2 Objectives

With a focus on young children living at northern latitudes, the overall aim of this PhD thesis was to identify factors associated with vitamin D status during autumn, assess the dietary vitamin D requirement during winter, and investigate the effect of winter supplementation on muscle strength, body composition, and growth factors. From this aim, the three enclosed papers were developed with the following objectives:

1. Which factors are associated with vitamin D status during autumn in young children living at northern latitudes?
   (Paper I)
2. How do school types (preschool versus school) affect children’s sun behaviours and outdoor time, and do potential differences affect autumn vitamin D status?
   (Paper I)
3. What is the dose-response association between total vitamin D intake (diet and supplementation) and serum 25(OH)D in white young children?
   (Paper II)
4. Which intakes of vitamin D are required to maintain serum 25(OH)D above various cut-offs, and what is the estimated average requirement (EAR) and recommended dietary allowance (RDA) of vitamin D in young white children living at northern latitudes, when using definitions set by the Institute of Medicine?
   (Paper II)
5. Are muscle strength, fat free mass index (FFMI) and fat mass index (FMI) associated with serum 25(OH)D in young children, and does vitamin D supplementation during winter affect these outcomes? Do potential associations or effects differ in boys and girls?
   (Paper III)
6. Are insulin-like growth factor I (IGF-1), IGF binding protein-3 (IGFBP-3), and height associated with serum 25(OH)D in young children, and does vitamin D supplementation during winter affect these outcomes? Do potential associations or effects differ in boys and girls?
   (Paper III)