**APPENDIX 1**

**Over- & Under-Estimation Trade-Off: Rationale and evidence informing on the ‘dubious’ inclusion decisions**

1. On the side of **Over-Estimation**, we ended up **Including** the sequelae (i.e. YLDs) from:

* All Cardiovascular (“causes”):
  + Currently, the quantity, quality and strength of the evidence base for cardiac rehabilitation varies across treated conditions [36-43], but strong evidence supports that cardiac rehabilitation approaches are overall cost-effective [44].
* All Chronic Respiratory Diseases (“causes”):
  + - Although the evidence more established for pulmonary rehabilitation applied to patients with chronic obstructive pulmonary disease [45,46], evidence of the benefit of pulmonary rehabilitation begin to emerge for other conditions as well [47,48].
* All Neonatal Conditions (“causes”).
  + - We include all neonatal conditions, including “Hemolytic diseases and other neonatal jaundice”. For instance, although frequently benign, neonatal jaundice can become severe and lead to encephalopathy neurodevelopment impairments [49]. Hence, sequalae (i.e. YLDs) from this condition would be amenable to physical rehabilitation. Overall, sequalae from neonatal conditions would likely lead to some form of physical, neurological or motor impairments or delays that are amenable to physical rehabilitation, although we acknowledge that it might not be present in all cases and therefore the possibility of some error on side of overestimation.
* Alzheimer’s Disease and other Dementias.
  + - A wide scope of mental, cognitive as well as physical impairments and rehabilitation needs are associated with these conditions, which progress to affect the activities of daily living (ADLs) and mobility, inclusively from deconditioning. Evidence points out that exercise programs may at least improve the ability to perform ADLs in people with dementia, as in the following examples:

Therapeutic interventions that include aerobic and strengthening exercises may help improve independence in ADLs and improve physical performance in people with Alzheimer’s Disease [50]. Strong evidence also supports the benefits of occupation-based interventions and physical exercise for adults with Alzheimer's Disease and related major neurocognitive disorders [51]. Some evidence hints that physical activity can even improve or slow down decreases in cognitive functioning [52-53]. Even though a Cochrane review in 2015 found no evidence of benefit from exercise on cognition, neuropsychiatric symptoms, or depression, benefits in ADLs were found [54]. Finally, another systematic review hints that preliminary support exists for the effectiveness of physical therapy and exercise interventions in patients with Huntington’s Disease [55].

Overall, the inclusion of these conditions can lead to an over-estimation of YLDs amenable to physical rehabilitation as the severity and respective disability weights of these conditions also account for cognitive and mental health needs, which might be addressed, in complement, by other forms of rehabilitative interventions.

* Autism Spectrum Disorder:
  + - Even though psychosocial dysfunction might be dominant, sensory-processing and motor impairments are prevalent and might be addressed by physical rehabilitation approaches [29-35], yet these impairments are not always present and psychosocial disfunction is often dominant. This means that YLDs from this condition are also germane to other forms of rehabilitative or habilitative interventions – therefore, the over-estimation of physical rehabilitation needs from YLDs that came from this condition.

1. On the side of under-estimation, we ended up **Excluding** the sequelae (i.e. YLDs) from:
   * Tuberculosis:
     + Although physical impairments might come as sequalae of this condition, we only found a study protocol for a scoping review on the subject [56], whose findings may inform a further systematic review to explore the effectiveness of rehabilitation strategies used to address physical impairments and activity limitations in people with this infection. At today’s level of synthesized evidence, we did not include this condition.
   * Malaria:
     + We did not find a strong, recent body of evidence systematically reviewed of the effect of physical or even cognitive rehabilitation interventions, even though cognitive impairments are prevalent sequelae in a sub-set of those with malaria and rehabilitative solutions have been proposed, including physical therapy and speech therapy [57]. Malaria is pointed out as one of the possible causes of the disproportionate, high prevalence of cerebral palsy in low-income countries [58]. While that consequence would be amenable to physical rehabilitation, we did not find a systematic study or review on that linkage, inclusively detailing the proportion of cases with sequalae from malaria that lead to cerebral palsy. Therefore, we did not include YLDs from this condition.
   * Other Neglected Tropical Diseases (apart from Leprosy and Zika Virus):
     + For Zika Virus and Leprosy we have found reviews or overviews on the likely benefit of physical rehabilitation approaches [59-61]. All other conditions in this category were not included, given the lack of identified research or reviews of research focused on the rehabilitation of those conditions.
   * Epilepsy:
     + While sequalae from Epilepsy may benefit from cognitive rehabilitation [62], the topic is under-researched [63] and cognitive rehabilitation only partly relates to physical rehabilitation.
   * Migraine:
     + There is a body of evidence supporting the benefits of physical therapy for migraine and other headaches, but the methodological shortcomings reduce the confidence in the results [64]. Besides, physical therapy in migraine is more controversial than in tension-type headaches (TTH), since migraine pathogenesis involves activation of sub-cortical structures and the trigemino-vascular system, whereas pathogenesis of TTH is more associated with musculoskeletal disorders, e.g. muscle pain [65]. Finally, we have found systematically reviewed information supporting specific types of physical therapy interventions for TTH [66]. Hence, we have included TTH, but not migraine, even though it cannot be ruled out the effectiveness of physical therapy across headache conditions.
   * Attention Deficit Hyperactivity Disorder:
     + Even though occupational therapy interventions can have positive impacts in children’s participation and executive functions [67], the cognitive-functional scope of the intervention only partly relates with physical rehabilitation, and we did not find any systematic reviews supporting the benefit of interventions within the realm of physical rehabilitation for this condition.
   * Diabetes
     + Even at the 5th level of the GBD hierarchy, the one with higher detail, we do not have the data for amputation as a consequence of diabetes, for example in contrast with kidney diseases. In these circumstances, we altogether exclude YLDs from diabetes to avoid many false positives from kidney and eye impairments.
   * All mental health conditions and substance abuse.
     + Even considering that for example physical activity/exercise have benefits for depression [68,69], the type of exercise does not necessarily equate to physical rehabilitation and the overall rehabilitative approach can be rather framed in the context of mental health / psychosocial rehabilitation.
   * Maternal, Urological, or Gynecological or conditions.
     + Even though there is a body of literature pointing out that physical therapy can be useful on strengthening the pelvic floor muscles and reducing related incontinence (versus no treatments) or even reduce vestibulodynia [70,71], the underlying evidence base, for example on the chronic pelvic pain and incontinence (when added to another active treatment) still is considered insufficient [72-75]. Finally, it was complex to depict which are the GBD “causes” which are in the origin of those symptoms, and there are no GBD “impairment” for example about incontinence. So, we altogether excluded the maternal, urological or gynecological diseases, even though some might generate YLDs eventually amenable to physical rehabilitation.
   * Nutritional deficiencies:
     + Sequalae from nutritional deficiencies can be many and varied. Therefore, some of the YLDs can be amenable to physical rehabilitation while many others not. For instance, even though Iodine Deficiency can lead to fatigue and that can be possibly addressed by physical rehabilitation, it often leads to more significant sequalae in terms of mental development [76,77]. We avoided the inclusion of conditions from which we can expect a high rate of YLDs not amenable to physical rehabilitation.
   * Unspecific conditions such as “Other Non-communicable diseases”, “Effect of different environmental factors” and “Complications following therapeutic procedures”
     + In some cases, these unspecific conditions might lead to physical rehabilitation needs (e.g.; hemorrhage after neurosurgery that leads to spinal cord damage) or not (e.g. wound infection after surgery). In a conservative approach, we opt not to include too many false positives.
   * Physical rehabilitation needs from deconditioning from non-specific causes (e.g. hospital-associated deconditioning) which we might not have included, or even physical rehabilitation needs arising from senescence, i.e. with no need for an underlying disease or injury.
     + This type of impairments could not be determined using the GBD as reference, even though they might count as physical rehabilitation needs [78,79].