

La nuova era della genomica e della medicina su misura:  
luci e ombre

Brescia, Palazzo Loggia, 15 Aprile 2019

## Farmacologia in continua evoluzione per costruire la Società del futuro

Prof. Maurizio Memo



Professore Ordinario di Farmacologia  
Coordinatore della Sezione di Farmacologia  
Dipartimento di Medicina Molecolare e Traslazionale  
Università degli Studi di Brescia



Direttore Scientifico del Centro Studi DIFF  
Documentazione Informazione e Formazione sul Farmaco  
Università degli Studi di Brescia

# Definizioni OMS

- **Farmaco:** Sostanza o prodotto usato per modificare ed esplorare sistemi fisiologici o patologici con beneficio di chi lo riceve.
- **Salute:** Stato di completo benessere fisico, psichico e sociale e non semplice assenza di malattia

# Vita media in Italia

Italia, anni 1900 - 2010

femmine

maschi



Fonte: ISTAT e G. Caselli

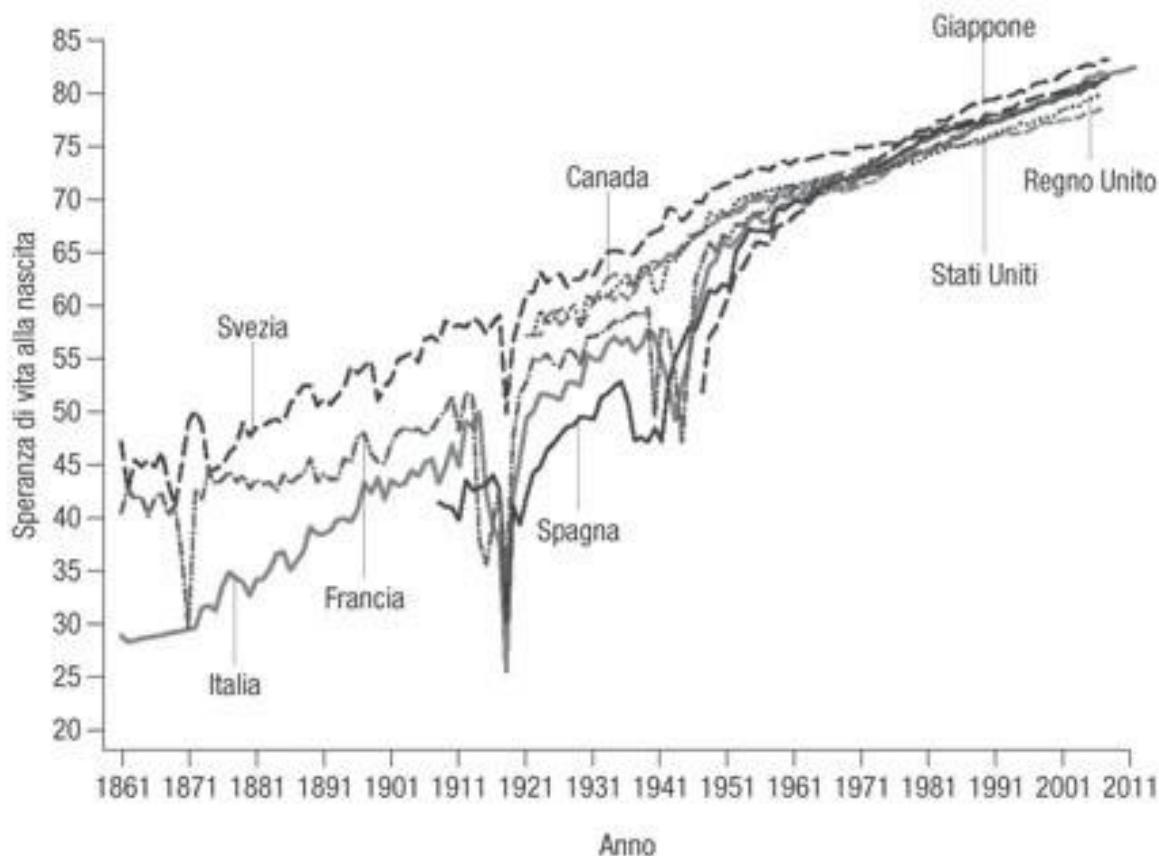
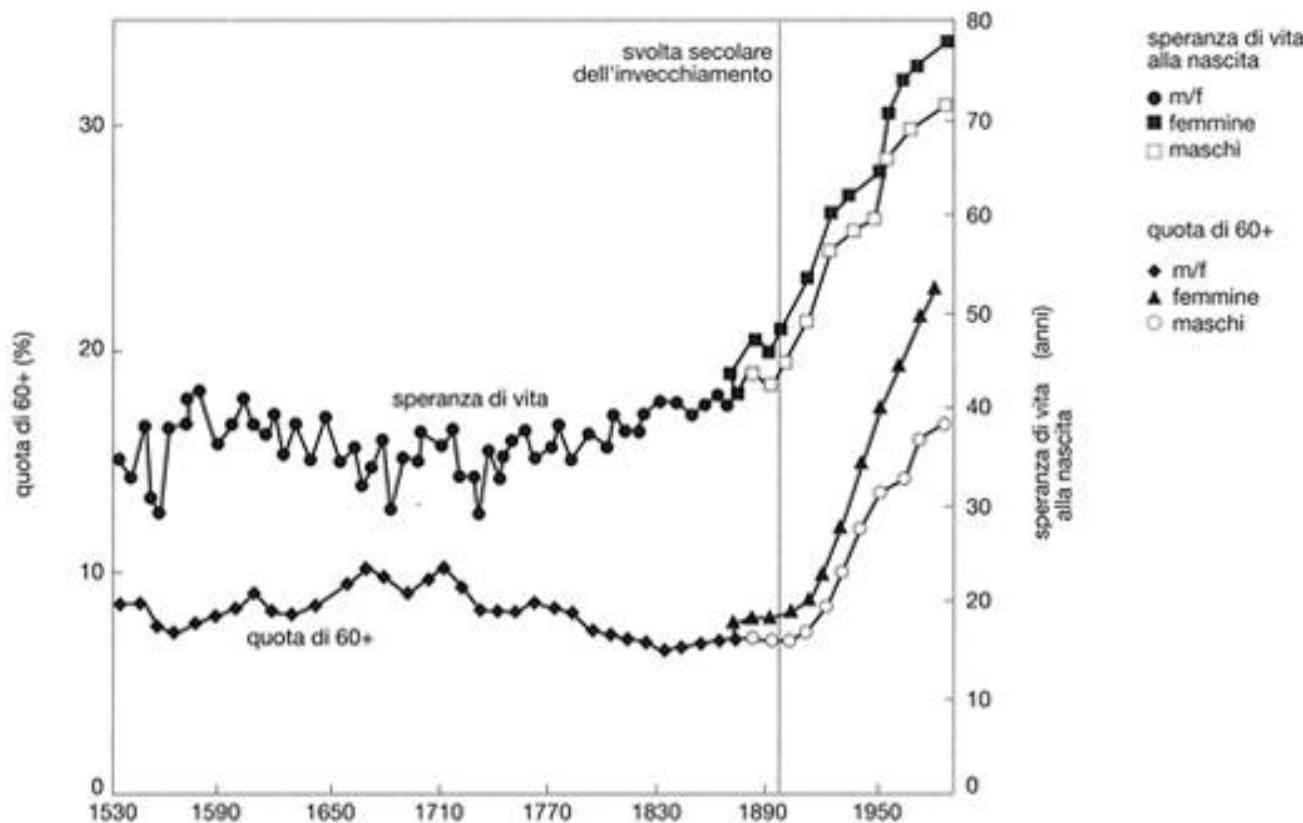
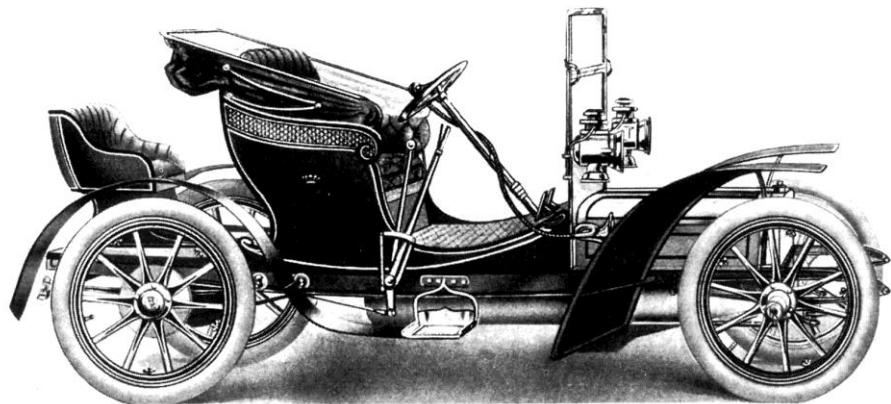


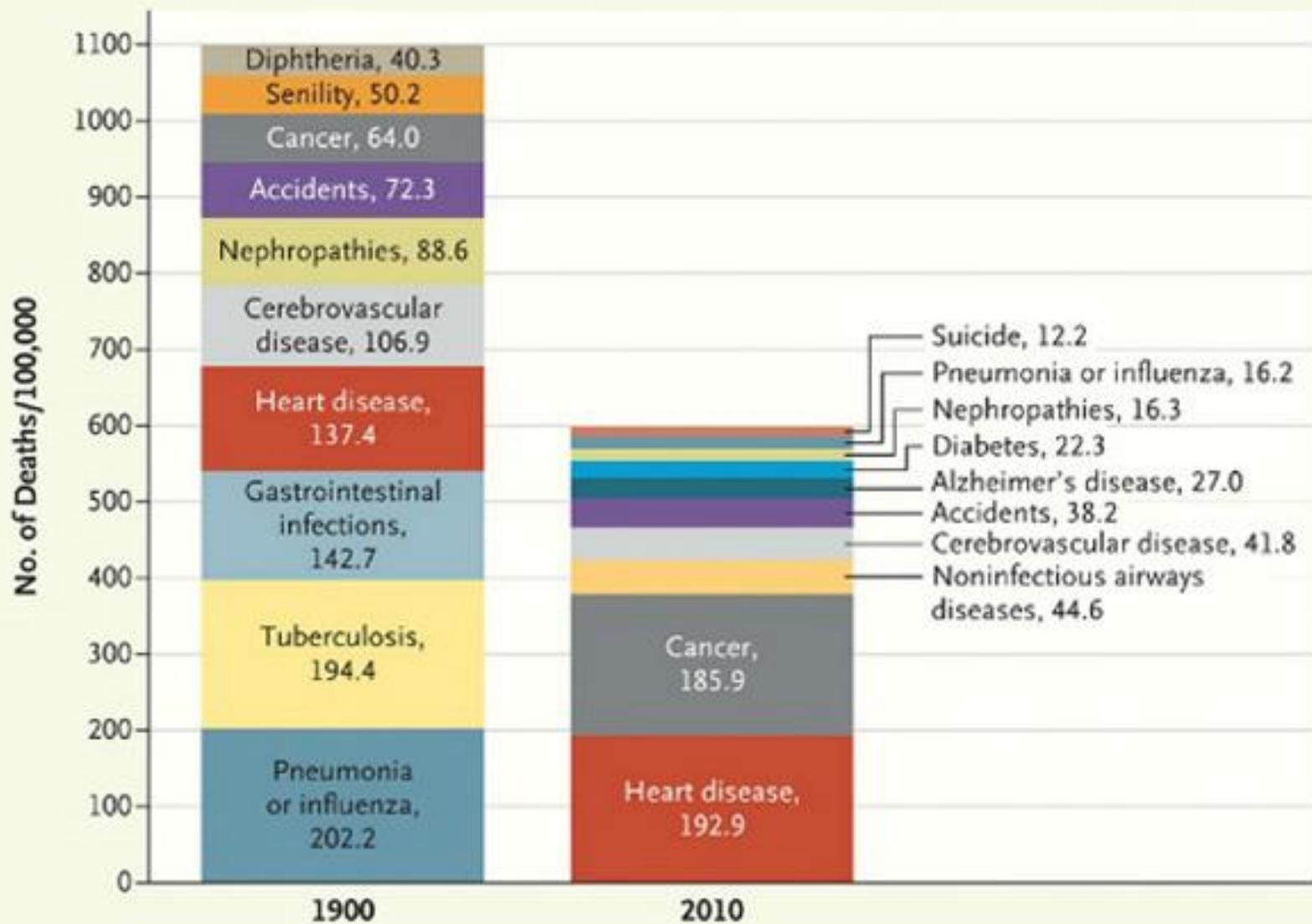
Figura 2 - La vita media in Italia a confronto col resto del mondo, 1861-oggi. Fonti: nostre elaborazioni su dati Hmd (2010) e altre fonti descritte nell'Appendice.

---

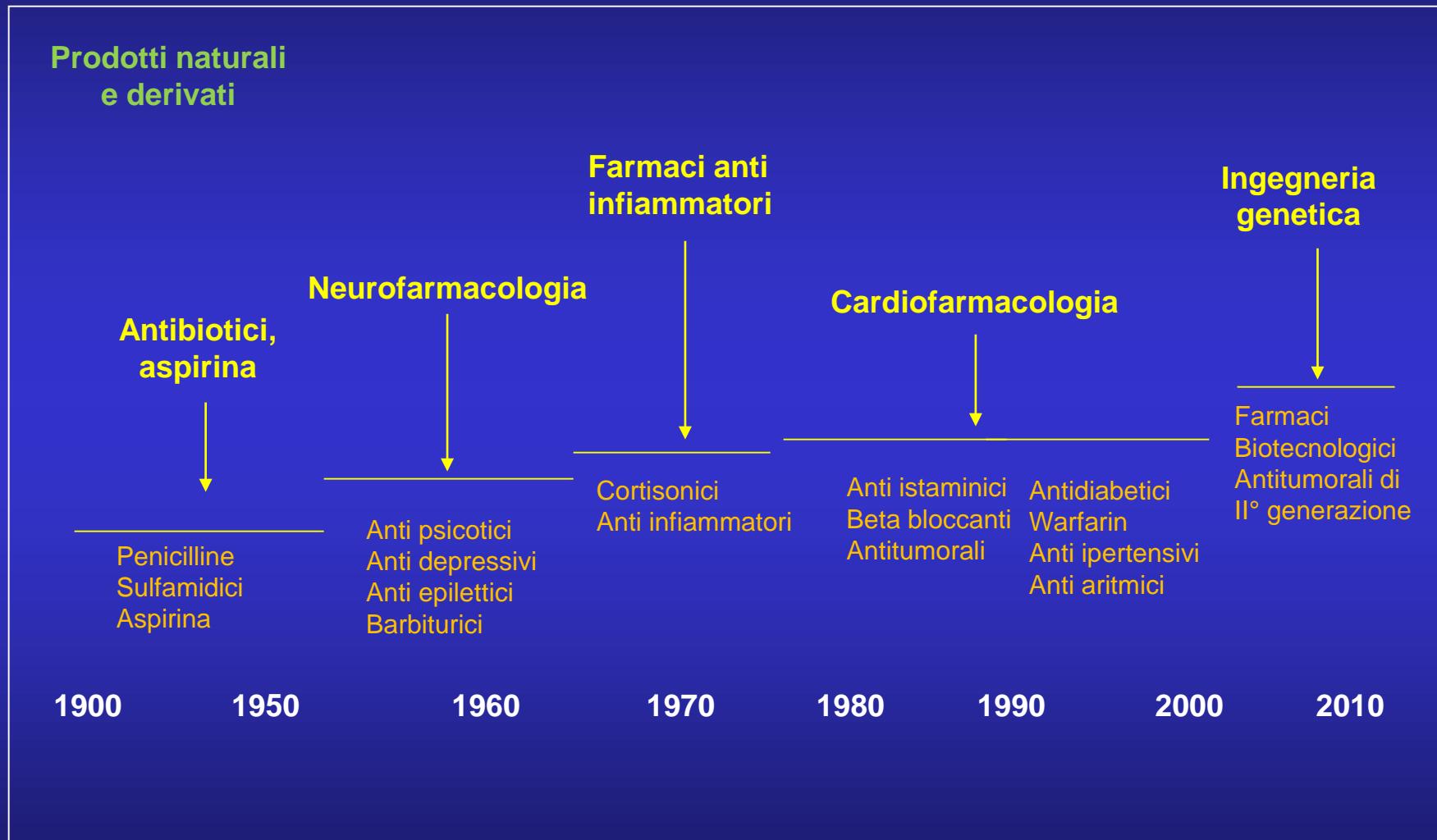
# Aspettativa di vita







# CRONOLOGIA DELL'INNOVAZIONE FARMACOLOGICA



# *The* PHARMACOLOGICAL BASIS *of* THERAPEUTICS

---

A Textbook of Pharmacology,  
Toxicology and Therapeutics for  
Physicians and Medical Students

---

*by*

LOUIS GOODMAN, M.A., M.D.

*Assistant Professor of Pharmacology and Toxicology  
Yale University, School of Medicine*

*and*

ALFRED GILMAN, Ph.D.

*Assistant Professor of Pharmacology and Toxicology  
Yale University, School of Medicine*

THE MACMILLAN COMPANY

NEW YORK

TABLE OF CONTENTS

SECTION I		
Chapter	INTRODUCTION	Page
1. General Principles		3
SECTION II		
CENTRAL NERVOUS SYSTEM DEPRESSANTS		
2. History and Theories of General Anesthesia		28
3. Stages of Anesthesia		35
4. Preamesthetic Medication, Technic of Anesthesia and Anesthetic Accidents		46
5. General Anesthetics		58
i. Ether and Chloroform, Divinyl Ether, Ethyl Chloride and Trichloroethylene		58
6. General Anesthetics		81
ii. Nitrous Oxide, Ethylene, Cyclopropane, Acetylene		81
7. Basal Anesthetics		100
Tribromethanol		100
8. The Alcohols		108
9. Hypnotics and Sedatives		126
i. The Barbiturates		126
10. Hypnotics and Sedatives		155
ii. The Bromides and Dilantin		155
11. Hypnotics and Sedatives		175
iii. Chloral Hydrate, Paraldehyde and Miscellaneous Agents		175
12. Morphine and other Opium Alkaloids		186
13. Analgesics and Antipyretics		224
i. The Salicylates, Cinchophen and Neocinchophen		224
14. Analgesics and Antipyretics		242
ii. Acetanilid and Acetophenetidin; Aminopyrine and Antipyrine		242
SECTION III		
CENTRAL NERVOUS SYSTEM STIMULANTS		
15. Strychnine and Picrotoxin		256
16. Metrazol, Coramine and Camphor		267
17. The Xanthines		274
Caffeine, Theophylline and Theobromine		274

## CONTENTS

## SECTION IV

## LOCAL ANESTHETICS

Chapter	Page
18. Cocaine; Procaine and Other Synthetic Local Anesthetics	286

## SECTION V

## DRUGS ACTING ON AUTONOMIC EFFECTOR CELLS

19. Anatomical, Physiological and General Pharmacological Considerations	317	32. V
20. Drugs Stimulating Structures Innervated by Cholinergic Nerves (Parasympathomimetic Drugs)	349	33. C
i. Choline Esters: <i>Acetylcholine, Acetyl-Beta-Methylcholine and Carbaminoylecholine</i>	349	34. A
ii. Inhibitors of Cholinesterase: <i>Physostigmine (Eserine) and Prostigmine</i>	376	35. D
21. Drugs Stimulating Structures Innervated by Cholinergic Nerves (Parasympathomimetic Drugs)	376	D
iii. <i>Pilocarpine, Arecoline and Muscarine</i>	389	36. O
22. Drugs Stimulating Structures Innervated by Cholinergic Nerves (Parasympathomimetic Drugs)	389	37. A
iii. <i>Pilocarpine, Arecoline and Muscarine</i>	389	
23. Drugs Stimulating Structures Innervated by Adrenergic Nerves (Sympathomimetic Drugs)	396	
i. <i>Epinephrine</i>	396	
24. Drugs Stimulating Structures Innervated by Adrenergic Nerves (Sympathomimetic Drugs)	423	38. Th
ii. <i>Ephedrine, Benzedrine and Miscellaneous Sympathomimetic Drugs</i>	423	C
25. Autonomic Blocking Agents	460	39. No
i. Drugs Inhibiting Structures Innervated by Postganglionic Cholinergic Nerves	460	40. No
<i>Atropine, Scopolamine and Related Synthetic Drugs</i>	460	B
ii. Drugs Inhibiting Structures Innervated by Adrenergic Nerves	482	41. Le
<i>Ergotamine and Ergotoxine</i>	482	42. Me
26. Autonomic Blocking Agents	482	43. Gol
iii. Drugs Inhibiting Autonomic Ganglia and Skeletal Muscles	488	M
<i>Nicotine and Curare</i>	488	
	488	

## SECTION VI

## CARDIOVASCULAR DRUGS

28. Digitalis and Allied Cardiac Glycosides	500
29. Quinidine	538
30. The Nitrites	548

Chap  
31.

32. V

33. C

34. A

35. D

D

36. O

37. A

38. Th

C

39. No

40. No

B

41. Le

42. Me

43. Gol

M

44. Dem

As

CONTENTS		xi
Page	Chapter	Page
286	31. Histamine, Thiocyanates and Miscellaneous Cardiovascular Drugs	566
317	32. Water, Sodium Salts and Other Agents Affecting the Volume and Composition of the Body Fluids	578
349	33. Cations: Potassium, Calcium, Magnesium, Barium and Ammonium	595
349	34. Anions: Phosphates, Iodides, Fluorides and Other Anions	613
349	SECTION VII WATER, SALTS AND IONS	
376	35. Diuretics and Antidiuretics	626
376	SECTION VIII DRUGS AFFECTING URINE FORMATION	
396	36. Oxytocics	653
396	37. Abortifacients, Uterine Sedatives, Uterine Hemostatics and Spermatocides	673
396	SECTION IX DRUGS ACTING ON THE REPRODUCTIVE ORGANS	
423	38. The Therapeutic Gases Oxygen, Carbon Dioxide and Helium	677
423	39. Noxious Gases and Vapors i. Carbon Monoxide, Hydrocyanic Acid and Miscellaneous Agents	694
460	40. Noxious Gases and Vapors ii. The War Gases	707
460	SECTION X GASES AND VAPORS	
482	41. Lead	717
482	42. Mercury, Arsenic and Antimony	732
488	43. Gold, Silver, Thallium, Selenium, Radioactive Elements and Miscellaneous Minor Metals	751
488	SECTION XI HEAVY METALS AND METALLOIDS	
500	44. Demulcents, Emollients, Protectives, Adsorbents, Irritants and Astringents	766
538		
548		
	SECTION XII DRUGS ACTING LOCALLY ON THE SKIN AND MUCOUS MEMBRANES	

## CONTENTS

Chapter	Page
45. Gastric Antacids and Digestants . . . . .	778
46. Cathartics . . . . .	798
47. Emetics and Expectorants . . . . .	812

## SECTION XIII

ANTISEPTICS, DISINFECTANTS AND DRUGS USED IN  
THE CHEMOTHERAPY OF INFECTIOUS DISEASES

48. Antiseptics, Germicides, Fungicides and Parasiticides . . . . .	823
49. Drugs Used in the Chemotherapy of Helminthiasis . . . . .	878
50. Drugs Used in the Chemotherapy of Malaria . . . . .	903
<i>Quinine, Plasmochin and Atabrine</i> . . . . .	903
51. Drugs Used in the Chemotherapy of Amebiasis . . . . .	930
<i>Emetine, Chiniofon, Vioform and Carbarsone</i> . . . . .	930
52. Drugs Used in the Chemotherapy of Leprosy . . . . .	943
<i>Chaulmoogra and Hydnocarpus Oils</i> . . . . .	943
53. Drugs Used in the Chemotherapy of Syphilis . . . . .	946
<i>I. The Pharmacology and Clinical Toxicology of the Antisyphilitic Arsenicals</i> . . . . .	946
<i>The Arsphenamines, Mapharsen and Tryparsamide</i> . . . . .	946
54. Drugs Used in the Chemotherapy of Syphilis . . . . .	978
<i>II. Bismuth, Mercury and Iodides</i> . . . . .	978
55. Drugs Used in the Chemotherapy of Syphilis . . . . .	993
<i>III. Principles of Syphilitotherapy</i> . . . . .	993
56. Sulfanilamide and Related Sulfonamide Drugs . . . . .	1002
<i>I. The Pharmacology of Sulfanilamide</i> . . . . .	1002
57. Sulfanilamide and Related Sulfonamide Drugs . . . . .	1029
<i>II. The Clinical Toxicology of Sulfanilamide</i> . . . . .	1029
58. Sulfanilamide and Related Sulfonamide Drugs . . . . .	1043
<i>III. Therapeutic Uses of Sulfanilamide</i> . . . . .	1043
59. Sulfanilamide and Related Sulfonamide Drugs . . . . .	1065
<i>IV. Sulfapyridine and Sulfathiazole</i> . . . . .	1065

## SECTION XIV

DRUGS ACTING ON THE BLOOD AND  
BLOOD-FORMING ORGANS

60. Drugs Effective in Iron-Deficiency Anemias . . . . .	1104
<i>Iron and Iron Salts</i> . . . . .	1104
61. Drugs Effective in Pernicious Anemia and Allied Anemias . . . . .	1123
<i>Liver Extract and Desiccated Stomach</i> . . . . .	1123
62. Miscellaneous Drugs Affecting the Blood . . . . .	1140
<i>Heparin, Nucleic Acid Derivatives and Phenylhydrazine</i> . . . . .	1140

## SECTION XV

## DRUGS OF ENDOCRINE ORIGIN

63. Thyroid . . . . .	1156
-----------------------	------

## Chapter

64. Par	
65. An	
66. Fer	
67. Ma	
68. Ins	
69. Ad	

70. Wa	
71. Wa	
72. Fat	
73. Fat	

## INDEX

## CONTENTS

xiii

## Chapter

	Page
64. Parathyroid . . . . .	1173
65. Anterior Pituitary and Anterior Pituitary-Like Hormones . . . . .	1180
66. Female Sex Hormones . . . . .	1192
<i>Estrogens and Luteal Hormone</i> . . . . .	1192
67. Male Sex Hormones . . . . .	1207
68. Insulin . . . . .	1214
69. Adrenal Cortical Hormones . . . . .	1229

## SECTION XVI

## THE VITAMINS

70. Water-Soluble Vitamins . . . . .	1244
i. <i>The Vitamin B Complex, Thiamine, Riboflavin, Nicotinic Acid and Vitamin B<sub>6</sub></i> . . . . .	1244
71. Water-Soluble Vitamins . . . . .	1263
ii. <i>Ascorbic Acid (Vitamin C)</i> . . . . .	1263
72. Fat-Soluble Vitamins . . . . .	1269
i. <i>Vitamin A and Vitamin D</i> . . . . .	1269
73. Fat-Soluble Vitamins . . . . .	1293
ii. <i>Vitamin K and Vitamin E</i> . . . . .	1293

## APPENDIX

Principles of Prescription Writing . . . . .	1305
--	------

INDEX . . . . .	1327
-----------------	------

# Evoluzione nella tipologia e nel concetto di malattia e terapia

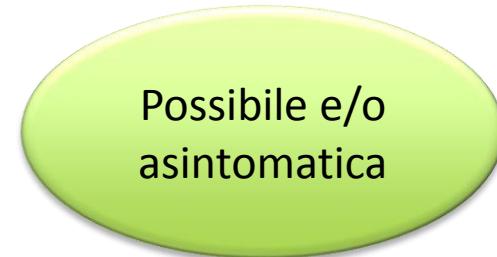
**CD** → **NCD**



Farmaci antidolorifici



Farmaci sintomatici



Terapia preventiva

# Evoluzione del concetto di malato



acuto

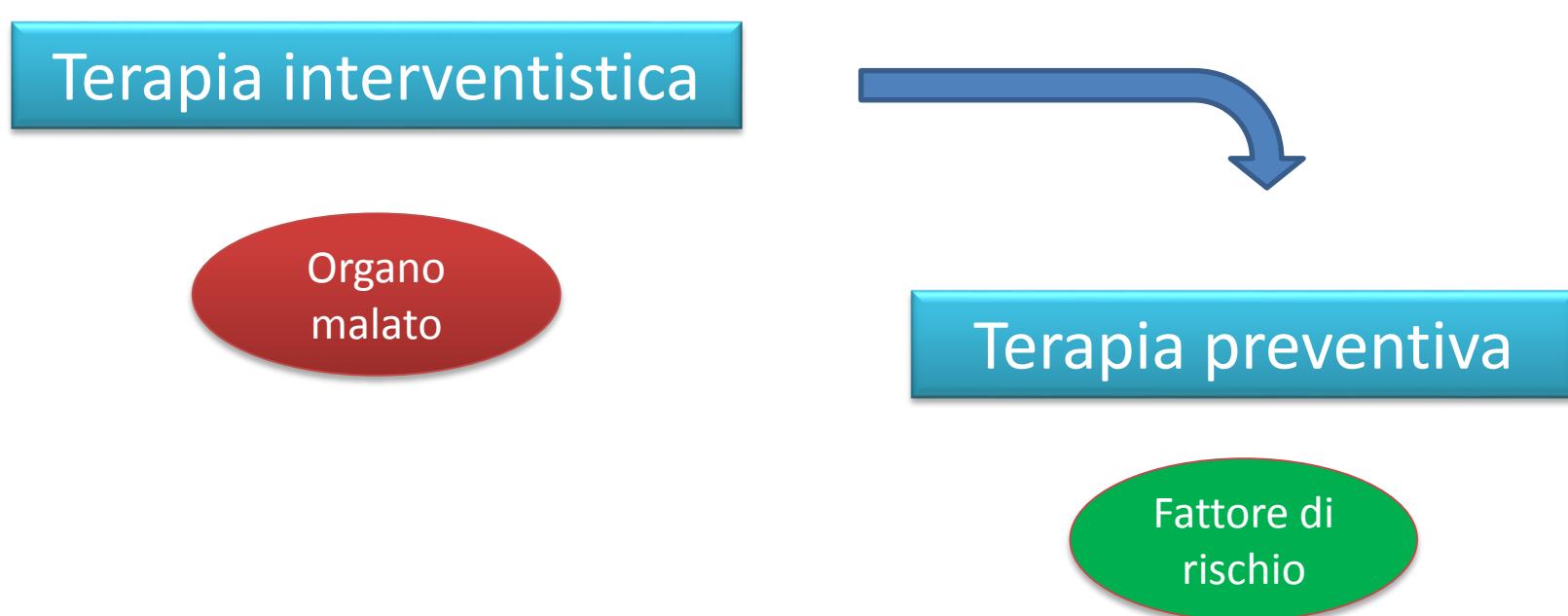


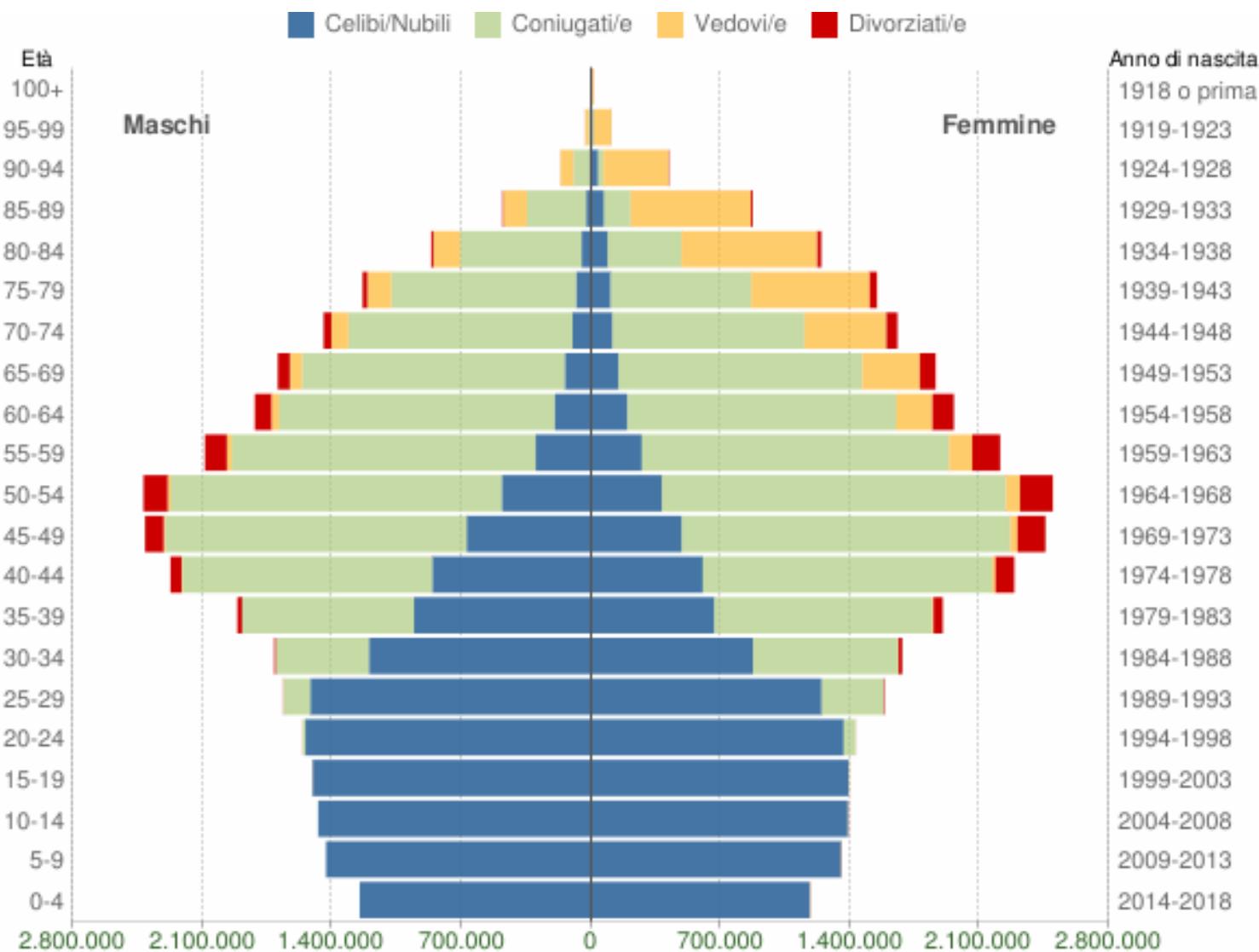
cronico



sano

# Evoluzione dell'approccio terapeutico





Popolazione per età, sesso e stato civile - 2018

ITALIA - Dati ISTAT 1° gennaio 2018 - Elaborazione TUTTITALIA.IT

## Over 80

Tot 4.168.300

Ved 2.205.790 53%

M 1.541.109

F 2.627.191 63%

29.445.741	31.143.704	60.589.445
48,6%	51,4%	
Male	Female	
		Tot

## Over 100

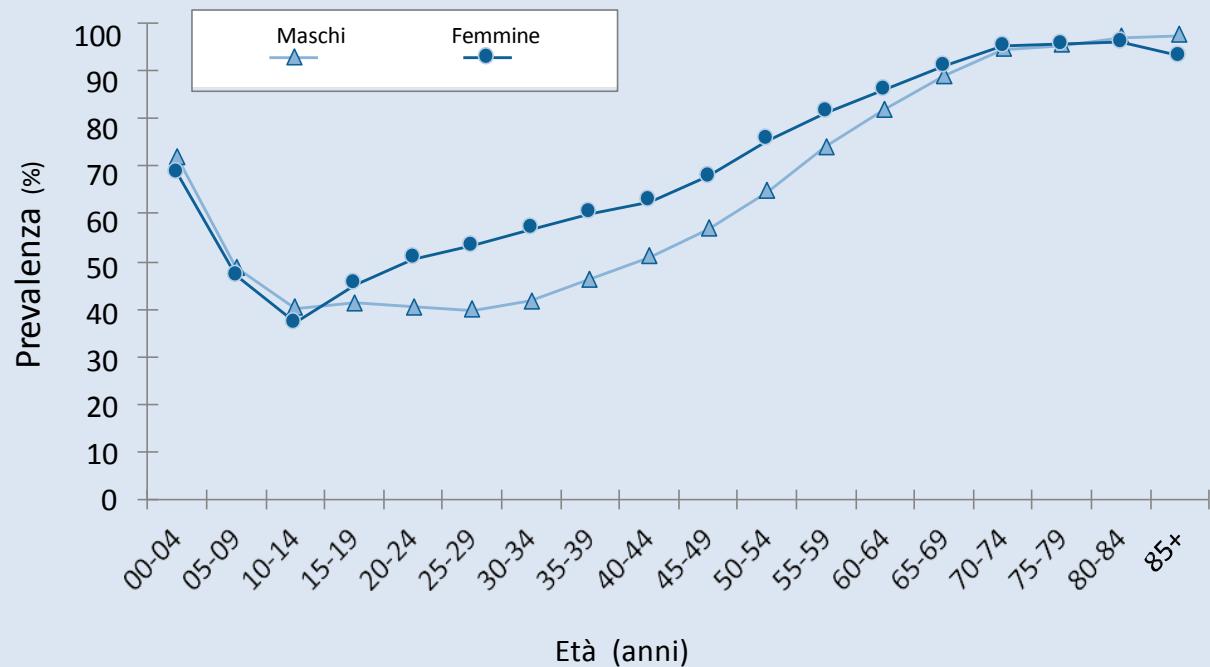
Tot 15.647

M 2.557

F 13.090 83%



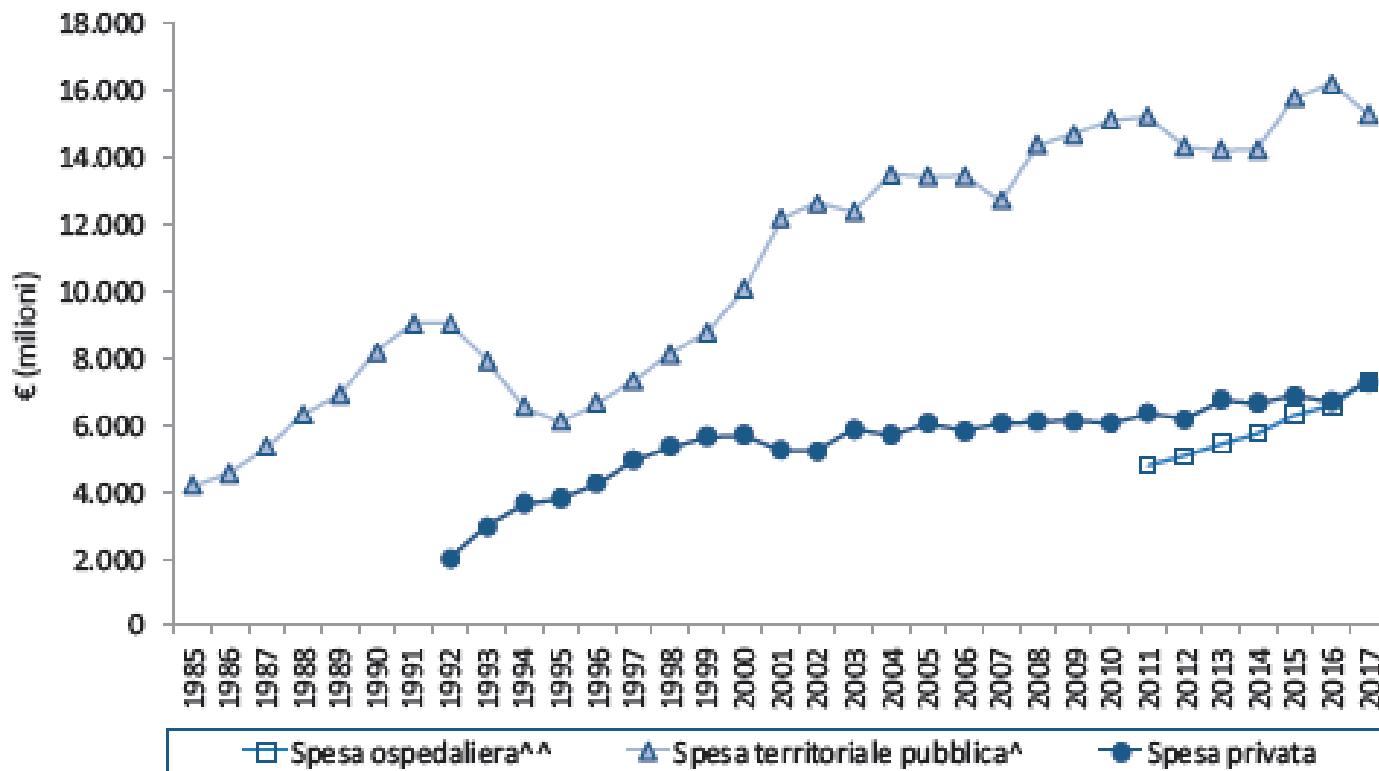
# Consumo dei farmaci in Italia nel 2017: Prevalenza in funzione del genere e dell'età



## **Numero di farmaci assunti giornalmente dalla popolazione anziana, in Italia nel 2017**

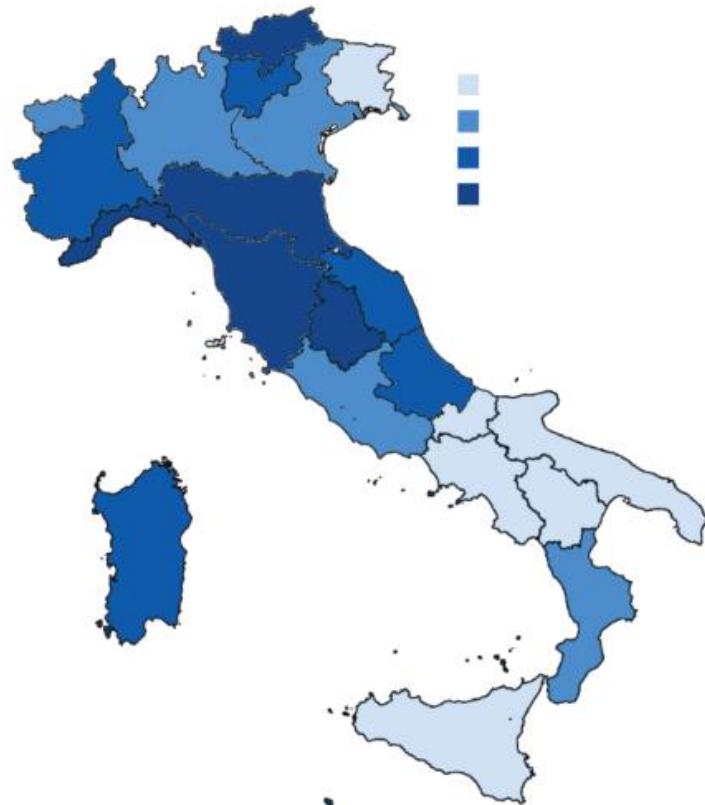
Età	Numero di farmaci (media)		
	Maschi	Femmine	Tutti
65-69	7,6	7,8	7,7
70-74	9,1	9,3	9,2
75-79	10,1	10,3	10,2
80-84	11,4	11,4	11,4
≥ 85	12,1	11,6	11,8
≥ 65	9,6	9,9	9,7

**Figura 1.1.b Spesa farmaceutica nel periodo 1985 – 2017 (Figura e Tabella)**

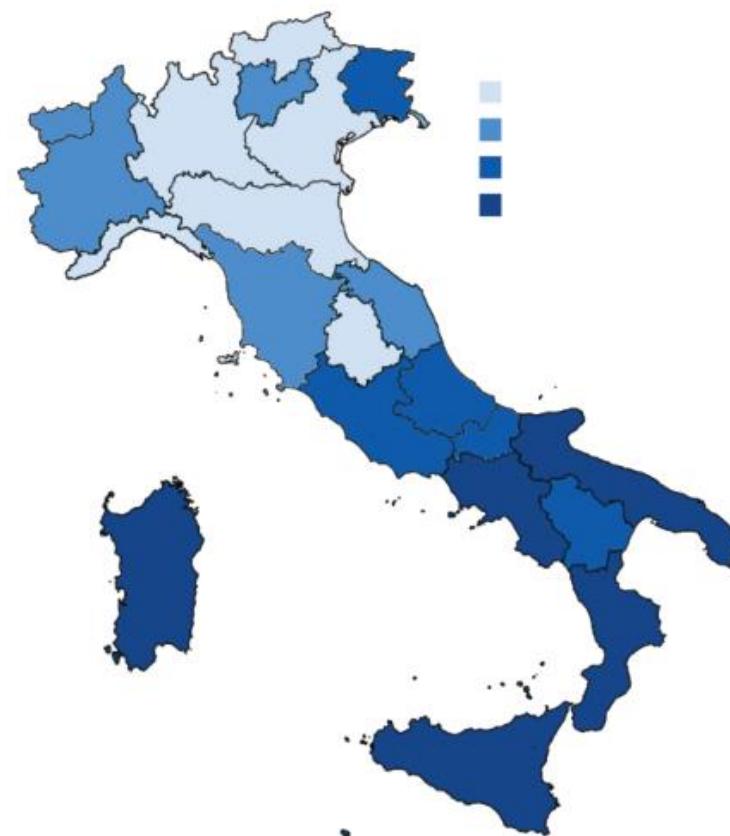


# Consumo di farmaci

Antidepressivi



Antinfiammatori



**Tabella 1.4.4. Primi trenta principi attivi per consumo in età pediatrica nel 2017**

ATC	Principio attivo	Confezioni (per 1000 ab.)	Consumi (%) <sup>*</sup>	
			Maschi	Femmine
J	amoxicillina/acido clavulanico	401,9	53,6	46,4
R	beclometasone	151,0	54,4	45,6
J	amoxicillina	127,5	52,4	47,6
J	cefixima	104,7	51,1	48,9
H	betametasone	101,7	56,7	43,3
J	azitromicina	96,5	53,2	46,8
R	salbutamolo	94,1	60,0	40,0
J	claritromicina	86,7	53,9	46,1
A	colecalciferolo	68,6	49,5	50,5
R	cetirizina	68,6	59,4	40,6
N	acido valproico	58,4	62,4	37,6
R	budesonide	56,3	56,2	43,8
R	fluticasone	44,4	61,4	38,6
J	cefpodoxima	43,9	52,8	47,2
R	montelukast	42,6	63,2	36,8
J	ceftriaxone	37,7	53,7	46,3
R	salbutamolo/ipratropio	36,1	55,1	44,9
J	cefaclor	26,1	50,5	49,5
H	somatropina	18,5	62,1	37,9
J	acidovir	17,3	51,2	48,8
R	flunisolide	17,0	54,5	45,5
R	levocetirizina	17,0	63,3	36,7
H	levotiroxina	14,9	37,0	63,0
N	carbamazepina	13,6	55,0	45,0
H	prednisone	13,6	53,6	46,4
N	levetiracetam	13,3	46,3	53,7
R	salmeterolo/fluticasone	13,0	66,2	33,8
P	mebendazolo	12,5	47,6	52,4
R	desloratadina	11,7	61,2	38,8
B	sodio cloruro	11,2	54,3	45,7

\* calcolato rispetto al totale dei consumi in età pediatrica

**Tabella 2.8 Primi trenta principi attivi per spesa convenzionata di classe A-SSN: confronto 2017-2016**

ATC	Principio attivo	Spesa (milioni)	%*	Spesa linda pro capite	Rango 2017	Rango 2016
A	pantoprazolo	277,9	2,7	4,59	1	1
C	rosuvastatina	244,8	2,3	4,04	2	2
C	atorvastatina	234,5	2,3	3,87	3	3
A	colecalciferolo	233,9	2,2	3,86	4	6
C	ezetimibe/simvastatina	186,8	1,8	3,08	5	8
A	lansoprazolo	180,4	1,7	2,98	6	4
J	amoxicillina/acido clavulanico	173,7	1,7	2,87	7	7
A	omeprazolo	163,5	1,6	2,70	8	9
R	salmeterolo/fluticasone	161,3	1,5	2,66	9	5
A	esomeprazolo	149,2	1,4	2,46	10	11
C	bisoprololo	130,3	1,3	2,15	11	17
R	beclometasone/formoterolo	124,0	1,2	2,05	12	19
B	enoxaparina sodica	124,0	1,2	2,05	13	13
G	dutasteride	123,1	1,2	2,03	14	10
C	ramipril	122,4	1,2	2,02	15	16
C	ezetimibe	113,8	1,1	1,88	16	26
C	omega 3	112,3	1,1	1,85	17	21
A	mesalazina	104,3	1,0	1,72	18	22
A	insulina lispro	103,9	1,0	1,71	19	23
C	simvastatina	103,8	1,0	1,71	20	20
N	pregabalin	101,5	1,0	1,67	21	15
R	fluticasone/vilanterolo	96,6	0,9	1,59	22	35
R	tiotropio	96,4	0,9	1,59	23	18
C	amlodipina	93,7	0,9	1,55	24	24
C	olmesartan/amlodipina	92,6	0,9	1,53	25	28
A	insulina aspart	89,6	0,9	1,48	26	25
A	metformina	87,8	0,8	1,45	27	29
N	levetiracetam	85,9	0,8	1,42	28	32
A	rifaximina	84,2	0,8	1,39	29	30
C	nebivololo	83,0	0,8	1,37	30	31
<b>Totale</b>		<b>4079,0</b>	<b>39,1</b>			
<b>Totale spesa classe A-SSN</b>		<b>10.418,9</b>				

\*calcolata sul totale della spesa convenzionata

**Tabella 3.4.2. Primi venti principi attivi di classe C con ricetta a maggiore spesa nel 2017**

ATC	Principio attivo	DDD/1000 ab die	Spesa (milioni)	%*	Δ% 17-16
N	paracetamolo	4,6	143	5,0	10,7
G	tadalafil	0,6	121	4,2	5,3
N	lorazepam	10,2	111	3,8	4,0
N	alprazolam	8,7	105	3,6	8,5
G	sildenafil	0,7	87	3,0	14,9
G	drospirenone/etinilestradiolo	6,1	73	2,5	-3,0
D	gentamicina/betametasone	3,5	64	2,2	11,3
N	lormetazepam	13,0	53	1,8	8,2
N	zolpidem	4,1	49	1,7	16,4
N	bromazepam	1,4	47	1,6	7,4
R	acetilcisteina	4,4	46	1,6	9,0
N	delorazepam	2,3	41	1,4	10,2
M	tiocolchicoside	0,6	39	1,4	0,1
N	triazolam	3,3	37	1,3	8,0
G	gestodene/etinilestradiolo	6,2	37	1,3	-5,9
N	levoacetilcarnitina	0,7	35	1,2	7,8
N	betaistina	2,1	34	1,2	12,6
G	vardenafil	0,2	33	1,1	-11,4
G	etonogestrel/etinilestradiolo	2,1	32	1,1	8,8
S	desametasone/tobramicina	1,4	31	1,1	8,5

\* calcolata sul totale della spesa



# Pharma giant Pfizer pulls out of research into Alzheimer's

Wed, Jan 17, 2018

WaltaHealth

Drug company Pfizer has announced it is pulling out of research into drugs to treat Alzheimer's disease. The US-based pharmaceutical giant said it would be ending its neuroscience discovery programmes following a review, and 300 jobs would be lost.

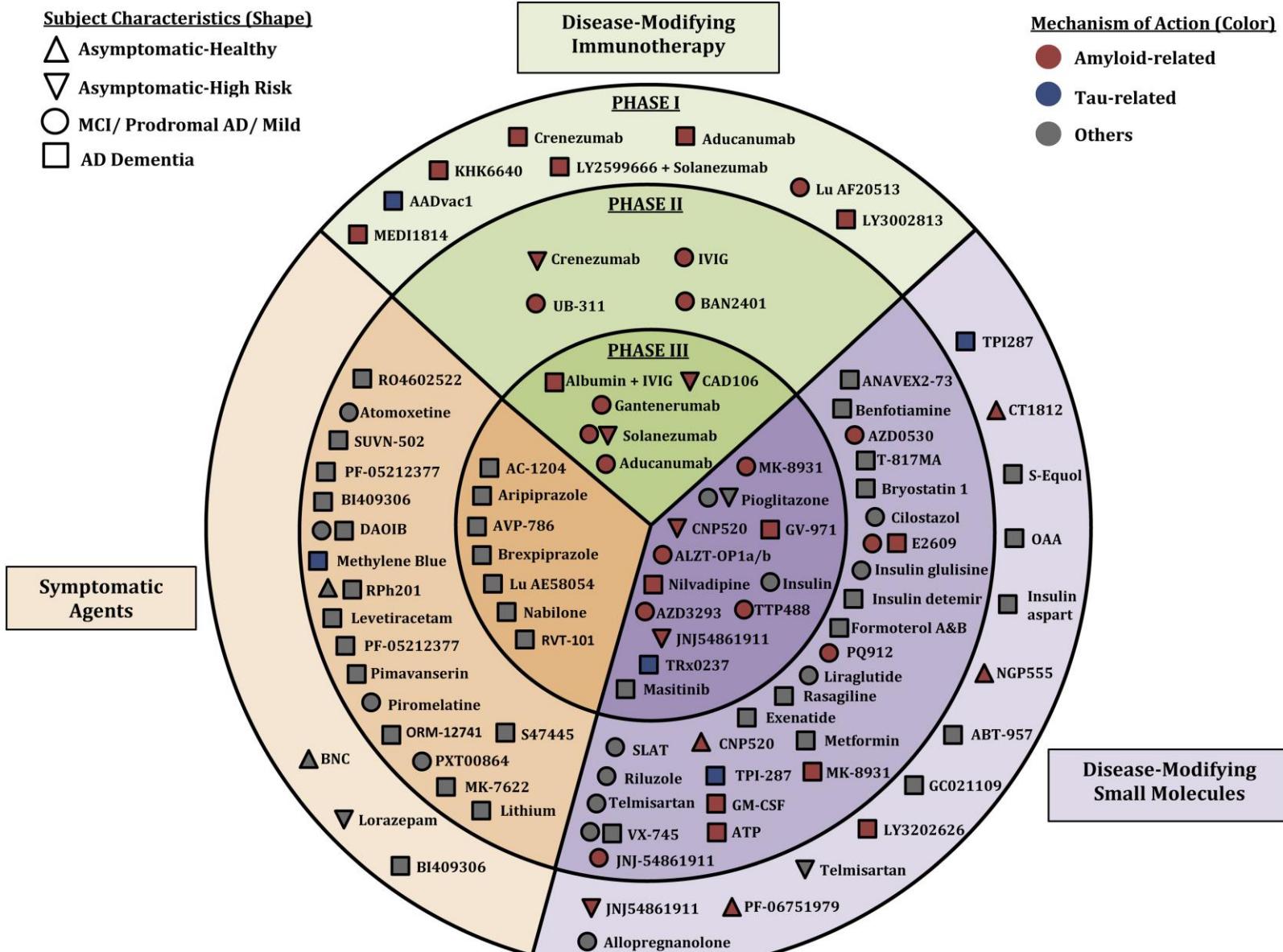
The Alzheimer's Society called the news "disappointing" and a "heavy blow" to those living with dementia. Companies should be encouraged to invest in research into neuroscience, Alzheimer's Research UK said.

The move means Pfizer will also stop looking for treatments for Parkinson's disease, but the company said it planned to create a new fund dedicated to neuroscience research in the future.

A statement from the company said: "We have made the decision to end our neuroscience discovery and early development efforts and re-allocate funding to those areas where we have strong scientific leadership and that will allow us to provide the greatest impact for patients."

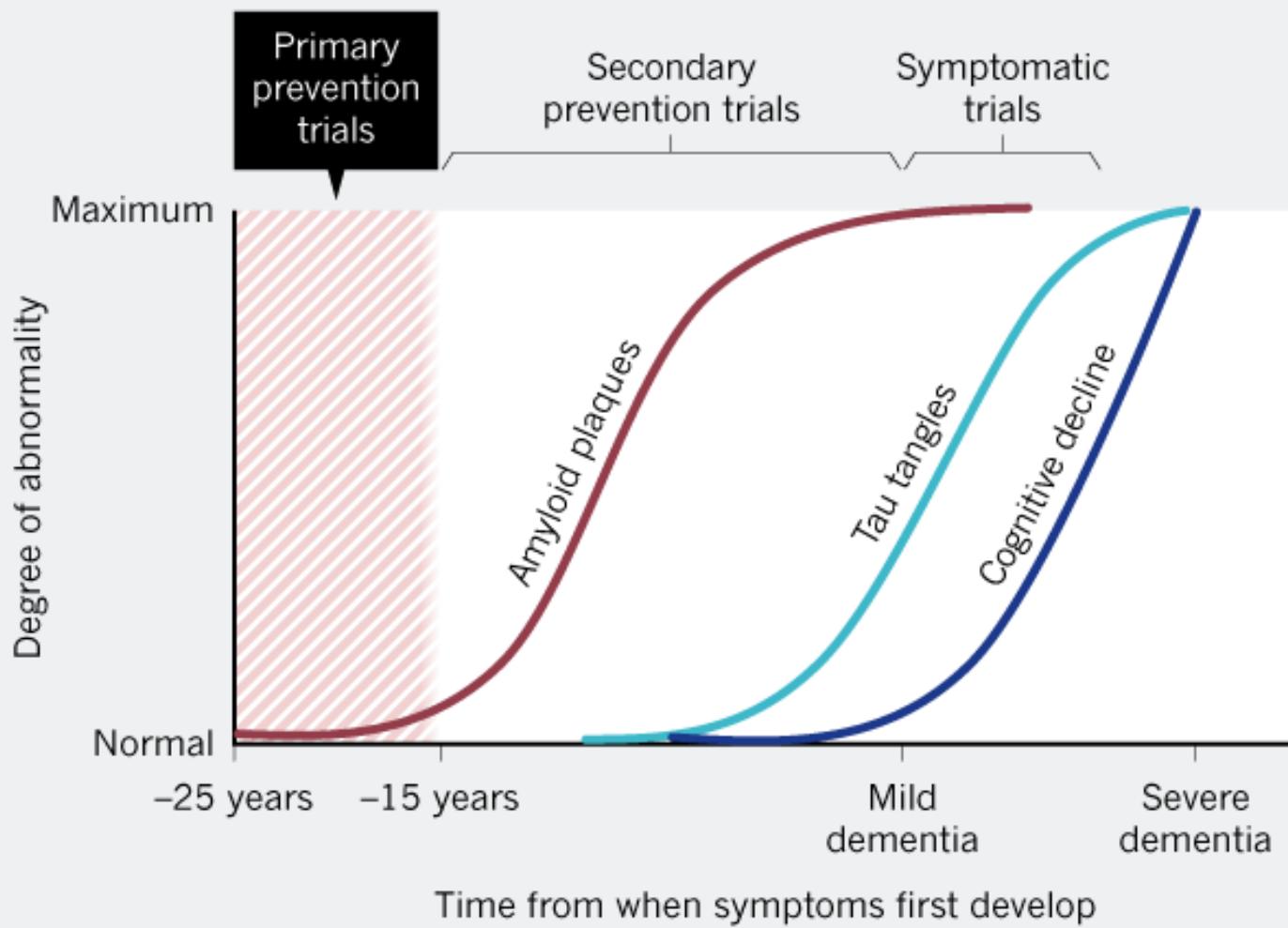


# Esplorazione nuovi potenziali trattamenti (Clinical trials 2016)



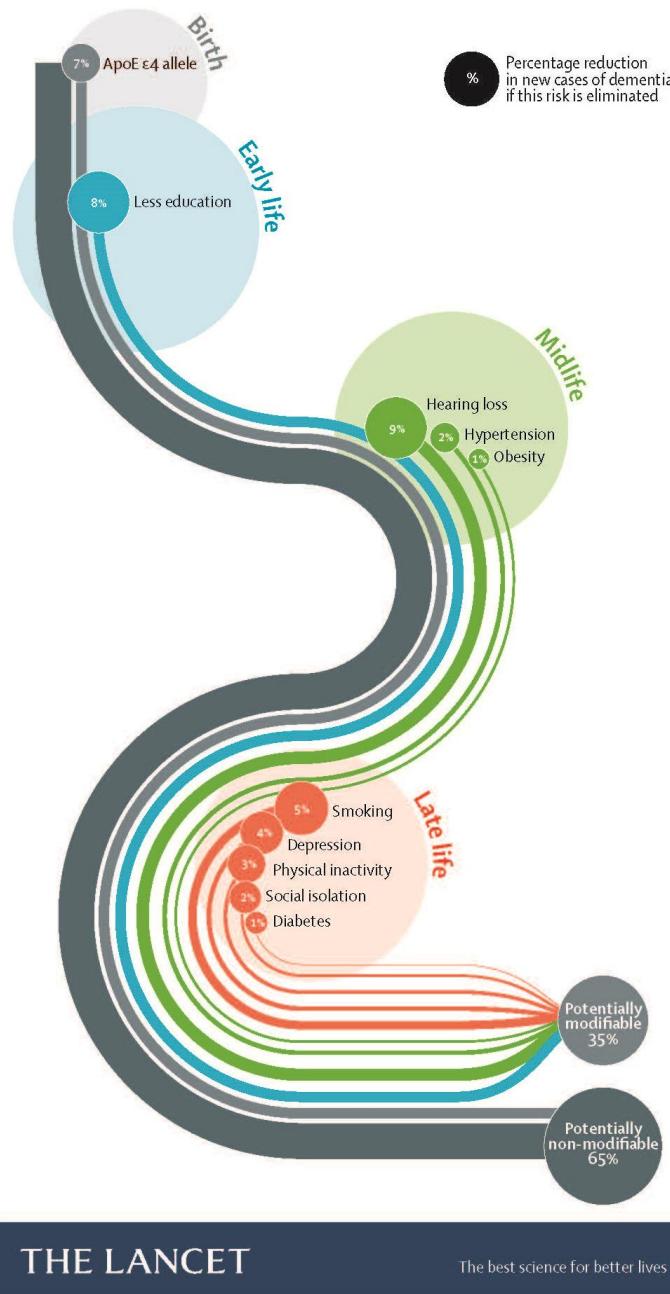
## STAYING AHEAD

Primary prevention trials would investigate drugs designed to treat Alzheimer's disease before brain pathology, such as amyloid- $\beta$  plaques and tau tangles, or cognitive symptoms develop.



## Risk factors for dementia

The Lancet Commission presents a new life-course model showing potentially modifiable, and non-modifiable, risk factors for dementia.



## Potentially modifiable risk factors for Dementia

Less education 8%

Hearing loss 9%

Hypertension 2%

Obesity 1%

Smoking 5%

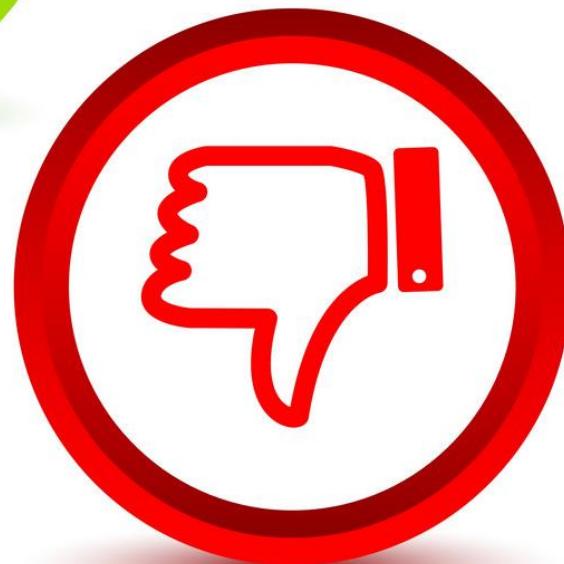
Depression 4%

Physical inactivity 3%

Social isolation 2%

Diabetes 1%

The Lancet Commissions. Lancet On Line, July 20, 2017



# Mass media power



# Bill Gates announces \$30 Million investment to support AD research

Tuesday 17 July 2018

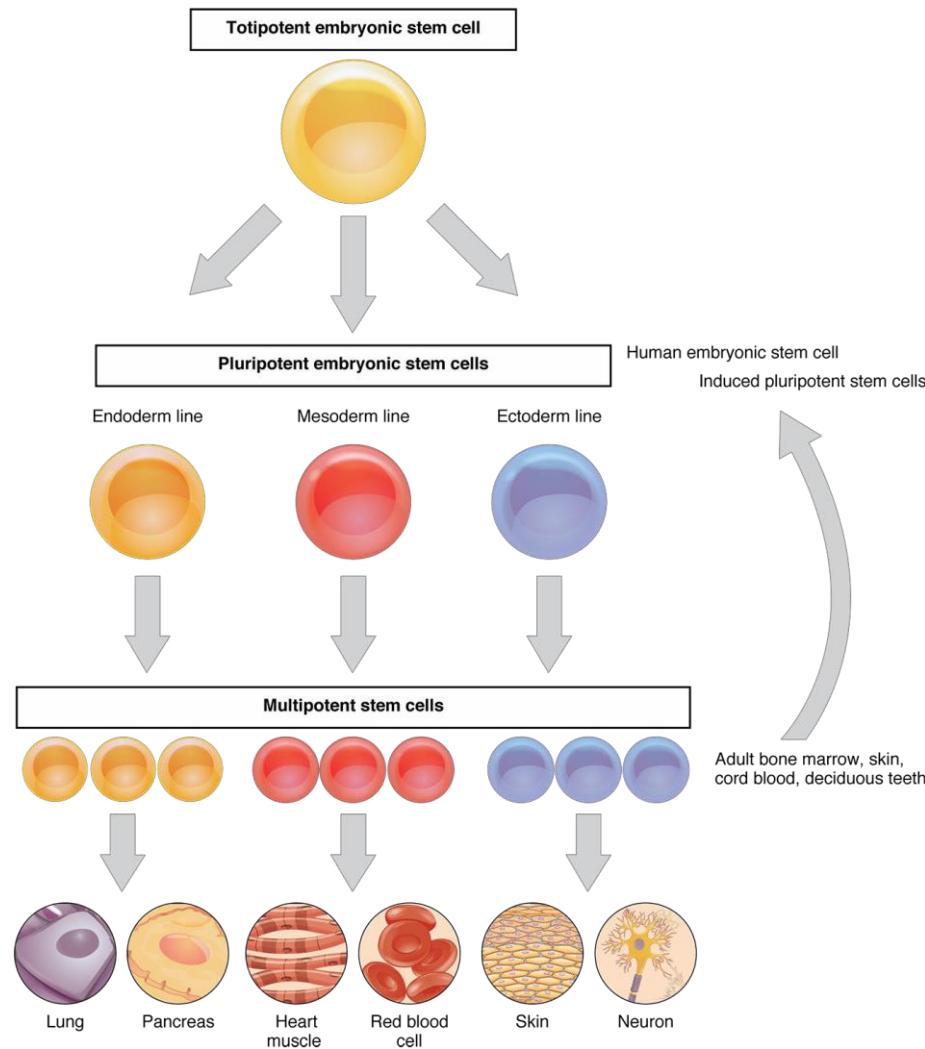
On 17 July, Microsoft co-founder and billionaire philanthropist Bill Gates announced his next investment in AD with the launch of the Diagnostics Accelerator - a "venture philanthropy" fund backed by Bill Gates and Alzheimer's Drug Discovery Foundation (ADDF) co-founder Leonard Lauder.



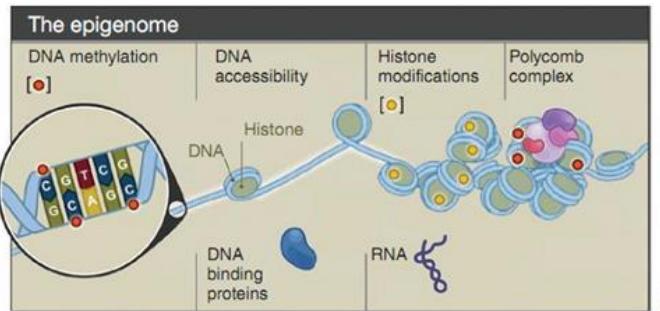
They are joined by other philanthropists, including the Dolby family and the Charles and Helen Schwab Foundation. This coalition of philanthropists has committed more than \$30 million to accelerate innovative new ideas for earlier and better diagnosis of AD and related dementias.



200 different cell types ----- Only 1 genome



# Epigenoma



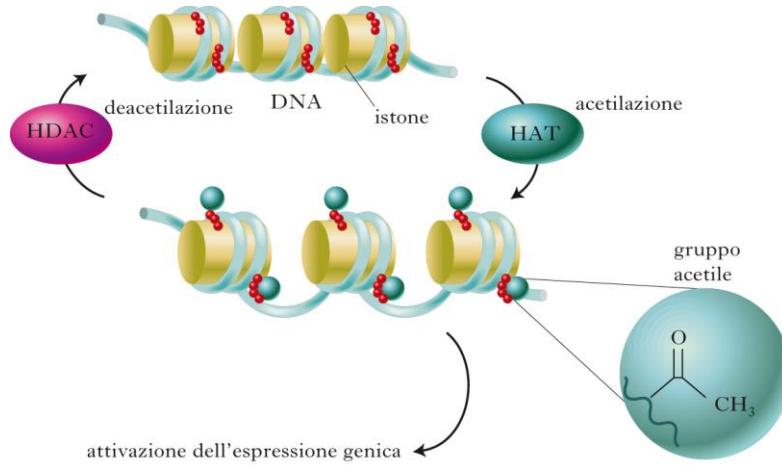
E' il risultato del processo attraverso il quale si determina l'attivazione di specifici set di geni in specifiche cellule.

Il programma del profilo di espressione genica è definito «epigenoma».

L'epigenoma è ereditabile, auto- conservante e reversibile

L'epigenoma è composto da due moduli:

- i) una componente parte integrante e covalente del DNA, le citosine metilate localizzate nelle regioni ricche in CG
- ii) una componente non –covalente costituita dalla cromatina e gli enzimi regolatori degli istori



L'epigenomica è regolata da fattori intrinseci (processi di attivazione trascrizionale programmata) o fattori estrinseci

I fattori estrinseci possono essere **segnali sensoriali** o **sostanze esterne**

## Epigenetics and the Agouti Yellow Mouse: How the Maternal Environment Influences Disease in Offspring



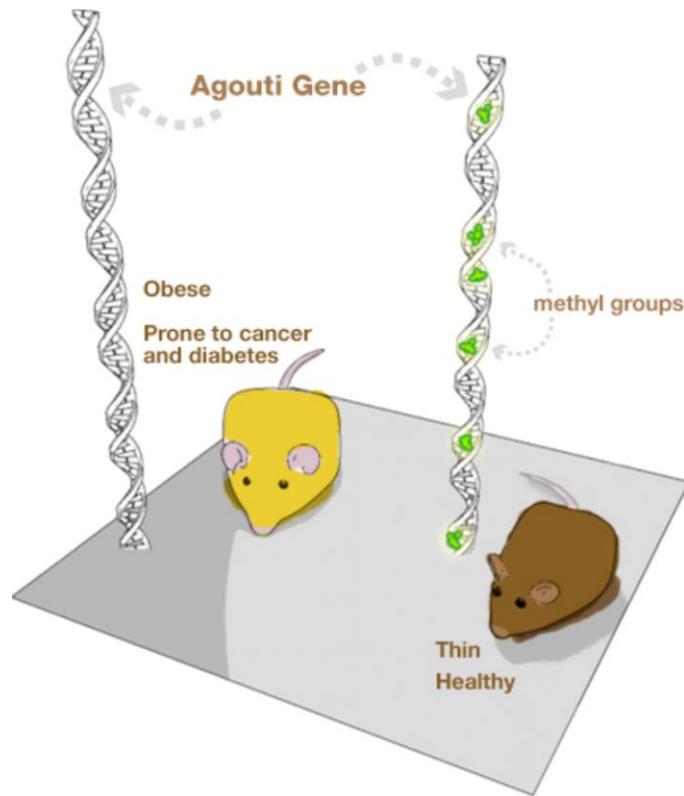
Pregnant  
Mouse

Normal  
Diet

Diet Rich in  
Methyl Groups



Experiments in mice show just how important a mother's diet is in shaping the epigenome of her offspring



# Epigenetics and Gene Activation for Improved Health and Longevity



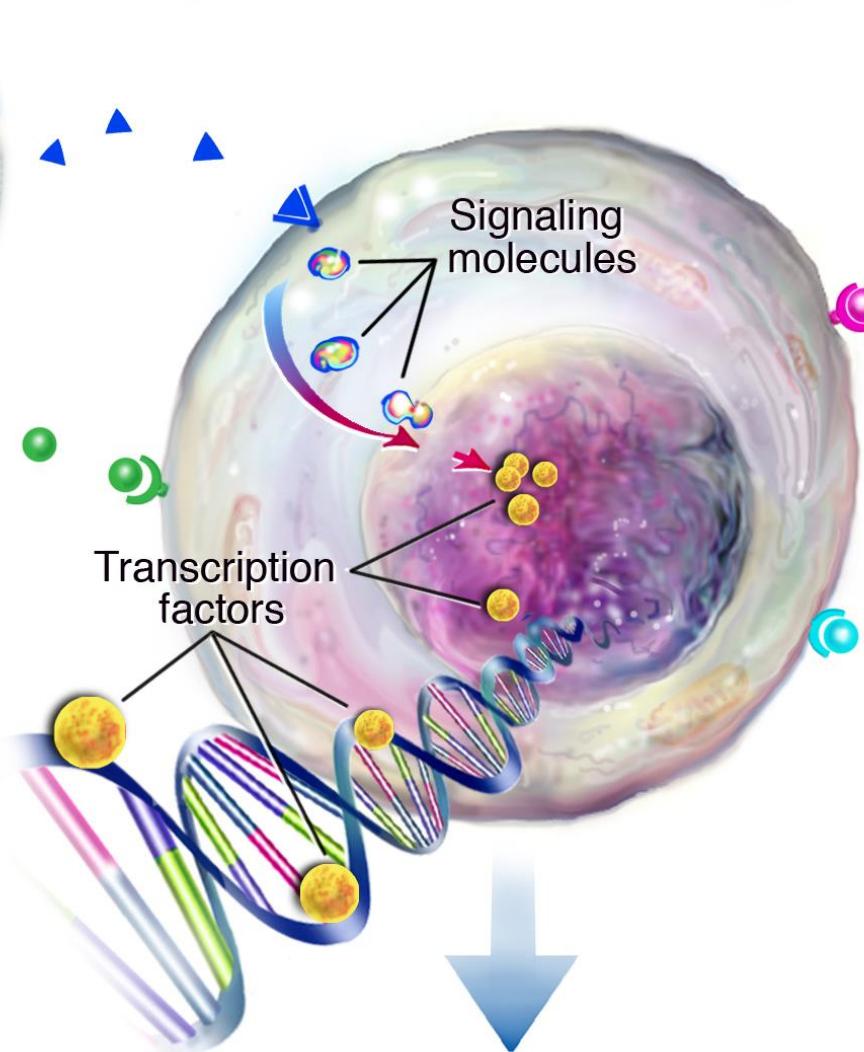
## Excercise

- BDNF



## Nutritional Factors

- Calorie Restriction
- Mediterranean Diet
- Polyphenols



## Environment

- Clean air, water and soil
- No smoking



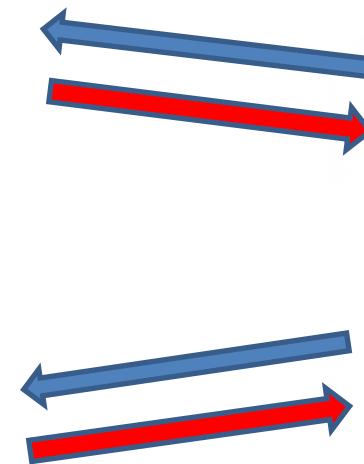
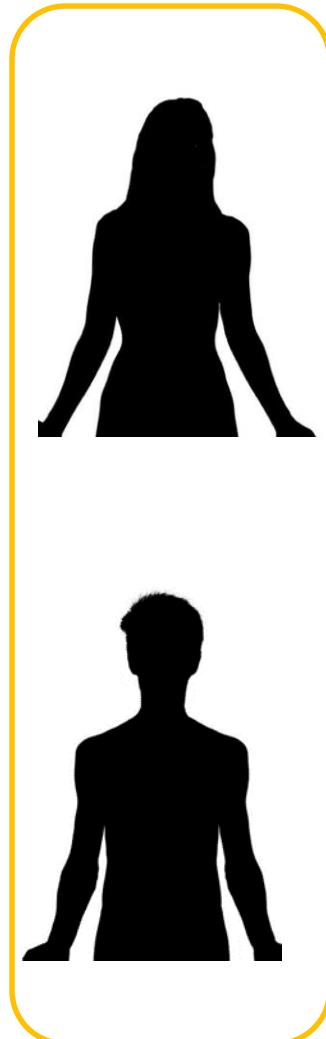
## Emotional Health

- Religion
- Meditation
- Spirituality

# Il rapporto reciproco e interattivo tra patrimonio genetico individuale, epigenetica e malattia genera un nuovo modello di «malato»



# Individuo con malattia

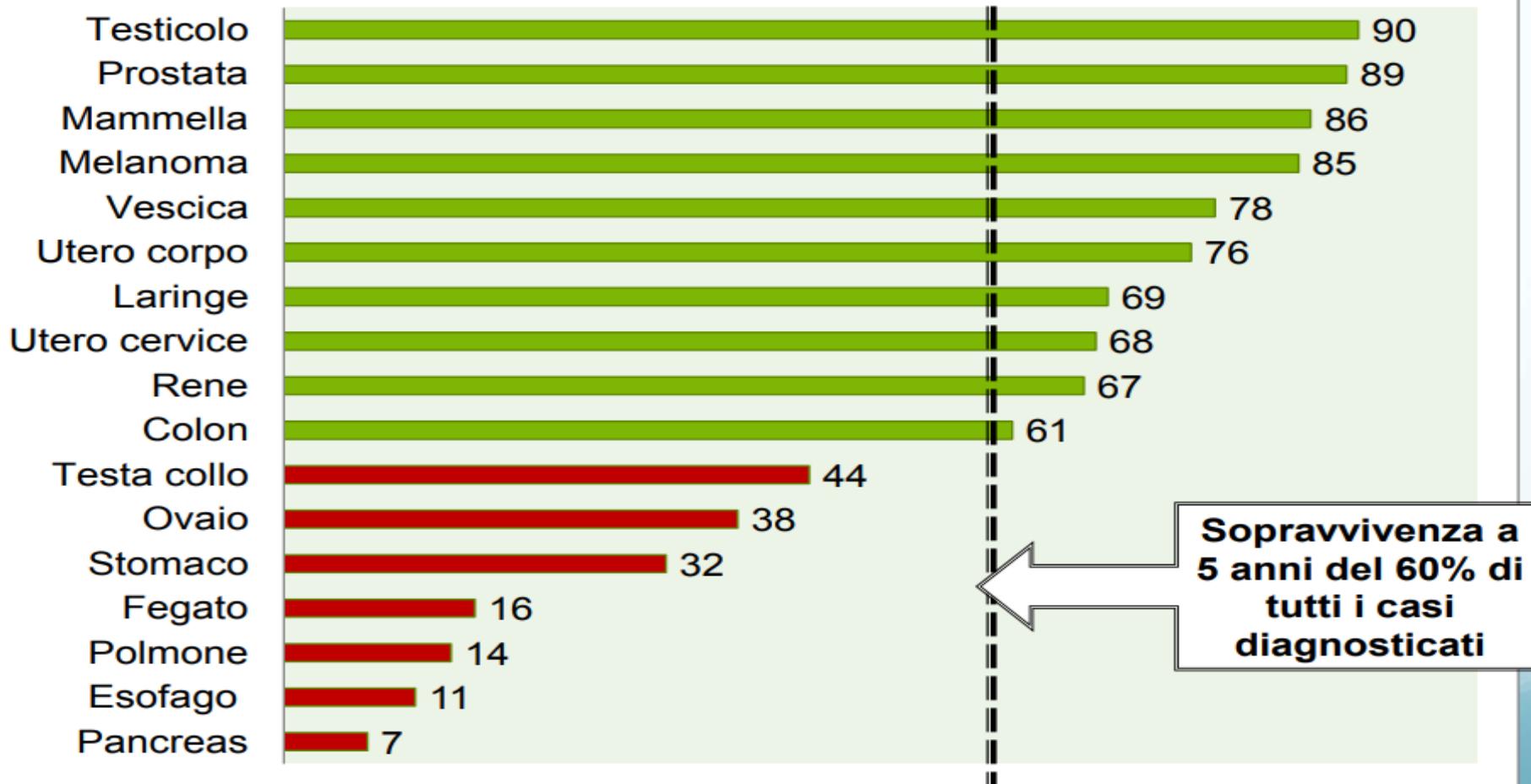


## La sopravvivenza dai tumori in Italia

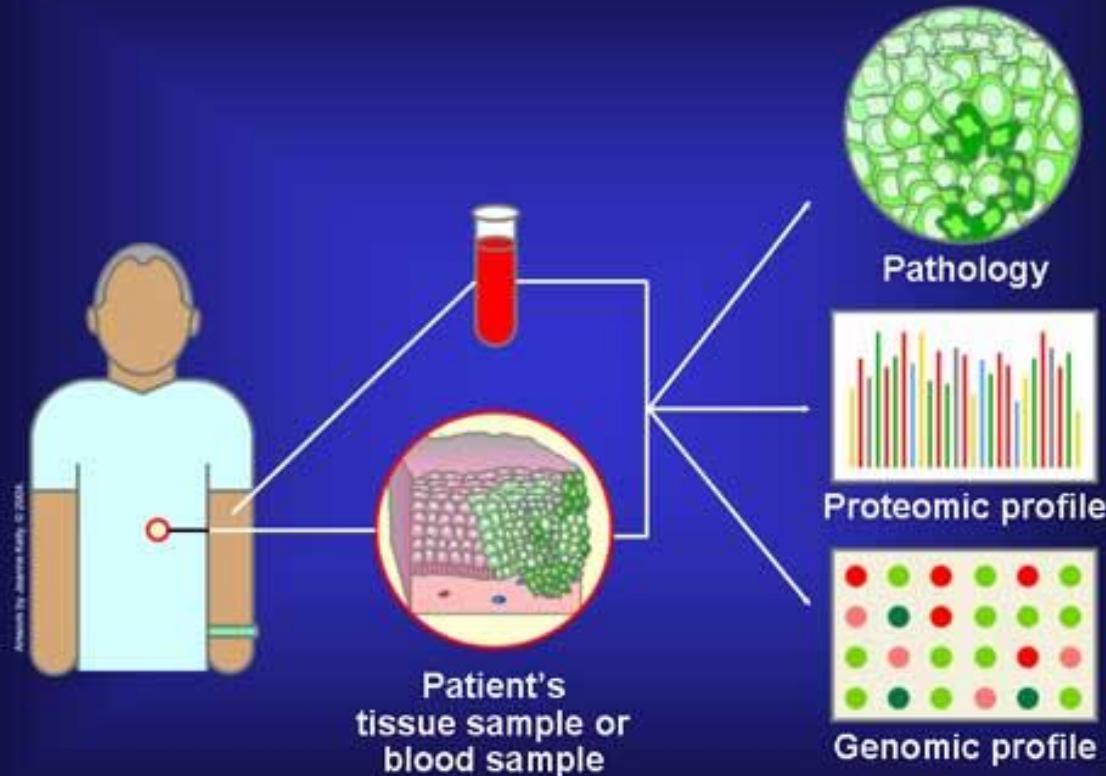
- In Italia, la sopravvivenza media a cinque anni dalla diagnosi di un tumore maligno è **del 57% fra gli uomini e del 63% fra le donne**.
- **La sopravvivenza è aumentata nel corso del tempo** e cambia, migliorando, man mano che ci si allontana dal momento della diagnosi.
- È particolarmente elevata la sopravvivenza dopo un quinquennio in **tumori frequenti** come quello del seno (87%) e della prostata (91%).
- Il cancro è ancora la seconda causa di morte (il 30% di tutti i decessi) dopo le malattie cardiovascolari, ma chi sopravvive cinque anni dalla diagnosi ha, per alcuni tumori (testicolo, corpo dell'utero, ma anche melanoma, linfomi di Hodgkin e in misura minore colon-retto), **prospettive di sopravvivenza vicine a quelle della popolazione che non ha mai avuto una neoplasia**.

# INCIDENZA E SOPRAVVIVENZA TUMORI

## Sopravvivenza (%) a 5 anni per sede tumorale in Italia



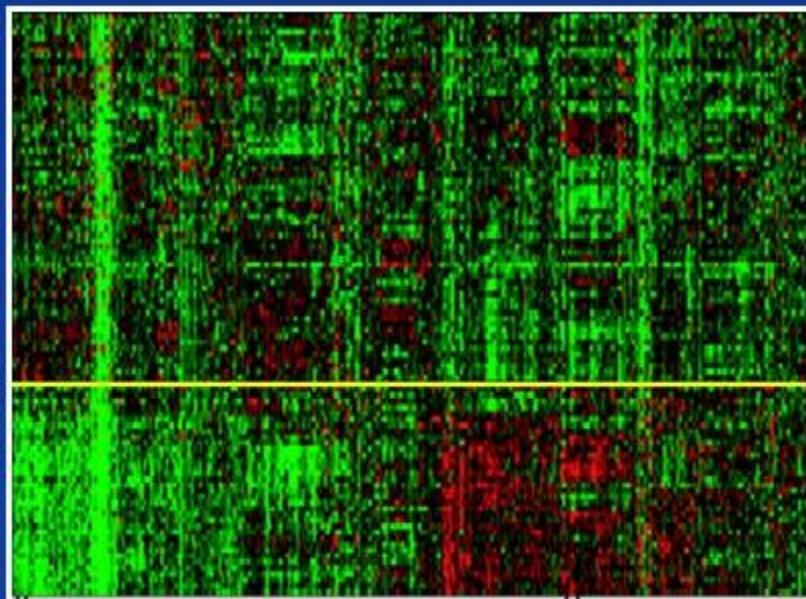
# Biopsy



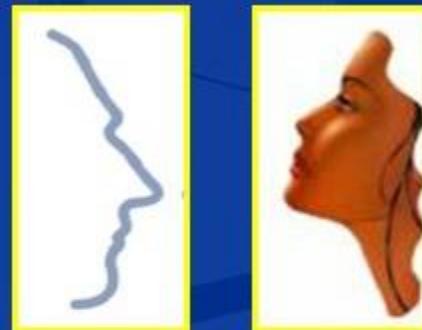
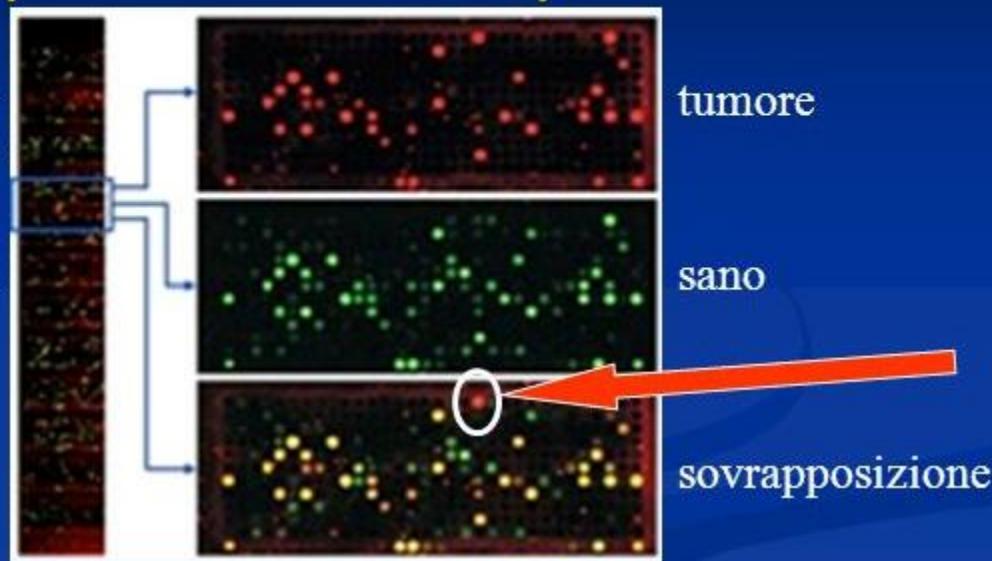
NATIONAL  
CANCER  
INSTITUTE

# microarray o DNA chip

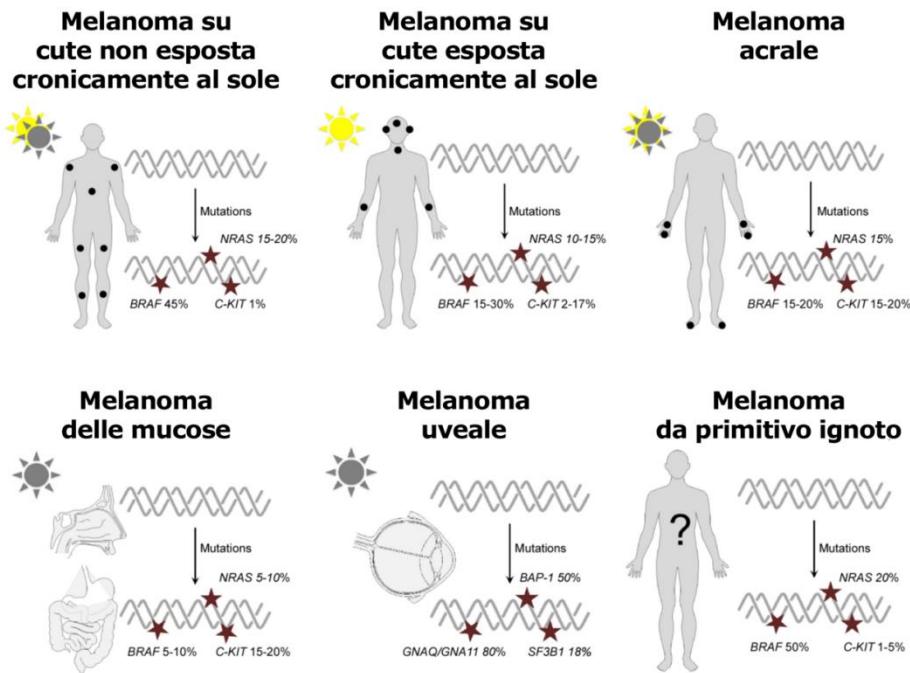
consente di analizzare **migliaia di geni** di un tumore, per identificare quali geni **con potenziale attività tumorale** sono attivi nelle cellule di un paziente



Esempio di "microgriglia"



Viene fatto il cosiddetto  
**"profilo molecolare"** di un cancro



## Diagnosi molecolare dei tumori

Le più importanti innovazioni degli ultimi anni hanno riguardato il trattamento del melanoma avanzato.

I principali traguardi sono stati l'approvazione di nuovi farmaci specifici:

- Inibitori della proteina BRAF (terapia mirata)
- Inibitori di MEK (terapia mirata)
- Inibitori dei checkpoint immunitari (immunoterapia).

# Personalized therapy for personalized tumour

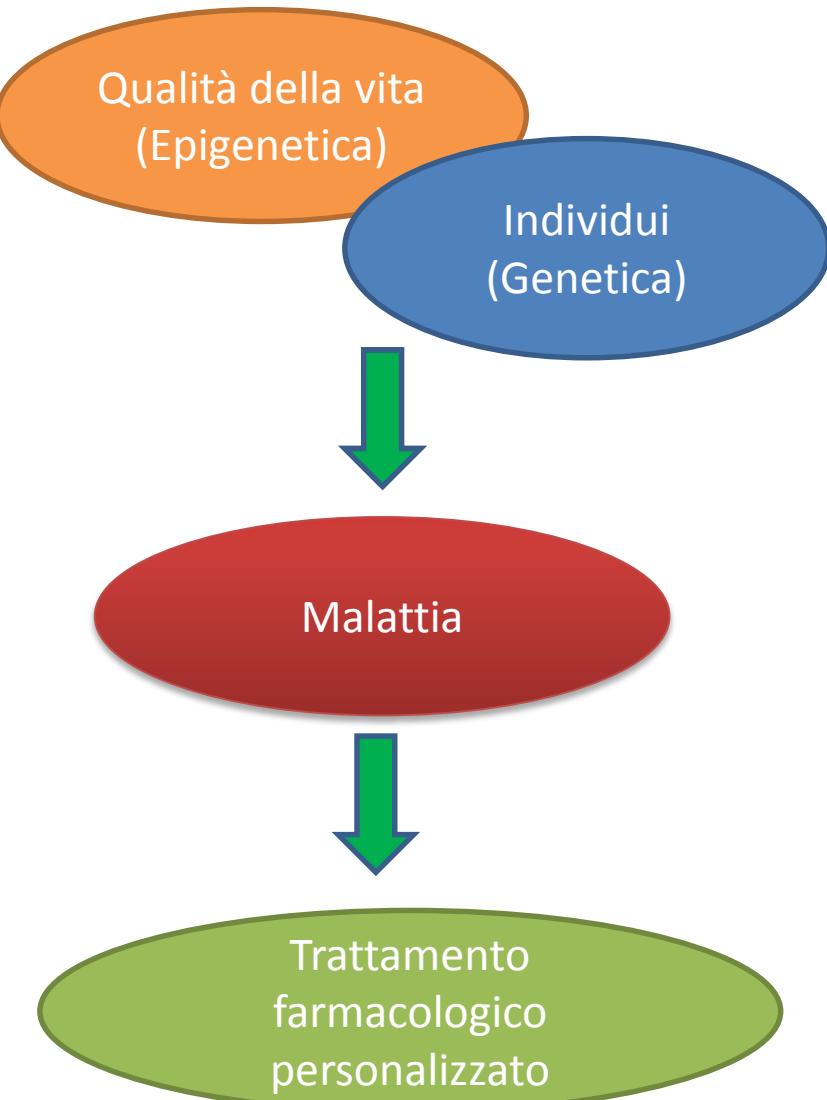
- Non tutti i tumori sono
  - PD1 positivi
  - HER positivi
  - ER positivi
  - etc .....



Numero di  
pazienti da  
trattare



La possibilità di successo:  
sopravvivenza "libera da  
malattia a cinque anni»



La medicina personalizzata comporta la necessità di

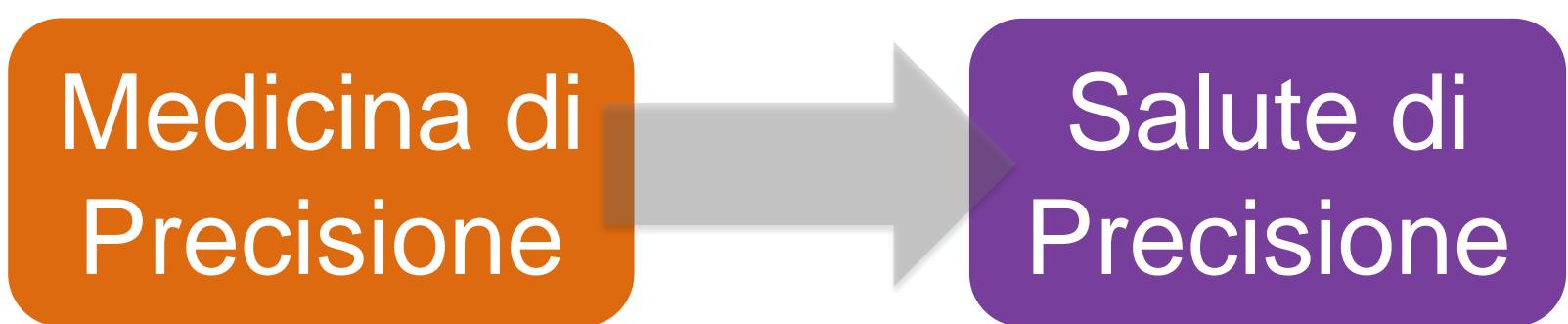
- acquisizione di notevoli informazioni
- elaborazione dei dati attraverso algoritmi validati



La medicina personalizzata potrà generare

- una maggiore percentuale di successo terapeutico
- una minore discrezionalità del medico

## Il Passaggio incombente



Salute: Stato di completo benessere fisico, psichico e sociale e non semplice assenza di malattia (Definizione OMS)



## Maternal Diet Affects Epigenetic Gene Regulation in Isogenic Offspring ( $A^{vy}/a$ )

Young Mice

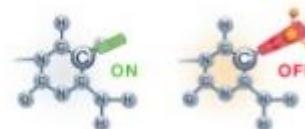
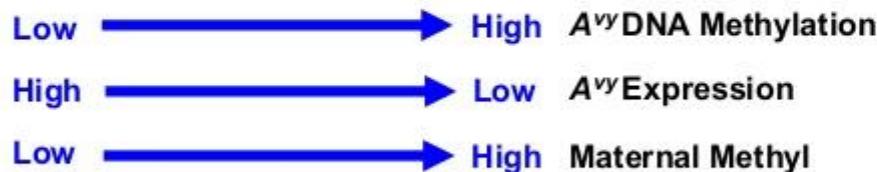


Yellow      Slightly mottled      Mottled      Heavily mottled      Pseudo-agouti

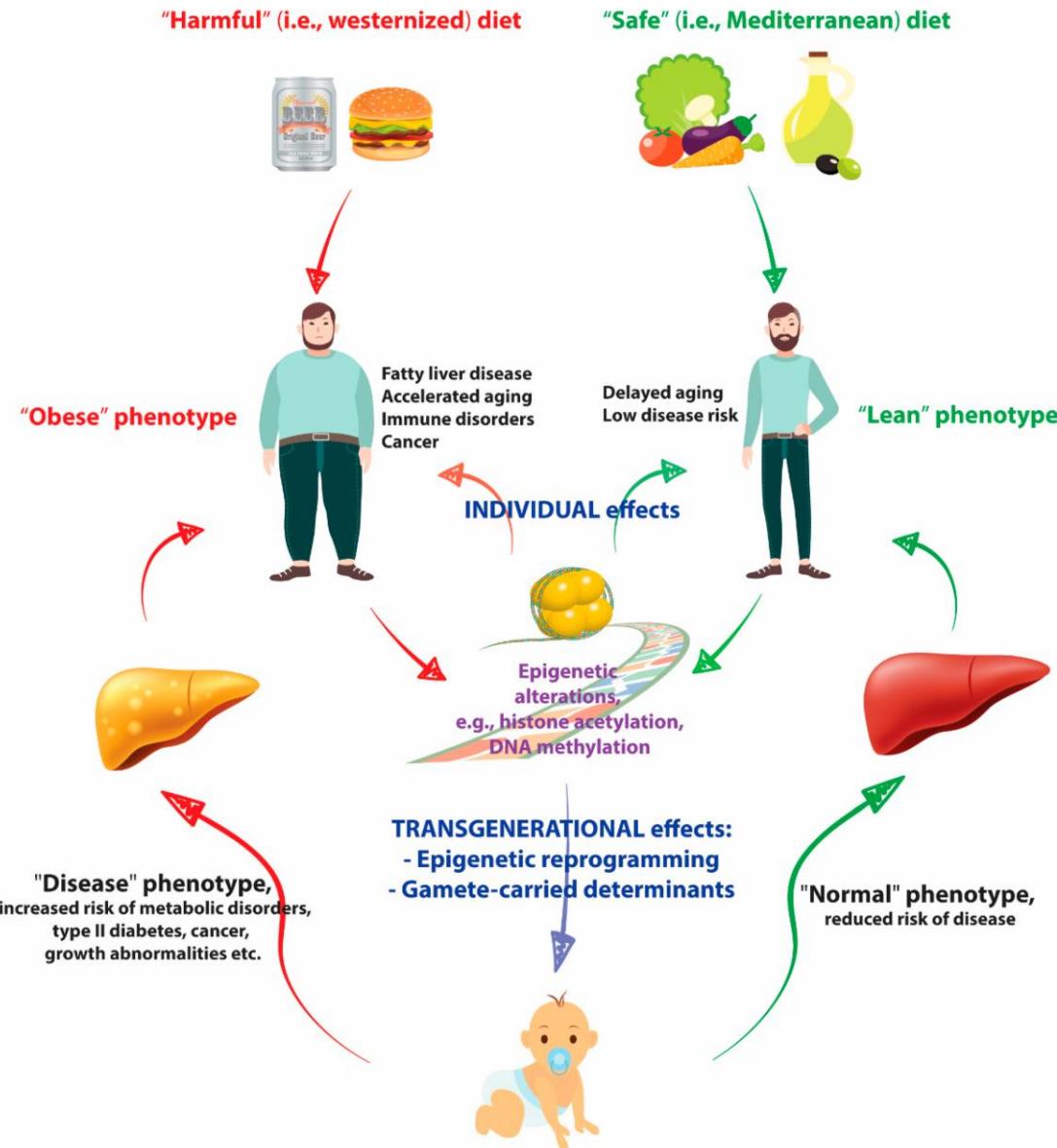
Adult Mice



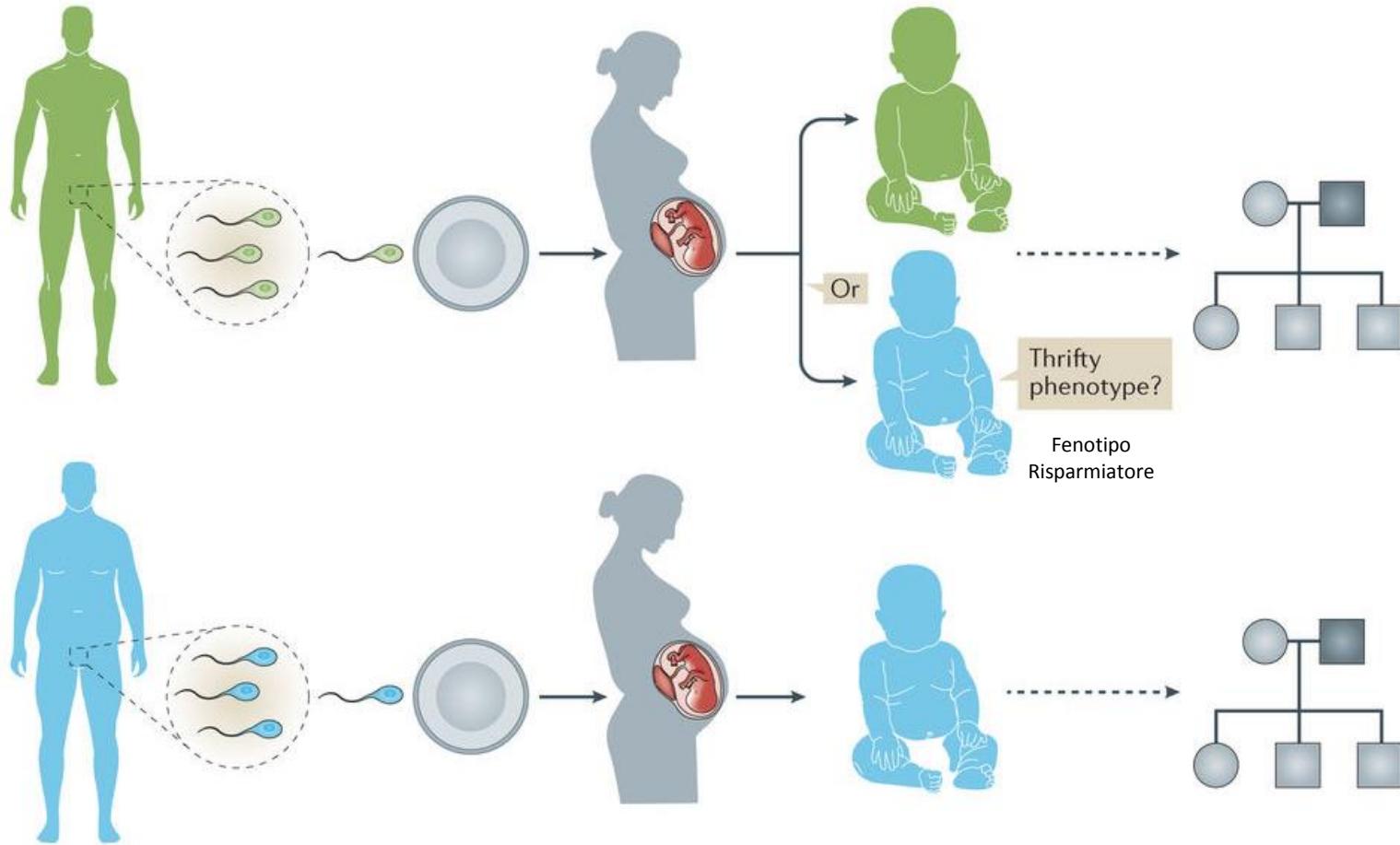
Obese      Lean

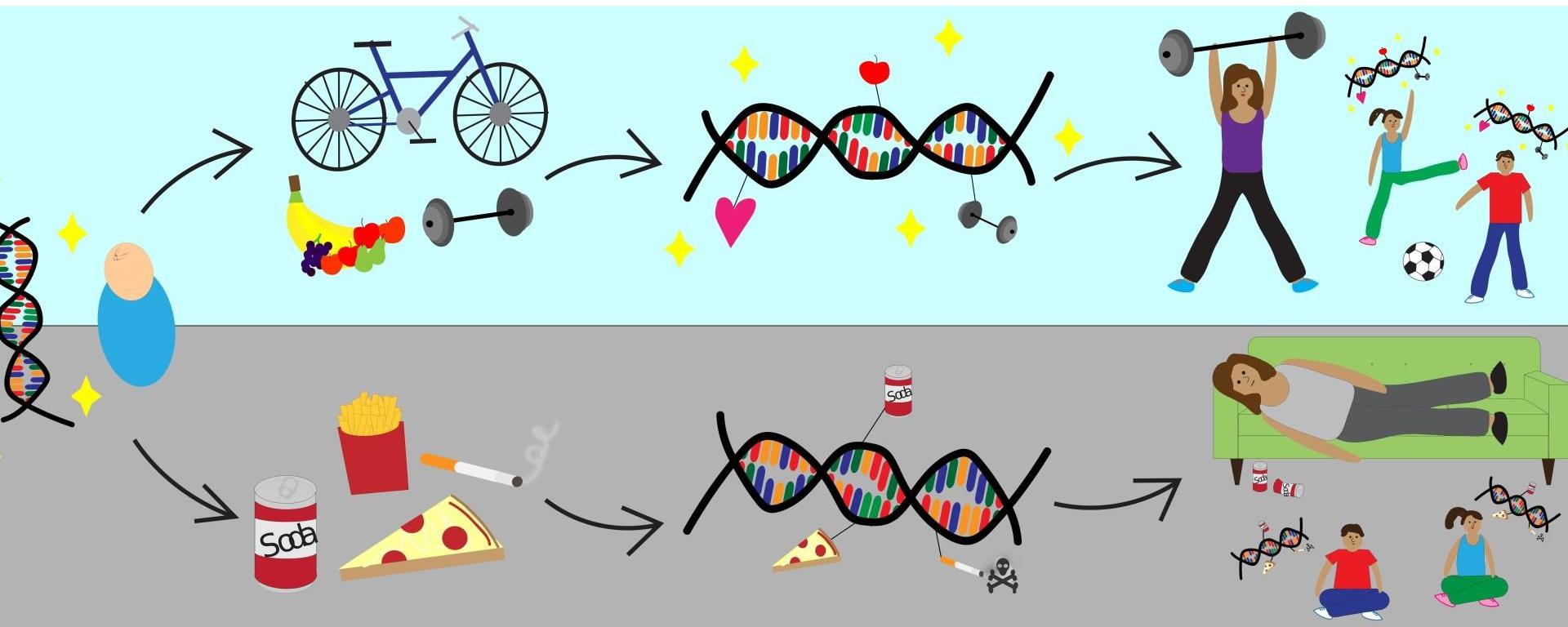


Randy Jirtle Duke  
Waterland MCB 2003

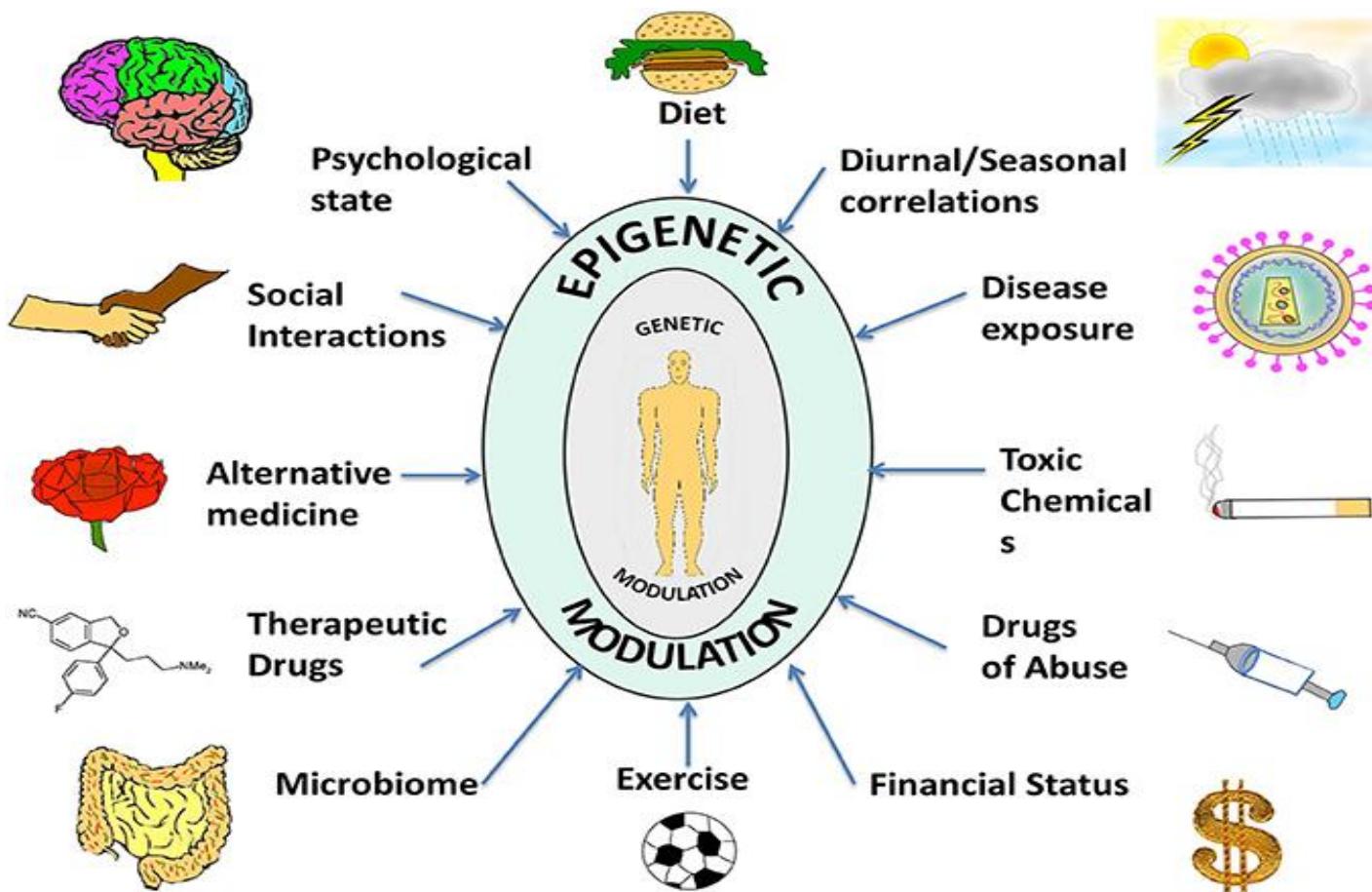


# Effetti genitoriali dell'Esercizio e dell'Obesità sulla predisposizione alle malattie metaboliche

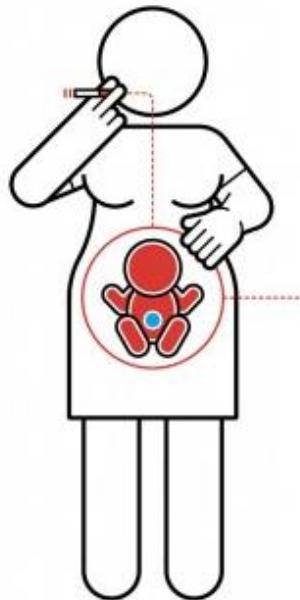




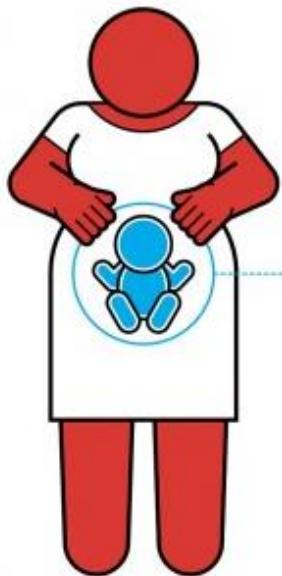




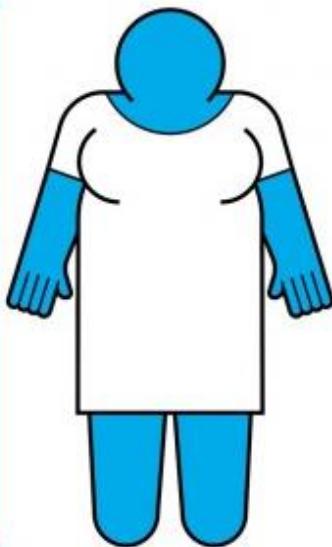
# L'Eredità Epigenetica



I Generazione



II Generazione



III Generazione

I corretti Stili di Vita (soprattutto l'esercizio fisico e la dieta) hanno il potenziale di modificare l'epigenoma delle cellule riproductive e potrebbero avere un effetto senza precedenti sulla salute delle future generazioni, influenzando la salute e il rischio di malattie delle generazioni successive.