

Global Burden of Disease: Diarrhoeal Diseases

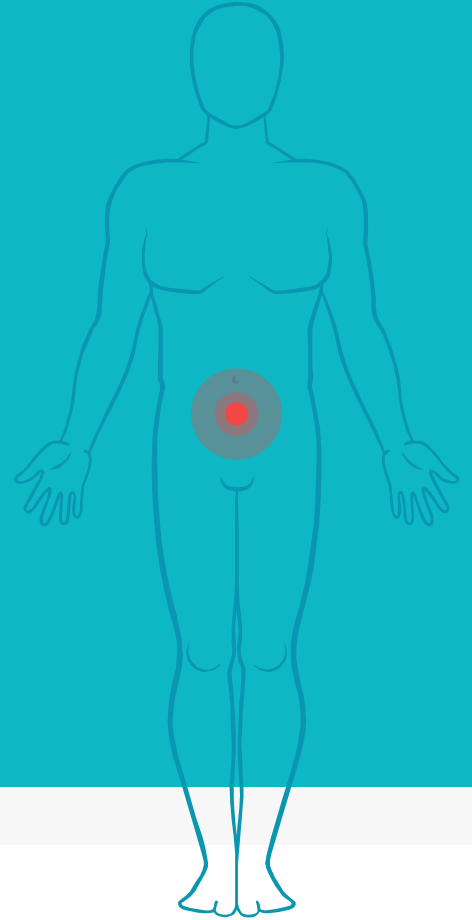
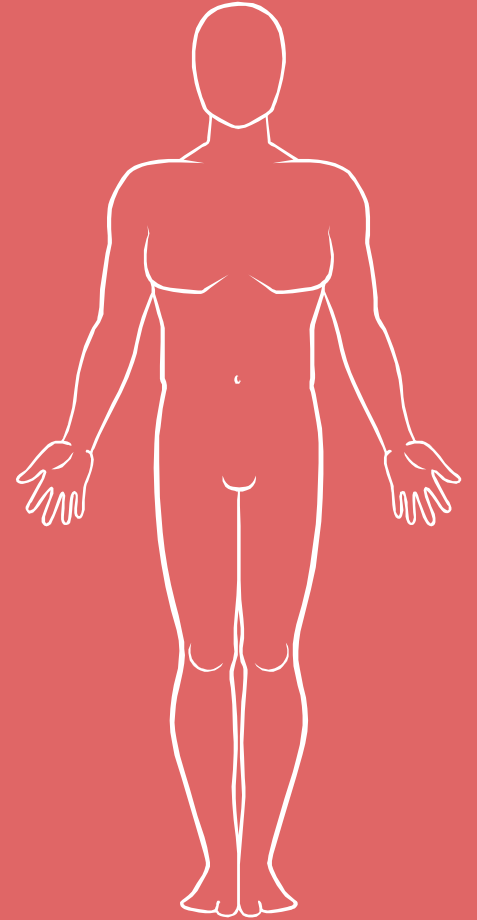


Table of Contents

1. What is the Global Burden of Disease?
2. Overview of Diarrhoeal Diseases
3. Epidemiology of Diarrhoeal Diseases
4. Pathophysiology of Diarrhoeal Diseases
5. Risk Factors associated with Diarrhoeal Diseases
6. Diagnosing Diarrhoeal Diseases
7. Treatment Options for Diarrhoeal Diseases
8. Future Burden of Diarrhoeal Diseases

Diarrhoeal Diseases

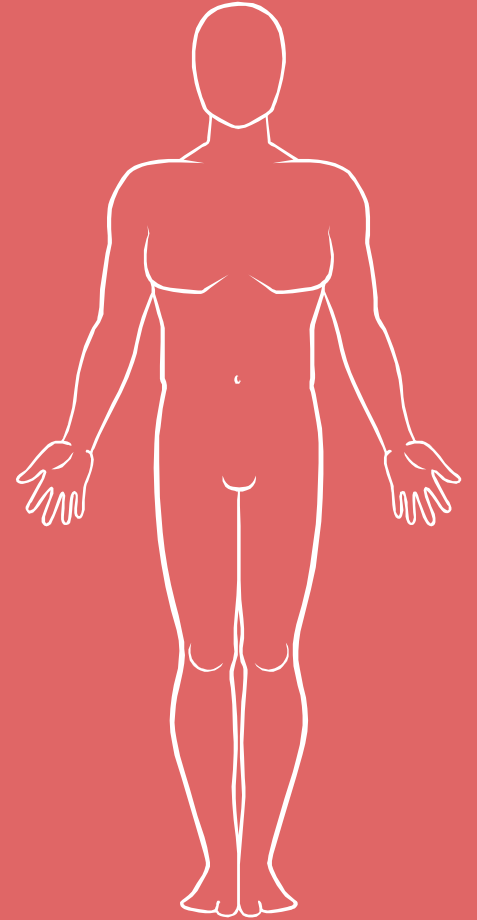


Overview: Why does this matter?

- ▷ Diarrhoeal Diseases have a significant global burden of disease
 - ▶ **“A disease of poverty”**
- ▷ Leading cause of childhood malnutrition in the world
- ▷ **Preventable and treatable**

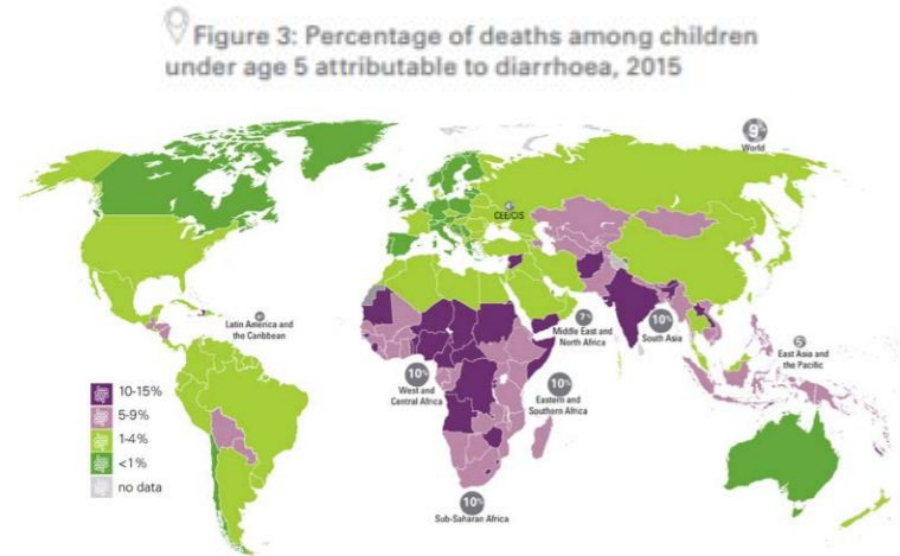


Epidemiology



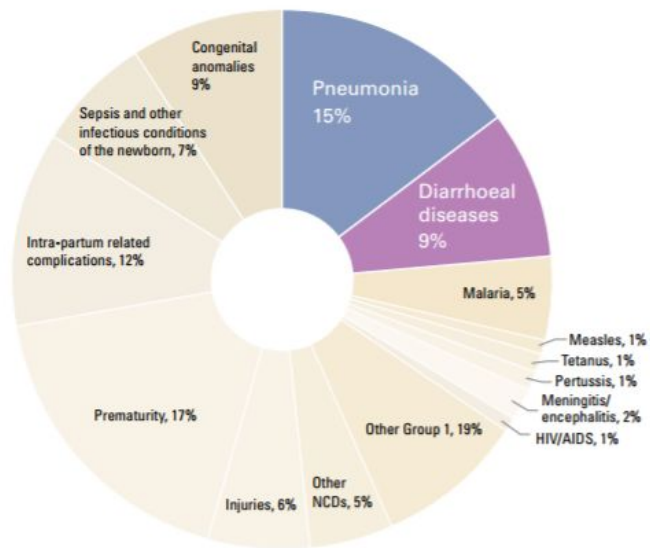
World Health Organization Statistics

- ▷ Diarrhoeal Diseases are the fifth leading cause of DALYs in the world
- ▷ From 2000-2012, 38% decrease in DALYs associated with Diarrhoeal Diseases
- ▷ Diarrhoeal Diseases affects individuals of all ages and ethnicities with **children** being the **most negatively affected**

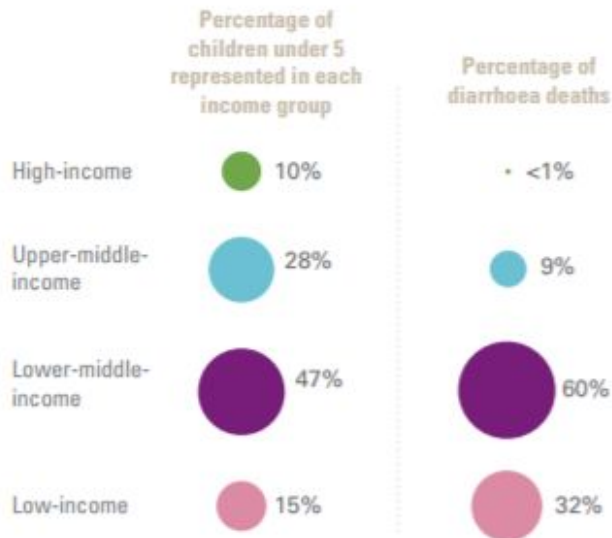


Causes of Childhood Mortality

Pneumonia and diarrhoea are responsible for almost a quarter of all deaths among children under 5 in 2015

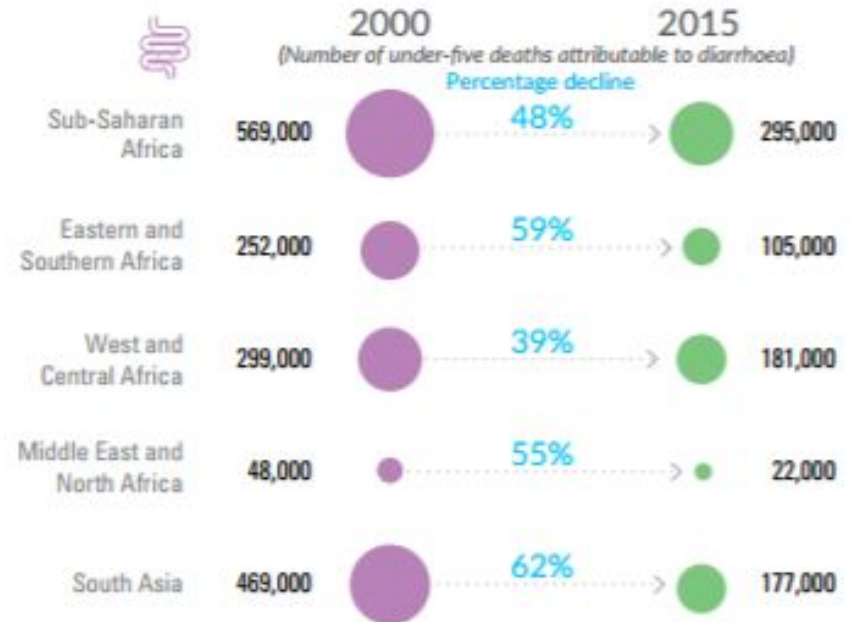


Children in low- and lower-middle income countries account for a disproportionate share of pneumonia and diarrhoea deaths

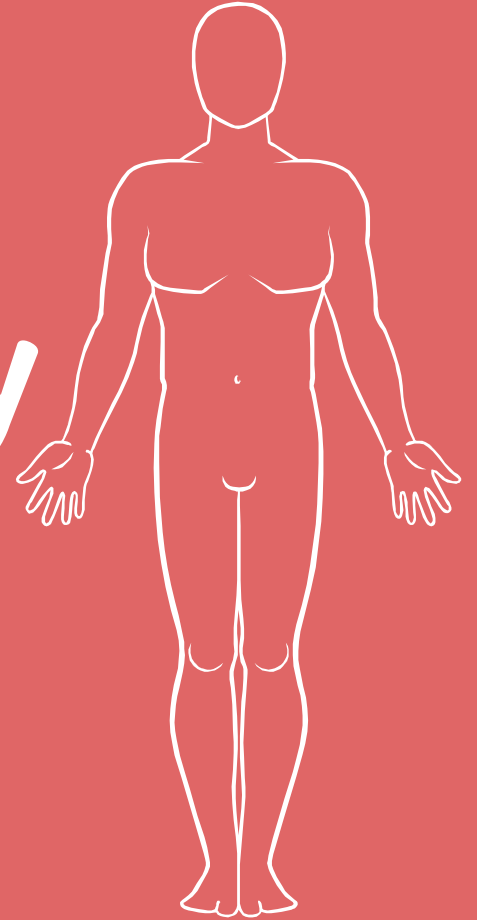


Substantial Progress

- ▷ **38% decrease** in DALYs associated with Diarrhoeal Diseases
- ▷ 8 million diarrhoeal deaths were averted between 2001-2015

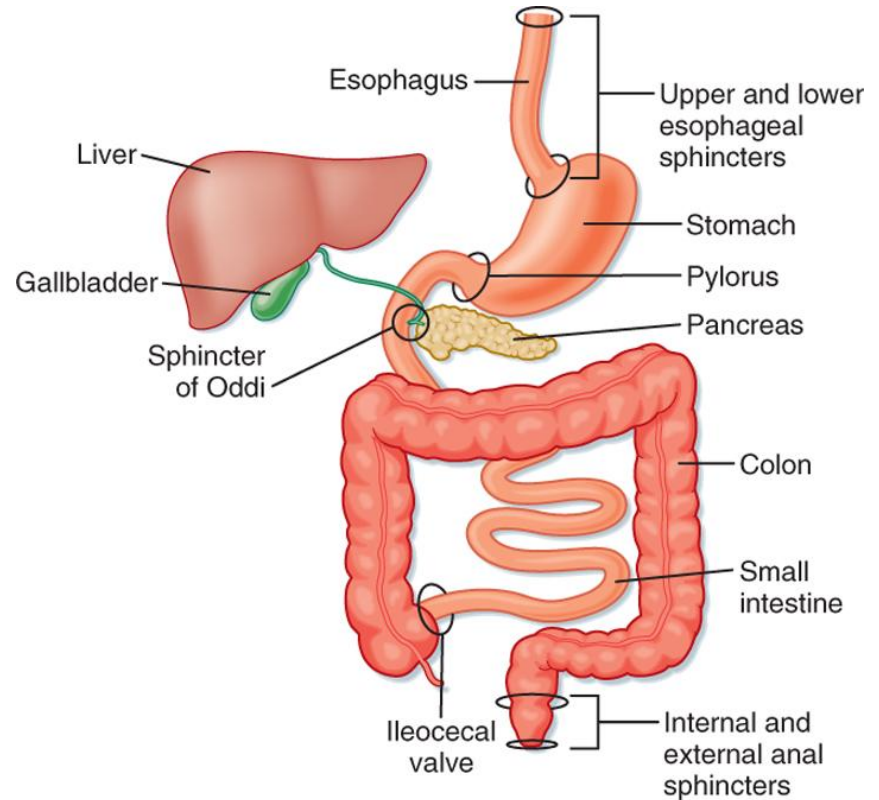


Pathophysiology



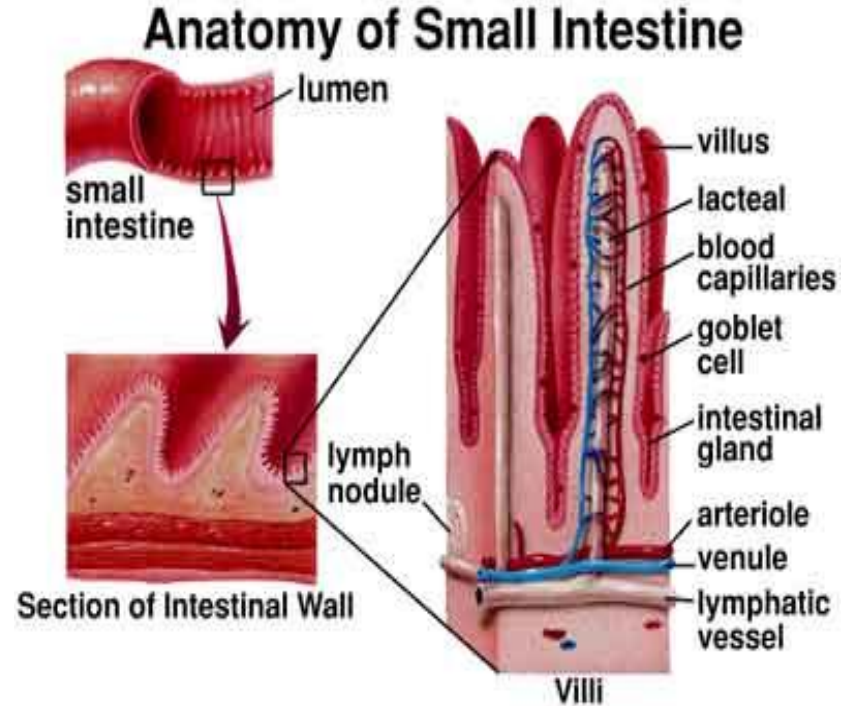
GI Tract Function and Anatomy

- ▷ Digestion of food and absorption of important nutrients and water
- ▷ Main anatomical components:
 - ▶ Mouth
 - ▶ Esophagus
 - ▶ Stomach
 - ▶ Small intestine
 - ▶ Large intestine
 - ▶ Anus



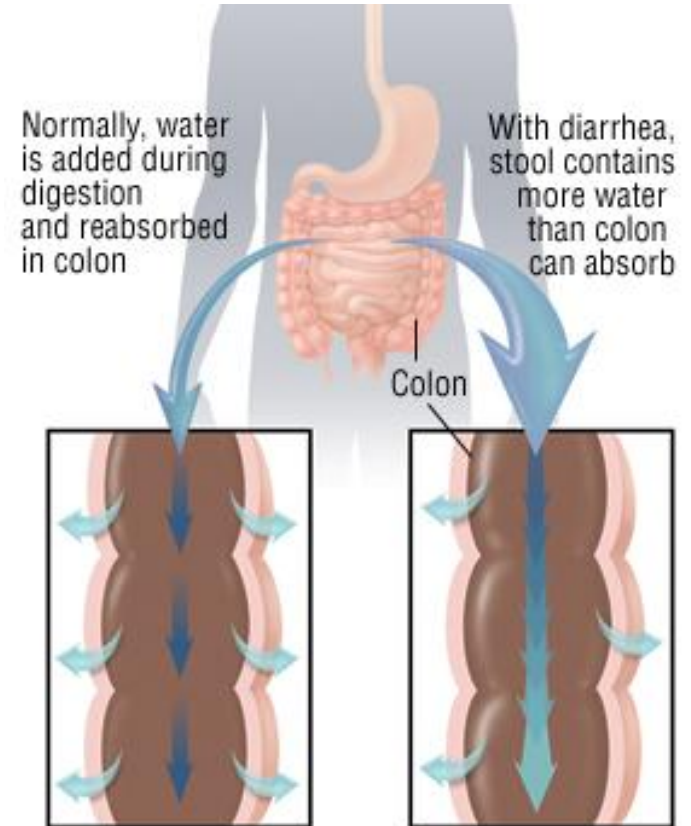
Cells of the Small Intestine

- ▷ Lined with villi
- ▷ Composed of simple columnar epithelial cells, aka **enterocytes**
- ▷ Main functions:
 - ▶ Water uptake
 - ▶ Nutrient uptake
 - ▶ Secretion of immunoglobulins



Diarrhea

- ▷ Increase in volume of stool or frequency of defecation
- ▷ Four main mechanisms of manifestation:
 - a. Osmotic Diarrhea
 - b. Secretory Diarrhea
 - c. Inflammatory Diarrhea
 - d. Deranged motility diarrhea



Osmotic Diarrhea

- ▷ Excessive amounts of insoluble solutes, water not reabsorbed
- ▷ 2 main reasons:
 - ▶ Ingestion of poorly absorbed substance
 - ▶ Malabsorption
 - ◆ Eg. lactose intolerance

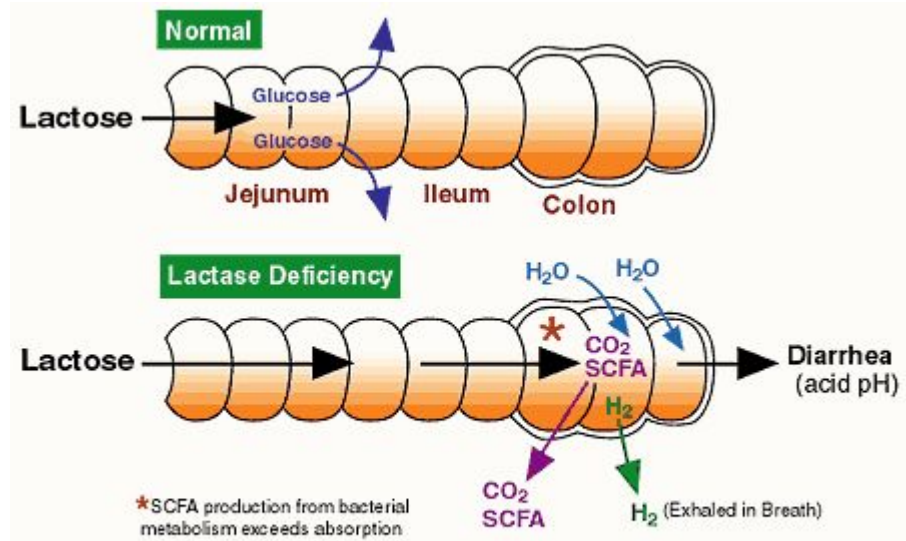


Fig. 2 Pathophysiology of Lactose Intolerance. SCFA = Short-Chain Fatty Acids.

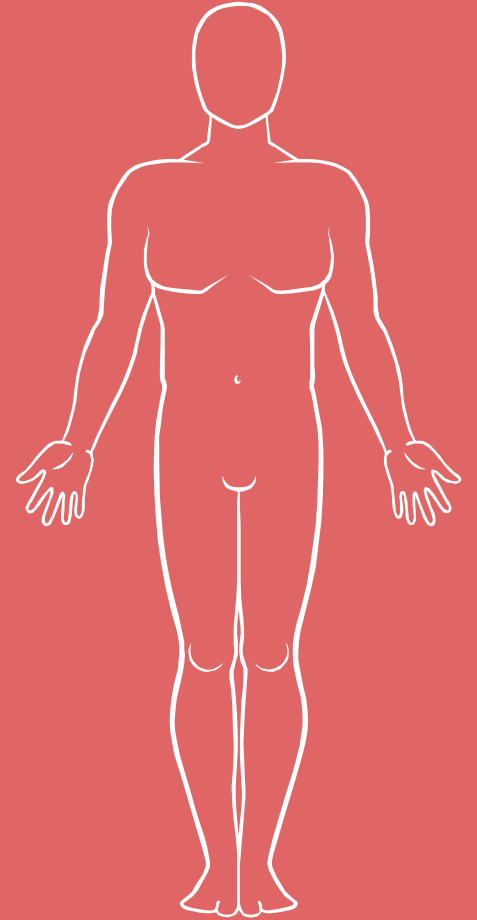
Secretory Diarrhea

- ▷ Abnormal ion transport, decrease in electrolyte absorption
- ▷ Exposure to toxins = prolonged opening of Ca ion channels
- ▷ Other causative agents:
 - ▶ Laxatives
 - ▶ Hormones
 - ▶ Drugs
 - ▶ Metals, organics toxins and plant products

Inflammatory & Deranged Motility Diarrhea

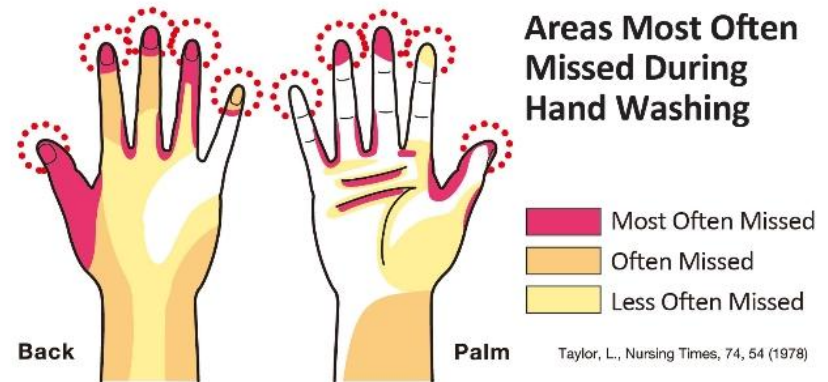
- ▶ Inflammatory: GI barrier breached by bacterial or viral pathogens
- ▶ Deranged Motility: intestinal contents accelerated, poor absorption rate

Risk Factors



Lifestyle Risk Factors

- ▷ Improper handwashing techniques
- ▷ Travelling
- ▷ Weakened immune system
 - ▶ Smoking
 - ▶ Alcohol abuse
 - ▶ Immunosuppressant medications

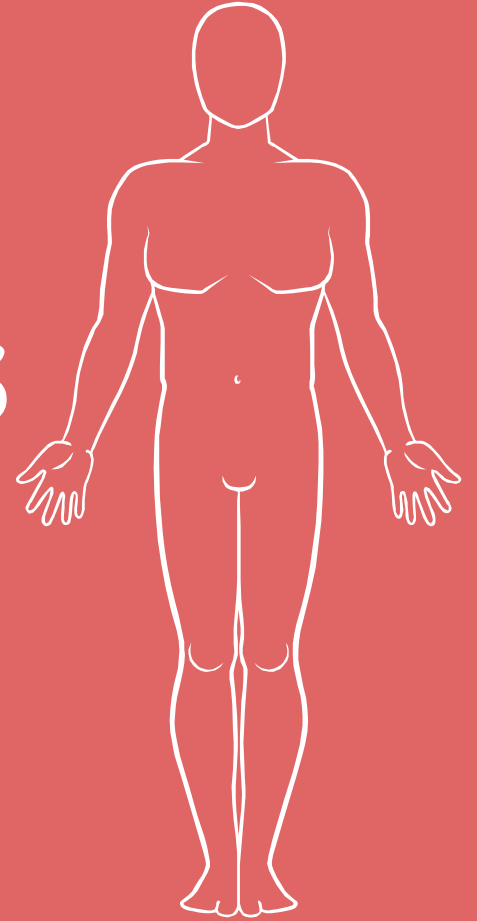


Physiological Factors

- ▷ Medications
 - ▶ Broad Spectrum Antibiotics
 - ▶ Antacids
- ▷ Food Intolerances
 - ▶ Lactose
- ▷ Intestinal Disorders
 - ▶ Crohn's disease



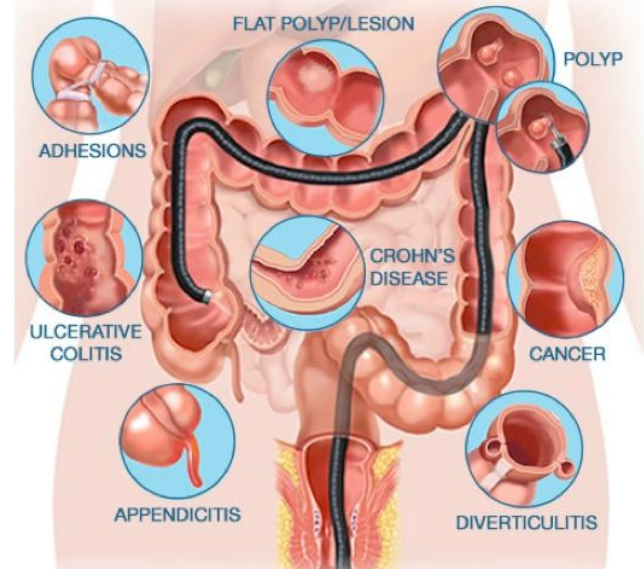
Diagnostic Tests



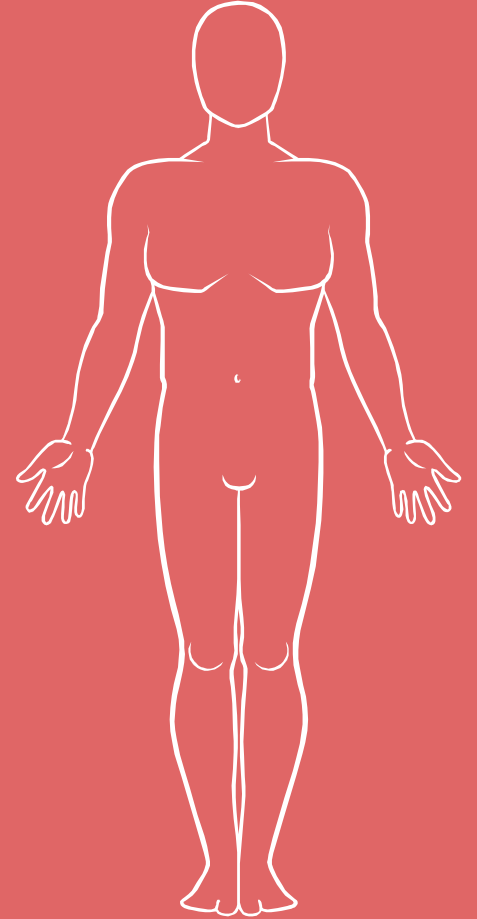
Diagnostic Tests

- ▷ Stool tests
 - ▶ Parasites, bacteria
 - ▶ Checked for color, shape, presence mucus, blood
 - ▶ Checked for fat
- ▷ Blood tests
- ▷ Digital rectal Examination (DRE)
- ▷ Colonoscopy
- ▷ Sigmoidoscopy

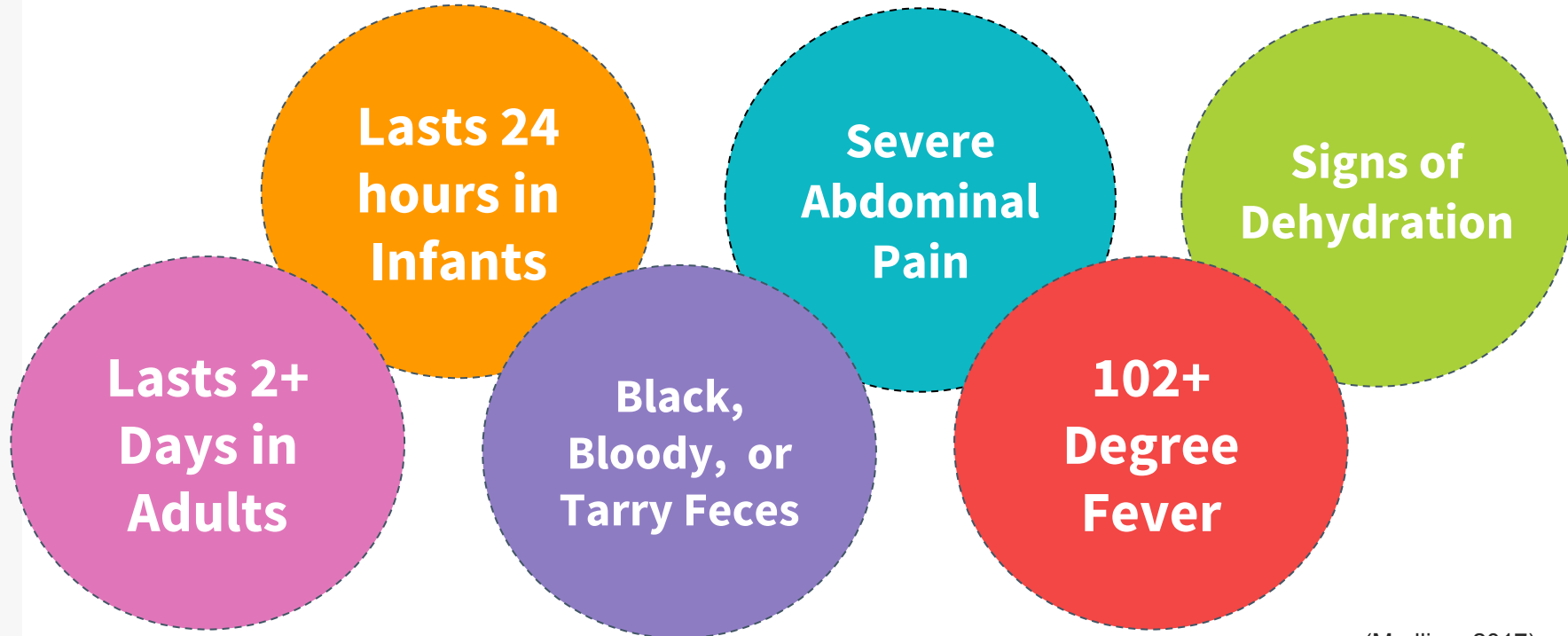
The COLONOSCOPY



Treatments



When to Seek Medical Attention



Signs of Dehydration



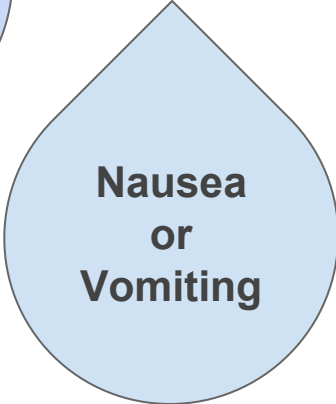
Headaches



Cramps



Dry Mouth



**Nausea
or
Vomiting**



**Excessive
Thirst**

Mild Cases



✗ AVOID ✗

- Caffeinated Beverages
- Alcohol
- Sugar-Free Gum or Candy

Over the Counter Treatments

- ▷ Anti-diarrheal medications can be used for symptom management
 - ▶ **Slow bowel motility**
- ▷ E.g. Imodium
 - ▶ Contains Loperamide
 - ▶ Slow contractions of intestines

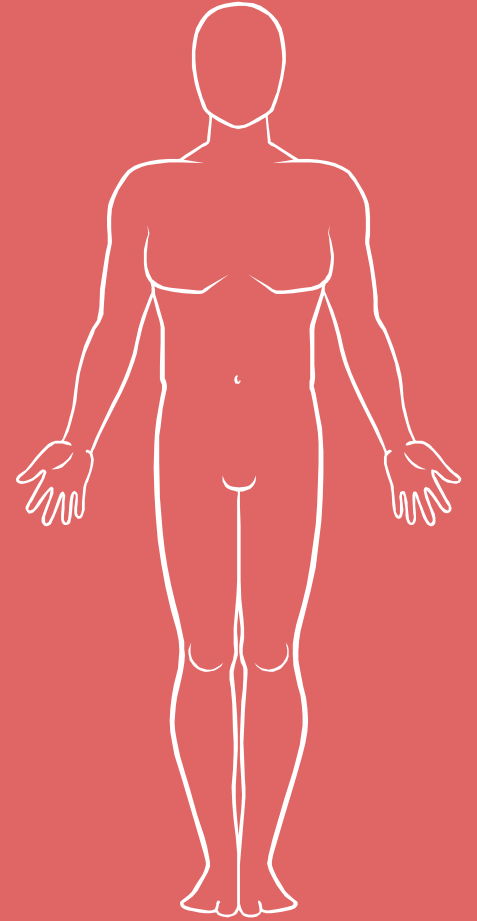


Treatments for Severe or Persistent Diarrhea

- ▷ Physicians may recommend antimicrobial or antiparasitic agents
- ▷ One of the most common bacterial cause is *Clostridium difficile*
 - ▶ Treated w/ Metronidazole
 - ▶ Kills anaerobic bacteria



Future Global Burden



Future Burden

- ▶ Most deaths occur in the **poorest regions** due to:
 - ▶ Poor hygiene
 - ▶ Malnutrition
 - ▶ Access to clean water
- ▶ Over **5 million** lives of children, under the age of 5 could be saved by 2030 by scaling up:
 - ▶ Protection
 - ▶ Prevention
 - ▶ Treatment

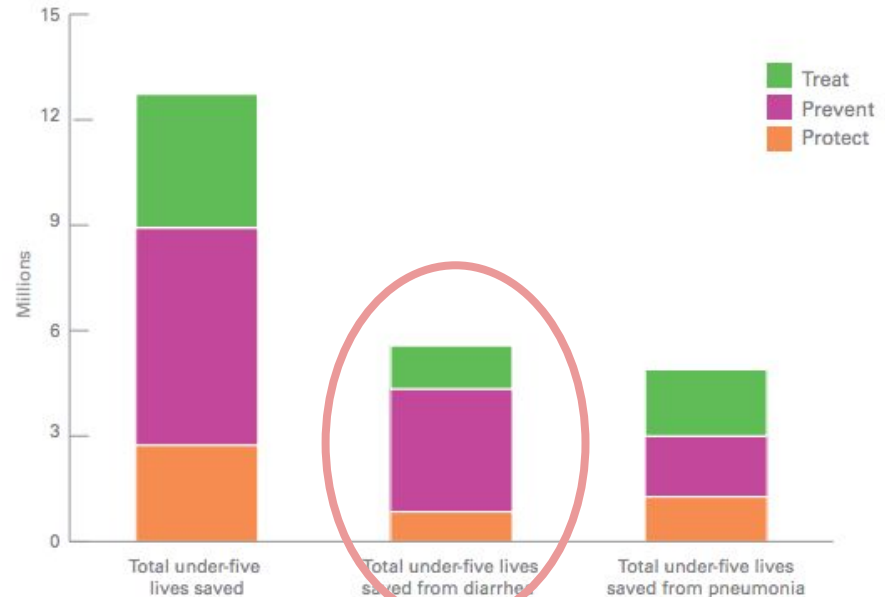


Figure 1: Estimated lives saved (2015 to 2030) from scaling up protect, prevent and treat interventions

Questions?

References

- Abraham, B., & Sellin, J. H. (2007). Drug-induced diarrhea. *Current gastroenterology reports*, 9(5), 365-372.
- Bailen, L. S. (n.d.) Diarrhea and Malabsorption. Retrieved from: <http://ocw.tufts.edu/Content/48/lecturenotes/571075>
- Bowen, R. (2006). Pathophysiology of Diarrhea. Retrieved from: <http://arbl.cvmb.colostate.edu/hbooks/pathphys/digestion/smallgut/diarrhea.html>
- DuPont, H. L. (2009). Bacterial diarrhea. *New England Journal of Medicine*, 361(16), 1560-1569.
- Ellershaw, J. E., Sutcliffe, J. M., & Saunders, C. M. (1995). Dehydration and the dying patient. *Journal of pain and symptom management*, 10(3), 192-197.
- Fischbach, F. T., & Dunning, M. B. (2009). *A manual of laboratory and diagnostic tests*. Lippincott Williams & Wilkins.
- Hamilton, A. C., & Auron, M. (2013). Diarrhea. *Hospital Medicine Clinics*, 2(2), e227-e246.
- Hung, B. (2006). The most common causes of and risk factors for diarrhea among children less than five years of age admitted to Dong Anh Hospital, Hanoi, Northern Vietnam, 16-18.
- Mayo Clinic.(n.d.). Diagnosis. <http://www.mayoclinic.org/diseases-conditions/diarrhea/diagnosis-treatment/diagnosis/dxc-20232996>
- Mayo Clinic. (2016, October 4). Traveller's Diarrhea. Retrieved from <http://www.mayoclinic.org/diseases-conditions/travelers-diarrhea/symptoms-causes/dxc-20251649>
- MU Health Care (2017). Anatomy and Function of the GI Tract. Retrieved from: <http://www.muhealth.org/services/surgical/bariatrics/getting-started/anatomy-and-function-of-the-gi-tract/>
- Rodriguez, D. (2009, January 7). Common Causes of Diarrhea. Retrieved from <http://www.everydayhealth.com/digestive-health/common-causes-of-diarrhea.aspx>
- Ross, M.H. & Pawlina, W. (2003) *Histology: A Text and Atlas, 4th Edition*. Lippincott Williams & Wilkins, Philadelphia.

References (2)

UNICEF (2016). One is too many: Ending child deaths from pneumonia and diarrhoea. Retrieved from:

https://data.unicef.org/wp-content/uploads/2016/11/UNICEF-Pneumonia-Diarrhoea-report2016-web-version_final.pdf

United Nations Children's Fund (2016). Pneumonia and Diarrhoea Report. Retrieved from:

https://data.unicef.org/wp-content/uploads/2016/11/UNICEF-Pneumonia-Diarrhoea-report2016-web-version_final.pdf

Webmd. (n.d.). Stool analysis. Retrieved from <http://www.webmd.com/digestive-disorders/stool-analysis#1>

World Health Organization (2013). Diarrhoeal Diseases. Retrieved from: <http://www.who.int/mediacentre/factsheets/fs330/en/>

World Health Organization. (n.d.). Estimates for 2000-2012: Disease Burden. Retrieved from: http://www.who.int/gho/phe/water_sanitation/burden_text/en/

Zaki, M., Gallad, K. B., Ramadan, D. G., & Ogila, S. (1999). A newborn with watery diarrhoea. *Postgraduate medical journal*, 75(882), 245-247.