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# A Broad-Spectrum Health Delivery Model and Intelligent Mobile Information-Network to Strengthen Individual-Based Primary Care Medicine: Scientific Foundation and Architecture

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## Abstract

**Background:** Primary care (PC) medicine, while nurturing patient's few positive (+) health states and enhancer factors, has mostly healed many negative (-) health/disease states and risk factors. In 2013, we designed a US research program for quality/cost improvement of healthcare measuring patient global health outcome using e-health record and socio-bio-sensed data.

**Aim:** To justify and engineer a US broad-spectrum health PC's delivery/intelligent mobile information-network.

**Methods:** 1) Quasi-experimental evaluation of democratic-scientific-industrial revolutions' effects on 193 nations and the US assessed by 106 life-health, theoretical-technological variables' trends from 1750 to 2015, and 2) optimization via system analysis and categorization by analogy-making of PC medical model.

**Results:** The modernization has practically tripled human life expectancy, by spreading life-health advances and controlling nutritional-infectious and maternal-infant diseases/injuries. In 1957-2014, life expectancy increased slightly more slowly than in 1900-1956, despite the fact that quality, equality, and survival of high-lethality chronic diseases/injuries greatly improved, through much more preventive-therapeutic biomedical-biopharmaceutical advances and higher costs. This difference in the rate of increase of life expectancy seems linked to the persistently high-incidence of chronic diseases/injuries related to chronic disorders and risks in infants, children and teenagers. With an individual-based broad-spectrum health delivery PC system to measure, enhance, and safeguard his health reserve, upgraded with information sciences/technologies, we can evaluate/reduce objectively the health information overload of our young and adult individuals. Physician-nurse teams managing it can increase the individual health intelligence, helping process his entire life e-health record data, enriched with smart wearable through a smartphone-computer network, empowering self-health induction with prompt data-exchange of defragmented cultureconosocio-psychoneuro-biophysiological (+ ± -) global health. It also must increase the homogeneity of lifestyle/biomedical trials' groups in global health index, profile, +prognostic/enhancer factors, and enable developing integral bottom-up population health indices.

**Conclusion:** Increasing individual health intelligence through primary care integral info-medicine should increase healthcare efficiency.

**Keywords:** Patient-physician always-on online communication and advice; Patient negative, positive and global health status; Primary care medicine health broad-spectrum delivery model; Life and health indices and scientific biomedical secular tendencies; Intelligent mobile healthcare information network; Patient health reserve self-enhancement and safeguard; Healthcare quality and cost improvement

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# Introduction

## Historical premises

In the 5th-century BC, standard Euryphon's Cnidus school of primary care (PC) and general medical (GM) science concentrated on disease classification, grouped by symptoms and syndromes to organize diagnosis and therapy. Meanwhile, Hippocrates' Cos school of PC-GM art focused on 1) observation of individual and environment, recorded in case-histories and 2) reasoning for guidance in diagnosis, prognosis, prevention and therapy [1-7]. Individual health normalcy was an initial experience, while the healing powers of nature battled one's sickness. The general physician (GP) nurtured and preserved the individual's positive (+) health enhancer factors and states, protected him from negative (-) health risk factors, and alleviated his suffering and cured his diseases [8, 9]. According to the goddess 'Hygeia', health was the natural order of things to which man is entitled if life is governed wisely. The function of PC-GM was to discover and teach the laws that will ensure health. The followers of the god 'Asclepius' believed that the GP's key role is to be a healer, replacing Hygeia cult in the 3rd century BC. Since then, GPs mostly treat patient disease and reactively restore health by medicating or operating. However, treating disease is not the same thing as creating proactively health. Health is the expression of the way in which the individual responds and adapts to the challenges met in everyday life, and has been valued as 90% of one's happiness [1].

In the 2nd-century AD, Galen, wrote, "Health is such a condition in which we neither suffer pain nor are hindered in the functions of daily life." He preserved patient health by carefully directing attention to "air, cleanliness, exercise, food, drink, occupation, sleep, sexual life, and emotions." The preservation and attainment of health is the moral responsibility of the individual [7-9]. Galen stated, "Given a congenitally sound constitution and a politically free situation, an individual could -with recurring effort and constant attention- attain health." He championed human choice and free will for everything. "Humans alone have the capacity to modify their feelings by choosing responses, activities, and regimens, which will make moderation a reality as well as an ideal [1]." In the middle ages, the Hippocratic concept of individual medicine was replaced by that of community medicine. In the 1600s, Newton used the scientific method as an iterating cycle of Bacon's empirical and Descartes' rational steps in the pursuit of objectivity [2, 3, 10], guiding Sydenham to link the Hippocratic patient's observation approach with the Euryphon focus on disease classification. Sauvages patho-nosology science still confusing symptoms with diseases, was not useful, emphasizing clinical phenomenology, evading the conflicting anatomic, physiologic, and etiologic speculative systems [11-13]. A similar nosology is still being used in diagnosing patient mental disorders, with poorly recordable, measurable, and reproducible factors regarding etio-pathogeneses [5, 11-14].

In 1760, democratic, scientific and industrial revolutions began to increase freedoms, knowledge-technologies, and life-health standards in some western nations [15, 16]. The French-style general hospital isolated patients from their PC environment for specialized critical clinical-surgical secondary level care, raising efficiency, while some ones evolved to German-style institutes for more specialized tertiary level care and research [2, 10]. The birth of thousands of somatic diseases, hundreds of psychic and dozens of psychosomatic disorders, broke down the unified individual mind-body health concept [17, 18]. Thus, the fragmented PC-GM could not progress scientific and technologically in the patient's global and + health, as much as it did it in the hospital care of his somatic diseases [19-25].

## Present premises

In 2013, we designed a 30 year US research program for quality and cost improvement of healthcare via measurement of patient global bioecono-psychosocial (+ ± -) health outcome using e-health record and sociobio-sensed data. Continued study and exchanges with experts have prompted us to clarify further the necessity for the creation of a patient global health clinical decision support system (CDSS), using health information technologies (HIT), to strengthen our Western/US PC-GM [26]. With respect to the enhancement and preservation of the healthiest patient, we doubt the adequacy of the Hippocrates' individual-based PC and Euryphon's science GM models, reduced 2200 years ago to handle mainly patients' somatic diseases and risks, and 200 years ago to porter the hospital technological critical care, and manage the uncritical PC. However, upgrading the original Hippocratic PC human health broad-spectrum and Euryphon's GM science can permit us to create a patient global health index, classification, intelligence and advice mobile HIT/CDSS managed by our GP-nurse team.

### Objective

Our objective here is to justify more historical and logically the scientific need of a US broader model of PC's health delivery and GM's scientific research and engineer further our health intelligence mobile HIT/CDSS algorithm.

## Methods

### Study design and tasks

We made observational analyses of 194 nations (world population), in a 'quasi-experimental' evaluation of the intervention of the democratic-scientific-industrial revolution policies since 1760, assessing on. We assessed baseline and post-intervention outcomes values and trends by numerical comparisons between 1750 and 1900, 1957, 2015, using 106 variables of life-support, healthcare, biomedical and info-medical models, methods, knowledge and technologies in the following two tasks:

1. Quantitative cohort study of outcomes of global life and health population indices from 1750 to 2014, by percent of change of 90 indices between both years. It included a comparison of longitudinal outcomes by US trends 1900 to 1956 *vs.* 1957 to 2014, and of a cross-section contrast in 2014, of the US value per index vs. the best value of reference of the other 27 most developed nations, with non-probabilistic contrasts [27-31].
2. Qualitative longitudinal study of scientific results with 16 variables on global healthcare problems with scientific discoveries of etio-pathogenesis and preventive-therapeutic knowledge and technologies 1750 to 2015, by nation and year of origin, application in the US and world. It included a comparison of the percents of US vs. global achievements 1900 to 1956 vs. 1957 to 2015 periods, with non-probabilistic contrasts [32, 33].

We engineered our PC-GM delivery model on the bases of our conceptual premises [34-48] and empirical results of our first two tasks, integrating healthcare main components defragmented 1760 to 2015 in two more tasks.

3. Searching for new relations of principal components, levels and elements via system analysis and categorization by analogy-making, we optimized our preliminary CDSS PC-GM delivery model solution to amplify the patient-GP communication through HIT apps {e-health record (EHR), wireless-sensing wearables of the patient internal/external milieu, intelligent mobile smartphone-computer networks}.
4. Developing further the main multi-algorithm-components, scale-levels and element-variables of our preliminary broad-spectrum health-metrics of the patient's global health status and factors {index and classification of +health states, enhancer factors, besides the - health or disease states, and risk factors}.
5. Details of our preliminary HIT/CDSS and broad-spectrum health-metrics can be found in our paper of 2013 [26].

### Limitations of the study

In the two first tasks, we were obliged to estimate for **Table 1** some world/US populations' life and health indices for the years 1750, 1900, and even 1957, absent in the Universities of Pennsylvania, Yale and Miami Libraries' Databases and Web sources in 2010-2016. We estimated these by analogy with Maddison and other indirect econometric methods for incomplete pre-modern historical series (even for the year 1 AD) [49-58]. We marked these estimates in the table, so the accurate analyses of some trends are limited. We think that is better to have than to lack now these first modest estimates by the expert method, which can be adjusted further iteratively with more information and other methods. For the **Boxes 1-3** a selection bias of healthcare advances' sources in English language, overestimating slightly the US percents of advances in 1957-2015, was verified comparing percent with the national institutions of 210 Nobel Prize laureates 1901 to 1956 and 1957 to 2015. We had heuristic limitations in the last two tasks, in operational system and mathematical research, which require research of other professionals.

## Results

### Impact of the democratic-scientific-industrial revolutions in the life and the health of the world

**Table 1** shows how, since 1760 modern human development in the United Kingdom (UK), France, US, Germany, and other nations, accelerated life and health growth, allowing liberation from global main disease's risk factors: extreme oppression, inequality, hunger, poverty, ignorance [46] and dystrophy, distressing the poorest class, 99% of world population in 1750. Dirt, pestilence, wars and natural disasters, affected and prevailed in affluent and poorest classes**.** These 10 hazards caused most premature deaths, suffering and disabilities by nutritional, infectious and chronic diseases, and injuries, before the 26 years of average life expectancy at birth (ALE-B). The percents of change followed empirically Nobelist Fogel's 'human techno-physiological evolution/physio-capital enhancement theory. Rising freedoms fostered the growth of education, scientific-technologies, and productivity of agro-artisanal industries, and food output allowed increased daily intake of required nutrients per person, reducing the chronic caloric-protean malnutrition. Former beggars without enough energy (25% of labor force) began to work, increasing the standards of living and health of the affluent 1% and a growing middle class, but much more so of the declining poorest class [49, 50].

Better nutrition improved the health and longevity, allowing future parents to reproduce with bodies that were more robust. Better education increased their awareness of and ability to assume responsibly for their lives, environment, and health. Parental health led to more physiological conceptions, pregnancies, and less intrauterine nutritional, traumatic, infectious and other

**Table 1** Impact of the scientific revolution in the long-term trends of life and health in the world in 1760-2014 and in the US in 1900-1957-2014.

| **Health & Living Standard Population Index** | **World Development Level Trend** (year, value & percent of change) | | | **US Development Level Trend** (year, value & rank in relation to developed 1st rank nation) | | | **1st Developed Nation** (year, level value) |
|---|---|---|---|---|---|---|---|
| | **1750** | **2014** | **%** | **1900** | **1957** | **2014** | **2014** |
| **Politic-civil rights [index 7 worst-1 best score] (Freedom House)** | 14 not free | 9 partly free | -1,6 | 4 freest (2nd) | 3 freest (1st) | 2 freest (1st) | Switzerland 2 |
| **Economic freedom [1–100 score] (Heritage Foundation)** | 10 repressed | 60 mod. free | +6 | 90 freest (2nd) | 80 freest(1st) | 76mosfree(12th) | Switzerland 82 |
| **Global weighted liberty [1-100 score] (State World Liberty Index Project)** | <10* | 57 | +5,7 | 66 (2nd) * | 75 (3rd) * | 82 (6th) | Ireland 83,3 |
| **Total adult >14 y population literacy [%] (UNESCO-UNDP)** | <15 | 81,2 | +40,6 | 95 (7th) | 99 (5th) | 100 (1st) | Switzerland 100 |
| **Years of schooling [mean years] (UNESCO-UNDP)** | <3* | 7,9 | +2,6 | 6 (8th) * | 9 (6th) | 12,9 (1st) | Germany 13,1 |
| **Expected years of schooling [number] (UNESCO-UNDP)** | >5* | 12,2 | +2,4 | 8 (7th) * | 12 (5th) | 16,5 (9th ) | Australia 22,1 |
| **GDP [1990 G-Khamis US$] (Maddison) [PPP US$ billion] (WB-UNDP)** | <498.0 | 97,140.4 | +195,1 | 0,312.0 (1st) | 1,808.0 (1st) | 16,230.2 (1st) | US 16,230.2 |
| **Population [billion inhabitants] (Maddison, UNFPA-UNDP)** | >0.790 | 7,643,2 | +9,7 | 0,076 | 0,165 | 0,322 (1st) | US 0,322 |
| **GDP percapita [1990 G-Khamis US$] (Maddison) [PPP US$] (WB-UNDP)** | <630 | 13,964 | +22,2 | 4,091 (2nd) | 10,920 (3rd) | 51,340 (3rd) | Norway 62,448 |
| **GDP share for health expenditures [%] (WHO, WB-UNDP)** | <0,5 * | 9,9 | +19,8 | 2 (3rd) * | 5 (1st ) | 17,1 (1st) | US 17,1 |
| **Government health expenditures [%] (WHO, WB-UNDP)** | <10 * | 62,8 | +6,3 | 15 (1st) * | 25 (1st) | 53,1 (1st) | US 53,1 |
| **GDP share for education expenditures [%] (EUROSTAT, WB-UNDP)** | <0,5 * | 5 | +10 | 3 (3rd) * | 6 (2nd) | 5,2 (16th) | Denmark 8,7 |
| **GDP share for R&D expenditures [%] (EUROSTAT, WB-UNDP)** | <0,1 * | 2 | +20 | 2 (4th) * | 2,3 (3rd) | 2,8 (7th) | Israel 3,9 |
| **GDP share military expenditures [%] (SIPRI, WB-UNDP)** | >10 * | 2,4 | -4.2 | 2,3 (5th) * | 13 (3rd) | 4,8 (6th) | Israel 6,5 |
| **Kcal [mean daily intake x person] (Fogel, FAO)** | <1 700 | 2 900 | +1,7 | 3000 (3rd) * | 3300 (2nd) | 3770 (1st) | US 3770 |
| **People not working due to chronic caloric malnutrition [%] (Fogel)** | >20 | > 5 | -4 | 2 (3rd) * | 1 (1st) * | 0,0 (1st ) | US 0 |
| **Daily vegetable eating consumption >14 y prevalence [%] (OECD)** | >80 * | 45 | -1,7 | 40 (6th ) * | 55 (5th) | 79 (7th) | Australia 100 |
| **Daily fruit eating consumption >14 y prevalence [%] (OECD)** | >70 * | 40 | -1,7 | 30 (14th) * | 45 (13th) | 47 (26th) | Australia 94 |
| **Moderate-to-vigorous daily physical activity at 11 & 15 y [%] (OECD)** | >50 * | 25 | -2 | 40 (7th) * | 33 (4th) | 27 (5th) | Austria 40 |
| **Height at maturity 20-74 y [mean m] (Fogel/Costa, NCHS)** | <1,55 * | <1,65 | +1,1 | 1,58 (5th) * | 1,62 (3rd) | 1,70 (3rd) | Holland1,75 |
| **Weight at maturity 20-74 y [mean kg] (Fogel/Costa, NCHS)** | <50 * | <67 | +1,3 | 60 (3rd) * | 67 (2nd) | 83 (1st) | US 83 |
| **BMI at maturity 20-74 y [mean kg/m$^2$] (Fogel/Costa, NCHS)** | <21 * | <25 | +1,2 | 24,9 (3rd) * | 25,6(2nd) | 29 (1st) | US 29 |
| **Obesity measured prevalence >14 y [%] (OECD-NCHS)** | <1 * | 10 | +10 | 6 (22nd) * | 13 (23rd) | 35 (28tht) | Japan 3,7 |
| **Overweight+obesity measured prevalence 0-14 y [%] (OECD-NCHS)** | <5 * | 15 | +3 | 10 (16th) * | 20 (18th) | 33 (26th) | Norway 15 |
| **Diabetes type I-II prevalence 20-79 y [%](OECD-NCHS)** | <1 * | 3 | +3 | 3 (18th) * | 5 (20st) | 9,2 (22nd) | Iceland 3,2 |
| **Diabetes type I incidence children 0-14 y [%](OECD-NCHS)** | <2 * | 8 | +4 | 7 (15th) * | 11 (17th) | 23,7 (19th) | Japan 2,4 |
| **T-cholesterol >200 mg/dL preval >17 y [%] (REACH Registry-NCHS)** | <10 * | 38 | +4 | 50 (10th) * | 35 (7th) | 29 (5th) | Finland 24 |
| **Arterial hypertension >140/90 mm Hg preval >14 y [%] (OECD-NCHS)** | <5 * | 10 | +2 | 25 (4th) * | 22 (2nd) | 17 (1st ) | US 17 |
| **Alzheimer-dementia prevalence elder >59 y [%] (OECD-NCHS)** | <1 * | 2 | +2 | 1 (15th) * | 2 (10th) | 6,2 (7th) | Greece 5,2 |
| **Schizophrenia/Manic-depressive psychosis preval. [%] (Torrey & Miller)** | <0,1 * | 0,4 | +4 | 0,3 (8th) * | 0,4 (4th ) | 0,5 (1st) | US 0,5 |

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|---|---|---|---|---|---|---|---|
| **Smoking daily prevalence 14 y+pop. [%] (WHO, OECD-NCHS)** | >10 * | 22 | 2,2 | 33 (10th) * | 45 (12th) | 15 (3rd) | Sweden 13,1 |
| **Daily smoking prevalence among >14 y [%] (OECD-NCHS)** | >20 * | 15 | -2 | 40 (6th) * | 46 (5th) | 13 (4th) | Sweden 10 |
| **Alcohol consumption prevalence >14 y [l x head] (WHO, OECD-NCHS)** | <3 * | 6,2 | +2,1 | 10 (8th) * | 12 (10th) | 8,6 (9th) | Israel 2,4 |
| **Insufficient physical activity prevalence adult >17 y [%] (WHO)** | <3 * | 23 | +7,6 | 25 (12th) * | 40 (16th) | 35 (14th) | Greece 15,4 |
| **Insufficient physical activity prevalence adolescent 11-17 y [%] (WHO)** | <3 * | 81 | +27 | 83 (2nd) * | 78 (3rd) | 72,6 (2nd) | Ireland 71,6 |
| **Low birth weight (<2 500 g) [%] (Fogel, WHO-UNICEF, OECD)** | >30 | 16 | -1,9 | 13 (3rd) | 10 (7th) | 8 (21st) | Iceland 3,7 |
| **Natality or birth (× $10^3$ inhabitant) [rate] (Clark, WHO-UNFPA-NHSC)** | >50 | 19 | -2,6 | 32 (13rd) | 25 (12nd ) | 13 (19th) | Germany 8 |
| **Adolescent birth (× $10^3$ girls 15-19 y) [rate] (Clark, UNICEF-NHSC)** | >300 | 47,4 | -6,3 | 40 (18th) | 35 (20th) | 31 (27th) | Switzerland 1,9 |
| **Preterm birth <37 week pregnancy (× $10^2$ live-birth) [%] (Fogel, WHO)** | >33 * | 11,1 | -3 | 20 (18th) | 16 (19th) | 12 (22nd) | Finland 5,5 |
| **Total fertility per woman [ratio] (Clark, UNFPA)** | >10 | 2,5 | -4 | 3,3(14th) | 3,5(16th) | 2 (17th) | Portugal 1,3 |
| **Use of contraceptive prevalence (women 15-49 y) [rate] (Clark, UNFPA)** | <10 | 64 | +6,4 | 66 (10th) | 70 (8th) | 77 (6th) | Norway 88 |
| **Induced abortion (× $10^2$ live-births) [ratio] (Guttmacher Institute)** | >5 * | 32 | +6,4 | 5 (5th) * | 10 (4th) | 18 (6th) | Portugal 0,2 |
| **Infant mortality <1 y (× $10^3$ live-births) [rate](UNICEF-UNDP,OECD)** | >330 | 34 | -9,7 | 135 (4th) | 26 (8th) | 5,9 (28th) | Iceland 1,6 |
| **Neonatal mortality <28 days (× $10^3$ live-birth) rate] (UNICEF-WHO)** | >300 | 20 | -15 | 61 (4th) | 19 (8th) | 4 (27th) | Japan 1 |
| **Child mortality <5 y (× $10^3$ live-births) [rate] (UNICEF-UNDP)** | >360 | 46 | -7,8 | 150 (9th) | 32 (8th) | 6,9 (28th) | Luxembourg 2 |
| **Maternal mortality (× $10^5$ live-births) [ratio] (UNFPA)** | >2 000 | 210 | -9,5 | 500 (6th) | 40 (5th) | 28 (26th) | Israel 2 |
| **Homicide mortality (× $10^5$ inhab.) [crude rate] (OECD-UNOCD-NCHS)** | >50 * | 6,2 | -8,1 | 1,2 (14th) * | 4,8 (24th) | 4,7 (28th) | Iceland 0,3 |
| **Suicide mortality (× $10^5$ inhab.) [standard rate] (OECD-UNOCD-NCHS)** | >3 * | 11,3 | 3,8 | 13,1 (10th) * | 9,8 (8th) | 12,3 (20th) | Greece 3,8 |
| **Transport accident mort. (× $10^5$ inhab.) [stand. rate] (WHO-OECD-NCHS)** | >0,1 * | 18 | 180 | 2 (4th) * | 23 (28th) | 12,5 (28th) | UK 3,5 |
| **Diabetes mellitus mortality (× $10^5$ inh.) [stand. rate] (WHO-OECD-NCHS)** | >15 * | 21 | 1,4 | 20 (4th) | 16 (8th) | 21 (22nd) | Japan 4 |
| **Ischemic heart dis mortality (× $10^5$ inhab.) [standard rate](OECD-NCHS)** | >44 * | 104 | 2,4 | 137 (4th) | 369 (7th ) | 128 (20th) | Japan 35 |
| **Cerebrovascular dis mortality (× $10^5$ inhab.) [stand. rate] (OECD-NCHS)** | >34 * | 95 | 2,8 | 107 (4th) | 110 (7th) | 44 (5th) | Switzerland 37 |
| **Respiratory dis mortality (× $10^5$ inh.) [stand. rate] (WHO-OECD-NCHS)** | >240 * | 88 | -2,7 | 202 (4th) | 36 (8th) | 38 (25th) | Switzerland 13 |
| **Cancer dis mortality (× $10^5$ inhab.) [standard rate] (WHO-OECD-NCHS)** | >15 * | 116 | 7,7 | 64 (4th) | 149 (8th) | 195 (12th) | Finland 175 |
| **Prostatic cancer 5 y survival [%] (CONCORD 2-NCI/SEER)** | >8 * | 50 | +6,23 | 40 (1st) * | 50 (1st) | 99 (1st) | US 99 |
| **Female breast cancer 5 y survival [%] (CONCORD 2-NCI/ SEER)** | >5 * | 45 | +9 | 33 (1st) * | 60 (1st) | 90 (1st) | US 90 |
| **Colorectal cancer 5 y survival [%[ (CONCORD 2-NCI/ SEER)** | >6 * | 33 | +5,5 | 25 (1st) * | 37 (1st) | 65 (1st ) | US 65 |
| **Melanoma-skin 5 y survival [%[ (CONCORD 2-NCI/SEER)** | >9 * | 46 | +5,1 | 20 (1st) * | 49 (1st ) | 92 (1st) | US 92 |
| **Hodgkin lymphoma 5 y survival [%[ (CONCORD 2-NCI/ SEER)** | >5 * | 44 | +8,8 | 15 (1st) * | 35 (1st) | 86 (1st) | US 86 |
| **All Leukemias 5 y survival [%[ (CONCORD 2-NCI/SEER)** | >5 * | 29 | +5,8 | 10 (1st) * | 25 (1st) | 60 (1st) | US 60 |
| **Childhood cancer 5 y survival [%] (CONCORD 2-NCI/ SEER)** | >5 * | 40 | +8 | 15 (1st) * | 30 (1st) | 83 (1st) | US 83 |
| **All cancer sites/types 5 y survival [%] (CONCORD2 -NCI/ SEER)** | >5 * | 33 | +6,6 | 20 (1st) * | 35 (1st) | 67 (1st) | US 67 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Male premature mortal. 15-59 y (x10³ inh.) [prob. dying] (WHO-HMD)** | >900 * | 187 | -4,8 | 228 (23rd) * | 167 (21st ) | 130 (28th) | Iceland 67 |
| **Female premature mortal 15-59 y (x10³ inh.) [prob. dying] (WHO-HMD)** | >800 * | 124 | -6,5 | 126 (22nd) * | 89 (22nd) | 77 (28th) | Iceland 34 |
| **Median age of the population [y] (Clark, UNDESA-UNDP)** | <14 * | 30,2 | 2,2 | 27 (18th) * | 30 (15th) | 37,7 (20th) | Japan 46,5 |
| **Gross ALE-B [y] (Clark, WHO-UNDP-HMD, Salomon et al)** | <26 | 72 | +2,8 | 47 (5th) | 68 (7th) | 79,1 (27th) | Japan 83,5 |
| **Standardized HALE-B [y] (WHO, Fogel, Salomon et al)** | <14 * | 62 | +4,4 | 34 (3rd) * | 55 (7th) * | 69 (27th) | Japan 75 |
| **Gross ALE at age 60 [y] (Clark, WHO, HMD/Max Plank Inst.)** | <9 * | 20,7 | +2,3 | 14 (5th ) | 16 (7th) | 23,2 (20th) | Japan 26,1 |
| **Standardized HALE at age 60 [y] (WHO, Fogel, Salomon et al)** | <5 * | 16 | +3,2 | 6 (3rd) * | 9 (5th) | 18 (20th) | Japan 22 |
| **Gross ALE at age 80 [y] (US Natl. Res Council, HMD/Max Plank Inst.)** | <1 * | 3 | +3 | 5 (3rd) | 6 (5th) | 9,7 (5th) | France 10 |
| **Standardized ALE-B free of fatal injury [y] (Clark, Ohsfeld-Scheneider)** | <25 * | 69 | +2,8 | 48 (4th) * | 68 (5th) | 79 (1st) | US 79 |
| **Good general health self-perceived by adults > 14 yr [%] (WHO-OECD)** | <25 * | 50 | +2 | 40 (1st) * | 70 (1st) * | 88 (3rd) | New Zealand 90 |
| **Practicing university physicians (× 10⁴ population) [rate] (WHO-OECD)** | <2 * | 13,8 | +6,9 | 17 (3rd) * | 13 (7th) | 24,5 (26th) | Austria 48,3 |
| **Generalists as share of all practicing physicians [%] (WHO-OECD)*** | <100 * | 50 | -2 | 95 (28th) * | 50 (28th) * | 25 (2nd) | US 25 |
| **Urban population access to drinking water [%] (UNICEF-WHO)** | <2 * | 96 | +48 | 90 (5th) * | 95 (5th) | 99 (27th) | Switzerland 100 |
| **Rural population access to drinking water [%] (UNICEF-WHO)** | <2 * | 82 | +41 | 80 (5th) * | 85 (5th) | 98 (27nd) | Switzerland 100 |
| **Urban population access to sanitation facilities [%] (UNICEF-WHO)** | <2 | 80 | +40 | 90 (3rd) * | 95 (3rd) | 100 (1st) | Switzerland 100 |
| **Rural population access to sanitation facilities [%] (UNICEF-WHO)** | <2 | 47 | +23,5 | 80 (3rd) * | 90 (3rd | 100 (1st) | Switzerland 100 |
| **Access top tech. emergency/inpatient critic care/rehab care [%]* (WHO)** | <10 * | 75 | +7,5 | 80 (5th) * | 95 (1st) | 100 (1st) | US 100 |
| **Access top PC reproductive risk perinatal mother/infant care[%]*(WHO)** | <2 * | 69 | +34,5 | 75 (10th) * | 95 (1st ) | 98 (5th) | Holland100 |
| **Access top PC comm. diagnosis, therapy, rehab. care [%] * (WHO)** | <2 * | 55 | +27,2 | 67 (15th) * | 75 (10th) | 95 (1st) | Sweden 100 |
| **Access top PC comm. health prom, disease prev. care [%]*(WHO)** | <2 * | 40 | +20 | 55 (20th) * | 67 (15th) | 90 (10th) | Norway 100 |
| **Access top PC comm. lifestyles/intensive outreach programs [%]*(WHO)** | <2 * | 34 | +17 | 55 (20th) * | 67 (15th) | 90 (10th) | Switzerland 100 |
| **Net migration (× 10³ people) [ratio] (UNDESA-UNDP)** | 0,0 * | 0,0 | 0,0 | 3,5 (10th) * | 2,0 (20th) | 3,1 (22nd) | Luxembourg 9,7 |
| **Stock of immigrants in population [%] (UNDESA-UNDP)** | <10 * | 3,2 | -3,1 | 14 (5th) * | 6 (20th) | 14,3 (22nd) | Luxembourg 43,3 |
| **Urban population [%] (UNDP)** | >10 | 53,5 | +5,4 | 40 (15th) | 67 (10th) | 83,1 (22nd) | Belgium 97,6 |
| **Growing middle-class (reduction of 99% of low-class) [%]* (Sachs)** | <1 * | 45 | +45 | 25 (2nd) * | 33 (1st) | 50 (1st) | US 50 |
| **Human development index [0-1] (UNPD)** | <0,150 * | 0,711 | +4,7 | 0,300(2nd) * | 0,500(2nd) * | 0,915 (8th) | Norway 0,944 |
| **Mobile cellular subscriptions (× 100 people) [%] (WB-UNDP)** | - | 96,2 | - | - | - | 98,4 (24th) | Italy 154,3 |
| **Internet users in population [%] (WB-UNDP)** | - | 40,5 | - | - | - | 87,4 (12nd) | Iceland 98,2 |

BMI=Body Mass Index ALE=Average Life Expectancy HALE=Healthy ALE UN=United Nations UNDP=UN Development Program UNESCO=UN Education/Science/Cultural Organisation UNFPA=UN Population Fund WHO=World Health Organisation UNICEF=UN Children's Fund HMD=Human Mortality Database FAO=UN Food/Agricultural Organisation UNDESA=UN Deparment Economic/Social Affairs UNODC=UN Office Drugs/Crime WB=World Bank EUROSTAT=European Commission Statistics OECD=Organisation of Economic Cooperation/ Development SIPRI=Stockholm International Peace Research Institute NCHS=US National Center Health Statistics CONCORD 2=Global Comparison of Population-Based Cancer Survival Study NCI/SEER=US National Cancer Institute/Surveillance, Epidemiology & End Results *Some are authors' indicators, estimations & adjustments. **Sources:** [46, 49-116] ecological insults to the embryos-fetuses. Newborns were sturdier and breast-fed more often, protecting child health. New contraceptive and safer abortion methods decreased the gross -and adolescent- birthrates and mean fertilities. Hospital deliveries reduced neonatal, infant and maternal mortality rates (IMR, MMR). Cultureconosocio-psychoneuro-biophysiological health reserve increased with each new generation, resisted acute diseases and postponed the onset of chronic diseases, their complications and deaths, increasing overall/disease-free survival rates, and reducing adult mortality rates too. Gross and healthy ALE-B (HALE-B) trends grew rapidly 1900 to 2014, but their 1900 to 1956 fastest-growing trends, slightly slowed up to 2014, from 28-51 years to 71 years and 16-40 years to 62 years [56, 58, 61, 65, 76, 77, 80, 91, 92]. This slowdown concurred with a fast rise of the quality, equity, survival and cost of care rates on high incidence rates of most lethal and disabling chronic diseases and injuries, stagnated along with high incidence rates of chronic disorders and risks in infants, children and teenagers.

## Impact of the democratic-scientific-industrial revolutions in the life and the health of the US

The US did well increasing its population's access to all types of over 150 human rights, though very few civil ones still need attention. Thus, the US grew its middle class and equity, reduced its poor class and achieved top world years of schooling. In 1957-2013, US top world gross domestic product (GDP) rose nine-fold [79]; share of GDP tripled for health (excluding 5% lost by patients unable to work and on welfare), halved for defense, and slightly rose for education and research. Health expenses threaten to reach nearly a third of GDP in 2040 [50]. Caloric intakes per person and body mass index are on average excessive, while safe drinking water is about to reach 100% in rural/urban areas. The US lost the top world human development index with its slowed rise of ALE-B, due to a decelerated rate of fall in IMR, because a braked fall of birth rates in adolescent pregnant, preterm, and percent of low birth weight newborns [105-111], and a slowed fall in adult 15-59 years mortality rates, mainly in males [93, 112]. Though the US kept the world's first rank on ALE-B standardized by fatal injuries, ALE over 74 years old [85, 112], and self-perceived best health status in 1980-2012 [86], its ALE-B and HALE-B ranking 7th in 1957 worsened five-fold mostly in 1990-2014 to the 35th positions [59-65, 76, 77, 91-93, 100, 112]. These anomalies seem related with high incidence rates of chronic cultureconosocio-psychoneuro-biophysiological disorders, addictions, violence, HIV/AIDS, obesity and lifestyle factors, disturbing infant, child and teen health [48-50, 59-63, 82, 85, 86, 91-93, 100, 102, 103, 112-116], and US involvement in six wars overseas 1950-2014, while freedom, GDP, ALEs, and other life-health standards in Europe, Canada, Japan, Australia, Israel, and rest of the world improved. Access to the world's highest standards and technologies of emergent/critical hospital care, community-based PC, diagnosis, therapy, rehabilitation, prevention, reproductive risk, peri-natal, infant medical facilities continue to increase in the US.

## Progress of medicine and health care with sciences, industries and business in the world and US

**Boxes 1-3** show how the biomedical sciences in two-dozen advanced nations, created new theories, models, methods, and technologies for health promotion and disease prevention-therapeutics, empowering individual and population health 1760 to 2015. **Box 1** shows that scarcely 29% (10 of 35) of the main advances in etio-pathogenesis and protective measures of infectious, nutritional, cancerous, and genetic diseases were discovered by US institutions 1900 to 1956, while 86% (24/28) of the main advances including also metabolic, cardiovascular, mental, and other chronic diseases were found in the US 1957 to 2015. **Box 2** displays how 1900 to 1956, 37% (26/70) of new clinical-surgical diagnosis, therapeutic, and rehabilitation means for infectious and chronic diseases were accomplished in the US, whereas **Box 3** reveals that 75% (49/65) of all those advances 1957 to 2015 were discovered in the US. Notably, the US institutions 1901 to 1956, achieved 31% (22 of 70) of Nobel Prize laureates in physiology-medicine among 17 nations, while 1957 to 2015 accomplished 59% (83/140) among 13 nations [117-124].

In 1747, Lind began scientific controlled preventive trials. In 1761, based on Vesalius, Harvey and others' post-mortem patho-anatomic and pre-mortem patho-physiologic findings, disease was no longer considered as only the clinical manifestations experienced by the patient and GP. From 1800 to 1820, Bichat, Broussais, Pinel, and Cabanis assisted the birth of 'internal medicine' [1, 5, 11-13], disease now considered as the organ and tissue anatomic 'lesion' or physiologic 'disturbance' caused by 'modifiers'. Louis started controlled therapeutic trials. Based on Darwin's theory of evolution through adaptation, Bernard developed the Hippocratic dictum that health is universal sympathy. He argued that life balance and fitness depend of constant multiple interplays between the external and internal milieu of the patient. Virchow stated, "Disease is the altered vital state of larger or smaller number of cells or cell-territories; not life under abnormal conditions, not the disturbance as such, engenders a disease, rather disease begins with the insufficiency of the regulatory apparatuses [1, 5, 11-13]." A more accurate classification of diseases increased the probabilities of exact diagnosis, therapy and cure. Hundreds of somatic diseases, based on thousands of patho-morphophysiological biophysico-chemical 'inner-body macro/micro-parameters' were found earlier than an isolated from dozens of psychic and psychosomatic disorders, grounded on hundreds of not well-recordable, measurable and reproducible 'outer-cultureconosocial and inner-psychoneurological parameters'. In 1855-1885, Snow, Hirsch, Koch and Pasteur's contributions on germs' transmission began 'Medicine's first golden era of hygiene-epidemiology, microbiology-immunology, and physiology-cell biology' [124]. The patient's history and exam, correlated with lab findings, completed the clinical method, with the pathologist arbiter of the true diagnosis, therapy and pathogenesis [2, 10].

In the eve of the 1900s, the GP rescued a PC-GM short-range health examination, pursuing more somatic than psychic/psychosomatic diseases [125-128]. Cannon developed Bernard 'homeostasis', as the condition of actively sustained equilibrium prevailing in the organism by neuroendocrine regulatory mechanisms. Biophysico-chemical labs appeared for diabetes, cancer, cardiovascular, and other diseases' applied and basic research, beginning a boom of discoveries of theories and technologies' inventions and innovations, starting 'Medicine's second golden era of biophysical imaging-radiation, chemotherapy, biochemical genetic-molecular and micro, endoscopic, transplantation surgery'. These advances sowed the seeds of 'evidence-based medicine', diverting attention from individual living processes, and causing a self-imposed segregation from the cultureconosocio-psychological health dimensions. This truncated clinical method focusing mainly on diseases and risks, restored the patient's physiological equilibrium, excluding +health states, enhancer factors, cultureconosocio-psychoneuro-biophysiological harmony, and global quantity and quality of health [1, 2, 5, 17-26]. Staging classification in cancer advised according to prognostic evolutionary factors the spectrum and strength of the therapies. In 1946, Hill began randomized controlled trials (RCTs), and cross-section/cohort controlled surveys, empowering with probability errors and epidemiologic criteria the proof of cause-effect relationships judged by a biostatistician. Small and middle-size RCTs need stratification by bad or - prognostic factors of patients' population/sample before random allocation of intervention to trial and control groups, or after in the outcome analysis, rising groups homogeneity to detect intervention effects with statistical testing. In the 1980s, began 'Medicine's third golden era of personalized, precision, telemedicine, robotic-surgery, tele-education / research, with genetic, biotechnology, computer, internet, and mobile HIT apps' [2, 10].

## Optimizing the individual-based PC-GM delivery and science models with our HIT/CDSS

Our broad PC-GM HIT/CDSS fused Hippocrates' PC delivery and Euryphon's GM science models with Snow's transmission theory (1855), Pasteur's germ theory (1862), Flexner's biomedical model (1913), Watson and Crick's biomolecular theory (1953), Backer's patient health equation, Engel's biopsychosocial model (1977), Antonovski's salutogenesis concept (1979), McWhinney's patient-centered method (1983), Foss and Rothenberg's info-medical model (1987), Hollnagel and Malterud's health resource/risk balance (1995), Archimedes' simulation for control of diabetes risks (2002), and Collins and Varmus's personalized/precision medicine for cancer and diabetes (2015) [2, 26, 129-135]. Since the 1800s, the PC-GM had no differentiated technological research field, and stayed only with a partial-health integrated care [136, 137]. The discovery of new + health enhancer factors and states, interacting with - health risks and diseases, to materialize the patient global health index and classification, are GP-nurse teams' new differentiated and integrated high-technological research fields. It is time to re-evaluate the best 60 year tools created by GP-nurse teams with psychologists, sociologists and mathematicians on patient's health-metrics [26]. These teams must measure patient global (+ ± -) health status, as engineers and scientists use to do with every object of study [26]. The patient needs this automated health assessment, intelligence and advice HIT/CDSS to re-build its individuality and re-engage him in his own PC. It shall be always ready to work when he consults the GP-nurse team, between visits and virtual exchanges, wanting to know how his health is and what to do to his freedom to choose. Practice-based research networks must strengthen the HIT/CDSS function and integrate it in family PC programs [26, 138]. It shall actively 'transmit' + health potentiating factors and states throughout the patient's life, fostering and preserving his health reserve free from potential subclinical diseases, and decreasing the hazards and costs of hospital care [5].

The US PC-GM shall be potentiated with our HIT/CDSS, if we individualize +health enhancement and -health safeguard, and search for the healthiest social milieu, life-styles, as well as immune-defenses, genes, and biomolecules. This must accelerate the enhancement of the patient cultureconosocio-psychoneuro-biophysiological (+ ± -) health reserve, slowing its deterioration. The private-charity-public sectors ought to develop research programs on patient's +health causes, enhancer factors and states. It would facilitate support of richer global health status decisions on PC-GM interventions by the patient, growth of GP-nurse team, and a better managerial evaluation. Our HIT/CDSS shall work in parallel and on personalized+and global health reserve enhancement, too abstractedly done by public health programs now. It shall complement novel community-based PC delivery models, i.e., medical home, retail clinics protocol-based for conditions handled by nursing software, and digitized models focusing risks and diseases monitoring and intervention. Potentiating tele-health providers, smartphone-based apps, networks, and consumer-oriented devices, a HIT/CDSS shall help enrich a personal 'always-on' PC-GM [139, 140].

## Toward a patient multi-level-variable global health index and classification algorithm

**Figure 1** depicts an algorithm for our global health measures of 2013 [26]. We defined a comprehensive + and -health matrix with symptoms, signs, milieu, and lab variables, as well as a research path to build an integral health semiology, nosology, algorithms and equations, more ambitious than simply mirroring opposite taxonomies to the current ones of thousands of symptoms and diseases. These tools shall offer shortest numerical and categorical answers to the GP and the patient's question about his degree of health. This query usually involves a GP synthetic judgment of dozens of present and past patient self-perceived symptoms, feelings, and biosocial milieu variables referred, plus dozens of objective signs, factors, lab, and milieu parameters observed. Our HIT/CDSS shall give more exact and standardized answers than the ones the GP can process mentally in an ordinal scale of gross qualities as: excellent, good, regular, bad, and worst health. Our model of multiple organization levels of patient's global health is for best assisting the reasoning of the GP and patient by using thousands, rather than dozens of interacting variables at the memory, using linear and non-linear functions and equations. Not viable for the GP's brain, such 'homeodynamic' model [131] needs automated mathematical software acting on an expanded patient lifelong EHR database, running in a secure smartphone-computer network. It shall be fed by biosocial sensors (in watch, belt, glasses with camera, shoes, blood monitors and other wearables) indicating trends and fluctuations in personalized cultureconosocio-psychoneuro-biophysiological parameters. It must work according to patient's life-cycle stage, gender, environment and time, assisting him and the GP-nurse team in managing the complex healthcare of his individuality [26].

# Discussion

## Impacts of freedoms, scientific-technologies, industries, and businesses on health

From 1855 to 2015, the US and Western developed nations' main axes of modernization have allowed achieve the 'Greatest Enhancement of Health and other Living Standards on Earth'. However, 1957 to 2015 trends of quality, equity, survival, and cost of hospital care rates grew exponentially, while high-lethal chronic diseases/injuries' mortality and incidence rates, and cultureconosocio-psychoneuro-biophysiological distresses and risks' incidence rates declined logarithmically in the best health systems [85-87, 93, 95-99, 102-104]. This seems due to the forgotten value and power of the individualized health information [131, 132]. This is increasingly being used by digitally savvy 'millennials', adults, and even 'boomers', through the explosion of social networks, online websites and HIT bio-sensing apps, overloading self-individual PC [141] with non-well evaluated health promotion information, in relation to the well-focused disease prevention-therapeutics means with best-tested biomedical-biopharmaceutical technologies. With our individual-based broad-spectrum health delivery PC system to measure, enhance, and safeguard his health reserve, upgraded with information sciences/technologies, we can evaluate/reduce objectively the redundant health information overload, and the possibility of 'cyberchondria' [141], in our young and adult individuals.

We read frequently, "The US healthcare system is broken and must be fixed [142]". Nobelist Fogel suggested increasing access to the best standard and technology community-based health promotion, lifestyle change, preventive PC, and intensive outreach programs [49, 50]. Thus, the US shall re-boost a part of the slowed rising trends of ALEs and HALEs. The problem is that the current PC-GM model is of the disease era in the 1800s [143], when personal hygiene was subsumed by public hygiene and preventive medicine of groups, and abandoned the study of the healthy individual, life processes, lifestyles, and hygiene. Later, mental hygiene became applied psychology and preventive psychiatry, as bodily hygiene became applied physiology and preventive medicine [144]. The 200 year successful disease-therapy oriented hospital care [36, 40, 85, 97, 98] needs harmonization with a long-range view of health-centered individual-based PC-GM to increase patient quantity and quality of health reserve, even in the 'absence' of subclinical diseases and risks [26]. Although much suffering is relieved and many diseases are regressed or stabilized, yet many risks of diseases and injuries are neither well-known nor well-controlled yet.

We think that what not only the US but all other world healthcare systems have broken is the concept of individual cultureconosocio-psychoneuro-biophysiological (+ ± -) health reserve. Its upgraded reintegration could accelerate the + health outcomes and broaden the PC clinical history, method and delivery model scopes to the original Hippocratic ones. The GP left behind the logical PC-GM path to enhance the patient + health enhancement factors and states, because as disease and other failures of adaptation are obvious and often dramatic, whereas health and fitness are considered the 'normal' state and therefore unnoticed [1], it is not surprising that he tended to be very busy and focused in the restoration and protection of the patient's biophysiological health. While this happened, public health specialists absorbed these +health promotion tasks, but at the abstract level of diverse populations of patients. The US patient needs personalized health information by a HIT/CDSS built with Euryphon's GM science, to enable him to administer in a wiser and healthier way, the amazing freedom, knowledge, and wealth that he owns.

## HIT/CDSS improvement of population health-metrics and randomized clinical trials efficiency

The HIT/CDSS software for the US patient global health index values calculation and profile identification could be programmed by a multidisciplinary research team with GPs, nurses and other professionals [26], supported by the National Collaborative for Improving Primary Care through Industrial and Systems Engineering, Patient-Centered Outcomes Research Institute, and Primary Care Extension Program [138]. It could run experimentally in supercomputers of the National Institutes of Health Center for HIT and Centers for Disease Control/Prevention. The software shall receive big data from the patient's EHR and sensors through secure GP-patient smartphones-computer network, upon a standardized personalized health data matrix created by the GP-nurse research team. The software response in near real-time, to each patient enquiry or virtual consultation to the GP-nurse team, could give also an instantaneous bottom-up more real health aggregate index and profile results to the city, county, state, CDC, and US Department of Health [145].

Some have criticized the effectiveness of general health checks, screening, and lifestyle counseling in reducing chronic disease and injury mortality and even incidence [146-149]. Our patient global health index, profile and +health enhancers, can help perfect the PC health promotion RCTs, causal-healthgenic surveys, preventive and even therapeutic RCTs, mainly immunologic and genetic, and etio-pathogenic case-control/exposed-control surveys [150]. New good or +prognostic and health enhancer factors discovered could help balance and reduce better the bias allowed by randomized designs and analyses of RCT trials and surveys, contributing to higher homogeneity of baseline and outcome test and control groups through a broader prognostic stratification. This will allow more valid research conclusions about new intervention effects, new individual causal factors of +health, and healthy lifestyles. Thus, our research program also offers new means for the enhancement and safeguard of the patient health reserve.

## Conclusion and Implications

We have argued the necessity of an individual health broad-spectrum HIT/CDSS, fusing the upgraded Hippocrates' PC delivery and Euryphon's GM science models with the models of the past 160 years. Giving personalized mobile integral health intelligence to the individual, empowering self-health induction with prompt data-exchange shall amplify healthcare communication with the GP-nurse team and potentiate healthier outcomes. This can make possible, very necessary medical work before the patient is distressed, suffers, or is disabled.

A more aware patient can better solve -health weaknesses, build up +health strengths, and balance his cultureconosocio-psychoneuro-biophysiological (- ± +) 'health reserve', enriching and guarding it supported by the GP-nurse team. Besides personalized/precise biomedical, pharmaceutical, genetic, and biomolecular means to reduce - health, we shall also research and use more the individualized healthy-lifestyle info tools to increase + and global health.

We have advanced our HIT/CDSS algorithm architecture to reopen the patient health scope of the non-critical PC-GM delivery model, and process his 'entire life data' resulting in automatic multi-level and variable global health results by mathematical software that shall be created. Measuring individual global health reserve with more information sciences/technologies, we can help evaluate/reduce objectively the health information overload of our 'millennials', adults, and even 'boomers'.

It needs communities with rapid and secure access to Internet, EHR, wearable-sensors and smartphone-computers' networks. Responses in near real-time to patient/GP enquiries and comments on enhancement and safeguard of patient global health output, could offer also automatically bottom-up more real health aggregate index and profile outcomes to local, state and US health departments. Patient global health index, profile, good or +prognostic and enhancer factors and states, besides debilitating - prognostic, risk factors and diseases, are crucial to all RCTs and surveys' results validity. Searching for and testing new healthier-lifestyles is essential.

Our proposal is, through this research program, to encourage the progression of pleasant and optimal comprehensive wellness feelings, hyper-abilities, healthiest, and happiest states in each patient, as well as the regression or stabilization of even subclinical diseases and risk factors. Health economics benefits, always sought and valued, must result from this approach. Its effectiveness at improving quality of patient global healthcare and lowering its costs, would allow our nation's wealth to be shared with other necessary priorities.

Global Health Index & Global Health Classification = ⅓ (Global Physio-Health Ind./Class.) + ⅓ (Global Psycho-Health Ind./Class.) + ⅓ (Global Social-Health Ind./Class.)

***Where: Each health index & classification = subjective/objective positive health ± subjective/objective negative health, and the following items:***

| Global Physio-Health Index/Class = | Global Psycho-Health Index/Class = | Global Socio-Health index/Class = |
|---|---|---|
| **{[Positive ( + ) Physiological (P) Health:** P health symptom/sign(s) + P health enhancing factors + P wellbeing status + P abilities/skills status + P health status + personal P health antecedents + parents/grandparents/offspring P health antecedents**]** ± | **{[Positive ( + ) Mental (M) Health:** M health symptom/sign(s) + M health enhancing factors + M wellbeing status + M abilities/skills status + M health status + personal M health antecedents + parents/grandparents/offspring M health antecedents**]** ± | **{[Positive ( + ) Social (S) Health:** S health symptom/sign(s) + S health enhancing factors + S wellbeing status + S abilities/skills status + S health status + personal S health antecedents + parents/grandparents/offspring S health antecedents**]** ± |
| **[Negative ( - ) Physiological (P) Health:** P illness(es) symptom(s)/sign(s) + P illness(es) + P risk(s) factors + P suffering status + P disabilities status + P disease(s) status + personal P disease(s) antecedents + parents/grandparents/offspring P disease(s) antecedents**]** ± | **[Negative ( - ) Mental (M) Health:** M illness(es) symptom(s)/sign(s) + M illness(es) + M risk(s) factors + M suffering status + M disabilities status + M disease(s) status + personal M disease(s) antecedents + parents/grandparents/offspring M disease(s) antecedents**]** ± | **[Negative ( - ) Social (S) Health:** S illness(es) symptom(s)/sign(s) + S illness(es) + S risk(s) factors + S suffering status + S disabilities status + S disease(s) status + personal S disease(s) antecedents + parents/grandparents/offspring S disease(s) antecedents**]** ± |
| **[Biophysicochemical External Milieu + & - Health Variables:** Personal home, neighborhood, school, work, club, other locations, envirome, etc.**]** ± | **[Psychoneurophysiological External Milieu + & - Health:** Personal internal interaction + external relations with individual familiar, classmate, coworker, friend, stranger, etc.**]** ± | **[Cultureconosocial External Milieu + & - Health:** Couple, family, community, special groups, etc. + freedoms, income, other living standards, etc.**]** ± |
| **[Biophysicochemical Internal Milieu + & - Health Lab Parameters:** Clinical biometric imaging/chemical tests (metabolo-/proteomic) + genome structure/function (healthome & diseasome status), etc.**]}** | **[Psychoneurophysiological Internal Milieu + & - Health Lab Parameters**: Clinical psychometric tests of personality, Intelligence, cognition, behavior & psychoneurobiological imaging, etc.**]}** | **[Cultureconosocial Internal Milieu + & - Health Lab Parameters:** Clinical ethnosocioeconometric tests of adjustment & support + memome structure/function (healthmome & diseasmome status), etc.**]}** |

**Figure 1** Patient global health index (GHI) and classification (GHC) rules of inference to optimize health reserve potential growth.

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