.19285714	0.34285714	-0.253571429	0.017857143	0.028571429	0.26071429	0.45357143	-0.210714286		1	-0.060714286	0.20357143	0.389285714	<b>0.768137335</b>	-0.203571429	0.07857143	0.38406867	<b>0.53403834</b>	0.139285714	-0.25234128	-0.23214286	0.05357143	-0.17857143	
16	0.321428571	0.45357143	0.292857143	0.31339159	0.31428571	-0.150000000	0.600000000	0.51071429	0.042857143	0.046428571	-0.071428571	-0.23571429	-0.33928571	0.242857143	-0.06071429		10.36428571	0.350000000	-0.142654076	-0.232142857	<b>-0.62142857</b>	0.39138426	0.42796223	0.003571429	<b>0.70004354</b>	-0.475000000	0.40357143	0.33928571		
17	0.514285714	0.03214286	0.075000000	<b>0.65120329</b>	-0.15357143	0.28214286	0.475000000	0.100000000	0.414285714	0.142857143	0.342857143	-0.14642857	-0.43214286	0.382142857	0.20357143	0.364285714		10.085714286	0.186547638	0.100000000	-0.150000000	0.32920171	0.28165036	0.200000000	0.46805237	0.08928571	-0.050000000	0.08214286		
18	-0.121428571	0.56428571	0.478571429	-0.11396058	0.03214286	-0.31071429	-0.11071429	0.575000000	-0.114285714	-0.003571429	-0.578571429	0.03928571	0.09285714	0.007142857	0.38928571	0.350000000	0.08571429		10.248730185	-0.260714286	-0.525000000	0.35480629	0.46819799	0.021428571	0.07326037	<b>-0.58571429</b>	0.250000000	0.2857143		
19	-0.007315594	-0.076813733	-0.204836623	0.22342872	-0.29993934	-0.26701917	-0.07315594	0.14265408	-0.219647810	0.391384261	0.179232045	0.44625121	0.32920171	-0.237756794	<b>0.76813733</b>	-0.142654076	0.18654764	0.248730185		1	-0.142654076	0.15362747	0.52047952	0.45679321	0.062182546	-0.35181687	0.11339170	-0.04389356	-0.25970358	
20	0.085714286	-0.15357143	-0.003571429	-0.01628008	0.06071429	0.450000000	0.09285714	-0.01785714	0.514285714	-0.064285714	0.235714286	-0.26071429	0.31071429	0.010714286	-0.20357143	-0.232142857	0.100000000	-0.260714286	-0.142654076		10.18571429	0.02926237	-0.30359714	<b>0.739285714</b>	0.15466078	0.36428571	-0.450000000	-0.14642857		
21	0.017857143	<b>-0.60714286</b>	-0.421428571	-0.07733039	-0.150000000	0.01071429	-0.36071429	<b>-0.650000000</b>	-0.046428571	0.114285714	<b>0.589285714</b>	0.12142857	0.16071429	-0.067857143	0.07857143	<b>-0.621428571</b>	-0.150000000	-0.525000000	0.153627467	0.185714286		1	-0.14265408	-0.19752103	-0.182142857	-0.32560165	<b>0.56071429</b>	-0.07857143	-0.10714286	
22	0.237756794	0.34017511	0.237756794	0.22759717	0.05852475	-0.06949814	0.24141459	0.55598512	0.340175105	0.252387981	0.087781214	0.20117883	0.17557425	0.182889842	0.38406867	0.391384261	0.32920171	0.354806293	0.520479520	0.029262375	-0.14265408	10.29570430	0.109733905	-0.1834116	-0.06584034	0.10241831	0.31822832			
23	0.054866952	0.11339170	0.073155937	-0.06002563	-0.10973390	-0.32920171	0.18654764	0.33285951	-0.395042058	0.471855791	-0.036577968	0.35114850	0.04023577	-0.245072388	0.53403834	0.427962229	0.28165036	0.468197995	0.456793207	-0.303597137		-0.19752103	0.29570430		1	-0.098760514	0.17340737	-0.23775679	0.06218255	0.06949814
24	0.200000000	0.11785714	0.103571429	0.21978111	-0.04642857	0.14285714	0.05714286	0.26071429	0.303571429	-0.146428571	0.157142857	-0.45357143	<b>0.51785714</b>	-0.067857143	0.13928571	0.003571429	0.200000000	0.021428571	0.062182546	<b>0.739285714</b>	-0.18214286	0.10973390	-0.09876051		10.13838070	-0.08571429	-0.26785714	-0.40357143		
25	0.512822594	0.19943101	0.044770226	0.29499072	0.22385113	-0.03256016	<b>0.65527331</b>	0.13024066	0.154660782	-0.105820535	0.093610474	-0.48026243	-0.39072198	0.419212121	-0.25234128	<b>0.700043541</b>	0.46805237	0.073260371	-0.351816872	0.154660782	-0.32560165	-0.01834116	0.17340737	0.138380700		1	-0.17094086	0.19536099	0.14245072	
26	0.014285714	-0.56428571	-0.264285714	-0.06919035	0.25714286	0.50357143	0.29285714	-0.40357143	0.421428571	0.253571429	0.385714286	0.30357143	-0.18928571	0.278571429	-0.23214286	-0.475000000	0.08928571	<b>-0.585714286</b>	0.113391702	0.364285714	0.56071429	-0.06584034	-0.23775679	-0.085714286	-0.17094086		1	-0.09285714	-0.17142857	
27	0.385714286	0.37857143	0.450000000	0.18722095	<b>0.70714286</b>	-0.12142857	0.36071429	0.31428571	0.128571429	-0.403571429	-0.196428571	-0.33214286	-0.18928571	0.585714286	0.05357143	0.403571429	-0.050000000	0.225000000	-0.043893562	-0.450000000	-0.07857143	0.10241831	0.06218255	-0.267857143	0.19536099	-0.09285714		10.33214286		
28	0.132142857	0.41071429	0.617857143	-0.07326037	0.3785714	0.275000000	0.125000000	0.38571429																						



# Discusión

