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# The Connection Between Vitamin D and IBD

Immundiagnostik, Inc.

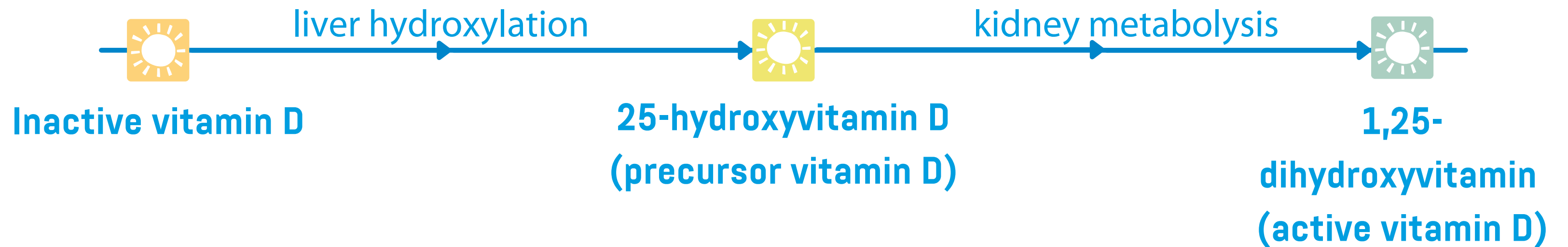


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# Intro to Vitamin D Deficiency

Vitamin D is an essential, fat-soluble vitamin produced in the body following exposure to sunlight or consumption of certain foods. It is bound in the blood to a binding protein (DBP) in its inactive form and must be activated by undergoing hydroxylation in the liver to become 25-hydroxyvitamin D (precursor vitamin D). It is then further metabolized in the kidney to form 1,25-dihydroxy vitamin D (active vitamin D), which is the vitamin D metabolite with the highest biological activity and functions as a hormone (D-hormone). It regulates the uptake of calcium from the intestine, the mineralization of bones, the differentiation of osteoblasts as well as bone matrix synthesis. Furthermore, D-hormone influences neuro-muscular functions.



# Intro to Vitamin D Deficiency

## Prevalence

**Table 1**

Prevalence of vitamin D deficiency among susceptible populations.

Study	Population Group	Vitamin D Deficiency Prevalence
1	American Adults	35%
2	Healthy-Weight Children	21%
3, 4, 5, 6	African American Adults	63-82%
6	Obese Adults	43%
2	Obese Children	34%
2	Severely Obese Children	49%
2	Severely Obese African American Children	87%
7, 8, 9, 1	Elderly Adults	60-87%
10, 11, 12	Crohn's Disease	34-59%
10, 11	Ulcerative Colitis	44-45%

Vitamin D deficiency is a global public health issue due to limited sunlight exposure or dietary intake. A value less than 50 nmol/L on the 25-hydroxyvitamin D (precursor vitamin D) test may suggest a vitamin D deficiency. The prevalence of vitamin D deficiency varies among geographic locations, but it is generally highest in individuals with dark skin, the elderly, the obese, and those with gastrointestinal illnesses.

Table 1 summarizes the results of several studies investigating the prevalence of vitamin D deficiency among particularly vulnerable populations.

Vitamin D deficiencies can increase susceptibility to numerous health conditions, including COVID-19 and other respiratory diseases, diabetes, heart disease, depression, various cancers, dementia, osteoporosis, and gut disorders and diseases.

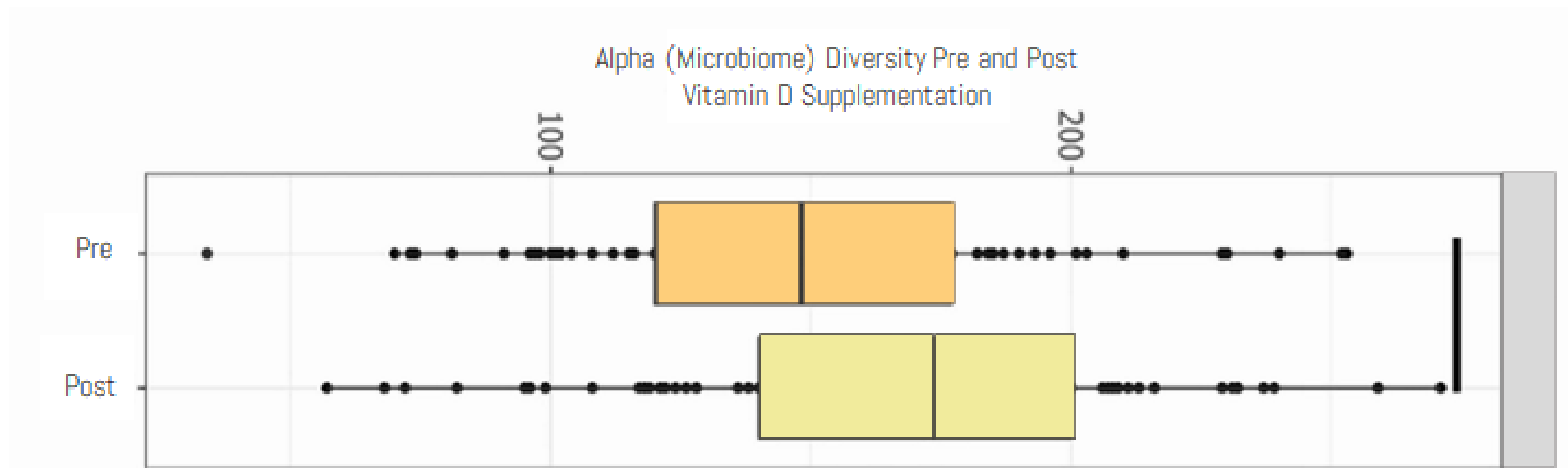
# How Vitamin Deficiencies Affect the Gut

Recent studies have shown that active vitamin D levels are closely related to gut microbiome diversity, which suggests the gut microbiome's role as a catalyst in the metabolism of precursor vitamin D to active vitamin D.

Researchers from the University of California San Diego found that in older men from across the US, higher active vitamin D levels were correlated with higher levels of gut microbiome diversity<sup>13</sup>.

Precursor vitamin D, however, was not correlated with the gut microbiome diversity, which supports the idea that the gut microbiome is involved in producing active vitamin D. Further, active vitamin D supplementation was found to increase gut microbiome diversity significantly.<sup>14</sup>

Like vitamin D, increased vitamin C levels have also been found to significantly increase gut microbiome diversity<sup>15</sup>.

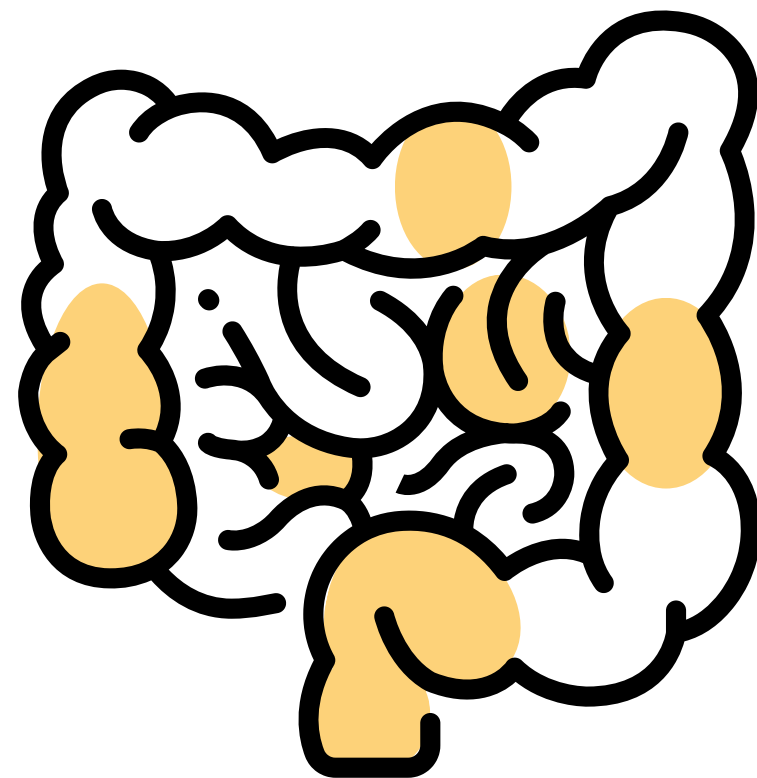


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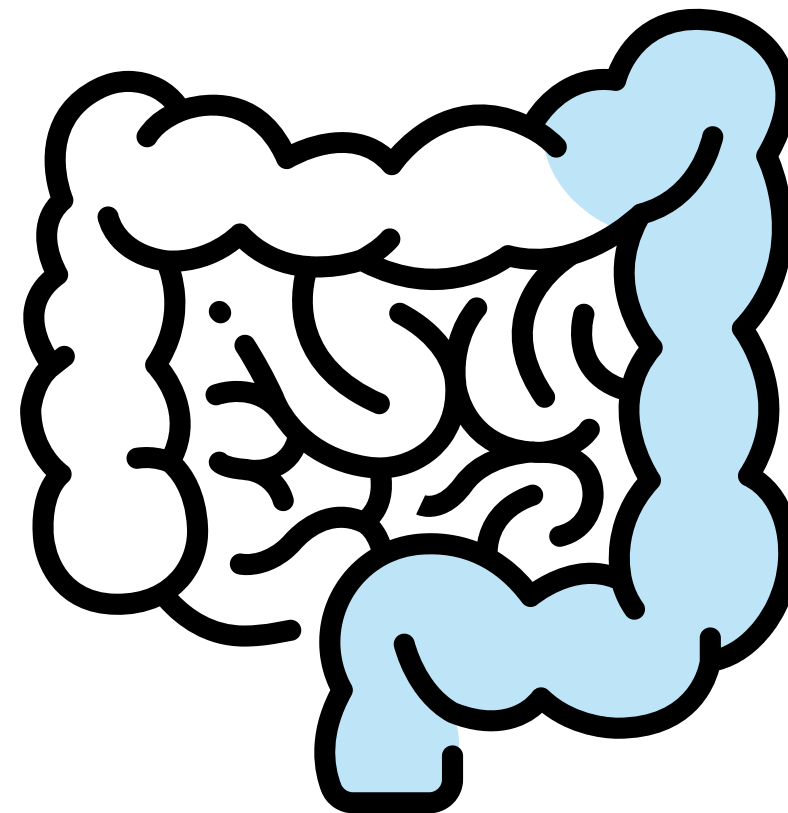
# Inflammatory Bowel Disease

Inflammatory bowel disease (IBD) includes two digestive diseases: Crohn's disease and ulcerative colitis. Both are caused by inflammatory pathologies of the gut mucosa and are characterized by diarrhea, rectal bleeding, abdominal pain, fatigue, and weight loss<sup>16</sup>. With ulcerative colitis, inflammation is localized to the large intestine, whereas with Crohn's disease, inflammation may be located anywhere along the digestive tract<sup>17</sup>. The cause of IBD is not certain, but it is thought to be related to an immune system malfunction in which the immune system attacks the digestive tract cells. The extent of IBD damage is further aggravated by poor diet and stress<sup>16</sup>.

## Crohn's Disease



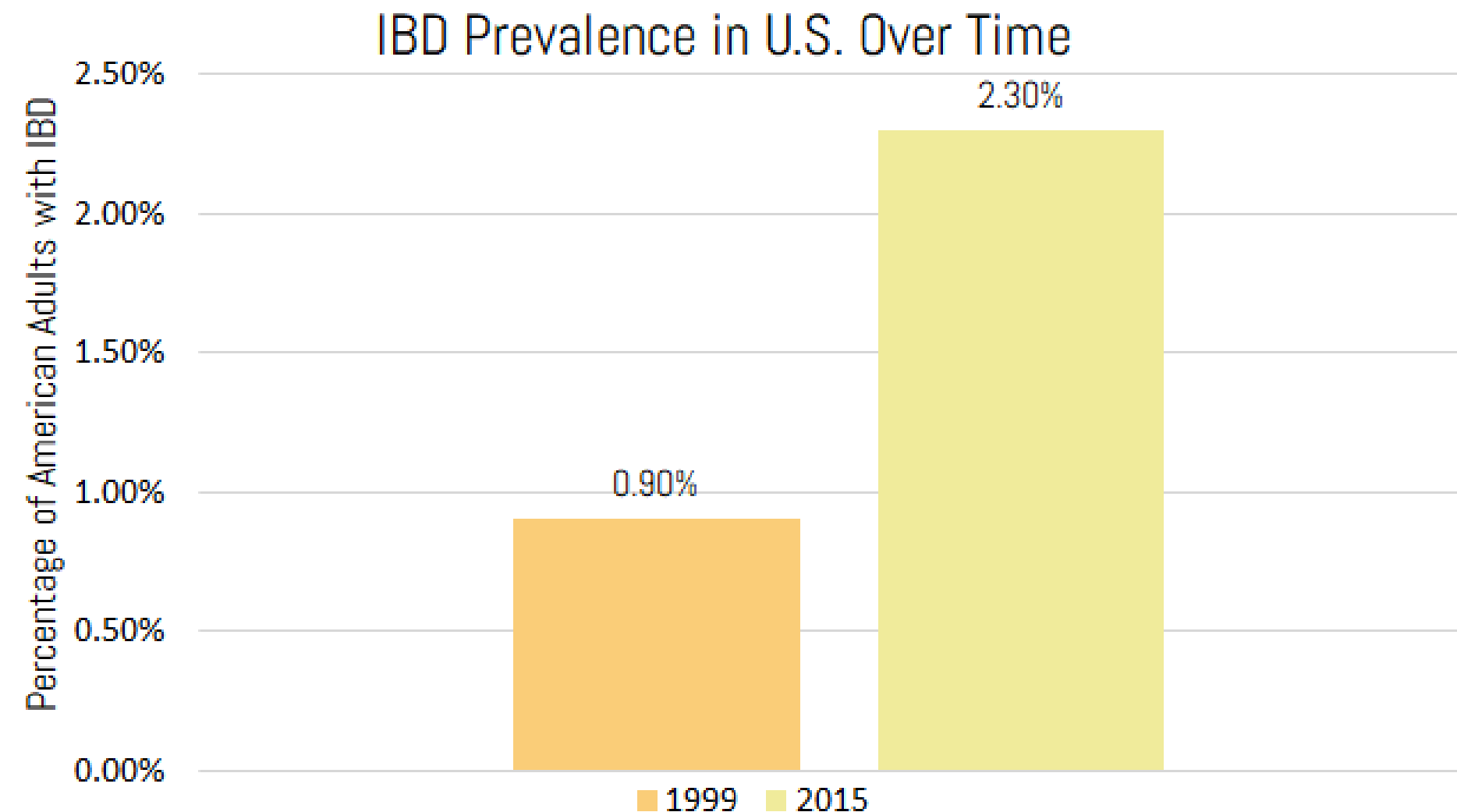
## Ulcerative Colitis



# Inflammatory Bowel Disease

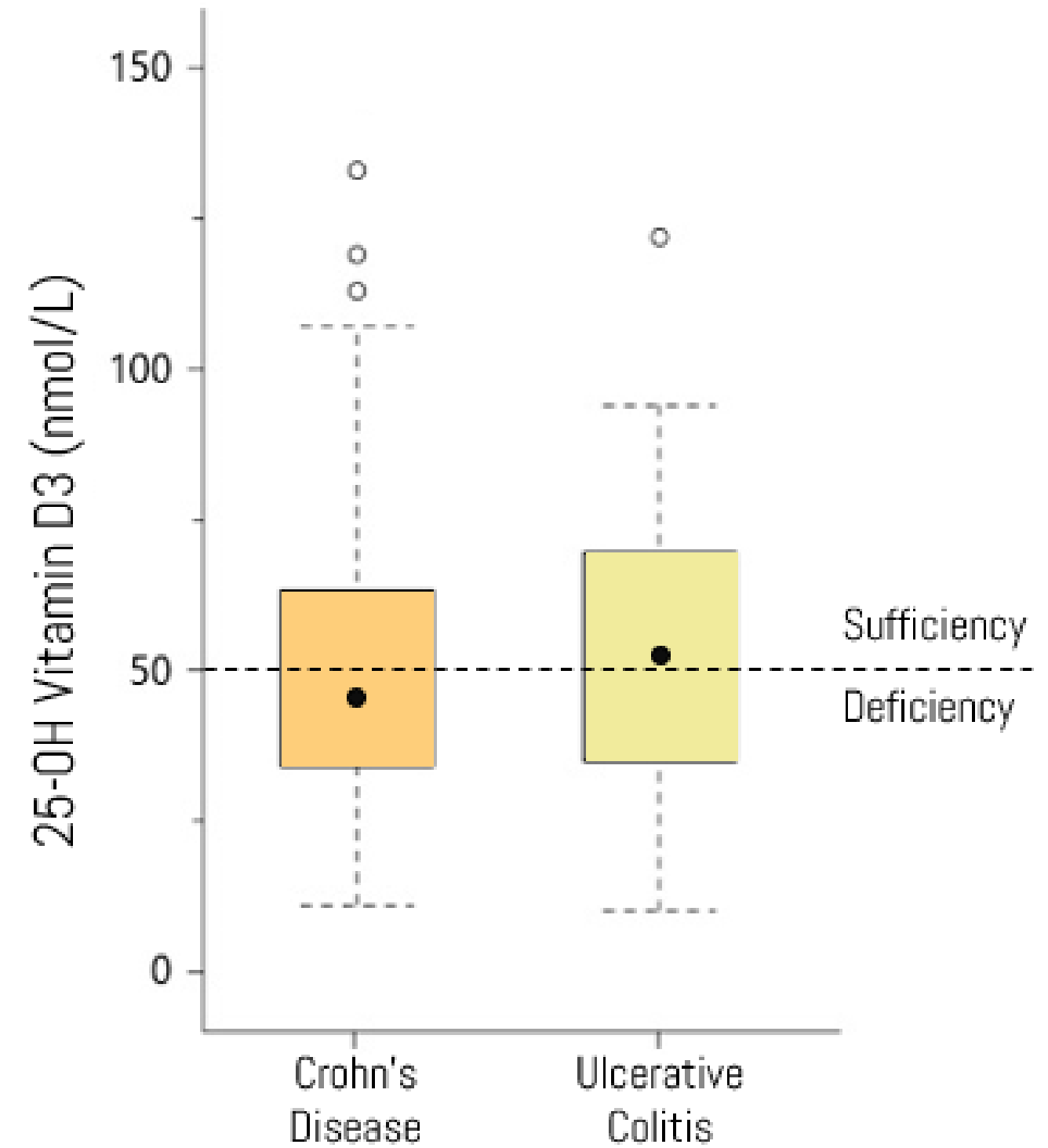
## Prevalence

IBD's effect on the US continues to grow. There has been an increase in IBD prevalence in the US from 0.9% (2 million adults) in 1999 to 1.3% (3 million adults) in 2015<sup>18</sup>. Further, the US has the highest age-standardized IBD prevalence in the world<sup>19</sup>.



# Vitamin D Deficiency and IBD

The connection between vitamin D levels and the presence of IBD has been well investigated. Several studies have found that individuals with vitamin D deficiency are at a greater risk of developing IBD<sup>20, 21, 22</sup>. Further, in some studies, up to 60-70% of individuals with IBD have vitamin D insufficiency<sup>21</sup>. In those individuals with IBD, a vitamin D deficiency makes them more susceptible to cancer, especially colon cancer. Low vitamin D levels also put individuals with IBD at a higher risk for *Clostridium difficile* infection. Vitamin D deficiency impacts the severity of IBD too. People with Crohn's disease and ulcerative colitis tend to have a more aggressive form of the disease if they have a vitamin D deficiency.<sup>23</sup>



Adapted from 24



# Summary

IBD and vitamin D deficiency are highly prevalent health issues worldwide and in the US, especially. Studies have connected the two, showing that vitamin D deficiencies can increase the risk of developing IBD. It has also been found that many individuals with IBD also have a higher prevalence of vitamin D deficiency. It is suspected that the gut microbiome is responsible for metabolizing vitamin D from its precursor form into its active form; thus, a more diverse gut microbiome will allow for increased metabolism and, subsequently, more active vitamin D.

This connection between IBD and vitamin D suggests that any labs testing for IBD should consider adding vitamin D tests to their portfolio to help better evaluate individuals' overall health.

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# About IDK, Inc.

Immundiagnostik, Inc. is the North American subsidiary of Immundiagnostik AG based in Bensheim, Germany. Located in Manchester, New Hampshire, we are a provider of innovative immunoassays and detection tools for clinical and research laboratories.

Our extensive product offering is continuously refueled by a rich pipeline of exclusive developments supported by collaborations with leading clinical and research laboratories, biopharma companies, and a global network of key scientific pioneers.

We understand that the results of our laboratory tests matter - there are people in need of the best possible clinical care - this is why we work to discover solutions on the cutting edge of science and provide reliable detection tools for laboratories to apply toward improved clinical outcomes.





# Contact Us

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