First European-wide data from the ODIN project shows that the prevalence of vitamin D deficiency, which is completely preventable through nutrition, is 13%: these first internationally comparable data present firm evidence for significant risk to public health from vitamin D deficiency

Vitamin D deficiency has serious implications for European populations in terms of bone health, but also likely other non-skeletal health effects [1]. While there is general agreement that prevention of vitamin D deficiency is a key public health priority, there is less agreement on which serum 25-hydroxyvitamin D [25(OH)D, the indicator of vitamin D status] threshold defines vitamin D deficiency [2,3]. While some have suggested that circulating levels of 25(OH)D below 50, and even 75, nmol/L reflect vitamin D deficiency, this is much debated [4]. In contrast, there is almost universal agreement that circulating levels of 25(OH)D below 25 to 30 nmol/L reflects vitamin D deficiency and the associated increased risk of metabolic bone diseases, such as rickets and osteomalacia [2,5].

Knowledge of the distributions of serum 25(OH)D concentrations in representative populations are critical for the quantification of vitamin D deficiency as well as for devising effective strategies for its prevention [6]. However, serum 25(OH)D distribution data for the European Union are of variable quality making it difficult to estimate and compare the prevalence of vitamin D deficiency across member states [7]. While there are many likely contributory reasons for differences in prevalence estimates between populations, differences in analytical methodology for serum 25(OH)D are likely to contribute [8]. Several key reports have shown that available 25(OH)D assays can yield markedly differing results [9,10]. As a consequence of these widespread, method-related differences in results of serum 25(OH)D, the National Institutes of Health-led international *Vitamin D Standardization Program* (VDSP) developed protocols for standardizing 25(OH)D measurement in national health/nutrition surveys around the world [8].

Recent application of the VDSP protocols to serum 25(OH)D data from the Irish National Adult Nutrition Survey as a case-study showed that the yearly prevalence of serum 25(OH)D <30 nmol/L increased from 6.5% (via the original immunoassay measurement) to a projected 11.4% [11]. Importantly, re-analysis of all serums in the survey (*n*=1118) by liquid chromatography tandem mass spectrometry method (LC-MS/MS; considered the gold-standard) confirmed the true prevalence estimate as 11.2%, which was almost twice as high as the immunoassay-based estimate and almost identical to the VDSP projection [11]. Thus, the VDSP approach, if coupled with key representative population studies, offers the potential to allow for generation of prevalence estimates of vitamin D deficiency in Europe using standardized serum 25(OH)D data. This would permit quantification of the magnitude of the public health problem and a solid platform upon which to build public health policy aimed at preventing vitamin D deficiency in Europe.

Accordingly, the EC-funded *ODIN* project applied the VDSP protocols to existing serum 25(OH)D data from 18 key identified nationally or regionally representative studies of children, teenagers, adults, and elderly (*n*=55,844 individuals), which were of strategic importance for European coverage. As part of the protocols, the *Cork Centre for Vitamin D and Nutrition Research* used their

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CDC-certified LC-MS/MS method to perform 25(OH)D re-analysis of targeted serum subsamples from each population contributed collaboratively from 14 research groups throughout Europe [12].

While there was considerable variation across study populations (See **Figure 1**), overall 13% of our combined sample of childhood, teenage, adult and older adult population studies across Europe (*n* 55,844), ranging from Southern to mid to Northern European member states (35^{o}N to 69^{o}N) had vitamin D deficiency at the time of sampling [12]. That thirteen in a hundred European citizens have serum 25(OH)D levels <30 nmol/L, using even this relatively conservative definition of vitamin D deficiency, translates into enormous numbers of individuals and highlights the need to devise strategies for prevention of vitamin D deficiency in Europe. For example, the vitamin D deficiency estimates of 12.5-15.2%, 12.3% and 22.0% from the nationally representative nutrition/health surveys for Germany, Ireland and the UK included in the present work, translate to 10.9, 0.6 and 14.1 million individuals, respectively, in these member states alone, based on their recent census data. It is also worth noting that other expert bodies have suggested vitamin D deficiency is defined by a higher serum 25(OH)D threshold of 50 nmol/L [3]. Using serum 25(OH)D <50 nmol/L in the same surveys would translate to 44.9, 2.1 and 32.6 million individuals in Germany, Ireland and the UK, respectively having deficiency as defined by this threshold.

Another key finding within the work was that dark-skinned ethnic subgroups in European member-states are at worryingly higher risk of vitamin D deficiency compared to their white counterparts. For example, compared to white populations in the UK, Norway and Finland, the non-white population subgroups have 3- to 71-fold higher yearly prevalence of vitamin D deficiency [12].

On this basis, the present work within the ODIN project, which is the first to report internationally comparable prevalence estimates of vitamin D deficiency based on standardized serum 25(OH)D data, provide the first firm evidence that vitamin D deficiency is widespread across Europe and at prevalence rates that are indicative of a serious public health problem underlying not only risk of metabolic bone diseases but potentially other health outcomes as well. The ODIN project is working on developing food-based strategies to prevent vitamin D deficiency, which will require action from a public health perspective.

Click on the link below for the freely available PDF of the full paper describing the entire study and its important findings:

http://ajcn.nutrition.org/content/early/2016/02/10/ajcn.115.120873.long

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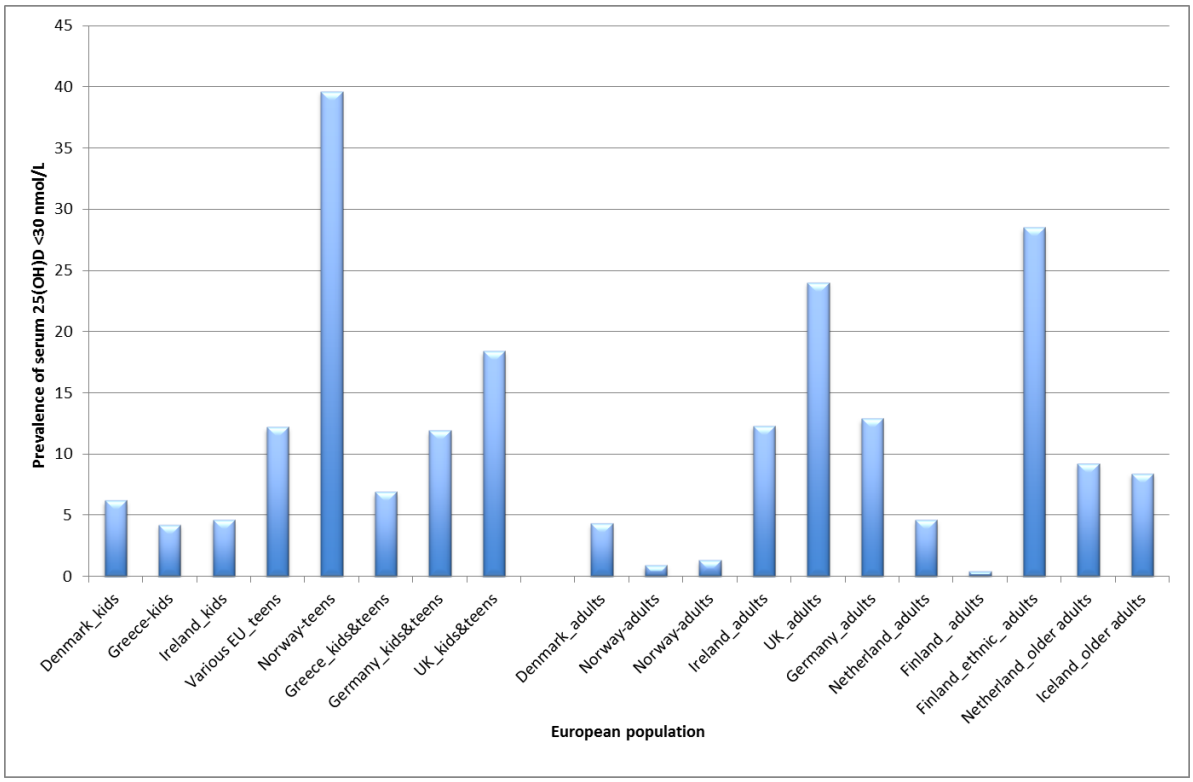

Figure 1. Prevalence of vitamin D deficiency (serum 25(OH)D less than 30 nmol//L) in European young and adult/older adult, populations [12].

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