

CEIOPS-CP-50/09
2 July 2009

Consultation Paper No. 50

Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II:

SCR standard formula - Health underwriting risk module

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1. Introduction

- 1.1. In its letter of 19 July 2007, the European Commission requested CEIOPS to provide final, fully consulted advice on Level 2 implementing measures by October 2009 and recommended CEIOPS to develop Level 3 guidance on certain areas to foster supervisory convergence. On 12 June 2009 the European Commission sent a letter with further guidance regarding the Solvency II project, including the list of implementing measures and timetable until implementation.
- 1.2. This Paper aims at providing advice with regard to the health underwriting risk module in the standard formula for the Solvency Capital Requirement as requested in Article 109 Level 1 text¹ (herein "Level 1 text").
- 1.3. The objective of this paper is to give draft advice on the scope of the module and the calculation of the capital requirement for risk arising from the underwriting of health insurance obligations, where it is pursued on a similar technical basis to that of life insurance or not.
- 1.4. CEIOPS will continue working on following aspects:
 - The calibration of the parameters used in the calculation of the SCR;
 - Any simplifications according to Article 109 of the Level 1 text which may be necessary to calculate the SCR.

¹ [Text adopted by the European Parliament on 22 April 2009.](#)

2. Extract from Level 1 Text

Legal basis for implementing measure

Article 109 – extract of implementing measures

1. In order to ensure that the same treatment is applied to all insurance and reinsurance undertakings calculating the Solvency Capital Requirement on the basis of the standard formula, or to take account of market developments, the Commission shall adopt implementing measures laying down the following:
 - a. a standard formula in accordance with the provisions of Articles 101 and 103 to 108;
 - b. any sub-modules necessary or covering more precisely the risks which fall under the respective risk modules referred to in Article 104 as well as any subsequent updates;
 - c. the methods, assumptions and standard parameters to be used, when calculating each of the risk modules or sub-modules of the Basic Solvency Capital Requirement laid down in Articles 104, 105, the symmetric adjustment mechanism and the appropriate period of time, expressed in the number of months, as referred to in Article 105ter, and Article 305b, as well as the appropriate approach for integrating the method referred to in Article 305b related to the use of this method in the Solvency Capital Requirement as calculated in accordance with the standard formula;

Other relevant articles for providing background to the advice

Article 104 – Design of the Basic Solvency Capital Requirement

2. The Basic Solvency Capital Requirement shall comprise individual risk modules, which are aggregated in accordance with point 1 of Annex IV. It shall consist of at least the following risk modules:
 - (a) non-life underwriting risk;
 - (b) life underwriting risk;
 - (c) health underwriting risk;
 - (d) market risk,
 - (e) counterparty default risk.
3. For the purposes of points (a), (b) and (c) of paragraph 1, insurance or reinsurance operations shall be allocated to the underwriting risk module that best reflects the technical nature of the underlying risks.
4. The correlation coefficients for the aggregation of the risk modules referred to in paragraph 1, as well as the calibration of the capital requirements for each risk module, shall result in an overall Solvency Capital Requirement which complies with the principles set out in Article 101.

[...]

Article 105 - Calculation of the Basic Solvency Capital Requirement

[...]

3. The life underwriting risk module shall reflect the risk arising from the life insurance obligations, in relation to the perils covered and the processes used in the conduct of business.

It shall be calculated, in accordance with point 3 of Annex IV, as a combination of the capital requirements for at least the following sub-modules:

- a. the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level, trend, or volatility of mortality rates, where an increase in the mortality rate leads to an increase in the value of insurance liabilities (mortality risk);
 - b. the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level, trend, or volatility of mortality rates, where a decrease in the mortality rate leads to an increase in the value of insurance liabilities (longevity risk);
 - c. the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level, trend or volatility of disability, sickness and morbidity rates (disability – morbidity risk);
 - d. the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level, trend, or volatility of the expenses incurred in servicing insurance or reinsurance contracts (life expense risk);
 - e. the risk of loss, or of adverse change in the value of insurance liabilities resulting from fluctuations in the level, trend, or volatility of the revision rates applied to annuities, due to changes in the legal environment or in the state of health of the person insured (revision risk);
 - f. the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level or volatility of the rates of policy lapses, terminations, renewals and surrenders (lapse risk);
 - g. the risk of loss, or of adverse change in the value of insurance liabilities, resulting from the significant uncertainty of pricing and provisioning assumptions related to extreme or irregular events (life catastrophe risk).
4. The health underwriting risk module shall reflect the risk arising from the underwriting of health insurance obligations, whether it is pursued on a similar technical basis to that of life insurance or not, following from both the perils covered and the processes used in the conduct of business.

It shall cover at least the following risks:

- a. the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level, trend, or volatility of the expenses incurred in servicing insurance or reinsurance contracts;
- b. the risk of loss, or of adverse change in the value of insurance liabilities, resulting from fluctuations in the timing, frequency and severity of insured events, and in the timing and amount of claim settlements at the time of provisioning;
- c. the risk of loss, or of adverse change in the value of insurance liabilities, resulting from the significant uncertainty of pricing and provisioning assumptions related to outbreaks of major epidemics, as well as the unusual accumulation of risks under such extreme circumstances.

[...]

3. Advice

3.1 Explanatory text

3.1.1 QIS4 feedback

- 3.1. In some Member States, private or voluntary health insurance represents a partial or complete alternative to health cover provided by the Social Security system. Given the social impact of health insurance it is an essential issue.
- 3.2. It carries a strong political weight and this weight will most probably increase with the ageing population and the reform of the Social Security system in many countries. It is crucial that the risks underlying health contracts are adequately captured in the financial requirements for insurance undertakings.
- 3.3. QIS4 feed-back on the calculation of the SCR for health insurance show no clear view among undertakings and supervisors whether the QIS4 treatment of health insurance is an improvement over QIS3. In particular, the allocation of contracts between the life, non-life and health underwriting risk modules still remained unclear in many markets. The present paper follows up on the concerns expressed by stakeholders and participants and proposes a new treatment of health insurance.
- 3.4. Over time, the discussion in CEIOPS has evolved concerning health, namely because the issue is complex and needs in-depth analysis to shift the focus from legal contract to the underlying risk drivers.
- 3.5. Health has been treated in different ways in the various QIS exercises. QIS1 only dealt with technical provisions and did not test a SCR standard formula. In QIS2 a specific health module was created to answer requests of two Member States for a long term health contracts, and this structure was kept in QIS3. In QIS4, the scope of the health underwriting risk module was enlarged, additional sub-modules were introduced in order to include the underwriting risk from Short-term health & accident insurance, and Workers' compensation (which were hitherto included in the non-life underwriting module, and combined in some cases with the Life underwriting module). Underwriting risk on other types of long-term health business and health sold as a supplementary guarantee to Life business was treated in the Life module.
- 3.6. While the Directive Proposal on Solvency II referred to the restricted Health module as it was designed in QIS2 and QIS3 to accommodate the specific long term health contracts, the final Level 1 text introduces flexibility on the Health module's scope so that it may include the additions to the Health module made in QIS4 (or even widen the scope further).
- 3.7. QIS4 participants held mixed views on how to combine the various types of health insurance in one module; many undertakings were unsure how to

classify specific types of insurance according to the sub-module structure provided. Some undertakings proposed to include health and disability risks in a new morbidity risk sub-module. Undertakings in a number of countries argued that both health and disability risks should be treated within the life module as part of the morbidity risk sub-module, in order to achieve consistent treatment of similar risks.

- 3.8. A consequence of this lack of clarity on health segmentation is that most of QIS4 participants felt the exact scope of the health module and sub-modules needed to be clarified. There was no common understanding as to what was exactly covered by "health insurance". Moreover, discussions in CEIOPS showed that the scope of "health insurance" is defined differently in the Member States, and that there are significant differences. For example, accident insurance is sometimes classified in health insurance and sometimes in non-life; occupational disability insurance can be classified in health insurance or in life insurance.
- 3.9. The diversity of views partially arises from the absence of a common understanding as to what exactly is health insurance.

3.1.2 Considerations on the nature of health insurance

- 3.10. Health insurance covers multiple risks which are linked to the event covered or the causing factor, i.e. any event affecting the physical or mental integrity of the person. For historical reasons and because of the differences in the social security systems in each of the European countries, the provisions for managing health risk can vary widely. Thus, the health guarantees provided by the system can be short term or long term, and based on life or on non-life techniques.
- 3.11. Additionally, the public and private health insurance schemes are likely to evolve under the influence of external factors and gradual economic reforms generating important transfers of expenses from the public to the private sector. These external factors include ageing population, increase in the economic burden of chronic diseases, emergence of the (old-age) long-term care risk, and a gradually diminishing scope of the mandatory regime.
- 3.12. As a result, private health insurance systems develop according to changes in the Social Security system, even taking different forms within a same country, and hence introducing new correlations between contracts which do not lead to a clear separation of the health module from the two major modules of life and non life.
- 3.13. For the reasons stated above, health insurance obligations are covered by a dedicated health module, to allow the many specificities of health risk to be adequately covered.

3.1.3 Definition of Health insurance obligations

- 3.14. The Level 1 text leaves unchanged the "legal" classification of classes for administrative authorisation provided in the EU Directives of 1973 and 1992

for non-life and life insurance respectively (see Annexes I and II of the Level 1 text).

- 3.15. There are two main types of health insurance in the Level 1 text. Health insurance which is legally classified in Non-life (classes 1 - accident - and 2 - sickness, see Annex 1) and health insurance as an alternative to Social Security (Article 204 – it concerns German and Austrian health insurance) which is legally classified in Non-life too according to the classes of insurance. Permanent health insurance not subject to cancellation currently existing in Ireland and the United Kingdom is legally considered as life insurance activities (Article 2 (3) of Level 1 text).
- 3.16. As stated above, health insurance covers multiple risks that have in common the event covered or the causing factor, i.e. any event affecting the physical or mental integrity of the person. The fundamental difficulty lies in the very great variety of businesses described as “health insurance” in the EU.
- 3.17. In Solvency II, the logic of the SCR calculation is to require a segmentation of the undertaking’s health insurance business according to the underlying risk drivers rather than on the legal contract aspect.
- 3.18. In the CEA-Groupe Consultatif “Solvency II Glossary”, Health insurance is considered as a “generic term applying to all types of insurance indemnifying or reimbursing losses (e.g. loss of income) caused by illness or disability, or for expenses of medical treatment necessitated by illness or disability”.
- 3.19. CEIOPS suggests to basically keep the same definition to define Health insurance obligations:
- Health insurance obligations are all types of insurance compensating or reimbursing losses (e.g. loss of income) caused by illness, accident or disability (income insurance), or medical expenses due to illness, accident or disability (medical insurance).
- 3.20. To clarify the boundary between Health and Life insurance obligations, it can be noted that life insurance obligations always relate to the length of human life. Life obligations may be related to guarantees offering life and/or death coverage of the insured in the form of a single or multiple (regular in case of an annuity or not) payments to a beneficiary. They include:
- Assurance on survival to a stipulated age only,
 - Assurance on death only,
 - Assurance on survival to stipulated age or on earlier death,
 - Life assurance with return of premiums,
 - Marriage assurance, birth assurance,
 - Annuities.

Guidance on the classification of specific insurance products

- 3.21. To help clarify the issue, we define and classify several potentially problematic products in the table below :

Definition	Classification for SCR purposes
<p><u>Critical illness insurance = dread disease insurance</u> An insurance policy that makes a lump sum payment in the event of the policyholder contracting one of a list of critical illnesses (e.g. cancer,) and sometime on disability. Critical illness insurance can be sold as a separate health or life insurance policy, but can also be a rider to a (group) life or health insurance contract.</p>	Health insurance obligations
<p><u>So called "Accelerated critical illness insurance"</u> An insurance policy that makes a lump sum payment on the earlier of the following events: - The death of the policyholder - The policyholder contracting one of a list of critical illnesses (e.g. cancer) or (potentially) on disability because the main risk driver is usually the death rather than contracting the illness.</p>	Life insurance obligations
<p><u>Permanent health insurance</u> not subject to cancellation currently existing in Ireland and the United Kingdom known as permanent health insurance not subject to cancellation</p>	Health insurance obligations (SLT Health) – because it is income protection
<p><u>Private medical insurance (as sold in the UK)</u></p>	Health insurance obligations (Non-SLT Health)
<p><u>Funeral cost insurance</u> A life policy with a low sum assured intended to pay for the burial costs on the death of the insured. Also referred to as an assistance policy or rider to a health insurance policy.</p>	Life insurance obligations
<p><u>Long term care insurance</u> An insurance policy that makes periodic payments when the policyholder needs assistance for activities of daily living or medical care required to manage a chronic condition. The policy will generally cover some of, if not all, the costs associated with skilled nursing facilities, residential care homes, assisted living or other types of similar facilities.</p>	Health insurance obligations
<p><u>Health insurance as an alternative to social security (as defined in article 204 of the Level 1 text).</u></p>	Health insurance obligations
<p><u>Workers compensation insurance</u> Insurance cover for the cost of medical care and rehabilitation for workers injured on the job, during the way to and from the job, or to work related diseases. Workers compensation insurance also compensates for wage loss and provides disability or death benefits for beneficiaries if the insured person is killed or injured in work-related accidents.</p>	Health insurance obligations
<p>All kind of annuities paid on non-life products (e.g. stemming from third party liability claims, motor third party liability claims , accident insurance)</p>	Life insurance obligations
<p>Annuities related to Workers' Compensation</p>	Health insurance obligations (SLT Health)
<p><u>Mortgage insurance</u></p>	CEIOPS needs to work further on this issue.
<p><u>Assistance</u></p>	Non-life insurance obligations
<p>Supplementary insurance underwritten in addition to life insurance, in particular, (1) insurance against personal</p>	Health insurance

injury including incapacity for employment, (2) insurance against death resulting from an accident and (3) insurance against disability resulting from an accident or sickness	obligations
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3.22. CEIOPS would appreciate suggestions as to the adequate treatment for mortgage insurance.

3.1.4 Scope of the Health underwriting risk module

3.23. For SCR purposes, the segmentation of Health insurance obligations is established according to the underlying risk drivers.

3.24. CEIOPS suggest to use the following classification:

- Where Health insurance obligations are defined according to paragraph 3.19, the underwriting risk should be covered by the Health underwriting risk module.
- For supplementary health insurance guarantee (a rider) underwritten in addition to non-health insurance contracts:
 - if the health risk is material OR can be unbundled for the purpose of the SCR calculation then the health insurance obligations are covered in the health underwriting risk module;
 - if the health risk is not material AND cannot be unbundled for the purpose of the SCR calculation, then:
 - where Health insurance obligations are underwritten in addition to Non-life insurance obligations, Health insurance obligations are covered in the Non-Life underwriting risk module;
 - where Health insurance obligations are underwritten in addition to Life insurance obligations, Health insurance obligations are covered in the Life underwriting risk module.

3.25. The regulatory treatment of health insurance should not lead to possible regulatory arbitrage, where changing the legal form of the product modifying its economic form could reduce the capital requirement. The classification chosen by the undertaking for a particular obligation should not lead to differing capital requirements. CEIOPS will give clear guidance as to when each module should be used to avoid cherry-picking.

3.26. As part of the governance system and the ORSA, the insurance undertaking will be required to justify the appropriateness of the specific treatment.

3.1.5 Sub-modules in the Health underwriting risk module

3.27. Health insurance could be split in several categories:

- By types of payments
 - A one-off payment (lump sum)
 - A regular series of payments (i.e. annuity payments)
- By types of cause
 - Sickness/illness
 - Accident
- By types of expenses
 - Hospital (expenditure, nursing...),
 - Non-hospital (dental care, optical...),
 - Medical goods,
 - Transport,
 - Other (services...)
- By type of insurance contract
 - Employment group health insurance includes health insurance schemes covering employees of a company
 - Personal health insurance includes health insurance that does not apply to specific groups
- By types of insurance cover
 - Income losses
 - Expenses of medical treatment
- By technical basis used
 - Pursued on a similar technical basis to that of life insurance (generally for long term health insurance obligations)
 - Not pursued on a similar technical basis to that of life insurance (generally for short term health insurance obligations)

3.28. As stated in Article 104(4), the Health underwriting risk module reflects the risk arising from the underwriting of health insurance obligations, whether it is pursued on a similar technical basis to that of life insurance or not, following from both the perils covered and the processes used in the conduct of business.

3.29. CEIOPS suggests to calculate the Health underwriting capital requirement as a combination of the capital requirements for the 2 following sub-modules:

- For health insurance obligations pursued on a similar technical basis to that of life insurance (SLT Health)
- For health insurance obligations not pursued on a similar technical basis to that of life insurance (Non-SLT Health).

3.30. The sub-classification should be based on both the risk profile and on the actuarial methods used to determine premiums and technical provisions.

3.1.6 Modelling approach

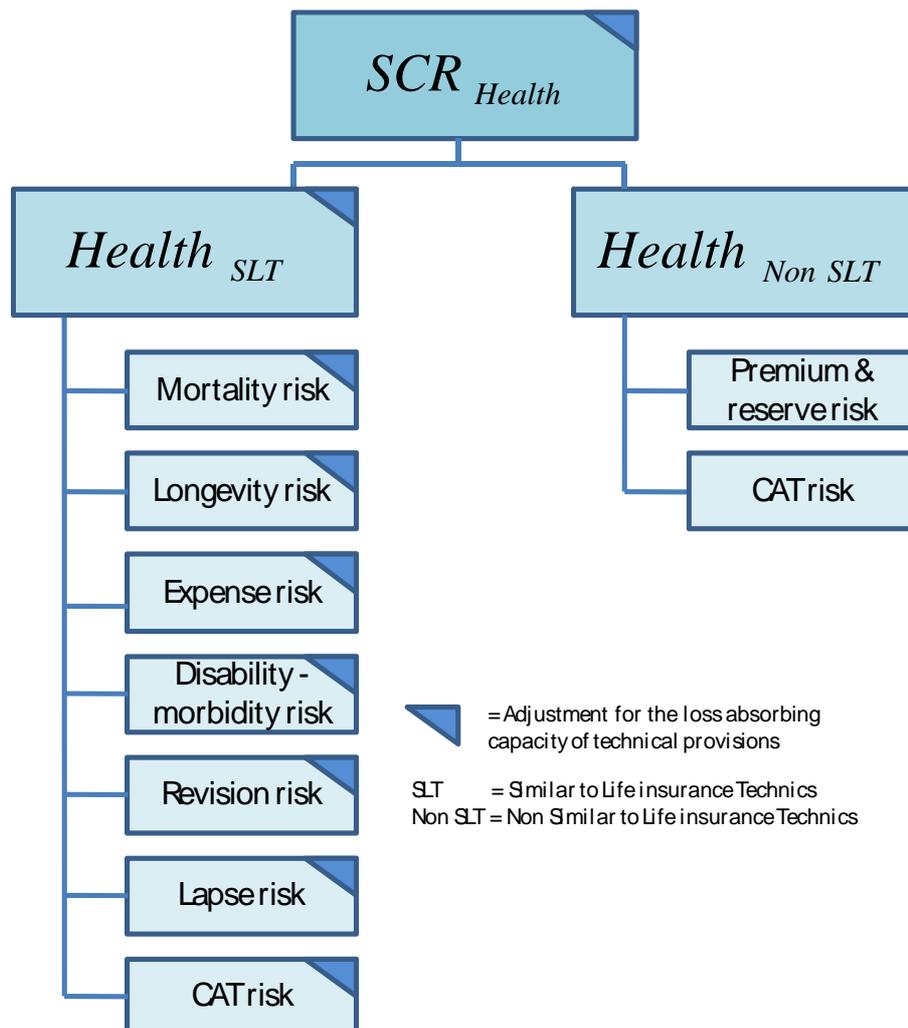
SCR Health underwriting risk module

3.33. The Health underwriting risk module reflects the risk arising from underwriting health insurance obligations, whether it is pursued on a similar technical basis to that of life insurance or not, following from both the perils covered and the processes used in the conduct of business.

3.34. Health underwriting risks are split into 2 categories:

- Health insurance obligations pursued on a similar technical basis to that of life insurance (SLT Health)
- Health insurance obligations not pursued on a similar technical basis to that of life insurance (Non-SLT Health).

3.35. Overall description:



3.36. The following input information is required²:

$Health_{SLT}$	=	Capital charge for health insurance obligations pursued on a similar technical basis to that of life insurance
$Health_{NonSLT}$	=	Capital charge for health insurance obligations not pursued on a similar technical basis to that of life insurance
$nHealth_{SLT}$	=	Capital charge for health insurance obligations pursued on a similar technical basis to that of life insurance including the loss absorbing capacity of technical provisions

3.37. The risk module delivers the following output:

SCR_{Health}	=	Capital charge for health underwriting risk
$nSCR_{Health}$	=	Capital charge for health underwriting risk including the loss absorbing capacity of technical provisions

3.38. The capital charge for health underwriting risk is derived by combining the capital charges for the health sub-modules using a correlation matrix as follows:

$$SCR_{Health} = \sqrt{\sum_{rxc} CorrHealth_{rxc} \cdot Health_r \cdot Health_c}$$

where:

$CorrHealth_{rxc}$	=	Cells of the matrix $CorrHealth$
$Health_r, Health_c$	=	The capital charges for individual health underwriting sub-modules according to the rows and columns of correlation matrix $CorrHealth$

and where the correlation matrix $CorrHealth$ is defined as:

$CorrHealth$	$Health_{SLT}$	$Health_{NonSLT}$
$Health_{SLT}$	1	
$Health_{NonSLT}$	1	1

Calibration for illustrative purpose only

3.39. The capital charge for $nSCR_{Health}$ is determined as follows:

² Where each of the capital charges SCR does not include the potential loss absorbing capacity of technical provisions

$$nSCR_{Health} = nHealth_{SLT} + Health_{Non\ SLT}$$

SLT Health (Similar to Life Techniques) underwriting risk sub-module

3.40. Description: the SLT Health underwriting risk arising from underwriting health insurance obligations, pursued on a similar technical basis to life insurance, following from both the perils covered and processes used in the conduct of business.

3.41. The following input information are required:

$Health_{mortality}^{SLT}$	=	Capital charge for SLT Health mortality risk
$Health_{longevity}^{SLT}$	=	Capital charge for SLT Health longevity risk
$Health_{disability / morbidity}^{SLT}$	=	Capital charge for SLT Health disability and morbidity risk
$Health_{expense}^{SLT}$	=	Capital charge for SLT Health expense risk
$Health_{revision}^{SLT}$	=	Capital charge for SLT Health revision risk
$Health_{lapse}^{SLT}$	=	Capital charge for SLT Health lapse risk
$Health_{CAT}^{SLT}$	=	Capital charge for SLT Health catastrophe risk
$nHealth_{mortality}^{SLT}$	=	Capital charge for SLT Health mortality risk including the loss absorbing capacity of technical provisions
$nHealth_{longevity}^{SLT}$	=	Capital charge for SLT Health longevity risk including the loss absorbing capacity of technical provisions
$nHealth_{disability / morbidity}^{SLT}$	=	Capital charge for SLT Health disability and morbidity risk including the loss absorbing capacity of technical provisions
$nHealth_{expense}^{SLT}$	=	Capital charge for SLT Health expense risk including the loss absorbing capacity of technical provisions
$nHealth_{revision}^{SLT}$	=	Capital charge for SLT Health revision risk including the loss absorbing capacity of technical provisions
$nHealth_{lapse}^{SLT}$	=	Capital charge for SLT Health lapse risk including the loss absorbing capacity of technical provisions
$nHealth_{CAT}^{SLT}$	=	Capital charge for SLT Health catastrophe risk including the loss absorbing capacity of technical provisions

3.42. The sub-module delivers the following output:

$Health_{SLT}$	=	Capital charge for health insurance obligations pursued on a similar technical basis to that of life insurance
$nHealth_{SLT}$	=	Capital charge for health insurance obligations pursued on a similar technical basis to that of life insurance including the loss absorbing capacity of technical provisions

3.43. The capital charge for SLT Health underwriting risk is derived by combining the capital charges for the SLT Health sub-modules using a correlation matrix as follows:

$$Health_{SLT} = \sqrt{\sum_{rxc} CorrHealth_{rxc}^{SLT} \cdot Health_r^{SLT} \cdot Health_c^{SLT}}$$

where:

$CorrHealth_{rxc}^{SLT}$	=	Cells of the matrix $CorrHealth^{SLT}$
$Health_r^{SLT}, Health_c^{SLT}$	=	The capital charges for individual health underwriting sub-modules according to the rows and columns of correlation matrix $CorrHealth^{SLT}$

and where the correlation matrix $CorrHealth^{SLT}$ is defined as:

$CorrHealth^{SLT}$	$Health_{mortality}^{SLT}$	$Health_{longevity}^{SLT}$	$Health_{disability/morbidity}^{SLT}$	$Health_{lapse}^{SLT}$	$Health_{expense}^{SLT}$	$Health_{revision}^{SLT}$	$Health_{CAT}^{SLT}$
$Health_{mortality}^{SLT}$	1						
$Health_{longevity}^{SLT}$	-0.25	1					
$Health_{disability/morbidity}^{SLT}$	0.5	0	1				
$Health_{lapse}^{SLT}$	0	0.25	0	1			
$Health_{expense}^{SLT}$	0.25	0.25	0.5	0.5	1		
$Health_{revision}^{SLT}$	0	0.25	0	0	0.25	1	
$Health_{CAT}^{SLT}$	0	0	0	0	0	0	1

The calibration is for illustrative purposes, it should eventually be the same as the one used for the Life underwriting risk module.

3.44. The capital charge for $nHealth_{SLT}$ is determined as follows:

$$nHealth_{SLT} = \sqrt{\sum_{rxc} CorrHealth_{rxc}^{SLT} \cdot nHealth_r^{SLT} \cdot nHealth_c^{SLT}}$$

3.45. Except for CAT risk, CEIOPS considers that the risk drivers of the SLT Health underwriting risk module should be developed consistently with those of the Life underwriting risk module³ :

- SLT Health Mortality risk
- SLT Health Longevity risk
- SLT Health Disability – morbidity risk (only income insurance)
- SLT Health Expense risk
- SLT Health Revision risk (with a larger scope)
- SLT Health Lapse risk

3.46. The capital charges including the loss absorbing capacity of technical provisions are computed as set in the “Draft CEIOPS’ Advice for Level 2 Implementing Measures on Solvency II: Article 109(h): Loss absorbing capacity of technical provisions for the standard formula SCR” (CEIOPS CP 54/09).

SLT Health mortality risk

3.47. Description: the SLT Health mortality risk covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level, trend, or volatility of mortality rates, where an increase in the mortality rate leads to an increase in the value of insurance liabilities.

3.48. The SLT Health mortality sub-module aims at capturing the increase in general mortality that negatively affects the obligations of the undertaking. For the health products concerned by this risk, mortality risk relates to the general mortality probabilities used in the calculation of the technical provisions. Even if the health product does not insure death risk, there may be a significant mortality risk because the valuation includes profit at inception: if the policyholder dies early he/she will not pay future premiums and the profit of the insurer will be lower than allowed for in the technical provisions. For SLT health insurance this can be a relevant effect.

3.49. The risk module delivers the following output:

$Health_{mortality}^{SLT}$	=	Capital charge for SLT Health mortality risk
$nHealth_{mortality}^{SLT}$	=	Capital charge for SLT Health mortality risk including the loss absorbing capacity of technical provisions

3.50. The calculation of $Health_{mortality}^{SLT}$ and $nHealth_{mortality}^{SLT}$ is computed as in the Life mortality risk module (see CEIOPS CP 49/09 Draft CEIOPS’ Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Life underwriting risk).

³ See CEIOPS CP 49/09 Draft CEIOPS’ Advice for Level 2 Implementing Measures on Solvency II : Standard formula SCR Life underwriting risk

SLT Health longevity risk

3.51. Description: the SLT Health longevity risk covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from the changes in the level, trend, or volatility of mortality rates, where a decrease in the mortality rate leads to an increase in the value of insurance liabilities.

3.52. The risk module delivers the following output:

$Health_{longevity}^{SLT}$	=	Capital charge for SLT Health longevity risk
$nHealth_{longevity}^{SLT}$	=	Capital charge for SLT Health longevity risk including the loss absorbing capacity of technical provisions

3.53. The calculation of $Health_{longevity}^{SLT}$ and $nHealth_{longevity}^{SLT}$ is computed as in the Life longevity risk module (see CEIOPS CP 49/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II : Standard formula SCR Life underwriting risk).

SLT Health disability/morbidity risk

3.54. Description: the SLT Health Disability/morbidity risk covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level, trend or volatility of disability, sickness and morbidity rates and capture the risk that more policyholders than anticipated are diagnosed with the diseases covered or are or unable to work as a result of sickness or disability during the policy term.

3.55. Morbidity or disability risk is associated with all types of insurance compensating or reimbursing losses (e.g. loss of income) caused by illness, accident or disability (income insurance), or medical expenses due to illness, accident or disability (medical insurance).

3.56. The following input information are required:

$Health_{Medical}^{SLT}$	=	Capital charge for disability/morbidity risk for medical insurance
$Health_{Income}^{SLT}$	=	Capital charge for disability/morbidity risk for income insurance
$nHealth_{Medical}^{SLT}$	=	Capital charge for disability/morbidity risk for medical insurance including the loss absorbing capacity of technical provisions
$nHealth_{Income}^{SLT}$	=	Capital charge for disability/morbidity risk for medical insurance including the loss absorbing capacity of technical provisions

3.57. The risk module delivers the following output:

$Health_{disability / morbidity}^{SLT}$	=	Capital charge for SLT Health disability and morbidity risk
$nHealth_{disability / morbidity}^{SLT}$	=	Capital charge for SLT Health disability and morbidity risk including the loss absorbing capacity of technical provisions

3.58. The capital charge for SLT Health disability/morbidity risk is determined as follows :

$$Health_{disability / morbidity}^{SLT} = Health_{Medical}^{SLT} + Health_{Income}^{SLT}$$

$$nHealth_{disability / morbidity}^{SLT} = nHealth_{Medical}^{SLT} + nHealth_{Income}^{SLT}$$

SLT Health disability/morbidity risk for medical insurance

3.59. For medical insurance, the determination of the disability/morbidity capital charge cannot be based on disability or morbidity probabilities. A large part of the risk in medical expense insurance is independent from the actual health status.

3.60. For example, it may be very expensive to find out whether the insured person is ill or to prevent the insured person from becoming ill – these expenses are usually covered by the health policy. If an insured person is ill, the resulting expenses significantly depend on the individual case. It can also happen that an insured person is ill but does not generate significant medical expenses.

3.61. Moreover, technically the business is not based on disability /morbidity probabilities but on expected annual medical expenses.

3.62. The disability/morbidity risk for medical insurance could be modelled as defined below. The risk of loss in income insurance should be modelled in a different scenario.

Input

3.63. The calculation is scenario-based. Input information is the effect of two specified scenarios on the net value of assets minus liabilities (NAV).

Output

3.64. The sub-module delivers the following output

$Health_{Medical}^{SLT}$	=	Capital charge for disability/morbidity risk for medical insurance
$nHealth_{Medical}^{SLT}$	=	Capital charge for disability/morbidity risk for medical insurance including the loss absorbing effect of technical provisions

Calculation

3.65. The capital charge is computed by analysing the scenarios *claim shock up* and *claim shock down* defined as follows:

Scenario		Permanent relative change of claims
Permanent absolute change of claim inflation		
<i>claim shock up</i>	+1%	+10%
<i>claim shock down</i>	-1%	-10%

The calibration is for illustrative purposes only.

CEIOPS would appreciate feedback on the relevant calibration for medical insurance SLT Health disability/morbidity risk sub-module.

3.66. The scenario *claim shock down* needs only to be analysed for policies that include a premium adjustment mechanism which foresees an increase of premiums if claims are higher than expected and a decrease of premiums if claims are lower than expected. Otherwise, undertakings should assume that the result of the scenario *claim shock down* is zero.

3.67. In a first step, capital charges for increase and decrease of claims are calculated:

$$Health_{medical,up}^{SLT} = \Delta NAV | claim\ shock\ up$$

$$Health_{medical,down}^{SLT} = \Delta NAV | claim\ shock\ down$$

$$nHealth_{medical,up}^{SLT} = \Delta NAV | claim\ shock\ up$$

$$nHealth_{medical,down}^{SLT} = \Delta NAV | claim\ shock\ down$$

3.68. ΔNAV is the change in the net value of assets and liabilities under the scenario. The scenario is assumed to occur immediately after the valuation date. In the first two scenarios, the calculation is made under the condition that the assumptions on future bonus rates remain unchanged before and after the shocks. The last two calculations are made under the condition that the assumptions on future bonus rates may be changed in response to the shock. Moreover, the revaluation should allow for any relevant adverse changes in policyholders behaviour (option take-up) in this scenario.

3.69. The relevant scenario (*up* and *down*) is the most adverse scenario taking into account the loss absorbing capacity of technical provisions:

$$nHealth_{medical}^{SLT} = \max(nHealth_{medical,up}^{SLT}; nHealth_{medical,down}^{SLT})$$

$$Health_{medical}^{SLT} = \begin{cases} Health_{medical,up}^{SLT} & \text{if } nHealth_{medical,up}^{SLT} > nHealth_{medical,down}^{SLT} \\ Health_{medical,down}^{SLT} & \text{if } nHealth_{medical,up}^{SLT} < nHealth_{medical,down}^{SLT} \\ \max(Health_{medical,up}^{SLT}; Health_{medical,down}^{down}) & \text{if } nHealth_{medical,up}^{SLT} = nHealth_{medical,down}^{SLT} \end{cases}$$

Calibration

3.70. For medical insurance, disability/morbidity risk can be split into three components:

- The assumption on the trend of health claims needs to be revised (inflation risk).
- The assumptions on the level of claims need to be revised because the level estimated from past observations deviates from the claims level of the observations (estimation risk).
- The assumptions on the level of claims need to be revised for any other reason than estimation risk (e.g. model risk, risk of change, random error)

3.71. There is no reliable database to estimate the volatility of medical inflation on a 99.5% VaR level. For the calculation of the expense risk sub-module an increase of inflation by 1% (in absolute terms) is proposed. Although the level of medical inflation may deviate from the level of general expense inflation, there are no indications that the variability of the level is significantly different. Therefore, the same inflation shock as for expense risk is proposed.

3.72. For estimation risk, a shock can be derived by assuming that undertakings estimate the level of claims based on the last five observations, i.e. the annual inflation-adjusted claims for the last five years. If the distribution of annual claims is assumed to be approximately normal, the estimation error on a 99.5%-VaR level can be calculated as follows:

$$\text{estimation error} = \frac{N^{-1}(0.995)}{\sqrt{5}} \cdot \sigma \approx 1.15 \cdot \sigma,$$

where N is the cumulative distribution function of the standard normal distribution and σ the standard deviation of annual claims.⁴

3.73. The standard deviation of annual claims was estimated based on data from 37 German health insurance undertakings. In order to allow for inflation and portfolio changes, the annual claims were standardised⁵ with the expected annual claims as taken into account in the premium calculation. The standard deviations varied from 2% to 10% of the expected annual claims; the average value was 4.4%. According to the formula of the above paragraph, the estimation error is 5% of the expected annual claims.

⁴ A corresponding derivation for lognormal distributed annual claims produces similar results. For example, a lognormal distribution as applied in the non-life premium and reserve risk sub-module with a standard deviation of 20% leads to an estimation error of approximately $1.25 \cdot \sigma$.

⁵ "Standardised" means here that we analysed the ratio of annual claims and expected annual claims; that is why in the following sentences the standard deviation is expressed in % of expected annual claims.

3.74. In order to allow for other risks (e.g. model risk, risk of change, random error), the value of 5% is doubled. The resulting scenario for a permanent increase of the claims level is a relative increase of 10%.

SLT Health disability/morbidity risk for income insurance

3.75. For income insurance, the determination of the capital requirement for disability/morbidity risk is based on disability or morbidity probabilities. Considering that the risk in income insurance depends on the health status, the SLT Health disability/morbidity risk for income insurance should be treated in the same way as disability/morbidity risk in the Life underwriting risk module.

3.76. The risk module delivers the following output:

$Health_{Income}^{SLT}$	=	Capital charge for disability/morbidity risk for income insurance
$nHealth_{Income}^{SLT}$	=	Capital charge for disability/morbidity risk for medical insurance including the loss absorbing capacity of technical provisions

3.77. The calculation of $Health_{Income}^{SLT}$ and $nHealth_{Income}^{SLT}$ is computed as set in Life disability-morbidity risk (see CEIOPS 49/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II : Standard formula SCR Life underwriting risk).

SLT Health Expense risk

3.78. Description: the SLT Health expense risk covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level, trend, or volatility of the expenses incurred in servicing insurance or reinsurance contracts. Expense risk arises if the expenses anticipated when pricing a guarantee are insufficient to cover the actual costs accruing in the following year. All expenses incurred have to be taken into account.

3.79. The risk module delivers the following output:

$Health_{expense}^{SLT}$	=	Capital charge for SLT Health expense risk
$nHealth_{expense}^{SLT}$	=	Capital charge for SLT Health expense risk including the loss absorbing capacity of technical provisions

3.80. The calculation of $Health_{expense}^{SLT}$ and $nHealth_{expense}^{SLT}$ is computed as in the Life expense risk module (see CEIOPS CP 49/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Life underwriting risk).

SLT Health Revision risk

3.81. Description: the SLT Health Revision risk covers the risk of loss, or of adverse change in the value of insurance liabilities resulting from fluctuations in the level, trend, or volatility of the revision rates applied to benefits, due to changes in either:

- the legal environment (or court decision); only future changes approved or strongly foreseeable at the calculation date under the principle of constant legal environment,
- inflation (not only consumer price inflation), or
- the state of health of the person insured (sick to sicker, partially disabled to fully disabled, temporarily disabled to permanently disabled).

3.82. The risk module delivers the following output:

$Health_{revision}^{SLT}$	=	Capital charge for SLT Health revision risk
$nHealth_{revision}^{SLT}$	=	Capital charge for SLT Health revision risk including the loss absorbing capacity of technical provisions

3.83. The calculation of $Health_{revision}^{SLT}$ and $nHealth_{revision}^{SLT}$ is computed as in the Life revision risk module (see CEIOPS CP 49/09 Draft CEIOPS’ Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Life underwriting risk).

3.84. CEIOPS will further work on taking into account inflation risk in the scope of the revision risk module and possibly, to also extend the scope of the Life revision risk module in a similar way.

SLT Health Lapse risk

3.85. Description: the SLT Health Lapse risk covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level or volatility of the rates of policy lapses, terminations, renewals and surrenders.

3.86. The risk module delivers the following output:

$Health_{lapse}^{SLT}$	=	Capital charge for SLT Health lapse risk
$nHealth_{lapse}^{SLT}$	=	Capital charge for SLT Health lapse risk including the loss absorbing capacity of technical provisions

3.87. The calculation of $Health_{lapse}^{SLT}$ and $nHealth_{lapse}^{SLT}$ is computed as in the Life lapse risk module (see CEIOPS CP 49/09 Draft CEIOPS’ Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Life underwriting risk).

SLT Health CAT risk

- 3.88. Description: the SLT Health CAT risk covers at least the risk of loss, or of adverse change in the value of insurance liabilities, resulting from the significant uncertainty of pricing and provisioning assumptions related to outbreaks of major epidemics, as well as the unusual accumulation of risks under such extreme circumstances.
- 3.89. CEIOPS considers that the CAT risk exposure for both SLT Health and Non-SLT Health should be treated in the same way as Non-life CAT risk module, i.e. according to the same methodologies. Health CAT risk is required in both the SLT and the non SLT sub-modules because the life CAT risk does not apply to health business.

Health (SLT) CAT scenarios could include (non exhaustive list):

- pandemic, e.g. bird flu
- mass accident
- polio type debilitating disease effects
- bio-hazard from an insecure laboratory
- terrorist action (e.g. pathogen released, terrorist action with delayed effects)
- concentrated office block accident
- sudden downturn in the economy (e.g. with impact on the disability/morbidity inception rate).

3.90. The risk module delivers the following output:

$Health_{CAT}^{SLT}$	=	Capital charge for SLT Health catastrophe risk
$nHealth_{CAT}^{SLT}$	=	Capital charge for SLT Health catastrophe risk including the loss absorbing capacity of technical provisions

3.91. The calculation of $Health_{CAT}^{SLT}$ and $nHealth_{CAT}^{SLT}$ is computed as in the Non-Life catastrophe risk module (see CEIOPS CP 48/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Non-Life underwriting risk).

Non-SLT Health underwriting risk sub-module

3.92. Description: the Non-SLT Health underwriting risk arising from the underwriting of health insurance obligations, not pursued on a similar technical basis to that of life insurance, following from both the perils covered and processes used in the conduct of business.

3.93. The following input information are required:

$Health_{Premium\&Reserve}^{NonSLT}$	=	Capital charge for NSLT Health premium and reserve risk
$Health_{CAT}^{NonSLT}$	=	Capital charge for NSLT Health CAT risk

3.94. The risk module delivers the following output:

$Health_{Non\ SLT}$	=	Capital charge for Health insurance obligations not pursued on a similar technical basis to that of life insurance
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3.95. The capital charge for NSLT Health underwriting risk is derived by combining the capital charges for the health sub-modules using a correlation matrix as follows:

$$Health_{Non\ SLT} = \sqrt{\sum_{rxc} CorrHealth_{NonSLT}^{rxc} \bullet Health_r^{NonSLT} \bullet Health_c^{NonSLT}}$$

where:

$CorrHealth_{NonSLT}^{rxc}$	=	Cells of the matrix $CorrHealth_{NonSLT}$
$Health_r^{NonSLT}, Health_c^{NonSLT}$	=	The capital charges for individual health underwriting sub-risks according to the rows and columns of correlation matrix $CorrHealth_{NonSLT}$

and where the correlation matrix $CorrHealth_{NonSLT}$ is defined as:

$CorrHealth_{NonSLT}$	$Health_{Premium\&Reserve}^{NonSLT}$	$Health_{CAT}^{NonSLT}$
$Health_{Premium\&Reserve}^{NonSLT}$	1	
$Health_{CAT}^{NonSLT}$	0.25	1

The calibration is for illustrative purposes only. Eventually, it should be the same as the one used for the Non-Life underwriting risk module.

Non SLT Health premium & reserve risk

3.96. This module combines a treatment for the three main sources of underwriting risk: premium risk, reserve risk and expense risk.

3.97. Premium risk is understood to relate to future claims arising during and after the period until the time horizon for the solvency assessment. The risk is that expenses plus the volume of losses (incurred and to be incurred) for these claims (comprising both amounts paid during the period and provisions made at its end) is higher than the premiums received (or if allowance is made elsewhere for the expected profits or losses on the business, that the profitability will be less than expected).

3.98. Premium risk is present at the time the policy is issued, before any insured events occur. Premium risk also arises because of uncertainties prior to issue of policies during the time horizon. These uncertainties include the premium rates that will be charged, the precise terms and conditions of the policies and the precise mix and volume of business to be written.

3.99. Premium risk shall therefore cover:

- the risk of loss because the premium provision at the start of the year proves inadequate - that is premium provision at the start of the year plus outstanding premiums receivable plus interest at risk free rate is insufficient to cover claims incurred during the year plus premium provision at end of year.
- the risk of loss on new contracts written during the year - that is premiums receivable during the year plus interest is insufficient to cover claims incurred during the year plus premium provision at the end of the year.

3.100. CEIOPS therefore identify 3 types of risk of loss:

- New premiums may be written at inadequate rates.
- The loss on exposure during the year may be more than expected.
- The provisions at the start of the year for exposure after the end of the year may need to be increased.

3.101. Premium risk relates to policies to be written (including renewals) during the period, and to unexpired risks on existing contracts.

3.102. Premium risk shall also allow for volatility of expense payments. Expense risk can be quite material for some lines of business and shall therefore be fully reflected in the module calculations. Expense risk is implicitly included as part of the premium risk.

3.103. Reserve risk stems from two sources:

- The absolute level of the claims provisions may be mis-estimated
- Because of the stochastic nature of future claims payouts, the actual claims will fluctuate around their statistical mean value.

3.104. The following input information are required:

PCO_{LOB}	=	Best estimate for claims outstanding (for the individual LOB)
$P_{LOB}^{t,written}$	=	Estimate of net written premium during the forthcoming year (for the individual LOB)
$P_{LOB}^{t,earned}$	=	Estimate of net earned premium during the forthcoming year (for the individual LOB)
$P_{LOB}^{t-1,written}$	=	Net written premium during the previous year (for the individual LOB)
C_{LOB}^{PP}	=	Expected present value of net claims and expense cash out-flows which are related to claims incurred after the year and covered by the existing contracts

3.105. The estimates $P_{LOB}^{t,written}$ and $P_{LOB}^{t,earned}$ are provided by the participant.

3.106. The module delivers the following output:

$Health_{Premium\&Reserve}^{NonSLT}$	=	Capital charge for NSLT Health premium and reserve risk
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3.107. The capital charge for the combined premium risk and reserve risk is determined as follows:

$$Health_{Premium\&Reserve}^{NonSLT} = \rho(\sigma_{NonSLT\ Health}) \cdot V_{NonSLT\ Health}$$

Where

$V_{NonSLT\ Health}$	=	Volume measure (for NSLT Health insurance obligations)
$\sigma_{NonSLT\ Health}$	=	Standard deviation (for NSLT Health insurance obligations)
$\rho(\sigma_{NonSLT\ Health})$	=	A function of the standard deviation

3.108. The function $\rho(\sigma_{NonSLT\ Health})$ is set such that, assuming a lognormal distribution of the underlying risk, a risk capital charge consistent with the VaR 99.5% standard is produced. Roughly $\rho(\sigma_{NonSLT\ Health}) \approx 3 \cdot \sigma_{NonSLT\ Health}$.

3.109. The volume measure $V_{NonSLT\ Health}$ and the standard deviation $\sigma_{NonSLT\ Health}$ for the NSLT Health insurance obligations are determined as follows:

- in a first step, for each lines of business (LoB) standard deviations and volume measures for both premium risk and reserve risk are determined;

- in a second step, the standard deviations and volume measures for the premium risk and the reserve risk are aggregated to derive an overall volume measure $V_{NonSLT\ Health}$ and an overall standard deviation

$$\sigma_{NonSLT\ Health}$$

Step 1: Volume measures and standard deviations per LoB

3.110. The volume measures and standard deviations for premium and reserve risk are denoted as follows:

V_{LOB}^{prem}	=	Volume measure for premium risk (for NSLT Health insurance obligations)
V_{LOB}^{res}	=	Volume measure for reserve risk (for NSLT Health insurance obligations)
σ_{LOB}^{prem}	=	Standard deviation for premium risk (for NSLT Health insurance obligations)
σ_{LOB}^{res}	=	Standard deviation for reserve risk (for NSLT Health insurance obligations)

Step 1(1)

3.111. The volume measure for premium risk is determined as follows:

$$V_{LOB}^{prem} = \max\left(P_{LOB}^{t,written}; P_{LOB}^{t,earned}; P_{LOB}^{t-1,written}\right) + C_{LOB}^{PP}$$

3.112. If the insurer has committed to its regulator that it will restrict premiums written over the period so that the actual premiums written (or earned) over the period will not exceed its estimated volumes, the volume measure is determined only with respect to estimated premium volumes, so that in this case:

$$V_{LOB}^{prem} = \max\left(P_{LOB}^{t,written}; P_{LOB}^{t,earned}\right) + C_{LOB}^{PP}$$

Step 1(2)

3.113. The volume measure for reserve risk is determined as follows:

$$V_{LOB}^{res} = PCO_{LOB}$$

Step 1(3)

3.114. The standard deviation for premium and reserve risk in the individual LOB is defined by aggregating the standard deviations for both risks under the assumption of a correlation coefficient of 0.50:

$$\sigma_{LOB} = \sqrt{\frac{1}{(V_{LOB}^{res} + V_{LOB}^{prem})^2} \cdot \left[(\sigma_{LOB}^{prem*})^2 \cdot (V_{LOB}^{prem})^2 + (\sigma_{LOB}^{res})^2 \cdot (V_{LOB}^{res})^2 + \sigma_{LOB}^{prem} \cdot \sigma_{LOB}^{res} \cdot V_{LOB}^{prem} \cdot V_{LOB}^{res} \right]}$$

Step 2: Overall volume measures and standard deviations

3.115. The volume measure $V_{NonSLT\ Health}$ is determined as follows:

$$V_{NonSLT\ Health} = V_{NonSLT\ Health}^{prem} + V_{NonSLT\ Health}^{res}$$

3.116. The overall standard deviation $\sigma_{NonSLT\ Health}$ is determined as follows:

$$\sigma_{NonSLT\ Health} = \sqrt{\frac{1}{V^2} \cdot \sum_{rxc} CorrLob_{NonSLT}^{rxc} \cdot \sigma_r \cdot \sigma_c \cdot V_r \cdot V_c}$$

Where

r, c	=	All indices of the form (LOB)
$CorrLob_{NonSLT}^{rxc}$	=	Cells of the correlation matrix $CorrLob_{NonSLT}$
σ_r, σ_c	=	Standard deviation for the individual lines of business, as defined in step 1
V_r, V_c	=	Volume measures for the individual lines of business, as defined in step 1

3.117. In respect of the calibration of the standard deviations for reserves and premium risks, these will be segmented according to the segmentation for health insurance obligations. For this CEIOPS would like to consult the industry on the options that are described hereunder:

Options discussed

3.118. With regards to the definition of lines of business considered to the assessment of the Non SLT Health premium and reserve risk, CEIOPS has considered the following options (calibration is given for illustrative purposes only):

Option 1: only 1 line of business to cover all Non SLT health insurance obligations.

LOB	σ_{LOB}^{res}	σ_{LOB}^{prem}
$Non\ SLT\ Health$	12%	5%

Sub-issue 1: given the fact that Workers' compensation is not a legal class of non-life insurance like accident and sickness⁶, should Workers compensation be kept as a segment of LoB?

- If Workers compensation is not a LoB then health insurance obligations are segmented in 2 lines of business.

⁶ CEIOPS doesn't have in mind the legal classification but for calibration CEIOPS suggests this segmentation.

- If Workers compensation is a LoB then health insurance obligations are segmented in 3 lines of business.

Option 2: a segmentation of the health insurance obligations in 2 lines of business.

<i>LOB</i>	σ_{LOB}^{res}	σ_{LOB}^{prem}
<i>Accident</i>	15%	5%
<i>Sickness</i>	7,5%	3%

With the following correlation matrix:

<i>CorrLob_{Non SLT}</i>	<i>Accident</i>	<i>Sickness</i>
<i>Accident</i>	1	
<i>Sickness</i>	1	1

Option 3: a segmentation of the health insurance obligations in 3 lines of business.

<i>LOB</i>	σ_{LOB}^{res}	σ_{LOB}^{prem}
<i>Accident</i>	15%	5%
<i>Sickness</i>	7,5%	3%
<i>Workers Compensation</i>	10%	7%

With the following correlation matrix:

<i>CorrLob_{Non SLT}</i>	<i>Accident</i>	<i>Sickness</i>	<i>WC</i>
<i>Accident</i>	1		
<i>Sickness</i>	1	1	
<i>Workers Compensation</i>	1	1	1

The calibration will depend on the option chosen.

Non SLT Health CAT risk

3.119. The CAT risk capital charge covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from the significant uncertainty of pricing and provisioning assumptions related to outbreaks of major epidemics, as well as the unusual accumulation of risks under such extreme circumstances (Article 105 (4) c) in Level 1 text).

3.120. The CAT risk exposure for both SLT Health and Non-SLT Health should be treated in the same way as Non-life CAT risk module, i.e. according to the same methodologies.

Health (non SLT) CAT scenarios could at least include:

- terrorism, mostly for group contracts,
- pandemic,
- stagflation (as this touches upon death spiral territory it may not be well captured in the premium and risk component).

3.121. The module delivers the following output:

$Health_{CAT}^{NonSLT}$	=	Capital charge for NSLT Health catastrophe risk (for NSLT Health insurance obligations)
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3.122. The calculation of $Health_{CAT}^{NonSLT}$ is computed as in the Non-Life catastrophe risk module (see CEIOPS CP 48/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Non-Life underwriting risk).

Use of Undertaking-Specific Parameters (USP)

3.123. The possibility of introducing undertaking-specific parameters (USP) in the Health underwriting risk module will be studied at a later stage (CEIOPS will publish a forthcoming Consultation paper on this issue).

3.2 CEIOPS'Advice

General approach of SCR Health underwriting risk module

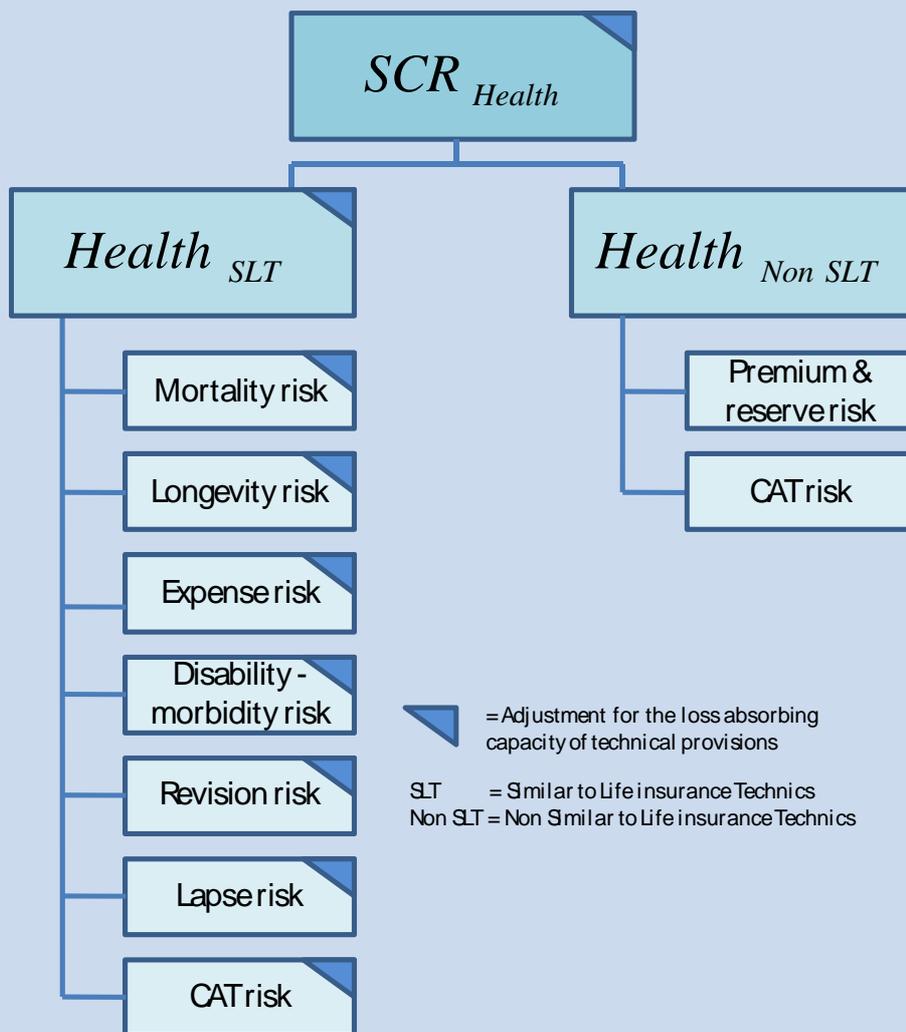
3.124. Health insurance obligations are all types of insurance compensating or reimbursing losses (e.g. loss of income) caused by illness, accident or disability (income insurance), or medical expenses due to illness, accident or disability (medical insurance).

3.125. CEIOPS suggests considering that health insurance obligations pursued on a similar technical basis to that of life insurance (SLT Health) are the health insurance obligations for which life techniques have been used for valuing the best estimate.

3.126. CEIOPS suggests to split Health underwriting risks into 2 categories:

- Health insurance obligations pursued on a similar technical basis to that of life insurance (SLT Health)
- Health insurance obligations not pursued on a similar technical basis to that of life insurance (Non-SLT Health).

3.127. Overall description:



3.128. The following input information is required⁷:

$Health_{SLT}$	=	Capital charge for health insurance obligations pursued on a similar technical basis to that of life insurance
$Health_{NonSLT}$	=	Capital charge for health insurance obligations not pursued on a similar technical basis to that of life insurance
$nHealth_{SLT}$	=	Capital charge for health insurance obligations pursued on a similar technical basis to that of life insurance including the loss absorbing capacity of technical provisions

3.129. The risk module delivers the following output:

SCR_{Health}	=	Capital charge for health underwriting risk
$nSCR_{Health}$	=	Capital charge for health underwriting risk including the loss absorbing capacity of technical provisions

3.130. The capital charge for health underwriting risk is derived by combining the capital charges for the health sub-modules using a correlation matrix as follows:

$$SCR_{Health} = \sqrt{\sum_{rxc} CorrHealth_{rxc} \cdot Health_r \cdot Health_c}$$

where:

$CorrHealth_{rxc}$	=	Cells of the matrix $CorrHealth$
$Health_r, Health_c$	=	The capital charges for individual health underwriting sub-modules according to the rows and columns of correlation matrix $CorrHealth$

and where the correlation matrix $CorrHealth$ is defined as:

$CorrHealth$	$Health_{SLT}$	$Health_{NonSLT}$
$Health_{SLT}$	1	
$Health_{NonSLT}$	1	1

Calibration for illustrative purpose only

3.131. The capital charge for $nSCR_{Health}$ is determined as follows:

$$nSCR_{Health} = nHealth_{SLT} + Health_{NonSLT}$$

SLT Health (Similar to Life Techniques) underwriting risk sub-module

3.132. Description: the SLT Health underwriting risk arising from underwriting health insurance obligations, pursued on a similar technical basis to life insurance, following from both the perils covered and processes used in the conduct of business.

3.133. The following input information are required:

$Health_{mortality}^{SLT}$	=	Capital charge for SLT Health mortality risk
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$Health_{longevity}^{SLT}$	=	Capital charge for SLT Health longevity risk
$Health_{disability / morbidity}^{SLT}$	=	Capital charge for SLT Health disability and morbidity risk
$Health_{expense}^{SLT}$	=	Capital charge for SLT Health expense risk
$Health_{revision}^{SLT}$	=	Capital charge for SLT Health revision risk
$Health_{lapse}^{SLT}$	=	Capital charge for SLT Health lapse risk
$Health_{CAT}^{SLT}$	=	Capital charge for SLT Health catastrophe risk
$nHealth_{mortality}^{SLT}$	=	Capital charge for SLT Health mortality risk including the loss absorbing capacity of technical provisions
$nHealth_{longevity}^{SLT}$	=	Capital charge for SLT Health longevity risk including the loss absorbing capacity of technical provisions
$nHealth_{disability / morbidity}^{SLT}$	=	Capital charge for SLT Health disability and morbidity risk including the loss absorbing capacity of technical provisions
$nHealth_{expense}^{SLT}$	=	Capital charge for SLT Health expense risk including the loss absorbing capacity of technical provisions
$nHealth_{revision}^{SLT}$	=	Capital charge for SLT Health revision risk including the loss absorbing capacity of technical provisions
$nHealth_{lapse}^{SLT}$	=	Capital charge for SLT Health lapse risk including the loss absorbing capacity of technical provisions
$nHealth_{CAT}^{SLT}$	=	Capital charge for SLT Health catastrophe risk including the loss absorbing capacity of technical provisions

3.134. The sub-module delivers the following output:

$Health_{SLT}$	=	Capital charge for health insurance obligations pursued on a similar technical basis to that of life insurance
$nHealth_{SLT}$	=	Capital charge for health insurance obligations pursued on a similar technical basis to that of life insurance including the loss absorbing capacity of technical provisions

3.135. The capital charge for SLT Health underwriting risk is derived by combining the capital charges for the SLT Health sub-modules using a correlation matrix as follows:

$$Health_{SLT} = \sqrt{\sum_{rxc} CorrHealth_{rxc}^{SLT} \bullet Health_r^{SLT} \bullet Health_c^{SLT}}$$

where:

$CorrHealth_{rxc}^{SLT}$	=	Cells of the matrix $CorrHealth^{SLT}$
$Health_r^{SLT}, Health_c^{SLT}$	=	The capital charges for individual health underwriting sub-modules according to the rows and columns of correlation matrix $CorrHealth^{SLT}$

and where the correlation matrix $CorrHealth^{SLT}$ is defined as:

$CorrHealth^{SLT}$	$Health_{mortality}^{SLT}$	$Health_{longevity}^{SLT}$	$Health_{disability/morbidity}^{SLT}$	$Health_{lapse}^{SLT}$	$Health_{expense}^{SLT}$	$Health_{revision}^{SLT}$	$Health_{CAT}^{SLT}$
$Health_{mortality}^{SLT}$	1						
$Health_{longevity}^{SLT}$	-0.25	1					
$Health_{disability/morbidity}^{SLT}$	0.5	0	1				
$Health_{lapse}^{SLT}$	0	0.25	0	1			
$Health_{expense}^{SLT}$	0.25	0.25	0.5	0.5	1		
$Health_{revision}^{SLT}$	0	0.25	0	0	0.25	1	
$Health_{CAT}^{SLT}$	0	0	0	0	0	0	1

The calibration is for illustrative purposes, it should eventually be the same as the one used for the Life underwriting risk module.

3.136. The capital charge for $nHealth_{SLT}$ is determined as follows:

$$nHealth_{SLT} = \sqrt{\sum_{rxc} CorrHealth_{rxc}^{SLT} \cdot nHealth_r^{SLT} \cdot nHealth_c^{SLT}}$$

3.137. Except for CAT risk, CEIOPS considers that the risk drivers of the SLT Health underwriting risk module should be developed consistently with those of the Life underwriting risk module⁸ :

- SLT Health Mortality risk
- SLT Health Longevity risk
- SLT Health Disability – morbidity risk (only income insurance)
- SLT Health Expense risk
- SLT Health Revision risk (with a larger scope)
- SLT Health Lapse risk

3.138. The capital charges including the loss absorbing capacity of technical provisions are computed as set in the CEIOPS CP-54/09 "Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: Article 109(h): Loss absorbing capacity of technical provisions for the standard formula SCR".

SLT Health mortality risk

3.139. Description: the SLT Health mortality risk covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level, trend, or volatility of mortality rates, where an increase in the mortality rate leads to an increase in the value of insurance liabilities.

3.140. The SLT Health mortality sub-module aims at capturing the increase in general mortality that negatively affects the obligations of the undertaking. For the health products concerned by this risk, mortality risk relates to the general mortality probabilities used in the calculation of the technical provisions. Even if the health product does not insure death risk, there may be a significant mortality risk because the valuation includes profit at inception: if the policyholder dies early he/she will not pay future premiums and the profit of the insurer will be lower than allowed for in the technical provisions. For SLT health insurance this can be a relevant effect.

3.141. The risk module delivers the following output:

$Health_{mortality}^{SLT}$	=	Capital charge for SLT Health mortality risk
$nHealth_{mortality}^{SLT}$	=	Capital charge for SLT Health mortality risk including the loss absorbing capacity of technical provisions

3.142. The calculation of $Health_{mortality}^{SLT}$ and $nHealth_{mortality}^{SLT}$ is computed as in the Life mortality risk module (see CEIOPS CP-49/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Life underwriting risk).

SLT Health longevity risk

3.143. Description: the SLT Health longevity risk covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from the changes in the level, trend, or volatility of mortality rates, where a decrease in the mortality rate leads to an increase in the value of insurance liabilities.

3.144. The risk module delivers the following output:

$Health_{longevity}^{SLT}$	=	Capital charge for SLT Health longevity risk
$nHealth_{longevity}^{SLT}$	=	Capital charge for SLT Health longevity risk including the loss absorbing capacity of technical provisions

3.145. The calculation of $Health_{longevity}^{SLT}$ and $nHealth_{longevity}^{SLT}$ is computed as in the Life longevity risk module (see CEIOPS CP-49/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Life underwriting risk).

SLT Health disability/morbidity risk

3.146. Description: the SLT Health Disability/morbidity risk covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level, trend or volatility of disability, sickness and morbidity rates and capture the risk that more policyholders than anticipated are diagnosed with the diseases covered or are or unable to work as a result of sickness or disability during the policy term.

3.147. Morbidity or disability risk is associated with all types of insurance compensating or reimbursing losses (e.g. loss of income) caused by illness, accident or disability (income insurance), or medical expenses due to illness, accident or disability (medical insurance).

3.148. The following input information are required:

$Health_{Medical}^{SLT}$	=	Capital charge for disability/morbidity risk for medical insurance
$Health_{Income}^{SLT}$	=	Capital charge for disability/morbidity risk for income insurance
$nHealth_{Medical}^{SLT}$	=	Capital charge for disability/morbidity risk for medical insurance including the loss absorbing capacity of technical provisions
$nHealth_{Income}^{SLT}$	=	Capital charge for disability/morbidity risk for medical insurance including the loss absorbing capacity of technical provisions

3.149. The risk module delivers the following output:

$Health_{disability / morbidity}^{SLT}$	=	Capital charge for SLT Health disability and morbidity risk
$nHealth_{disability / morbidity}^{SLT}$	=	Capital charge for SLT Health disability and morbidity risk including the loss absorbing capacity of technical provisions

3.150. The capital charge for SLT Health disability/morbidity risk is determined as follows :

$$Health_{disability / morbidity}^{SLT} = Health_{Medical}^{SLT} + Health_{Income}^{SLT}$$

$$nHealth_{disability / morbidity}^{SLT} = nHealth_{Medical}^{SLT} + nHealth_{Income}^{SLT}$$

SLT Health disability/morbidity risk for medical insurance

3.151. For medical insurance, the determination of the disability/morbidity capital charge cannot be based on disability or morbidity probabilities. A large part of the risk in medical expense insurance is independent from the actual health status.

3.152. For example, it may be very expensive to find out whether the insured person is ill or to prevent the insured person from becoming ill – these expenses are usually covered by the health policy. If an insured person is ill, the resulting expenses significantly depend on the individual case. It can also happen that an insured person is ill but does not generate significant medical expenses.

3.153. Moreover, technically the business is not based on disability /morbidity probabilities but on expected annual medical expenses.

3.154. The disability/morbidity risk for medical insurance could be modelled as defined below. The risk of loss in income insurance should be modelled in a different scenario.

Input

3.155. The calculation is scenario-based. Input information is the effect of two specified scenarios on the net value of assets minus liabilities (NAV).

Output

3.156. The sub-module delivers the following output

$Health_{Medical}^{SLT}$	=	Capital charge for disability/morbidity risk for medical insurance
$nHealth_{Medical}^{SLT}$	=	Capital charge for disability/morbidity risk for medical insurance including the loss absorbing effect of technical provisions

Calculation

3.157. The capital charge is computed by analysing the scenarios *claim shock up* and *claim shock down* defined as follows:

Scenario	Permanent absolute change of claim inflation	Permanent relative change of claims
<i>claim shock up</i>	+1%	+10%
<i>claim shock down</i>	-1%	-10%

The calibration is for illustrative purposes only.

CEIOPS would appreciate feedback on the relevant calibration for medical insurance SLT Health disability/morbidity risk sub-module.

3.158. The scenario *claim shock down* needs only to be analysed for policies that include a premium adjustment mechanism which foresees an increase of premiums if claims are higher than expected and a decrease of premiums if claims are lower than expected. Otherwise, undertakings should assume that the result of the scenario *claim shock down* is zero.

3.159. In a first step, capital charges for increase and decrease of claims are calculated:

$$Health_{medical,up}^{SLT} = \Delta NAV | \text{claim shock up}$$

$$Health_{medical,down}^{SLT} = \Delta NAV | \text{claim shock down}$$

$$nHealth_{medical,up}^{SLT} = \Delta NAV | \text{claim shock up}$$

$$nHealth_{medical,down}^{SLT} = \Delta NAV | \text{claim shock down}$$

3.160. ΔNAV is the change in the net value of assets and liabilities under the scenario. The scenario is assumed to occur immediately after the valuation date. In the first two scenarios, the calculation is made under the condition that the assumptions on future bonus rates remain unchanged before and after the shocks. The last two calculations are made under the condition that the assumptions on future bonus rates may be changed in response to the shock. Moreover, the revaluation should allow for any relevant adverse changes in policyholders behaviour (option take-up) in this scenario.

3.161. The relevant scenario (*up* and *down*) is the most adverse scenario taking into account the loss absorbing capacity of technical provisions:

$$nHealth_{medical}^{SLT} = \max(nHealth_{medical,up}^{SLT}; nHealth_{medical,down}^{SLT})$$

$$Health_{medical}^{SLT} = \begin{cases} Health_{medical,up}^{SLT} & \text{if } nHealth_{medical,up}^{SLT} > nHealth_{medical,down}^{SLT} \\ Health_{medical,down}^{SLT} & \text{if } nHealth_{medical,up}^{SLT} < nHealth_{medical,down}^{SLT} \\ \max(Health_{medical,up}^{SLT}; Health_{medical,down}^{SLT}) & \text{if } nHealth_{medical,up}^{SLT} = nHealth_{medical,down}^{SLT} \end{cases}$$

Calibration

3.162. For medical insurance, disability/morbidity risk can be split into three components:

- The assumption on the trend of health claims needs to be revised (inflation risk).
- The assumptions on the level of claims need to be revised because the level estimated from past observations deviates from the claims level of the observations (estimation risk).
- The assumptions on the level of claims need to be revised for any other reason than estimation risk (e.g. model risk, risk of change, random error)

3.163. There is no reliable database to estimate the volatility of medical inflation on a 99.5% VaR level. For the calculation of the expense risk sub-module an increase of inflation by 1% (in absolute terms) is proposed. Although the level of medical inflation may deviate from the level of general expense inflation, there are no indications that the variability of the level is significantly different. Therefore, the same inflation shock as for expense risk is proposed.

3.164. For estimation risk, a shock can be derived by assuming that undertakings estimate the level of claims based on the last five observations, i.e. the annual inflation-adjusted claims for the last five years. If the distribution of annual claims is assumed to be approximately normal, the estimation error on a 99.5%-VaR level can be calculated as follows:

$$\text{estimation error} = \frac{N^{-1}(0.995)}{\sqrt{5}} \cdot \sigma \approx 1.15 \cdot \sigma,$$

where N is the cumulative distribution function of the standard normal distribution and σ the standard deviation of annual claims.⁹

3.165. The standard deviation of annual claims was estimated based on data from 37 German health insurance undertakings. In order to allow for inflation and portfolio changes, the annual claims were standardised¹⁰ with the expected annual claims as taken into account in the premium calculation. The standard deviations varied from 2% to 10% of the expected annual claims; the average value was 4.4%. According to the formula of the above paragraph, the estimation error is 5% of the expected annual claims.

3.166. In order to allow for other risks (e.g. model risk, risk of change, random error), the value of 5% is doubled. The resulting scenario for a permanent increase of the claims level is a relative increase of 10%.

SLT Health disability/morbidity risk for income insurance

3.167. For income insurance, the determination of the capital requirement for disability/morbidity risk is based on disability or morbidity probabilities. Considering that the risk in income insurance depends on the health status, the SLT Health disability/morbidity risk for income insurance should be treated in the same way as disability/morbidity risk in the Life underwriting risk module.

3.168. The risk module delivers the following output:

$Health_{Income}^{SLT}$	=	Capital charge for disability/morbidity risk for income insurance
$nHealth_{Income}^{SLT}$	=	Capital charge for disability/morbidity risk for medical insurance including the loss absorbing capacity of technical provisions

3.169. The calculation of $Health_{Income}^{SLT}$ and $nHealth_{Income}^{SLT}$ is computed as set in Life disability-morbidity risk (see CEIOPS CP-49/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Life underwriting risk).

SLT Health Expense risk

3.170. Description: the SLT Health expense risk covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes

in the level, trend, or volatility of the expenses incurred in servicing insurance or reinsurance contracts. Expense risk arises if the expenses anticipated when pricing a guarantee are insufficient to cover the actual costs accruing in the following year. All expenses incurred have to be taken into account.

3.171. The risk module delivers the following output:

$Health_{expense}^{SLT}$	=	Capital charge for SLT Health expense risk
$nHealth_{expense}^{SLT}$	=	Capital charge for SLT Health expense risk including the loss absorbing capacity of technical provisions

3.172. The calculation of $Health_{expense}^{SLT}$ and $nHealth_{expense}^{SLT}$ is computed as in the Life expense risk module (see CEIOPS CP-49/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Life underwriting risk).

SLT Health Revision risk

3.173. Description: the SLT Health Revision risk covers the risk of loss, or of adverse change in the value of insurance liabilities resulting from fluctuations in the level, trend, or volatility of the revision rates applied to benefits, due to changes in either:

- the legal environment (or court decision); only future changes approved or strongly foreseeable at the calculation date under the principle of constant legal environment,
- inflation (not only consumer price inflation), or
- the state of health of the person insured (sick to sicker, partially disabled to fully disabled, temporarily disabled to permanently disabled).

3.174. The risk module delivers the following output:

$Health_{revision}^{SLT}$	=	Capital charge for SLT Health revision risk
$nHealth_{revision}^{SLT}$	=	Capital charge for SLT Health revision risk including the loss absorbing capacity of technical provisions

3.175. The calculation of $Health_{revision}^{SLT}$ and $nHealth_{revision}^{SLT}$ is computed as in the Life revision risk module (see CEIOPS CP-49/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Life underwriting risk).

3.176. CEIOPS will further work on taking into account inflation risk in the scope of the revision risk module and possibly, to also extend the scope of the Life revision risk module in a similar way.

SLT Health Lapse risk

3.177. Description: the SLT Health Lapse risk covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from changes in the level or volatility of the rates of policy lapses, terminations, renewals and surrenders.

3.178. The risk module delivers the following output:

$Health_{lapse}^{SLT}$	=	Capital charge for SLT Health lapse risk
$nHealth_{lapse}^{SLT}$	=	Capital charge for SLT Health lapse risk including the loss absorbing capacity of technical provisions

3.179. The calculation of $Health_{lapse}^{SLT}$ and $nHealth_{lapse}^{SLT}$ is computed as in the Life lapse risk module (see CEIOPS CP-49/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Life underwriting risk).

SLT Health CAT risk

3.180. Description: the SLT Health CAT risk covers at least the risk of loss, or of adverse change in the value of insurance liabilities, resulting from the significant uncertainty of pricing and provisioning assumptions related to outbreaks of major epidemics, as well as the unusual accumulation of risks under such extreme circumstances.

3.181. CEIOPS considers that the CAT risk exposure for both SLT Health and Non-SLT Health should be treated in the same way as Non-life CAT risk module, i.e. according to the same methodologies. Health CAT risk is required in both the SLT and the non SLT sub-modules because the life CAT risk does not apply to health business.

Health (SLT) CAT scenarios could include (non exhaustive list):

- pandemic, e.g. bird flu
- mass accident
- polio type debilitating disease effects
- bio-hazard from an insecure laboratory
- terrorist action (e.g. pathogen released, terrorist action with delayed effects)
- concentrated office block accident
- sudden downturn in the economy (e.g. with impact on the disability/morbidity inception rate).

3.182. The risk module delivers the following output:

$Health_{CAT}^{SLT}$	=	Capital charge for SLT Health catastrophe risk
$nHealth_{CAT}^{SLT}$	=	Capital charge for SLT Health catastrophe risk including the loss absorbing capacity of technical provisions

3.183. The calculation of $Health_{CAT}^{SLT}$ and $nHealth_{CAT}^{SLT}$ is computed as in the Non-Life catastrophe risk module (see CEIOPS CP-48/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Non-Life underwriting risk).

Non-SLT Health (Non-similar to Life Techniques) underwriting risk sub-module

3.184. Description: the Non-SLT Health underwriting risk arising from the underwriting of health insurance obligations, not pursued on a similar technical basis to that of life insurance, following from both the perils covered and processes used in the conduct of business.

3.185. The following input information are required:

$Health_{Premium\&Reserve}^{NonSLT}$	=	Capital charge for NSLT Health premium and reserve risk
$Health_{CAT}^{NonSLT}$	=	Capital charge for NSLT Health CAT risk

3.186. The risk module delivers the following output:

$Health_{Non\ SLT}$	=	Capital charge for Health insurance obligations not pursued on a similar technical basis to that of life insurance
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3.187. The capital charge for NSLT Health underwriting risk is derived by combining the capital charges for the health sub-modules using a correlation matrix as follows:

$$Health_{Non\ SLT} = \sqrt{\sum_{rxc} CorrHealth_{NonSLT}^{rxc} \bullet Health_r^{NonSLT} \bullet Health_c^{NonSLT}}$$

where:

$CorrHealth_{NonSLT}^{rxc}$	=	Cells of the matrix $CorrHealth_{NonSLT}$
$Health_r^{NonSLT}, Health_c^{NonSLT}$	=	The capital charges for individual health underwriting sub-risks according to the rows and columns of correlation matrix $CorrHealth_{NonSLT}$

and where the correlation matrix $CorrHealth_{NonSLT}$ is defined as:

$CorrHealth_{NonSLT}$	$Health_{Premium\&\ Reserve}^{NonSLT}$	$Health_{CAT}^{NonSLT}$
$Health_{Premium\&\ Reserve}^{NonSLT}$	1	
$Health_{CAT}^{NonSLT}$	0.25	1

The calibration is for illustrative purposes only. Eventually, it should be the same as the one used for the Non-Life underwriting risk module.

Non SLT Health premium & reserve risk

3.188. This module combines a treatment for the three main sources of underwriting risk: premium risk, reserve risk and expense risk.

3.189. Premium risk is understood to relate to future claims arising during and after the period until the time horizon for the solvency assessment. The risk is that expenses plus the volume of losses (incurred and to be incurred) for these claims (comprising both amounts paid during the period and provisions made at its end) is higher than the premiums received (or if allowance is made elsewhere for the expected profits or losses on the business, that the profitability will be less than expected).

3.190. Premium risk is present at the time the policy is issued, before any insured events occur. Premium risk also arises because of uncertainties prior to issue of policies during the time horizon. These uncertainties include the premium rates that will be charged, the precise terms and conditions of the policies and the precise mix and volume of business to be written.

3.191. Premium risk shall therefore cover:

- the risk of loss because the premium provision at the start of the year proves inadequate - that is premium provision at the start of the year plus outstanding premiums receivable plus interest at risk free rate is insufficient to cover claims incurred during the year plus premium provision at end of year.
- the risk of loss on new contracts written during the year - that is premiums receivable during the year plus interest is insufficient to cover claims incurred during the year plus premium provision at the end of the year.

3.192. CEIOPS therefore identify 3 types of risk of loss:

- New premiums may be written at inadequate rates.
- The loss on exposure during the year may be more than expected.
- The provisions at the start of the year for exposure after the end of the year may need to be increased.

3.193. Premium risk relates to policies to be written (including renewals) during the period, and to unexpired risks on existing contracts.

3.194. Premium risk shall also allow for volatility of expense payments. Expense risk can be quite material for some lines of business and shall therefore be fully reflected in the module calculations. Expense risk is implicitly included as part of the premium risk.

3.195. Reserve risk stems from two sources:

- The absolute level of the claims provisions may be mis-estimated
- Because of the stochastic nature of future claims payouts, the actual claims will fluctuate around their statistical mean value.

3.196. The following input information are required:

PCO_{LOB}	=	Best estimate for claims outstanding (for the individual LOB)
$P_{LOB}^{t,written}$	=	Estimate of net written premium during the forthcoming year (for the individual LOB)
$P_{LOB}^{t,earned}$	=	Estimate of net earned premium during the forthcoming year (for the individual LOB)
$P_{LOB}^{t-1,written}$	=	Net written premium during the previous year (for the individual LOB)
C_{LOB}^{PP}	=	Expected present value of net claims and expense cash out-flows which are related to claims incurred after the year and covered by the existing contracts

3.197. The estimates $P_{LOB}^{t,written}$ and $P_{LOB}^{t,earned}$ are provided by the participant.

3.198. The module delivers the following output:

$Health_{Premium\&\ Reserve}^{NonSLT}$	=	Capital charge for NSLT Health premium and reserve risk
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3.199. The capital charge for the combined premium risk and reserve risk is determined as follows:

$$Health_{Premium\&\ Reserve}^{NonSLT} = \rho(\sigma_{NonSLT\ Health}) \cdot V_{NonSLT\ Health}$$

Where

$V_{NonSLT\ Health}$	=	Volume measure (for NSLT Health insurance obligations)
$\sigma_{NonSLT\ Health}$	=	Standard deviation (for NSLT Health insurance obligations)
$\rho(\sigma_{NonSLT\ Health})$	=	A function of the standard deviation

3.200. The function $\rho(\sigma_{NonSLT\ Health})$ is set such that, assuming a lognormal distribution of the underlying risk, a risk capital charge consistent with the VaR 99.5% standard is produced. Roughly $\rho(\sigma_{NonSLT\ Health}) \approx 3 \cdot \sigma_{NonSLT\ Health}$.

3.201. The volume measure $V_{NonSLT\ Health}$ and the standard deviation $\sigma_{NonSLT\ Health}$ for the NSLT Health insurance obligations are determined as follows:

- in a first step, for each lines of business (LoB) standard deviations and volume measures for both premium risk and reserve risk are determined;
- in a second step, the standard deviations and volume measures for the premium risk and the reserve risk are aggregated to derive an overall volume measure $V_{NonSLT\ Health}$ and an overall standard deviation $\sigma_{NonSLT\ Health}$.

Step 1: Volume measures and standard deviations per LoB

3.202. The volume measures and standard deviations for premium and reserve risk are denoted as follows:

V_{LOB}^{prem}	=	Volume measure for premium risk (for NSLT Health insurance obligations)
V_{LOB}^{res}	=	Volume measure for reserve risk (for NSLT Health insurance obligations)
σ_{LOB}^{prem}	=	Standard deviation for premium risk (for NSLT Health insurance obligations)
σ_{LOB}^{res}	=	Standard deviation for reserve risk (for NSLT Health insurance obligations)

Step 1(1)

3.203. The volume measure for premium risk is determined as follows:

$$V_{LOB}^{prem} = \max\left(P_{LOB}^{t,written}; P_{LOB}^{t,earned}; P_{LOB}^{t-1,written}\right) + C_{LOB}^{PP}$$

3.204. If the insurer has committed to its regulator that it will restrict premiums written over the period so that the actual premiums written (or earned) over the period will not exceed its estimated volumes, the volume measure is determined only with respect to estimated premium volumes, so that in this case:

$$V_{LOB}^{prem} = \max\left(P_{LOB}^{t,written}; P_{LOB}^{t,earned}\right) + C_{LOB}^{PP}$$

Step 1(2)

3.205. The volume measure for reserve risk is determined as follows:

$$V_{LOB}^{res} = PCO_{LOB}$$

Step 1(3)

3.206. The standard deviation for premium and reserve risk in the individual LOB is defined by aggregating the standard deviations for both risks under the assumption of a correlation coefficient of 0.50:

$$\sigma_{LOB} = \sqrt{\frac{1}{(V_{LOB}^{res} + V_{LOB}^{prem})^2} \cdot \left[(\sigma_{LOB}^{prem*})^2 \cdot (V_{LOB}^{prem})^2 + (\sigma_{LOB}^{res})^2 \cdot (V_{LOB}^{res})^2 + \sigma_{LOB}^{prem} \cdot \sigma_{LOB}^{res} \cdot V_{LOB}^{prem} \cdot V_{LOB}^{res} \right]}$$

Step 2: Overall volume measures and standard deviations

3.207. The volume measure $V_{NonSLT\ Health}$ is determined as follows:

$$V_{NonSLT\ Health} = V_{NonSLT\ Health}^{prem} + V_{NonSLT\ Health}^{res}$$

3.208. The overall standard deviation $\sigma_{NonSLT\ Health}$ is determined as follows:

$$\sigma_{NonSLT\ Health} = \sqrt{\frac{1}{V^2} \cdot \sum_{rxc} CorrLob_{NonSLT}^{rxc} \cdot \sigma_r \cdot \sigma_c \cdot V_r \cdot V_c}$$

Where

r, c	=	All indices of the form (LOB)
$CorrLob_{NonSLT}^{rxc}$	=	Cells of the correlation matrix $CorrLob_{NonSLT}$
σ_r, σ_c	=	Standard deviation for the individual lines of business, as defined in step 1
V_r, V_c	=	Volume measures for the individual lines of business, as defined in step 1

Options discussed

3.209. With regards to the definition of lines of business considered to the assessment of the Non SLT Health premium and reserve risk, CEIOPS has considered the following options (calibration is given for illustrative purposes only):

Option 1: only 1 line of business to cover all Non SLT health insurance obligations.

<i>LOB</i>	σ_{LOB}^{res}	σ_{LOB}^{prem}
<i>Non SLT Health</i>	12%	5%

Sub-issue 1: given the fact that Workers' compensation is not a legal class of non-life insurance like accident and sickness¹¹, should Workers compensation be kept as a segment of LoB?

- If Workers compensation is not a LoB then health insurance obligations are segmented in 2 lines of business.
- If Workers compensation is a LoB then health insurance obligations are segmented in 3 lines of business.

Option 2: a segmentation of the health insurance obligations in 2 lines of business.

<i>LOB</i>	σ_{LOB}^{res}	σ_{LOB}^{prem}
<i>Accident</i>	15%	5%
<i>Sickness</i>	7,5%	3%

With the following correlation matrix:

<i>CorrLob_{Non SLT}</i>	<i>Accident</i>	<i>Sickness</i>
<i>Accident</i>	1	
<i>Sickness</i>	1	1

Option 3: a segmentation of the health insurance obligations in 3 lines of business.

<i>LOB</i>	σ_{LOB}^{res}	σ_{LOB}^{prem}
<i>Accident</i>	15%	5%
<i>Sickness</i>	7,5%	3%
<i>Workers Compensation</i>	10%	7%

With the following correlation matrix:

$CorrLob_{NonSLT}$	<i>Accident</i>	<i>Sickness</i>	<i>WC</i>
<i>Accident</i>	1		
<i>Sickness</i>	1	1	
<i>Workers Compensation</i>	1	1	1

The calibration will depend on the option chosen.

Non SLT Health CAT risk

3.210. The CAT risk capital charge covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from the significant uncertainty of pricing and provisioning assumptions related to outbreaks of major epidemics, as well as the unusual accumulation of risks under such extreme circumstances (Article 105 (4) c) in Level 1 text).

3.211. The CAT risk exposure for both SLT Health and Non-SLT Health should be treated in the same way as Non-life CAT risk module, i.e. according to the same methodologies.

Health (non SLT) CAT scenarios could at least include:

- terrorism, mostly for group contracts,
- pandemic,
- stagflation (as this touches upon death spiral territory it may not be well captured in the premium and risk component).

3.212. The module delivers the following output:

$Health_{CAT}^{NonSLT}$	=	Capital charge for NSLT Health catastrophe risk (for NSLT Health insurance obligations)
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3.213. The calculation of $Health_{CAT}^{NonSLT}$ is computed as in the Non-Life catastrophe risk module (see CEIOPS CP-48/09 Draft CEIOPS' Advice for Level 2 Implementing Measures on Solvency II: Standard formula SCR Non-Life underwriting risk).

Use of Undertaking-Specific Parameters (USP)

3.214. The possibility of introducing undertaking-specific parameters (USP) in the Health underwriting risk module will be studied at a later stage (CEIOPS will publish a forthcoming Consultation paper on this issue).

Annex A: QIS4 feedback on health

3.215. The health underwriting risk module covers the risk of loss or adverse change in the value of health insurance liabilities and workers' compensation guarantees and is split in three different sub-modules:

- long-term health insurance that is practised on a similar technical basis to that of life assurance,
- short-term health & accident insurance, and
- workers' compensation.

While these three sub-modules formed a single module in QIS3, the latter two sub-modules had been included in the non-life underwriting risk module prior to QIS4.

3.216. The main findings regarding the health underwriting risk module are:

- Participants held mixed views about how to combine the various types of health insurance in one module: a number of undertakings were unsure how to classify specific types of insurance according to the sub-module structure provided.
- Some undertakings proposed to include health and disability risks as parts of a new morbidity risk sub-module.

3.217. There is no clear view among undertakings and supervisors whether the QIS4 treatment of health insurance is an improvement over QIS3. While some undertakings and supervisors supported the new structure, in a few countries the new structure is considered a change for the worse –the rationale for this judgment is predominantly based on the classification of health business within QIS4 rather than on the calibration and parameterization. One supervisory authority argued that health underwriting risks would be better incorporated in the life and non-life modules according to whether the risks are short-term or long-term - this view was prominent especially among non-life insurance undertakings.

3.218. Undertakings in a large number of jurisdictions pointed out the difficulties of deciding which lines of business should be included under the various health sub-modules in QIS4. Some supervisors expressed concern that the classification should be based on the risk characteristics of the products and not on the legal form of the contracts, in order to prevent inconsistencies in treatment. Additional clarity in definitions was suggested to help with classification of risks. Accident contracts appeared particularly difficult to classify.

- 3.219. Most supervisors supported the different treatment of short-term and long-term products as consistent with a risk-based approach. Those respondents were keen to ensure that the relevant risks should be treated transparently and according to clear, well-structured formulae. It was noted, however, that different correlations with other risks could arise depending on the module chosen for treatment of a particular health contract; this could then lead to inconsistencies. Further, there could be potential for confusion where risks could change from “non-life” to “life” over the lifetime of a contract (e.g. for some forms of workers’ compensation).
- 3.220. Not all supervisors found the form of the separate health module appropriate for the types of health business sold by undertakings in their jurisdictions. Permanent health insurance was cited as one example by one supervisor, and workers’ compensation products also generated significant debate. It was noted that the diversity in viewpoints is due at least in part to the tendency for health insurance to interact with social security schemes in many countries, leading to corresponding diversity among contract structures. One supervisor suggested greater collaboration between CEIOPS and local regulators in order to optimise the approach in each case. It was suggested that a separate health module could provide an incentive for building partial internal models.
- 3.221. Undertakings in a number of countries argued that both health and disability risks should be treated within the life module as part of the morbidity risk sub-module, in order to achieve consistent treatment of similar risks. Undertakings from one country added that the modular split between life assurance contracts and attached non-life riders would be rather artificial.