

University of Northern Colorado

## Scholarship & Creative Works @ Digital UNC

---

Capstones & Scholarly Projects

Student Work

---

12-2021

### Development of a Culturally Adaptable Educational Program on Iron-Deficiency Anemia for use in Resource-Limited Communities.

Julie Hirman

*University of Northern Colorado*

Follow this and additional works at: <https://digscholarship.unco.edu/capstones>

---

#### Recommended Citation

Hirman, Julie, "Development of a Culturally Adaptable Educational Program on Iron-Deficiency Anemia for use in Resource-Limited Communities." (2021). *Capstones & Scholarly Projects*. 87.

<https://digscholarship.unco.edu/capstones/87>

This Scholarly Project is brought to you for free and open access by the Student Work at Scholarship & Creative Works @ Digital UNC. It has been accepted for inclusion in Capstones & Scholarly Projects by an authorized administrator of Scholarship & Creative Works @ Digital UNC. For more information, please contact [Nicole.Webber@unco.edu](mailto:Nicole.Webber@unco.edu).

UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

DEVELOPMENT OF A CULTURALLY ADAPTABLE EDUCATIONAL  
PROGRAM ON IRON-DEFICIENCY ANEMIA FOR USE IN  
RESOURCE-LIMITED COMMUNITIES

A Scholarly Research Project Submitted in Partial  
Fulfillment of the Requirements for the  
Degree of Doctor of Nursing Practice

Julie Hirman

College of Natural and Health Sciences  
School of Nursing  
Nursing Practice

December 2021

This Scholarly Project by: Julie Hirman

Entitled: *Development of a Culturally Adaptable Educational Program on Iron-Deficiency Anemia for Use in Resource-Limited Communities*

has been approved as meeting the requirement for the Degree of Doctor of Nursing Practice in College of Natural and Health Sciences in the School of Nursing, Program of Nursing Practice.

Accepted by the Scholarly Project Research Committee

---

Natalie Pool, Ph.D., RN, CNE, Research Advisor

---

Kathleen Dunem, Ph.D., APRN, CNM-BC, Committee Member

---

Carolyn Bottone-Post, DNP., CNM-BC, Committee Member

---

Melody Denny, PhD., Faculty Representative

Accepted by the Graduate School

---

Jeri-Anne Lyons, Ph.D.  
Dean of the Graduate School  
Associate Vice President for Research

## ABSTRACT

Hirman, Julie. *Development of a Culturally-Adaptable Educational Program on Iron-Deficiency Anemia for Use in Resource-Limited Communities*. Unpublished Doctor of Nursing Practice Scholarly Project, University of Northern Colorado. 2021.

Iron deficiency anemia (IDA) is a significant global health issue that disproportionately impacts individuals living in resource-limited countries. Access to professional healthcare in these regions is limited and rural communities often rely on specific community members for their basic health care needs. These community members, commonly referred to as community health promoters (CHPs), are seen as knowledgeable in informal or traditional healing practices and are often sought out when illnesses are present. This is a dynamic that could be cultivated and promoted to prevent and treat early stages of IDA. With culturally tailored support and education, advancing the healthcare knowledge of local CHPs might result in an increased awareness of IDA with the ultimate goal of empowering them to educate community members about prevention and early intervention. This scholarly project developed a culturally malleable, simple, low-cost educational program about IDA prevention and early intervention designed for CHPs in rural, resource-limited regions. The educational program was based on evidence from an extensive literature review and informed by a panel of experts using the Delphi technique. The evidence-based practice model by Rosswurm and Larrabee (1999) underpinned the project as a whole.

*Keywords:* iron-deficiency anemia, resource-limited, education, community health promoters

## TABLE OF CONTENTS

CHAPTER I. INTRODUCTION.....	1
Background.....	2
Statement of the Problem.....	9
Purpose of the Project.....	9
Need for the Project.....	10
Study Question.....	10
Objectives of the Project.....	10
Definition of Terms.....	11
Summary.....	11
CHAPTER II. REVIEW OF THE LITERATURE.....	13
Historical Background.....	13
Literature Review Methodology.....	14
Literature Synthesis.....	15
Summary of Literature Review.....	23
Conceptual Framework: Rosswurm and Larrabee’s Model of Evidence- Based Practice.....	24
CHAPTER III. METHODOLOGY.....	28
Design.....	28
Setting.....	30
Sample.....	30
Project Mission, Vision, and Objectives.....	31
Project Plan.....	34
Instrumentation.....	34
Data Analysis Procedures.....	35
Duration of the Project.....	35
Ethical Considerations.....	35
CHAPTER IV. DATA ANALYSIS AND RESULTS.....	37
Objective One: Results.....	37
Objective Two: Results.....	38
Objectives Three and Four: Results.....	46

Objective Five: Future Pilot Testing.....	50
Analysis of Study Question .....	50
CHAPTER V. DISCUSSION.....	51
Conclusions.....	51
Limitations .....	52
Recommendations for Future Practice.....	54
Reflections .....	54
Summary.....	57
REFERENCES .....	59
APPENDIX A. EVIDENCE SYNTHESIS TABLE .....	69
APPENDIX B. INSTITUTIONAL REVIEW BOARD APPROVAL.....	84
APPENDIX C. OUTLINE FOR EDUCATIONAL PROGRAM.....	87
APPENDIX D. RECRUITMENT LETTER.....	107
APPENDIX E. IRON-DEFICIENCY ANEMIA EDUCATIONAL PROGRAM: ROUND TWO .....	109
APPENDIX F. GUIDELINE FOR AN EDUCATIONAL PROGRAM ON IRON DEFICIENCY ANEMIA: FINAL DRAFT .....	158

## LIST OF TABLES

1.	Characteristics of Expert Panel.....	39
2.	Results from the Round 1 Questionnaire with Modification Plan.....	40
3.	Results of the Round 2 Questionnaire with Modification Plan .....	48
A1	Evidence Synthesis Table .....	70

## CHAPTER I

### INTRODUCTION

Anemia is a global health problem affecting one quarter of the world's population and is seen in every country regardless of economic position (World Health Organization [WHO], 2020). This condition is correlated with increased morbidity and mortality rates. Anemia not only affects the health of an individual, it also has social and economic impacts. Due to poor health outcomes associated with anemia, prevalence rates are an indicator of the overall health status of the country (Le, 2016).

There are several forms of anemia and hundreds of causes. The prevailing type of anemia and the one with the largest global impact is iron-deficiency anemia (IDA). Iron-deficiency anemia is frequently found in conjunction with other conditions such as nutritional deficiencies, parasitic infections, malaria, and hemoglobinopathies (Le, 2016; WHO, 2020). Healthcare goals are focused on the prevention, identification, and treatment of IDA. Minor changes to diet and lifestyle could have a significant positive impact on the individual and community (WHO, 2020). Even though IDA is a preventable condition and easily treated in early stages, anemia has devastating affects when there is a failure to identify and intervene in a timely fashion (Le, 2016; Stoltzfus et al., 1999; WHO, 2020).

Resource-limited countries have significantly higher prevalence rates and subsequent higher morbidity and mortality rates related to IDA in comparison to more economically and technologically advanced countries (WHO, 2020). Resource-limited countries are countries whose average gross national income per capita is less than \$1,035 (USD) per person per year



accompanied by fewer industrial and economic advancements (Worldbank, 2021). The reasons for the higher prevalence, morbidity, and mortality rates for IDA in these countries are complex and multi-faceted and include poor access to healthcare services and medical technology, financial instability, and variances in healthcare beliefs and practices (Stoltzfus et al., 1999; WHO, 2020).

To combat IDA in resource-limited communities, it is important to find sustainable, culturally appropriate, and financially feasible methods of preventing, diagnosing, and treating nutritional anemias. Many under-resourced rural communities rely on fellow community members for their basic healthcare needs, often referred to as community health promoters (CHPs), who have some form of informal or traditional knowledge (Meessen & Malanda, 2014; Najafizada et al., 2019). This dynamic could be cultivated to prevent and treat early-stage IDA. With culturally tailored education, advancing the healthcare knowledge of CHPs might result in an increased awareness around IDA accompanied by early intervention tactics in these communities.

## **Background**

Anemia is the general term used when the body does not have enough hemoglobin, which is the vital element responsible for transporting oxygen to organs and tissues (WHO, 2020). Without sufficient oxygen, the body does not function to its potential and serious health consequences could result, leading to the increased likelihood of health complications and death (WHO, 2020). Health complications for individuals with anemia have been extensively studied and range from mild to severe, potentially resulting in death (WHO, 2020). Those complications include but are not limited to decreased work capacity, lowered cognitive ability in children,

preterm labor, low birth weight babies, and death (Chandyo et al., 2016; Horton & Ross, 2003; Scott et al., 2014; WHO, 2020; Zhang et al., 2009).

The economic impact to both the individual and surrounding community can be seen with anemia. Loss of productivity by employees having fatigue or performing slower due to anemia has been estimated to be in the millions of dollars and can be as high as 5% of the country's gross national product (Horton & Ross, 2003). Simply by correcting anemia, an individual's productivity could increase by 5-17% (Horton & Ross, 2003).

Additionally, anemia has been linked to lower cognitive ability (Glazer & Bilenko, 2010; Horton & Ross, 2003; Zhai et al., 2011). Lower cognitive ability is defined as lower intelligence, poor sensory perception and attention span, and emotional and/or behavior problems (Glazer & Bilenko, 2010; Horton & Ross, 2003; Zhai et al., 2011). If anemia is not identified and resolved by the age of two, the consequences might result in permanent cognitive and developmental delays (Horton & Ross, 2003).

Maternal anemia has been linked with pre-term delivery (Rahmati et al., 2020; WHO, 2020; Zhang et al., 2009). Pre-term delivery is defined as when pregnant women deliver prior to completing 37 weeks gestation (Robinson & Norwitz, 2020). Infants born prior to 37 weeks gestation are at higher risks of being having low birth weight, life-long health complications, and higher mortality rates (Mandy, 2019, 2020). The infant mortality rate in preterm births could be greater than 50% in resource rich countries and even higher rates are seen in resource-limited countries (Mandy, 2020).

Not only are higher infant mortality rates related to anemia, all people have higher mortality rates when anemia is present. When severe anemia is seen in people with chronic conditions, there is a higher probability of death. Adults with severe anemia are 26 times more

likely to die as compared to those without anemia (Stoltzfus et al., 1999). Even modest improvement in anemia level by one point has been shown to decrease mortality rates in children by as much as 24% (Scott et al., 2014). Maternal mortality is just as devastating as approximately 20% of all perinatal deaths are a result of anemia with some countries having rates of anemia-related mortality as high as 40% (WHO, 2020).

### **Context of Anemia in Under-Resourced Regions**

The causes and types of anemia are vast, with the most common type being iron-deficiency anemia (WHO, 2020). The prevailing causes of world-wide IDA are a result of poor nutrition, parasitic infections, and malaria (WHO, 2020). Of the 1.62 billion people in the world with anemia, 70 million are in countries located on the continents of Africa, Asia, and parts of South America whereas only 1.4 million are noted in more economical stable areas such as the United States, Europe, and Canada; this corresponds to IDA prevalence rates that vary from 43% to 9%, respectively (WHO, 2020).

The population groups most impacted by anemia are disproportionately distributed with the highest prevalence in children and women (WHO, 2020). World-wide data showed that preschool-aged children were the population group suffering from anemia the most at 47% followed by pregnant women at 42%, 25% of children aged 6 to 17, 24% of elderly, and men aged 18 to 59 at 13% (WHO, 2020). These are average statistics of the 1.62 billion individuals with anemia around the globe. When looking at the distribution of anemia, the trend is consistent: resource-poor countries suffer significantly more. The WHO (2020) reported that amongst women of child-bearing age, those located in the Middle East and Africa have the highest rates of anemia. For example, the Middle Eastern country of Yemen has a prevalence rate of anemia that is greater than 70% among women and children whereas those in Canada and

Australia have a rate of 9%. Even greater disparity is noted in children under five; Burkina Faso and Yemen have anemia rates of 86% and 83% versus United States and Canadian rates of 8.5% and 9%, respectively (WHO, 2020). This trend is noted all over the world and resource-limited countries' anemia burden plays a significant role in the country's overall health stability.

The prevention and early identification of anemia is imperative to the health of the individual and community. Unfortunately, the barriers encountered are immense and access to healthcare is limited in many remote areas of the world. Poor healthcare infrastructure, physical distance of facilities, limited transportation and supplies, and reduced trust and confidence in health care are just a few of the issues local people confront in accessing health care in resource-limited countries.

Healthcare infrastructure is a critical requirement in attaining access to professional healthcare. Resource-limited countries have an inadequate number of hospitals and healthcare facilities to serve their growing populations (Strasser, 2003). The shortage of medical facilities limits the number of patients that seek medical assistance in these developing economies. Furthermore, the few medical facilities available are often understaffed with a chronic shortage of doctors, nurses, and specialists (Strasser, 2003). In many rural areas, the absenteeism of healthcare workers averages 35-40% and might reach as high as 74% in the most remote areas (Chaudhury & Hammer, 2004). Medications and supplies are often out of stock in these remote areas. Healthcare services are on a "first come, first served" basis and patients who visit such hospitals are faced with long queues, which necessitates setting aside an entire day to access care (Peters et al., 2008). Poorly equipped health centers disproportionately limit access to medical care and rehabilitation to marginalized groups such as expectant women and people with disabilities (Adugna et al., 2020).

Transportation services and infrastructure are important elements for healthcare access. Resource-limited nations generally lack adequate transport infrastructure, which hinders the ability to transport necessary medications and supplies to rural areas and inhibits emergency services (Adugna et al., 2020). Many critically ill patients die before they reach hospitals while others worsen their conditions due to poor transport infrastructure. Those living in poverty are often dependent on public transportation or must travel on foot to obtain health services. The time it takes to get to a healthcare facility and the cost for services rendered at that facility coupled with the public transportation fees lead to people in resource-limited countries opting out of visiting healthcare facilities (Adugna et al., 2020). This further leads to worsening conditions and delayed diagnosis and care. Thus, the identification and preventative education on IDA might be delayed and the progression from mild anemia to severe anemia is more frequently seen.

Rural areas have sparsely distributed health centers that require traveling long distances to access medical care. Most developing economies have a concentration of investment in urban areas, which neglects the rural communities (Najafizada et al., 2019). Skewed economic policies limit investment in rural healthcare infrastructure, further exacerbating the medical access disparities among rural communities (Strasser, 2003). There is a link between distance and time traveled to healthcare facilities and usage of these facilities: the further and harder to traverse, the less often visited (Peters et al., 2008). Local communities in remote areas have limited access to health care and might resort to traditional herbal medicine and advice from others in their community (Najafizada et al., 2019). With proper training, IDA could be prevented or managed at the early stages in the community but more severe forms require advanced treatment and intervention at a healthcare facility.

There is a distinct difference in availability of healthcare services depending on location. In resource rich countries such as the United States and Canada, there is an average of 2.67 physicians, 8.16 nurses, and 5.7 hospital beds per 1,000 people; whereas, in resource-limited continents such as Africa and Asia, there is an average of 0.21 physicians, 0.81 nurses, and less than one hospital bed per 1,000 people (Meessen & Malanda, 2014; Peters et al., 2008). There are locations that demonstrate less than 0.01 physicians to 1,000 people such as the countries of Ghana and Ethiopia. Additionally, most healthcare clinics are located in the urban areas (on average four times more) than in rural areas making access to healthcare even harder in these countries (Najafizada et al., 2019). To provide adequate healthcare support, a density of 2.3 healthcare providers per 1,000 people is recommended, thereby making the majority of resource-limited countries significantly lacking in access to health care (Meessen & Malanda, 2014). Unfortunately, the regions where IDA is most elevated are consistent with the regions that have a low density of healthcare providers and facilities.

Environment is a barrier to healthcare access in resource-limited countries. Rugged terrain in rural areas hinders the development of healthcare infrastructure due to high costs and remoteness (Strasser, 2003). Communities living in such a rugged landscape lack healthcare facilities. Paved roads could be virtually non-existent in poor areas of resource-limited countries (Peters et al., 2008). Drivable roads are necessary for people to access health facilities in a timely manner and are necessary for the distribution of medications and supplies (Peters et al., 2008). Additionally, harsh climatic conditions in some remote areas destroy the poorly developed infrastructure. Flooding in remote areas deems roads impassable, making health emergency evacuation challenging. Poor sanitation and garbage disposal in resource-limited nations also contribute to high incidences of cholera and other waterborne diseases (Strasser, 2003). Tropical

diseases such as malaria and dengue fever are common in these countries, thus overstressing the existing health system. In summary, poor road conditions and other geographical factors contribute to the inability to receive adequate care for IDA in many resource-limited countries.

### **Role of Community Health Promoters**

The shortage of professional healthcare clinicians and the unequal distribution of supplies and services are major contributors to health disparities in resource-limited countries (Najafizada et al., 2019; Perry et al., 2014). Community health promoters (CHPs) often fill the gap in health care where services are not available and serve as a link to professional services. For instance, in Afghanistan, it is estimated 60% of the maternal and child health care in rural locations is provided by CHPs (Najafizada et al., 2019). Community health promoters are an under-utilized resource in these countries; they are members of the community who have had some type of formal training but not at the duration or level of licensed or advanced-practice clinicians (Asweto et al., 2016; Javanparast et al., 2018; Najafizada et al., 2019; O'Donovan et al., 2018; Perry et al., 2014). Their training and scope of practice vary significantly from country to country (Asweto et al., 2016; Javanparast et al., 2018; O'Donovan et al., 2018; Perry et al., 2014). In some countries, the trainings are informal and primarily dependent on support from non-governmental organizations or faith-based organizations. In other countries, the trainings are more structured, formal, and sponsored by the government or other entities. In this case, CHPs might receive certificates upon completion. Community health promoters often serve as a link between the community and more advanced care by making referrals to hospitals, clinics, and licensed providers (Asweto et al., 2016; Javanparast et al., 2018; O'Donovan et al., 2018; Perry et al., 2014). The services CHPs provide range from basic hygiene practices such as

handwashing to health education and monitoring, pre-natal care and delivery, and herbal or over the counter medication administration.

Community health promotors in remote rural areas play a critical role in increasing access to health care and combatting stigma and misleading perceptions about certain health conditions (Andrews et al., 2018). Additionally, as these are local members of the community, they excel at tailoring health recommendations to be culturally appropriate and thus more easily accepted by community members (Perry et al., 2014). Within the context of anemia, CHPs could potentially serve an important role in the education and prevention of IDA in the communities where they live.

### **Statement of the Problem**

Iron deficiency anemia is a significant health problem for many populations in resource-limited communities. Due to challenges in accessing health care and financial concerns combined with the devastating effects of anemia, finding sustainable and cost-effective preventative methods and early recognition is imperative. Current preventative and intervention methods are insufficient to adequately combat this health problem. Partnering with local community health promotors might be an effective approach for reducing IDA morbidity and mortality.

### **Purpose of the Project**

The development of a culturally adaptable, simple, low-cost educational program on IDA based on evidence and informed by a panel of clinical experts was the purpose of this Doctor of Nursing Practice (DNP) scholarly project.



### **Need for the Project**

A variety of different programs have been instituted in resource-limited countries to decrease the prevalence of IDA, which are further described in Chapter II. Despite the successes some of these programs have had, it is apparent these efforts are not enough as evidenced by the continued prevalence and morbidity/mortality of IDA. To effectively combat IDA and its negative health effects, a multi-faceted approach must be implemented. No known programs use CHPs in the fight against IDA. Thus, there is a demonstrated need for the development of a culturally adaptable educational IDA program that could be utilized in the future in resource-limited communities.

### **Study Question**

This project aimed to answer the following research question:

- Q1 How can a culturally adaptable and appropriately scaled education program addressing iron-deficiency anemia be developed for community health promoters in resource-limited communities?

### **Objectives of the Project**

Objectives of this project were as follows:

1. Utilize existing literature to develop the framework for a culturally adaptable and appropriately scaled education program focused on IDA prevention and management by community health promoters in resource-limited communities.
2. Seek input from a panel of experts in global health care and/or community-based education in resource-limited communities regarding content, feasibility, and appropriateness of the proposed education framework.
3. After incorporating the panelists' initial input, create a more detailed draft of the education program and collect and analyze additional feedback.

4. Evaluate the revised draft of the education program with the panel of experts and make additional revisions until majority agreement is reached.
5. Propose a future pilot study to be implemented with community health promoters using the approved educational program in a resource-limited setting.

### **Definition of Terms**

**Anemia.** A medical condition in which there are not enough red blood cells in the blood.

**Clinical signs.** Observable evidence of disease.

**Community health promotor.** An unlicensed community member who has received some type of formal health training to perform a set of specific tasks to aid in the health of the individual (Perry et al., 2014).

**Hemoglobin.** A red substance in the red blood cells that contains iron and carries oxygen around the body.

**Iron-deficiency.** Insufficient iron in the body.

**Morbidity rate.** The number of people who have a particular disease or condition.

**Mortality rate.** The numbers of deaths caused by a particular condition.

**Resource-limited country.** A country with little industrial and economic activity and where people generally have low incomes (“Developing country,” 2019).

### **Summary**

Iron deficiency anemia impacts more than a quarter of the world’s population and has even higher prevalence rates among those living in resource limited communities. Many individuals in these areas face significant barriers and challenges in accessing iron-rich foods and adequate health care, thus IDA mortality and morbidity rates are higher. Some people living in rural communities rely on CHPs for their basic health care needs and the evidence

demonstrates that these specially trained individuals can be community assets. As with other diseases such as malaria, CHPs have the potential to enhance the fight against IDA. With the development of a simple and culturally adaptable program on IDA, this project aimed to provide CHPs with the knowledge and basic clinical skills to engage in prevention and early intervention to improve the health of their communities.

## CHAPTER II

### REVIEW OF THE LITERATURE

The development of a culturally adaptable, simple, low-cost educational program on IDA based on evidence and informed by a panel of clinical experts was the purpose of this Doctor of Nursing Practice (DNP) scholarly project. A literature review is a process that provides a comprehensive summary of previous research into the problem. This review of the literature was conducted to discover what was already known about IDA management by community health promoters in resource-limited settings and to evaluate if there was need for further research into this phenomenon. This chapter describes the historical background of IDA, determines the extent of the problem, what methods are being implemented to mitigate the problem, and discover what gaps, if any, exist in the diagnosing and prevention of IDA in resource-limited countries. This chapter also describes Rosswurm and Larrabee's (1999) model for evidence-based change as a conceptual framework that guided this scholarly project.

#### **Historical Background**

##### **Anemia**

Perhaps the first known documentation of anemia was recorded in the 'Papyrus' and 'Egyptian Manual of Therapeutics' in the 1500s BC ("History of iron deficiency anemia," 2011). In these documents, a medical condition called *chlorosis* was described and had the following symptoms: pallor, dyspnea, and edema ("History of iron deficiency anemia," 2011; Poskitt, 2003). During the 16<sup>th</sup> and 17<sup>th</sup> centuries, menstruating adolescent girls were noted to have

higher proportion of chlorosis and those who had poor dietary intake of iron were at higher risk (“History of iron deficiency anemia,” 2011; Poskitt, 2003).

It was not until the early 1900s that the link between iron and anemia was truly made and termed *iron deficiency anemia* (Poskitt, 2003). In 1931, Mackay (1932) ran hemoglobin levels on over 1,000 infants; her study showed a normal physiological change of hemoglobin and iron levels as a child aged and anemia was more pronounced in premature infants. Additionally, she noted that through examining and analyzing the diet of these infants, there was a link to iron levels and specific trends could be predicted (Mackay, 1932).

### **Community Health Promotors**

Community health promotors have been utilized to bridge the gap in health care for over a century. The first known CHPs were in the 1920s in China and were tasked with simple community education along with basic infection control, vaccination, and record keeping (Perry et al., 2014). The concept of CHPs as avenues for health care was slow to spread and be accepted until the 1960s when other countries (Indonesia, India, Tanzania, Venezuela, Honduras, and Guatemala) started having similar programs. Further expansion of these types of programs emerged in the 1970s after the WHO adopted these workers as essential partners (Perry et al., 2014). Currently, over 13 million CHPs work in a variety of countries ranging from a couple thousand to 1.5 million per country (Perry et al., 2014).

### **Literature Review Methodology**

An exhaustive literature review on IDA and resource-limited countries was conducted via the following databases: Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Cochrane Methodology Register, Cumulative Index of Nursing and Allied Health Literature and Medline. The search was performed between December 2020 and May

2021. The searched terms were “iron deficiency anemia” or “anemia” combined with the Boolean operator “AND” with terms “resource-limited countries” or “third world countries” or “developing countries” and “interventions” as well as “community health worker/promotor” or “traditional healer.” These search methods resulted in 441 potential articles.

The list was narrowed further to full-text scholarly journal articles dated from 2010 to 2021 in the English language. It was deemed to allow for inclusion of all patient types (infant, child, adult, male, female, pregnant) as IDA affects all ages, sexes, and human conditions. Exclusion criteria were other languages (nine), studies prior to 2010 (268), non-human subjects (two), studies conducted in resource-full countries (six), chemical names (46), and malaria or other parasitic diseases (37). Duplicated articles were removed (29) and editorial (one) and commentary articles (four) were excluded. The list of potential articles was further reviewed by examining the titles and/or abstracts to determine relevance or if needing to be excluded (seven) as not being pertinent to the project focus. The list was filtered down to a total of 32 articles that were deemed to be relevant to the research focus and were assembled in an evidence synthesis table (see Appendix A). The evidence synthesis table was formatted to analyze the articles for patterns, themes, and trends.

### **Literature Synthesis**

Several themes and trends emerged from the literature review. These themes were categorized and are discussed in the following sections: prevalence, testing methods, clinical assessment, prevention programs, and non-pharmacological methods of treatment. Additionally, the search provided information about CHPs and their role and training in resource-limited communities.

## **Prevalence**

The discovery of IDA prevalence in developing countries is well known and documented. Detailed research articles and official and reliable internet governmental and non-governmental websites report and capture this data on a regular basis. The summary of findings regarding prevalence were illustrated comprehensively in Chapter I but virtually all the articles discussed some form of prevalence rates ranging from 30% to more than 70% across under-resourced populations (Abeywickrama et al., 2018; Abujilban et al., 2018; Aldridge et al., 2012; Callister et al., 2020; Chandyo et al., 2016; Detzel & Wieser, 2015; Golden et al., 2011; Khan et al., 2015; Loy et al., 2019; Lu et al., 2017; Martial et al., 2021; McGann et al., 2015; Moor et al., 2016; Olupot-Olupot et al., 2019; Pratt, 2015; Rosado et al., 2010; Salah et al., 2018; Tata et al., 2019; Van Phu et al., 2010; Vasan et al., 2013; Yilma et al., 2020). Additionally, several trustworthy websites were accessed including the WHO, Centers for Disease Control (CDC) and Central Intelligence Agency (CIA). While the prevalence rates of anemia were slightly varied across these sources, the conclusions were similar—IDA is more problematic and prevalent in resource-limited communities.

## **Testing Methods**

Nearly all of the articles utilized some sort of testing equipment to identify and/or confirm presence of IDA (Abujilban et al., 2018; Aldridge et al., 2012; Callister et al., 2020; Chandyo et al., 2016; Golden et al., 2011; Khan et al., 2015; Lu et al., 2017; Martial et al., 2021; McGann et al., 2015; Moor et al., 2016; Olupot-Olupot et al., 2019; Pratt, 2015; Salah et al., 2018; Tata et al., 2019; Vasan et al., 2013; Yilma et al., 2020). These testing methods were employed to provide validity to support the research findings and diagnose anemia. Nine of the studies included in the literature review focused on analyzing which types of testing methods

were currently being utilized or had program effectiveness (Abujilban et al., 2018; Aldridge et al., 2012; Chandyo et al., 2016; Khan et al., 2015; Lu et al., 2017; McGann et al., 2015; Olupot-Olupot et al., 2019; Salah et al., 2018; Vasan et al., 2013).

Five studies evaluated the reliability of clinic-based testing methods (Aldridge et al., 2012; Khan et al., 2015; Lu et al., 2017; McGann et al., 2015; Olupot-Olupot et al., 2019). These types of testing methods were common in resource-limited areas where access to laboratory care facilities was limited for a variety of reasons. For resource-limited countries, a point-of-care (POC) testing method was commonly used and recommended (Khan et al., 2015; Lu et al., 2017; McGann et al., 2015). A POC is a diagnostic test performed outside of a laboratory and provides rapid testing results, usually within 15 minutes. With this information, diagnosing and treatment plans could be implemented with the goal of preventing poor health outcomes related to anemia.

Lu et al. (2017) and McGann et al. (2015) evaluated a new POC system that was effective in identifying severe anemia, thereby allowing the treatment of IDA to occur sooner. McGann et al. determined their POC testing was relatively inexpensive at a rate of 25 cents (USD) per test. However, not included in that rate was the cost associated with physically obtaining the samples. While both methods were determined to be effective at identifying anemia, additional studies are needed to validate their findings and to determine if their systems are feasible in resource-limited communities.

The remaining three studies (Aldridge et al., 2012; Khan et al., 2015; Olupot-Olupot et al., 2019) evaluated several clinic-based screening methods—the hemoglobin color scale (HSC), colorimetric, and SAHLi's method—and compared them to the gold standard: Hemocue. The SAHLi's method (EKF Diagnostics, 2021) was developed in 1902 and is still used in many countries. This method requires a small amount of blood to be mixed with hydrochloric acid and



then compared to readings on the machine to determine hemoglobin levels. The HCS was developed in 1995 by the WHO (2020) and is used widely in resource-limited communities. In this method, a small blood sample is placed on the test strip and then visually matched to color scales on the card that correspond to hemoglobin levels. The colorimetric system also requires a blood sample and chemical compound mixed; the resulting color indicates anemia level (Olupot-Olupot et al., 2019).

Aldridge et al. (2012) and Khan et al. (2015) compared clinical assessment of pallor and HCS, whereas Olupot-Olupot et al. (2019) compared clinical assessment, HCS, colorimetric and SAHLi methods. Regarding reliability and cost, their assessments indicated the Hemocue was most reliable but the cost (\$350) per testing machine and \$4 per test was restrictive in many situations (Olupot-Olupot et al., 2019). While the SAHLi meter was cheaper at \$50 per machine and 25 cents per test, the need for chemicals and technical training prevented this from being widely used in clinical sites. The HSC was very cost effective but varied significantly in reliability with a sensitivity rate as low as 33% in some instances (Aldridge et al., 2012; Khan et al., 2015; Olupot-Olupot et al., 2019). Virtually all of the articles illustrated the need to have a cost-effective method of identifying IDA in resource-limited communities; however, very few addressed the fundamental issues of access to health care and upkeep, staff training, and maintenance of the testing equipment long-term.

### **Clinical Assessment**

While prior studies have shown relative reliability and accuracy of data regarding the various methods of measuring anemia, only four studies (Aldridge et al., 2012; Khan et al., 2015; Olupot-Olupot et al., 2019; Stoltzfus et al., 1999) evaluated the effectiveness of clinical assessment. In the study conducted by Olupot-Olupot et al. (2019), nurses and providers

clinically assessed patients for anemia at a local hospital in Uganda. While their study did not indicate the clinical reasoning behind the clinicians' diagnostic findings, the study showed good and consistent agreement between nurses and providers in their categorization of anemia as mild, moderate, or severe. However, when comparing provider assessment results with data from their gold standard of Hemocue diagnostic testing, the clinicians tended to overestimate mild anemia and underestimate children with moderate and severe anemia. Clinical assessment was determined to have a sensitivity rate of 72% and specificity rate of 70% of anemia (Olupot-Olupot et al., 2019).

Similarly, Aldridge et al. (2012), Khan et al. (2015), and Stoltzfus et al. (1999) found the same trend of clinical assessment over-estimating the presence of anemia in Pakistan, Nepal, and Zanzibar. The implication was there would likely be some individuals who would receive intervention that was not needed. The accuracy of correctly identifying anemia by clinicians in one of the studies was 60-80% (Khan et al., 2015). However, it could be assumed that by overestimating mild anemia, if interventions were initiated at an earlier stage, progression to moderate and severe anemia might occur less frequently.

Overall, the literature suggested clinical assessment of anemia could be unreliable with healthcare providers over-estimating cases of mild anemia and under-estimating cases of severe anemia. However, because laboratory testing for IDA remains limited in under-resourced settings, clinical assessment is often the only mechanism for diagnosing and early intervention of IDA in resource-limited communities.

### **Prevention Programs**

A variety of preventative and treatment programs have been implemented in different countries to combat anemia. Many programs are widespread across entire countries and include

interventions such as the introduction of iron-fortified foods or iron supplements (Abeywickrama et al., 2018; Detzel & Wieser, 2015; Diamond-Smith et al., 2016; Loy et al., 2019; Pratt, 2015; Rosado et al., 2010; Salah et al., 2018; Stoltzfus, 2011; Van Phu et al., 2010; WHO, 2020). This has been shown to be helpful in reaching large numbers of people with minimal effort needed to evaluate those specific individuals. Six studies investigated iron supplementation to high-risk groups (Diamond-Smith et al., 2016; Loy et al., 2019; Pratt, 2015; Rosado et al., 2010; Salah et al., 2018; Stoltzfus, 2011). These studies found supplementation was helpful in the fight against anemia but there were barriers regarding adherence taking the supplements. Financial limitations and lack of knowledge were the main causes of poor adherence at the individual level (Abirami et al., 2018; Diamond-Smith et al., 2016; Loy et al., 2019; Rosado et al., 2010) whereas lack of adequate infrastructure to supply the supplements was discovered at the organizational level (Stoltzfus, 2011). On the other hand, iron-fortified food programs have been successful in many countries (Abeywickrama et al., 2018; Detzel & Wieser, 2015; Van Phu et al., 2010). However, these programs need to have ongoing governmental support to continue to be effective.

Abirami et al. (2018) studied pregnant women attending prenatal care at a rural hospital in India and found knowledge of IDA among individuals was weak. None of the 52 women who partook in the survey were found to have adequate knowledge of IDA. Adequate knowledge was deemed as accurately answering at least 68% of the questions presented on IDA. What this study illustrated was knowledge and understanding in the general population was lacking; therefore, educational programs might have been of benefit. To further support this, no other studies were located that examined a grassroots investigation into understanding of IDA among rural populations.

Very few studies were located that described program implementation at a local level. Martial et al. (2021) rolled out a program that offered biannual outreach clinics in Haiti. Every six months, the investigators would provide medications, vitamins, supplies, and education to community members. Findings from this study suggested the more clinic visits the community members had, the more improvement in hemoglobin levels among those members. This suggested regular contact with health-promoting programs was beneficial for IDA management.

### **Non-Pharmacological Interventions**

Four studies were located that trialed non-pharmacological interventions to improve the anemia status of the population of focus. The studies involved small group educational programs (Moor et al., 2016; Yilma et al., 2020), supplying iron-pots for cooking (Moor et al., 2016), modifications of school food (Moor et al., 2016), dietary changes (Callister et al., 2020; Golden et al., 2011; Tata et al., 2019), and free biannual health clinics (Martial et al., 2021; Moor et al., 2016). All these programs were successful and showed improvement in hemoglobin levels ranging from an increase of 0.3g/dl to 1.8g/dl among the participants.

Several studies suggested dietary intake and local food sources had a significant influence on hemoglobin levels (Callister et al., 2020; Golden et al., 2011; Tata et al., 2019). Two main themes noted in these studies were that those people who had more access and availability of meat products, mostly in the realm of wild animals, had higher hemoglobin levels than those who consumed less (Callister et al., 2020; Golden et al., 2011; Tata et al., 2019). However, the availability of local vegetables and plants high in iron also had a positive impact on hemoglobin levels (Callister et al., 2020; Tata et al., 2019). Eru, a dark green leafy vegetable common in the forests of Ghana, was the main contributor to higher hemoglobin levels in one study (Tata et al., 2019) whereas differences in consumption of iron-rich vegetables were noted to contribute to

better hemoglobin areas in other parts of Africa (Callister et al., 2020). While these results were not surprising, this illustrated the need to incorporate local and cultural food traditions when planning IDA interventions.

### **Community Health Promotors**

Several themes emerged surrounding CHPs when conducting the literature review: education/background, training and supervision, scope of practice, role in the community, and effectiveness (Abdel-All et al., 2017; Aldridge et al., 2012; Asweto et al., 2016; Javanparast et al., 2018; Jeet et al., 2017; Najafizada et al., 2019; O'Donovan et al., 2018; Perry et al., 2014). The educational backgrounds of CHPs were predominantly primary and secondary school education but there were some documented cases of university level CHPs (Abdel-All et al., 2017; O'Donovan et al., 2018; Perry et al., 2014). The initial training and educational background of CHPs varied from region to region and ranged from 45 minutes to a 12-month long training (Abdel-All et al., 2017; Aldridge et al., 2012; Javanparast et al., 2018; Perry et al., 2014). Additionally, continued supervision of CHPs after initial training varied from minimal to regular checks-in from the sponsoring entity (Aldridge et al., 2012; Asweto et al., 2016; Javanparast et al., 2018; Najafizada et al., 2019; O'Donovan et al., 2018; Perry et al., 2014).

In general, the duties assigned to CHPs included health education for disease prevention and sexual reproduction, monitoring of maternal well-being, assisting in deliveries of newborn children, data collection of pre-determined health statistics, identification of common health diseases such as malaria, and referrals as needed to higher levels of care (Abdel-All et al., 2017; Asweto et al., 2016; Javanparast et al., 2018; Najafizada et al., 2019; O'Donovan et al., 2018; Perry et al., 2014). Numerous studies indicated CHPs were effective at reducing undernutrition and mortality in children under the age of five, the spread of HIV, and other communicable/

noncommunicable diseases while also improving women's health (Abdel-All et al., 2017; Asweto et al., 2016; Javanparast et al., 2018; Najafizada et al., 2019; O'Donovan et al., 2018; Perry et al., 2014; WHO, 2020). CHPs are noted to be competent with diagnosing a variety of conditions and managing mild cases (Cherrington et al., 2010; Jeet et al., 2017; Najafizada et al., 2019; O'Donovan et al., 2018; Perry et al., 2014).

Finally, this portion of the literature review highlights an additional benefit of CHPs in that they are already members of the community and thereby able to connect with and build effective relationships within the community (Asweto et al., 2016; Cherrington et al., 2010; Javanparast et al., 2018; O'Donovan et al., 2018; Perry et al., 2014). Community health promoters' intimate knowledge of community needs helped to foster trusting relationships and increased the effectiveness of this group of healthcare partners. In addition, CHPs were in a unique position to provide culturally relevant interpretation, modification, education, and support surrounding health (Cherrington et al., 2010; O'Donovan et al., 2018; Perry et al., 2014).

### **Summary of Literature Review**

Iron deficiency anemia is prevalent and poses significant health concerns in resource-limited countries. Various healthcare testing methods utilized in these locations have been proven to be effective and reliable in identifying people with IDA. While many studies indicated clinic-based testing methods such as Hemocue were superior to clinical assessment in identifying anemia, persons with severe anemia could be identified correctly 60-80% of the time by clinical examination (Khan et al., 2015). National programs such as iron fortification of foods have had some success but often did not adequately address rates of anemia across populations. Programs such as the one conducted by Martial et al. (2021) in Haiti were successful but were questionable as to sustainability due to reliance on funding resources that might be limited. As knowledge and

education have longer-lasting effects, educating community members on signs of anemia and local food sources to combat anemia could be a sustainable solution.

Further identified in the literature were the personal barriers to accessing formal healthcare services and iron fortified foods in resource-limited areas. Of note, the majority of healthcare services were conducted in cities and towns, which made it difficult to access for more rural populations due to topographical terrain, distance, and lack of roads and transportation.

For global reporting purposes, objective data from laboratory testing were utilized to determine IDA prevalence (WHO, 2020). However, accessing sufficient numbers of people to participate in research studies was difficult in remote locations due to the aforementioned difficulties of terrain and road access. To access greater numbers of participants, research studies depend greatly on having the participants come to them at local healthcare facilities such as hospitals and clinics (WHO, 2020). Thus, it is highly likely the prevalence of anemia in remote locations is much higher and the severity of this condition is leading to even greater mortality and morbidity.

Of note, no research articles were located that addressed the teaching of anemia prevention and treatment to CHPs despite this group being utilized to reduce and manage a wide variety of other diseases. Although partnering with CHPs has been a proven strategy for improving community health in resource-limited regions, it has yet to be attempted with regard to a culturally adaptable IDA educational program.

### **Conceptual Framework: Rosswurm and Larrabee's Model of Evidence-Based Practice**

Rosswurm and Larrabee's (1999) model of evidence-based practice was initially developed in 1999 and has not undergone any further revisions. Their model has been utilized as

a basis for other theoretical frameworks and research studies. This model was a catalyst in changing the foundation of how research guides clinical practice (Rosswurm & Larrabee, 1999). It provides a straightforward, clear, and concise method to guide researchers in identifying the source of the problem, obtain evidence, and then foster and disseminate research findings into practice. This model provides six steps to critically evaluate research findings and integrate them into clinical practice: assess, link, synthesize, design, implement, and integrate. It should be noted these steps are fluid and not strictly linear throughout the research process.

### **Step 1: Assess**

The initial step of this model entails assessing the need for a change in the current way things are conducted. This step investigates the “why” a change might be needed. This step involves clearly identifying and stating the problem and collecting and evaluating the current manner of addressing the issue. This initial need for change could come from a variety of aspects such as noting poor health outcomes, new research data, or health directives from an organizational leadership.

For this scholarly project, this step was the evaluation of the prevalence of IDA in resource-limited settings and subsequent health and economic consequences. Upon evaluation of an extensive review of the literature and establishment of the prevalence of IDA using globally recognized sources, it was determined an educational program might augment current efforts in the fight against IDA in resource-limited countries.

### **Step 2: Linking**

Linking involves defining the problem by means of establishing standardized classifications and linking the problem with interventions and outcomes. Identifying and describing the terms and problems facilitates communication amongst the people involved and



aids in organizing common knowledge. This step was completed in the definitions part of this research project as well as the introduction and background of IDA to establish a common basis of knowledge. Once the link has been classified, it then needs to be linked with outcomes. This was accomplished by understanding the health consequences of IDA if no change or intervention were addressed. Essentially, the ongoing disparities surrounding IDA in resource-limited countries are unlikely to improve without a new approach.

### **Step 3: Evidence Synthesis**

Step three is the synthesis of evidence. This was initially completed via the literature review that explored what has been effective and what has not worked in the past. Additionally, interpreting and amalgamating expert panel feedback throughout the design of this program was undertaken, resulting in a synthesis of the findings from the literature review and the expert panel.

### **Step 4: Design**

After synthesizing and analyzing the data, the next step is designing a potential change. For this project, an educational program for CHPs was created that could potentially be implemented in a resource-limited community at a later date. This process is iterative and is described in more detail in Chapter III.

### **Step 5: Implementation and Evaluating Change**

This implementation and evaluation step entails the execution of the proposed change followed by evaluation (Rosswurm & Larrabee, 1999). This step was modified in this project to work within the realms of the Delphi technique and the overall purpose of the DNP project. This step occurred upon presenting the initial and then revised versions of the educational program to the expert panel. Modifications driven by the primary investigator occurred between evaluation

rounds. The program was not be implemented at this time; rather, the decision to further modify, approve, or reject the program was based on feedback from the members of the expert panel. The panelist fulfilled the role of stakeholders by commenting on acceptability, needed modifications, cost effectiveness, and feasibility.

**Step 6: Integrate**

Integration is the final step in Rosswurm and Larrabee's (1999) model. For this scholarly project, this step will occur in the future following the conduction and conclusion of the project after approval by the expert panel. Ideally, once this program has been implemented, pilot assessment and evaluation data from community-based stakeholders would allow for continued revisions and improvements. The educational program could eventually be adopted by healthcare communities or organizations for dissemination and testing.

## CHAPTER III

### METHODOLOGY

This chapter describes the methods and steps used for this DNP scholarly project. The project design, setting, sample and measures are detailed. Additionally, data analysis and ethical considerations are discussed.

#### **Design**

A pilot educational program was developed that incorporated findings from the integrated literature review. The Delphi technique guided the expert panel portion of this project. The Delphi technique is a process that was designed to forecast possible solutions to a problem (Davidson, 2017). This method was designed originally to achieve consensus or majority agreement among experts regarding complex issues where little published information was available (Davidson, 2017). Characteristics of this technique are:

- Panel participants are experts in their field.
- The technique uses at least two rounds in which information is given to the expert panel to review.
- The panelists review and provide feedback independently and anonymously.
- Development remains future focused.
- The goal is to reach majority agreement amongst the researchers and panelists.

For this scholarly project, the Delphi technique was implemented in the following manner (Gray et al., 2017):

1. The issue and objective were identified for the project. The issue was the prevalence of IDA in resource-limited countries and the objective was to develop an educational program that could be implemented by CHPs.
2. A questionnaire was designed based on the initial educational program framework that was sent to the expert panel. The initial framework was based on the literature review and professional experience of the primary investigator and project Chair.
3. A group of experts was chosen. This was accomplished in this project through the assembly of a panel of individuals who had experience in global health or care of populations in resource-limited communities.
4. The Round 1 questionnaire was sent to the expert panel. The first questionnaire and program framework (emergent from the previously completed literature review) was presented to the panel to solicit feedback.
5. The responses were collected and analyzed.
6. The questionnaire and educational program were redesigned based upon feedback from the expert panel.
7. The second questionnaire was sent with the revised (and more detailed) version of the educational program to the expert panel with the goal of achieving professional majority agreement.
8. Responses from the Round 2 questionnaire were collected and analyzed. Any needed changes were incorporated into a final version of the program.
9. The findings were reported and disseminated to the project committee and eventually the University of Northern Colorado (UNCO) Graduate School.

### **Setting**

Development of the IDA educational program occurred online and all feedback questionnaires with the expert panel while engaging in the Delphi technique were conducted virtually.

### **Sample**

The sample was composed of panel members with an expressed interest and who were identified as having expertise in working with populations in resource-limited areas. Inclusion criteria were as follows:

- Advanced practice (nurse practitioner, physician assistant, medical doctor) and other types of licensed clinicians (registered or licensed practical nurse) with experience in working with populations in resource-limited areas as well as those with global or public health expertise will be considered as part of the expert panel.
- Minimum of two years of relevant professional experience.
- Could read, write, and comprehend English fluently.

Exclusion criteria were as follows:

- Less than two years professional experience.
- Professionals lacking health care, public health, or health education backgrounds (e.g., missionaries, diplomats, etc.).
- Professionals lacking experience working with resource-limited populations.
- Lacking English fluency.

### **Project Mission, Vision, and Objectives**

The project mission was to contribute to the reduction of global IDA disparities. The vision was to develop an IDA educational program designed for CHPs that would be implemented in a pilot study at a future date in a resource-limited community. The following were objectives of this DNP project:

1. Utilize the existing literature to develop the framework for a culturally adaptable and appropriately scaled education program focused on IDA management by community health promoters in resource-limited regions:
  - From the literature, identify methods that have been or are currently being utilized to prevent and treat IDA in resource-limited communities along with their successes and barriers in order to formulate the framework for the educational program.
  - Identify the average literacy rate and educational levels of rural populations including CHPs. This would guide the development of an appropriately scaled learning program.
  - Develop, in a broad scope, the main components of the educational program based upon the above information.
  - Ensure the educational program is culturally adaptable by allowing for flexibility and input from the CHPs who would implement it in the future. This would entail avoiding any recommendations specific to any one region or culture while providing multiple options or ideas that could be adopted and tailored at the local level.

2. Seek input from a panel of experts in global healthcare and/or community-based education in resource-limited communities regarding content, feasibility, and appropriateness of the proposed education framework.
  - Objectives 2-4 were completed via an online Qualtrics survey software questionnaire to obtain feedback from the panelists using the above-described Delphi technique. The initial questionnaire administered to the panel was somewhat broad in nature and composed of largely close-ended responses derived from the literature review with a limited opportunity to offer free-text responses (Gray et al., 2017).
  - Surveying was conducted online and independently by each panelist to limit groupthink. The panelists were not informed of who else was on the panel, again with the goal to limit groupthink.
  - Questionnaire responses were compiled and organized in Excel spreadsheets for analysis by the primary investigator under supervision of the project Chair.
3. After incorporating the panelist's initial input, a more detailed draft of the education program was created and additional feedback was collected and analyzed. New data were obtained from the panelists and analyzed for consistency and differences in opinions.
  - Components of the educational program identified as being likely to succeed were retained and a more detailed and focused revision was formulated to create a revised draft of the educational program.
  - Areas identified as being unlikely to succeed were discarded and not used as part of the educational program.

- Areas that received conflicting and differing opinions were revised using the questionnaire feedback (especially open text responses) and the literature, then re-presented to the panelists for further review.
4. Evaluate the revised draft of the education program with the panel of experts and make additional revisions until majority agreement is reached.
    - The Round 2 Qualtrics questionnaire was administered to obtain feedback from the panelists. The revised educational program and accompanying questionnaire were more focused with predominantly confirmatory statements. The majority if not all questions were close-ended.
    - Questionnaire responses were once again compiled within an Excel spreadsheet for analysis.
    - Data obtained from the panelists were analyzed for consistency and differences in opinions. If there had been significant differences of opinions, a third revision and round would have been required with the above-described steps under Objectives 3-4 being repeated.
  5. Propose a future pilot study to be implemented with CHPs using the approved educational program in a resource-limited setting. Upon final acceptance of the educational program by the panel of experts, the findings are reported in Chapter IV and proposed for future use in Chapter V of this DNP scholarly project.



## **Project Plan**

This DNP scholarly project included the following key components:

- submission of an Institutional Review Board (IRB) application;
- development of a culturally adaptable IDA educational program that considered literacy levels, cultural factors, and was based on an integrated literature review;
- assembly of a panel of five independent experts meeting the inclusion criteria;
- submission via email the initial framework for the educational program with an accompanying questionnaire created using Qualtrics software for the panel to review;
- analyze feedback from the panel and make modifications to the educational program based on results;
- submit Round 2 of the educational program and a second questionnaire to the expert panel;
- evaluate the feedback and finalize the educational program;
- write up project findings and make recommendations for a future pilot study;
- resend and disseminate the DNP project to the committee and the UNCO Graduate School.

## **Instrumentation**

Qualtrics survey software was utilized to obtain feedback from the expert panel with predominantly yes/no questions offered on the questionnaires. The initial questionnaire was designed to be broad and primarily close-ended with the second one being more confirmatory in nature (Gray et al., 2017). When a panelist selected 'no' on an item, a brief (text limited to 120 characters) space was provided to provide mandatory explanation and inform subsequent drafts.

### **Data Analysis Procedures**

Basic statistical analysis of the yes/no (dichotomous data) results was completed. Qualitative responses were displayed and categorized in Excel tables. Revisions of the educational program were carefully tracked with data-supported explanations for all modifications.

### **Duration of the Project**

The timeline from proposal acceptance to completion lasted four months. The initial five weeks was spent completing and obtaining the IRB approval and development of the first draft of the educational program, both which were initially approved by the program Chair. This draft was submitted to the expert panel who completed the feedback to the program in two weeks. Changes to the educational program were based on feedback from the Round 1 questionnaire and lasted almost two weeks; it was followed by submission of the Round 2 questionnaire and revised educational program. Another two weeks was allowed for completion of feedback. Finally, two weeks was allotted for analysis of findings and finalization of the education program. Writing up of findings and presentation for dissemination to the project committee was allotted to the final three weeks.

### **Ethical Considerations**

An application for the UNCO IRB was submitted following approval of the proposal by the project committee and prior to initiating the DNP project. The project was determined to be in the 'exempt' category by the IRB and permission to proceed was granted (see Appendix B). Feedback data from the panelists were stored electronically and were only accessible by the primary investigator and project Chair on password protected devices. Electronic consent to participate in the project was obtained from each of the panel participants upon receipt of the

first draft of the educational program and questionnaire (see Appendix C). No anticipated risks were associated with participating in this project. Panelists were permitted to discontinue participation in the project at any time without recourse.

## CHAPTER IV

### DATA ANALYSIS AND RESULTS

This chapter reports on the data analysis and results of the DNP project. The Qualtrics questionnaire results of Rounds 1 and 2 were consistent with the Delphi method and are presented as well as the outcome of the project: an evidence and expert panel-informed educational program for IDA for use with CHPs in resource-limited communities. The project objectives and question are further analyzed.

#### **Objective One: Results**

The first objective of the project was to utilize the existing literature to develop the framework for a culturally adaptable and appropriately scaled education program focused on IDA management for community health promoters in resource-limited regions. This was accomplished through a comprehensive and integrated literature review, the results of which can be found both in Chapter II of this project and in the Table of Evidence (see Appendix A). From the literature review, an initial draft of the educational program was created by the primary investigator with input from the research advisor (project Chair). This initial draft can be viewed in Appendix C. Throughout this early development period, special consideration was taken to ensure the educational program remained evidence-based, low-cost, simple, culturally malleable, and appropriately scaled for the CHP audience in a rural, resource-limited community. High tech options (e.g., laboratory anemia testing, educational videos, etc.) were avoided in favor of more feasible activities and interventions that could be implemented in even the most rudimentary clinical setting.

## **Objective Two: Results**

The goal of the second objective was to seek input from a panel of experts in global health care and/or community-based health education in resource-limited communities regarding content, feasibility, and appropriateness of the proposed education framework. Recruitment of potential panelists was conducted using the professional networks of the primary investigator and program Chair, both of whom had a background in nursing care of vulnerable populations. Eight potential participants were identified and invited to participate via the recruitment email (see Appendix D). Of those eight, seven people responded and expressed an interest in participating in the project. The first draft of the educational program (see Appendix C) and accompanying questionnaire were submitted to the expert panel of seven participants who formally agreed to participate and confirmed they met the inclusion criteria at the start of the questionnaire. Of those seven, six completed the first round of the questionnaire and only one completed the demographics section. Due to failure to respond to the remainder of the questionnaire, demographic data were excluded from analysis.

### **Description of the Sample**

The demographic information obtained in the survey included gender, age, work experience, and current profession. The participants resided in a variety of states—Colorado, California, Washington and Nevada—and worked in various healthcare fields as presented in Table 1.

**Table 1***Characteristics of Expert Panel*

Characteristic	<i>n</i> (%)
<b>Professional Title</b>	
Advanced practice health clinician	3 (50)
Licensed clinical worker	2 (33)
Public health professional	1 (17)
<b>Number of Years Working in Profession</b>	
2-5y	1 (17)
6-10y	1 (17)
11y+	4 (67)
Experience in Resource-Limited Population	6 (100)
<b>Age (Years)</b>	
36-45	3 (50)
46-55	1 (17)
56+	2 (33)
<b>Gender</b>	
Female	6 (100)

*Note.* *N* = 6

**Results of the Round 1 Questionnaire**

The Qualtrics questionnaire results are displayed in Table 2. In this section, the categories of the educational program are listed with the panelists' responses and suggestions for improvement. The primary investigator and project Chair analyzed the short open-text responses together and the agreed-upon modifications of the initial educational program are listed in the far-right column of the table.

**Table 2***Results from the Round 1 Questionnaire with Modification Plan*

Category	Yes <i>n</i> (%)	No <i>n</i> (%)	Comments	Modification Based on Results
Introduction	5 (83)	1 (17)	If possible, I would suggest more active idea generation and brainstorming for the CHPs to come up with potential prototypes that would be useful to address this issue in their community.	Introduction was modified to be clearer as to the population this will be initiated with.
			What is identified as a need already in the communities where you will be working? I'm unclear where you're launching this initiative.	Added that the communities are ones that have already been identified as having high rates of IDA
Ground rules	3 (50)	3 (50)	I am unclear on the scope of ground rules/group norms and how a picture of them would be created. Perhaps an example would be beneficial?	Included more pictures
			I wonder if this concept will be new to the participants and if perhaps there are examples or rules that might apply to any/all, such as one person talking at a time.	
			I would call these guiding principles or community agreements and have the group come up with them.	Changed name to community agreements

Table 2 continued

Category	Yes <i>n</i> (%)	No <i>n</i> (%)	Comments	Modification Based on Results
What is anemia	3 (50)	3 (50)	Maybe consider a pre and post test to determine impact of the education?	This is addressed later
			I wonder if it might be better to start off with what is blood. What are the local concepts of blood? Is there such a think as bad blood? What causes it? How is blood made? What is the relationship between food and blood?	Added section describing blood and circulatory system. Added local concepts of blood to this section
			Find more examples with pictures of what it looks, what it does to the body, what causes it	Added more pictures of blood and anemia
Consequences of anemia	5 (83)	1 (17)		
Types of anemia/ causes of anemia	5 (83)	1 (17)	You do have menstruation but important I think more focus on excessive menstrual bleeding or excessive bleeding during childbirth. Perhaps also bring in how breastfeeding during the first 6 months of life helps to guard against anaemia, plus what is needed in child's diet at 6 months and beyond. Which age groups are most at risk in this country or what medical conditions put the person most at risk?	Added statement about importance of breastfeeding until 6 months of age Populations at higher risk already noted in program



Table 2 continued

Category	Yes <i>n</i> (%)	No <i>n</i> (%)	Comments	Modification Based on Results
Signs and symptoms	4 (67)	2 (33)	What would be the S&S in a child under age 5? Why may not complain the same way an older child or adult would. What will the mother notice?	Added section of s/s in young children
			Some of the pics are clear but others I don't think will be translate well at least to CHPs I've worked with	Added more pictures
Identification of anemia	4 (67)	2 (33)	I realize that resources may limit this but IMCI has some good videos on assessment.	Goal of program to be utilized in all areas including those that may not have electricity.
			Other disease reduction/prevention programs I've done with community-based agents, it helps to have a quick referral book/pocket guide lamented the that they can reference. Or in more urban/richer settings, an app that help the community-based agent go through the disease diagnosis and prevention recommendations	This was added to the introductory section  Resource guide already planned for in program
Referrals	6 (100)	0 (0)		

Table 2 continued

Category	Yes <i>n</i> (%)	No <i>n</i> (%)	Comments	Modification Based on Results
Perspectives/beliefs	4 (67)	2 (33)	I actually thought some of this info might be obtainable early and then referred to later when you get to this section. I guess to me putting it in local context first makes sense.  Unclear what purpose of this session will be...how will you being use it to inform the intervention or train them	This section was incorporated earlier in the program when discussing blood and throughout the sections
Interventions/prevention	4 (67)	2 (33)	Also what is the availability of meds and in which doses in the country. May be limited. Food choices-may be limited so what is a person to do if they are unable to obtain high iron foods?	Added statement about medications may be prescribed
Clinical assessment	5 (83)	1 (17)	Use of video would be great	Plan to be able to provide program in areas without electricity
Hands-on/skills practicum	5 (83)	1 (17)	I think this would be especially useful	

Table 2 continued

Category	Yes <i>n</i> (%)	No <i>n</i> (%)	Comments	Modification Based on Results
Is the educational program and associated materials (e.g., pictures, posters, etc.) at an appropriate literacy level for the intended target audience?	4 (67)	2 (33)	<p>The discussion about anaemia at the beginning seems to me it might be confusing. Need to make it clear that the bottles do not actually contain blood but represent blood.</p> <p>See my previous comments, it's hard to understand exactly how this will all play out. But I think much more hands-on learning, brainstorming, is needed with tangible tools they can use</p>	<p>Added statements about the bottles are not actually blood but represents blood</p> <p>Program has a hands-on section already planned</p>
Does the educational program allow for adequate time and break periods for learning?	6 (100)	0 (0)		
Does the educational program allow for variability and/or modifications for local and/or cultural adaptations?	5 (83)	1 (17)	I think they should be solicited at the beginning and incorporated throughout the day	This was incorporated
Should the program include a pre and post-test?	4 (67)	2 (33)	<p>I think that the evaluation described in the program is appropriate. A pre-test seems like a waste of valuable time.</p> <p>I found the only way I can comment is to answer no!</p> <p>Definitely not a pencil and paper pre and post test but maybe a return demo at the end.</p>	

Table 2 continued

Category	Yes <i>n</i> (%)	No <i>n</i> (%)	Comments	Modification Based on Results
Does the educational program need more visual aids?	2 (33)	4 (67)	Videos, photographs, charts, going into a clinical setting, etc.	Added more pictures, charts can be difficult to understand so excluded this, already a clinical setting planned in the hands-on session

*Note.*  $N = 6$

## **Summary of the Round 1 Questionnaire Findings**

The primary investigator and program Chair collaborated on all feedback and revisions of the educational program using their expertise, the literature, and critical decision-making based on the results of the first questionnaire administered to the panel of experts. The feedback revealed several important concepts that were taken into consideration and modified in the next draft of the educational program that were displayed in Table 2 and briefly discussed here. The participants expressed a need for more clarity in the intended community of focus in the introductory section and, thus, this was more clearly defined. The ground rules concept was determined to be one that might be difficult to define in different cultures and needed additional pictures and renaming. An important idea generated from the feedback was some foundational knowledge about blood needed to be addressed. Finally, the local context and beliefs section was incorporated into the beginning and woven throughout to better reflect the adaptability of the program. Other changes to the educational program included an improved program format, the creation of a table of contents, and a more detailed layout for improved organization and ease of use.

### **Objectives Three and Four: Results**

After incorporating the panelists' initial input, the primary investigator created a more detailed draft of the education program as planned in objective three and collected and analyzed additional feedback from the expert panelists using a second-round questionnaire in Qualtrics (see Appendix E), which is reflected in objective four. The iterative and simultaneous nature of these two objectives was anticipated and is typical of the Delphi method (Davidson, 2017). Of the original panel of six, all six reviewed the second draft of the program and completed the accompanying questionnaire.

## **Results of the Round 2 Questionnaire**

The Qualtrics questionnaire results are displayed in Table 3. In this section, the categories of the revised educational program are listed with the panelists' responses and suggestions for improvement. Comments included "Well thought out and I think would be very well received. Good job." "Who are the facilitators?" and "I am just anxious for you to try this with a target audience and see how it works." The primary investigator and project Chair reviewed results and open-test responses together and collaborated on the modification and finalization of the IDA educational program.

**Table 3***Results of the Round 2 Questionnaire with Modification Plan*

Category	Yes <i>n</i> (%)	No <i>n</i> (%)	Comments	Modifications to Educational Program
Icebreaker	5 (83)	1 (17)	I'd suggest giving a few options that are easily adaptable to audience make-up.	
			I think the example was clear, I am just not sure how well it translates across cultures	
Purpose of training	6 (100)	0 (0)		
Community agreements	5 (83)	1 (17)	The explanation was clear. I am not sure how well it would work through. It seems like it might take too long, leaving less time for the main content.	
What is blood	6 (100)	0 (0)		
What is anemia	6 (100)	0 (0)		
What is IDA	6 (100)	0 (0)		
Consequences of anemia	6 (100)	0 (0)		
Signs and symptoms	6 (100)	0 (0)		
Assessment techniques	6 (100)	0 (0)		

Table 3 continued

Category	Yes <i>n</i> (%)	No <i>n</i> (%)	Comments	Modifications to Educational Program
Interventions/prevention	6 (100)	0 (0)		
Physical assessment	5 (83)	1 (17)	The graphics are very helpful	
Are the educational program and associated materials at an appropriate literacy level for the intended target audience?	5 (83)	1 (17)	Generally I think so, be good to get stuff from their local stores, shops, clinics that they will use with their prevention work...and would also recommend having flipchart paper or other stuff where people can draw, write, sketch ideas, feedback they're sharing too, that then the facilitator can refer back during future sessions.	Add on materials list for flipchart paper Add on bring in food from local markets
Does the educational program allow for variability and/or modifications for local and/or cultural adaptations?	5 (83)	1 (17)	It depends on who the facilitator are (wasn't clear from your overview – are they from the 'community' too or outsiders like from the capital/from US, etc.)...if they are trained in pretty dogmatic/prescriptive fashions typical to many LMICs, then if the training curricula does not provide options a, b, etc. they will not modify...perhaps giving examples of how what you've outlined could be modified or adapted could be useful	Comment added to introductory statement to clarify facilitator
Does the educational program need more visual aids?	1 (17)	5 (83)		

*Note.* *N* = 6



## **Summary of Round 2 Questionnaire Findings**

The Round 2 questionnaire feedback was reviewed by both the primary investigator and project Chair and a few minor revisions were completed. Identifying who the intended facilitators should be and reviewing local food sources prior to implementing the program were incorporated into the introductory section. As there were very few discrepancies among the panelists upon review of the revised educational program, a third round was not conducted as appropriate for the Delphi method (Davidson, 2017). The final draft of the IDA educational program is displayed in Appendix F.

### **Objective Five: Future Pilot Testing**

To fully determine the effectiveness of the IDA educational program, pilot testing it with the intended audience is imperative. Objective five addressed creating a plan for future pilot testing of the educational program, which is further detailed in Chapter V.

### **Analysis of Study Question**

The aim of this DNP project was the development of a culturally adaptable, simple, low-cost educational program on IDA that was informed by a panel of clinical experts. This goal was accomplished and an IDA educational program was developed. The initial educational program was developed after being informed by the literature and presented to an expert panel of six. The program draft was revised based on their feedback and a modified IDA educational program was created. Once again, this revised educational program was sent to the expert panel for feedback. Due to majority consensus being reached, very minor changes were incorporated into the final IDA educational program (see Appendix F). This project successfully demonstrated the process of creating a clinical educational program using the Delphi method.

## CHAPTER V

### DISCUSSION

This chapter is a summation of the scholarly project that includes conclusions, limitations, and recommendations for future study. Finally, a reflection on how this scholarly project met the outcomes of the American Association of Colleges of Nursing's (AACN, 2006) *The Essentials of Doctoral Education in Advanced Nursing Practice* using the EC as PIE (Enhance, Culmination, Partnerships, Implements, and Evaluation) criteria as established by Waldrop et al. (2014) is provided.

#### **Conclusions**

The purpose of this DNP scholarly project was the development of a culturally adaptable educational program on iron-deficiency anemia (IDA) for use in resource-limited communities. The aim of the program was to create a low-cost, low-tech program that would be utilized to train community health promoters (CHPs) in various settings and cultures.

The prevalence and negative consequences of IDA in resource-limited communities was well established in the literature. Within these communities, CHPs are a valuable yet sometimes under-utilized resource that could be an avenue to both prevent and appropriately intervene with IDA to improve population health. As CHPs are local community members, they are in a unique and important position to partner with their communities on culturally acceptable and locally tailored prevention techniques and treatment options. With basic instruction and training, CHPs could screen for IDA, provide basic education about dietary and other sources of iron, and refer clients for medical care as needed.

Rosswurm and Larrabee's (1999) model of evidence-based practice was the theoretical framework that guided this project. An initial IDA educational program was developed from an extensive review of research and through ideas generated from professional experience in working with vulnerable populations in resource-limited communities. This program was then presented and evaluated by a team of skilled and knowledgeable healthcare professionals from around the country. Their feedback drove the revision of the educational program that was again presented to them for evaluation. Following this second round of evaluation in which broad consensus was achieved, a final educational program on IDA was generated and presented in Chapter IV.

Following evaluation of the various program drafts by the panel of experts, the data were exported from Qualtrics software into an Excel spreadsheet. Basic statistical analyses of nominal data and interpretation of free text responses were performed by the primary investigator under the supervision of the project Chair. The findings from these two sets of data analyses directed the modification of each draft of the educational program.

### **Limitations**

There were several limitations to this DNP project. During the planning stage of the scholarly project, the goal was to recruit five participants to be part of the expert panel. The program Chair wisely suggested to invite more participants and a total of eight were invited. While seven indicated their initial acceptance and interest in participating in the project, only six completed the questionnaires, reflecting an anticipated amount of attrition. While the six panelists offered important and insightful recommendations and feedback, they might not have reflected the full depth and breadth of expertise needed to create a robust IDA educational program. Considering that 50% of the panelists were advanced practice clinical practitioners, this

might have skewed the results toward a level of clinical practice beyond the scope and comprehension of some CHPs. Additionally, even though one of the inclusion criteria was needing experience with resource-limited populations, only one person identified herself as a public health worker. This project would likely benefit from additional viewpoints from those with expertise in the global health sector.

Another limitation discovered when analyzing the data was the tendency of one of the panelists to respond to each section whether in agreement or not. The questionnaire was developed so if the panelist agreed with how the section of the program was laid out, they would proceed to the next question without providing any open text feedback. One panelist desired to respond to each section so marked 'no' in order to provide a free-text response even if they agreed with the content. She made this clear in her responses but it was an aspect of the data that had to be taken into consideration during analysis as a potential limitation of the questionnaire design.

Lastly, a limitation of developing this program was it was not culture or community specific. Initially, this project was intended for development and testing in remote communities in the highlands of Peru. However, with the ongoing COVID-19 pandemic, the program was scaled back to a generalized program that could be fully developed online and adapted to any culture. Identifying and modifying for specific cultural nuances prior to implementing healthcare programs with vulnerable populations is always preferred but this was achieved in a more general sense for this project. As a result, one concern was the ability to culturally adapt and modify this program might be lacking for some facilitators and CHPs who might require additional training to do so effectively.

### **Recommendations for Future Practice**

To further determine the feasibility, effectiveness, and validity of the educational program, it will be necessary to perform a pilot study. Pilot studies are performed on a smaller scale to identify areas needing improvement, the quality of study design, determining recruitment successes and challenges, the feasibility of implementing on a larger scale, and the efficiency of the program (In, 2017; U.S. Department of Health and Human Services, n.d.). This program could be piloted in a small community in Peru through a non-profit organization that provides healthcare services known to the primary investigator. Past experience in this community suggests IDA is prevalent and of concern to the local population, which includes a number of CHPs who partnered with the organization previously. Following the pilot test, obtaining feedback (verbal and/or written) both from the facilitators and the CHPs would add valuable insight into future modifications of the program to promote a reduction of IDA. Part of the pilot testing would also include returning to the community at no more than six-month intervals to evaluate knowledge and retention of the information provided to the CHPs and to engage in surveillance monitoring of IDA prevalence rates in the community (Stoltzfus et al., 1999).

Once a pilot study has been performed, the data analyzed, and subsequent modifications made to the program, offering this program to international/national organizations whose focus is working with vulnerable communities in resource-limited regions is recommended.

Organizations such as the WHO, CDC, HRSA, and UNICEF are just a few of the groups that could benefit from this educational program.

### **Reflections**

This DNP scholarly project and program has been an invaluable educational experience that will lend itself to enhanced professional work experience. With the knowledge and skills

obtained in the program and project, the ability to critical think was expanded when interpreting and understanding new data and facts and how they could be utilized and integrated into clinical practice to improve patient outcomes.

The AACN (2006) has vigorous standards when it comes to ensuring DNP graduates have met the essential competencies to practice in the advanced practice role of the DNP. Waldrop et al. (2014) recognized the importance of having a standardized system to ensure the basic competency of DNP graduates. Their system is presented in the acronym EC as PIE (Enhance, Culmination, Partnerships, Implements, and Evaluation) and looks at five criteria that must be met to meet the essential outcomes the AACN has put forward. Delineated in the following section is a reflection of how this DNP scholarly project met the five EC as PIE criteria necessary for a successful DNP project:

- E—*Enhance* “health outcomes, practice outcomes, or health care policy” (Waldrop et al., 2014, p. 301). This DNP scholarly project developed an educational program designed to provide knowledge and skills to local CHPs to aid them in their clinical practice and care of community members. This has the potential to improve health and practice outcomes by providing the best evidence-based care to under-resourced patients.
- C—“Reflect a *culmination* of practice inquiry” (Waldrop et al., 2014, p. 301). An identified gap in practice and need was identified in this DNP scholarly project, which began with the primary investigator’s professional observations. An extensive literature review was completed to develop an educational program on IDA using the theoretical framework of Rosswurm and Larrabee’s (1999) model for change for evidence-based practice. The project was designed using the Delphi

method of research to ensure the program was pragmatic and practical for use in the real world as determined by a panel of experts. The program was also designed to be self-sustaining, low-cost, and low tech so it could be implemented in any situation and location.

- P—"Require engagement in *partnerships*" (Waldrop et al., 2014, p. 302). This DNP scholarly project engaged with several key partnerships. The project recruited six expert professionals with in-depth knowledge of working with vulnerable populations around the world for their feedback and input into the design and content of the educational program. Although predominately composed of advanced practice nurses, the panel did include professionals from other disciplines such as public health, which enhanced the interdisciplinary approach. In addition, the IDA educational program requires that whoever is facilitating the training should partner with a local healthcare clinic as part of the hands-on skills training of the CHPs. This represents an opportunity for local partnership and encourages acceptance of the program by the community.
- I—"Implement/apply/translate evidence into practice" (Waldrop et al., 2014, p. 302). Evidence was gathered from both the literature review and the panelists' feedback and integrated into the educational program, which is intended to guide practice recommendations. The educational program directly addressed a significant healthcare concern that is commonly observed in clinical situations, especially in resource-limited regions. The development of this educational program is the first step toward augmenting how care is provided in communities that are at-risk for IDA. If one or more completed pilot studies indicate the program has the potential

to detect and reduce IDA, local healthcare systems might adopt the program and incorporate CHPs in the management of this disease.

- E—"Requires *evaluation* of health care, practice, or policy outcomes" (Waldrop et al., 2014, p. 302). Evaluation is looking at a variety of aspects of health care including costs, quality, access, and healthcare outcomes and how the DNP project could add to one or more of these aspects. This criterion was met in this DNP scholarly project mostly via accessibility of health care. The educational program was designed to improve access to care for individuals and communities who lack it by deploying 'on the ground' CHPs to tackle IDA. Long-term evaluation is desired to determine the true impact of this educational program. Additionally, reduced healthcare costs and improved outcomes through IDA screening and early intervention could be determined through long-term evaluation.

### **Summary**

Iron-deficiency anemia is a significant healthcare problem for much of the world's venerable population. Current methods being utilized are failing to prevent and treat this common health condition. Community health promotors are valuable members of the healthcare team and a resource that is not being adequately utilized. Developing an educational program to build the clinical knowledge and skills of CHPs could potentially improve the health of individuals and communities in resource-limited regions. An educational program that is both low-cost and self-sustaining is essential for remote and often rural settings. This DNP project successfully created a practical IDA educational program that is evidence-based, culturally malleable, and could be implemented in a variety of settings.



A team of healthcare professionals evaluated and approved an educational program and agreed it could and should be utilized in the future. Future recommendations included the implementation of a pilot study and further modifications of the program before being disseminated on a larger scale.

## REFERENCES

- Abdel-All, M., Putica, B., Praveen, D., Abimbola, S., & Joshi, R. (2017). Effectiveness of community health worker training programmes for cardiovascular disease management in low-income and middle-income countries: a systematic review. *BMJ Open*, *7*(11), e015529. <https://doi.org/10.1136/bmjopen-2016-015529>
- Abeywickrama, H., Koyama, Y., Uchiyama, M., Shimizu, U., Iwasa, Y., Yamada, E., Ohashi, K., & Mitobe, Y. (2018). Micronutrient status in Sri Lanka: A review. *Nutrients*, *10*(11), 1583. <https://doi.org/10.3390/nu10111583>
- Abirami, P., Jayabharathi, B., Jothy, D., Nishanthi, B., & Jagdeesh, S. (2018). Assessment on level of knowledge regarding iron deficiency anemia during pregnancy among antenatal mothers at SRM General Hospital. *International Journal of Nursing Education*, *10*(4), 1. <https://doi.org/10.5958/0974-9357.2018.00126.5>
- Abujilban, S., Hatamleh, R., & Al-Shuqerat, S. (2018). The impact of a planned health educational program on the compliance and knowledge of Jordanian pregnant women with anemia. *Women & Health*, *59*(7), 748–759. <https://doi.org/10.1080/03630242.2018.1549644>
- Adugna, M. B., Nabbouh, F., Shehata, S., & Ghahari, S. (2020). Barriers and facilitators to healthcare access for children with disabilities in low and middle income sub-Saharan African countries: A scoping review. *BMC Health Services Research*, *20*(1). [doi:10.1186/s12913-019-4822-6](https://doi.org/10.1186/s12913-019-4822-6)

Aldridge, C., Foster, H. M., Albonico, M., Ame, S. M., & Montresor, A. (2012). Evaluation of the diagnostic accuracy of the hemoglobin colour scale to detect anemia in young children attending primary healthcare clinics in Zanzibar. *Tropical Medicine and International Health*, 17, 423–429.

American Association of Colleges of Nursing. (2006). *The essentials of doctoral education for advanced nursing practice*. <http://www.aacn.nche.edu/publications/position/DNPEssentials.pdf>

Andrews, C. M., Wyne, K., & Svenson, J. E. (2018). The use of traditional and complementary medicine for diabetes in rural Guatemala. *Journal of Health Care for the Poor and Underserved*, 29(4), 1188-1208. doi:10.1353/hpu.2018.0092

Asweto, C. O., Alzain, M. A., Andrea, S., Alexander, R., & Wang, W. (2016). Integration of community health workers into health systems in developing countries: Opportunities and challenges. *Family Medicine and Community Health*, 4(1), 37–45.  
<https://doi.org/10.15212/fmch.2016.0102>

Callister, A., Gautney, J., Aguilar, C., Chan, J., & Aguilar, D. (2020). Effects of indigenous diet iron content and location on hemoglobin levels of Ghanaians. *Nutrients*, 12(9), 2710.  
<https://doi.org/10.3390/nu12092710>

Chandyo, R. K., Henjum, S., Ulak, M., Thorne-Lyman, A. L., Ulvik, R. J., Shrestha, P. S., Locks, L., Fawzi, W., & Strand, T. A. (2016). The prevalence of anemia and iron deficiency is more common in breastfed infants than their mothers in Bhaktapur, Nepal. *European Journal of Clinical Nutrition*, 70(4), 456–462.  
<https://doi.org/10.1038/ejcn.2015.199>

Chaudhury, N., & Hammer, J. (2004). Ghost doctors: Absenteeism in rural Bangladeshi health facilities. *The World Bank Economic Review*, *18*(3), 423–441.

<https://doi.org/10.1093/wber/lhh047>

Cherrington, A., Ayala, G., Elder, J., Arredondo, E., Fouad, M., & Scarinci, I. (2010).

Recognizing the diverse roles of community health workers in the elimination of health disparities: from paid staff to volunteers. *Ethnicity & Disease*, *20*, 189-194.

Davidson, P. (2017). *Delphi method*. <https://research.phoenix.edu/content/research-methodology-group/delphi-method>

Detzel, P., & Wieser, S. (2015). Food fortification for addressing iron deficiency in Filipino children: Benefits and cost-effectiveness. *Annals of Nutrition and Metabolism*, *66*(2), 35–42. <https://doi.org/10.1159/000375144>

Developing country. (2019). <https://dictionary.cambridge.org/dictionary/english/developing-country>

Diamond-Smith, N. G., Gupta, M., Kaur, M., & Kumar, R. (2016). Determinants of persistent anemia in poor, urban pregnant women of Chandigarh City, North India: A mixed method approach. *Food and Nutrition Bulletin*, *37*(2), 132-143.

<https://doi.org/10.1177/0379572116637721>

EKF Diagnostics. (2021). *Anemia and blood testing for hemoglobin*.

<https://www.ekfdiagnostics.com/anemia-and-hemoglobin-testing.html>

Glazer, Y., & Bilenko, N. (2010). Effect of iron deficiency and iron deficiency anemia in the first two years of life on cognitive and mental development during childhood. *Harefuah*, *149*, 309–314, 335.

- Golden, C. D., Fernald, L. C. H., Brashares, J. S., Rasolofoniaina, B. J. R., & Kremen, C. (2011). Benefits of wildlife consumption to child nutrition in a biodiversity hotspot. *Proceedings of the National Academy of Sciences*, *108*(49), 19653–19656.  
<https://doi.org/10.1073/pnas.1112586108>
- Gray, J. R., Grove, S. K., & Sutherland, S. (2017). *Burns and Grove's The Practice of Nursing Research: Appraisal, synthesis, and generation of evidence* (8<sup>th</sup> ed.). Elsevier.
- History of iron deficiency anemia. (2011). <https://www.world-medicinehistory.com/2011/10/history-of-iron-deficiency-anemia.html#:~:text=History%20of%20iron%20deficiency%20anemia%20The%20Papyrus%20Ebers%2C,disease%20possibly%20was%20due%20to%20chronic%20hookworm%20infestation>
- Horton, S., & Ross, J. (2003). The economics of iron deficiency. *Food Policy*, *28*(1), 51–75.  
[https://doi.org/10.1016/s0306-9192\(02\)00070-2](https://doi.org/10.1016/s0306-9192(02)00070-2)
- In, J. (2017). Introduction of a pilot study. *Korean Journal of Anesthesiology*, *70*(6), 601.  
<https://doi.org/10.4097/kjae.2017.70.6.601>
- Javanparast, S., Windle, A., Freeman, T., & Baum, F. (2018). Community health worker programs to improve healthcare access and equity: Are they only relevant to low- and middle-income countries? *International Journal of Health Policy and Management*, *7*(10), 943–954. <https://doi.org/10.15171/ijhpm.2018.53>
- Jeet, G., Thakur, J. S., Prinja, S., & Singh, M. (2017). Community health workers for non-communicable diseases prevention and control in developing countries: Evidence and implications. *PLOS ONE*, *12*(7), e0180640. <https://doi.org/10.1371/journal.pone.0180640>

- Khan, A. A., Fatmi, Z., & Kadir, M. M. (2015). Accuracy and use of WHO hemoglobin color scale for diagnosis of anemia among pregnant women by health care providers in Periurban settings in Karachi, Pakistan. *Asia Pacific Journal of Public Health*, 27(6), 610–619. <https://doi.org/10.1177/1010539515588777>
- Le, C. H. H. (2016). The prevalence of anemia and moderate-severe anemia in the US population (NHANES 2003-2012). *PLOS ONE*, 11(11), e0166635. <https://doi.org/10.1371/journal.pone.0166635>
- Loy, S. L., Lim, L. M., Chan, S.-Y., Tan, P. T., Chee, Y. L., Quah, P. L., Chan, J. K. Y., Tan, K. H., Yap, F., Godfrey, K. M., Shek, L. P.-C., Chong, M. F.-F., Kramer, M. S., Chong, Y.-S., & Chi, C. (2019). Iron status and risk factors of iron deficiency among pregnant women in Singapore: A cross-sectional study. *BMC Public Health*, 19(1). <https://doi.org/10.1186/s12889-019-6736-y>
- Lu, Z., O'Dell, D., Srinivasan, B., Rey, E., Wang, R., Vemulapati, S., Mehta, S., & Erickson, D. (2017). Rapid diagnostic testing platform for iron and vitamin A deficiency. *Proceedings of the National Academy of Sciences*, 114(51), 13513-13518. <https://doi.org/10.1073/pnas.1711464114>
- Mackay, H. (1932). Nutritional anaemia in infancy with special reference to iron deficiency. *Journal of the American Medical Association*, 98(7), 577.
- Mandy, G. (2019, September 23). *Short-term complications of the preterm infant* (R. Martin, Ed.). [www.uptodate.com](http://www.uptodate.com)
- Mandy, G. (2020, November 30). *Incidence and mortality of the preterm infant* (L. Weisman, Ed.). [www.uptodate.com](http://www.uptodate.com)

- Martial, M.-A., Sward, K. A., Morse, J. M., Wilson, A. R., Martial, C., Penney, D. S., & Nicolas, E. (2021). Anemia management in rural Haitian children: A mixed methods study. *Journal of Transcultural Nursing*, 2(3), 104365962098661. <https://doi.org/10.1177/1043659620986616>
- McGann, P. T., Tyburski, E. A., De Oliveira, V., Santos, B., Ware, R. E., & Lam, W. A. (2015). An accurate and inexpensive color-based assay for detecting severe anemia in a limited-resource setting. *American Journal of Hematology*, 90(12), 1122-1127. <https://doi.org/10.1002/ajh.24180>
- Meessen, B., & Malanda, B. (2014). No universal health coverage without strong local health systems. *Bulletin of the World Health Organization*, 92(2), 78–78A. <https://doi.org/10.2471/blt.14.135228>
- Moor, M. A., Fraga, M. A., Garfein, R. S., Harbertson, J., Rodriguez-Lainz, A., Rashidi, H. H., Elder, J. P., & Brodine, S. K. (2016). Decreased anemia prevalence among women and children in rural Baja California, Mexico: A 6-year comparative study. *Journal of Community Health*, 41(4), 780–789. <https://doi.org/10.1007/s10900-016-0153-2>
- Najafizada, S. A., Labonté, R., & Bourgeault, I. L. (2019). HRH dimensions of community health workers: A case study of rural Afghanistan. *Human Resources for Health*, 17(1), 1-10. doi:10.1186/s12960-019-0347-7
- O'Donovan, J., O'Donovan, C., Kuhn, I., Sachs, S. E., & Winters, N. (2018). Ongoing training of community health workers in low-income and middle-income countries: a systematic scoping review of the literature. *BMJ Open*, 8(4), e021467. <https://doi.org/10.1136/bmjopen-2017-021467>

- Olupot-Olupot, P., Prevatt, N., Engoru, C., Nteziyaremye, J., Amorut, D., Chebet, M., Senyondo, T., Ongodia, P., Ndila, C. M., Williams, T. N., & Maitland, K. (2019). Evaluation of the diagnostic accuracy and cost of different methods for the assessment of severe anaemia in hospitalised children in Eastern Uganda. *Wellcome Open Research*, 3(3), 130.  
<https://doi.org/10.12688/wellcomeopenres.14801.2>
- Perry, H. B., Zulliger, R., & Rogers, M. M. (2014). Community health workers in low-, middle-, and high-income countries: An overview of their history, recent evolution, and current effectiveness. *Annual Review of Public Health*, 35(1), 399–421.  
<https://doi.org/10.1146/annurev-publhealth-032013-182354>
- Peters, D. H., Garg, A., Bloom, G., Walker, D. G., Brieger, W. R., & Hafizur Rahman, M. (2008). Poverty and access to health care in developing countries. *Annals of the New York Academy of Sciences*, 1136(1), 161–171. <https://doi.org/10.1196/annals.1425.011>
- Poskitt, E. M. E. (2003). Early history of iron deficiency. *British Journal of Haematology*, 122(4), 554–562. <https://doi.org/10.1046/j.1365-2141.2003.04529.x>
- Pratt, O. (2015). A review of the strategies used to reduce the prevalence of iron deficiency and iron deficiency anaemia in infants aged 6-36 months. *Nutrition Bulletin*, 40(4), 257–267.  
<https://doi.org/10.1111/nbu.12170>
- Rahmati, S., Azami, M., Badfar, G., Parizad, N., & Sayehmiri, K. (2020). The relationship between maternal anemia during pregnancy with preterm birth: A systematic review and meta-analysis. *The Journal of Maternal-Fetal & Neonatal Medicine: The Official Journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians*, 33(15), 2679–2689. <https://doi.org/10.1080/14767058.2018.1555811>



- Robinson, J., & Norwitz, E. (2020, November 9). *Preterm birth: Risk factors, interventions for risk reduction, and maternal prognosis*. [www.uptodate.com](http://www.uptodate.com)
- Rosado, J. L., González, K. E., Caamaño, M. D., García, O. P., Preciado, R., & Odio, M. (2010). Efficacy of different strategies to treat anemia in children: A randomized clinical trial. *Nutrition Journal*, 9(1). <https://doi.org/10.1186/1475-2891-9-40>
- Rosswurm, M. A., & Larrabee, J. H. (1999). A model for change to evidence-based practice. *Image-The Journal of Nursing Scholarship*, 31(4), 317. <https://www-proquest-com.unco.idm.oclc.org/scholarly-journals/model-change-evidence-based-practice/docview/236449236/se-2?accountid=12832>
- Salah, R. W., Hasab, A. A. H., El-Nimr, N. A., & Tayel, D. I. (2018). The prevalence and predictors of iron deficiency anemia among rural infants in Nablus Governorate. *Journal of Research in Health Sciences*, 18(3), e00417.
- Scott, S., Chen-Edinboro, L., Caulfield, L., & Murray-Kolb, L. (2014). The Impact of anemia on child mortality: An updated review. *Nutrients*, 6(12), 5915–5932. <https://doi.org/10.3390/nu6125915>
- Stoltzfus, R. (2011). Iron interventions for women and children in low-income countries. *The Journal of Nutrition*. 141, 756-762.
- Stoltzfus, R. J., Edward-Raj, A., Dreyfuss, M. L., Albonico, M., Montresor, A., Dhoj Thapa, M., West, K. P., Chwaya, H. W., Savioli, L., & Tielsch, J. (1999). Clinical pallor is useful to detect severe anemia in populations where anemia is prevalent and severe. *The Journal of Nutrition*, 129(9), 1675-1681.
- Strasser, R. (2003). Rural health around the world: Challenges and solutions. *Family Practice*, 20(4), 457-463. doi:10.1093/fampra/cm422

- Tata, C. Y., Ickowitz, A., Powell, B., & Colecraft, E. K. (2019). Dietary intake, forest foods, and anemia in Southwest Cameroon. *PLOS ONE*, *14*(4), e0215281.  
<https://doi.org/10.1371/journal.pone.0215281>
- U.S. Department of Health and Human Services. (n.d.). *Pilot studies: Common uses and misuses*.  
<https://www.nccih.nih.gov/grants/pilot-studies-common-uses-and-misuses>.
- Van Phu, P., Van Hoan, N., Salvignol, B., Treche, S., Wieringa, F. T., Khan, N. C., Tuong, P. D., & Berger, J. (2010). complementary foods fortified with micronutrients prevent iron deficiency and anemia in Vietnamese infants. *The Journal of Nutrition*, *140*(12), 2241–2247. <https://doi.org/10.3945/jn.110.123711>
- Vasan, A., Anatole, M., Mezzacappa, C., Hedt-Gauthier, B. L., Hirschhorn, L. R., Nkikabahizi, F., Hagenimana, M., Ndayisaba, A., Cyamatore, F. R., Nzeyimana, B., Drobac, P., & Gupta, N. (2013). Baseline assessment of adult and adolescent primary care delivery in Rwanda: An opportunity for quality improvement. *BMC Health Services Research*, *13*(1). <https://doi.org/10.1186/1472-6963-13-518>
- Waldrop, J., Caruso, D., Fuchs, M. A., & Hypes, K. (2014). EC as PIE: Five criteria for executing a successful DNP final project. *Journal of Professional Nursing*, *30*(4), 300–306. <https://doi.org/10.1016/j.profnurs.2014.01.003>
- World Health Organization. (2020). *Global anaemia prevalence and number of individuals affected*. [https://www.who.int/vmnis/anaemia/prevalence/summary/anaemia\\_data\\_status\\_t2/en/](https://www.who.int/vmnis/anaemia/prevalence/summary/anaemia_data_status_t2/en/)
- Worldbank. (2021). *Low-income countries*. <https://data.worldbank.org/country/XM>

- Yilma, H., Sedlander, E., Rimal, R. N., Pant, I., Munjral, A., & Mohanty, S. (2020). The reduction in anemia through normative innovations (RANI) project: Study protocol for a cluster randomized controlled trial in Odisha, India. *BMC Public Health*, *20*(1).  
<https://doi.org/10.1186/s12889-020-8271-2>
- Zhai, Y., Shi, X. M., Qian, H. Z., Fitzgerald, S. M., Zeng, Y., Yin, Z. X., Xu, J. W., & Liu, Y. Z. (2011). Association of anemia with cognition among senior female in China. *Chinese Journal of Preventive Medicine*, *45*(9), 802–805.
- Zhang, Q., Ananth, C. V., Li, Z., & Smulian, J. C. (2009). Maternal anaemia and preterm birth: A prospective cohort study. *International Journal of Epidemiology*, *38*(5), 1380–1389.  
<https://doi.org/10.1093/ije/dyp243>

**APPENDIX A**  
**EVIDENCE SYNTHESIS TABLE**

**Table A1***Evidence Synthesis Table*

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Abdel-All et al. (2017)	Evaluate the training of CHWs for prevention/management of cardiovascular disease and its risk factors in low-income and middle-income countries	None stated	Systematic review and meta-analysis Level II evidence	Low-income, lower-middle-income and upper-middle-income during 2015  8 studies	Review articles relating to CVDs  Studies included: post-observational and pre-observational studies and RCTs published until December, 31 2016	Post-test and post-intervention scores published in the 8 articles  Narrative synthesis conducted	Training methods include interactive modes Training designs include T5 instructional learning design to allow interactive learning Pre and post-training mean scores are a measure of training effectiveness.  The skill and knowledge set of CHWs improve after training Increase in knowledge average score among CHWs ranging from 3 percent and 40 percent pre and post training  CHWs experiences barriers: language, gender issues, cultural issues, safety and lack of trust and openness among community members	Training to be offered onsite where CHWs conduct their roles Government to incorporate national planning and offer legal and financial support to sustain implemented programs
Abeywickrama et al., (2018)	Describe micronutrient status of community	None stated	Cross-sectional descriptive study Level I	Sri Lanka  59 articles published from 2000	National nutrition survey National iodine survey	Meta-analysis	Iron, zinc, calcium, folate, Vit A deficient common together  Iodine deficiency improved after widespread salt iodization  IDA seen more in women	need for studies, nutritional policies, intervention programs in Sri Lanka to improve micronutrient status

Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Abirami et al., (2018)	Evaluate IDA during pregnancy  Antenatal Mothers  Relate knowledge on IDA to demographic factors	None found	Non-experimental descriptive Quantitative  Level III	52 antenatal mothers  SRM General Hospital, Kancheepuram	Non-probability convenient sampling	Descriptive and inferential stats	87.2% moderate knowledge 17.3% inadequate knowledge 0% adequate knowledge p-values 5% significance level	Education can help with IDA
Abujilba et al., (2018)	Assess a well-being data program of pregnant women	None stated	Randomized controlled  Pre/posttest design 2 groups Level II	Jordan  200 pregnant women  April to July 2016	SPSS  Pre/post test Questionnaire	Chi-square independent t-test  Descriptive statistics	Intervention group scored higher than in control group	Policymakers should recommend public system to help with IDA in pregnancy
Aldridge et al (2012)	Test accuracy of HCS vs IMCI method	None Stated	Convenience sampling Children Level II	Zanzibar 799 kids 2m to 59months	Observation Finger stick HCS EpiData 3.1 Stata	Linear regression & paired t-test 95% CI	Prevalence anemia 71% severe 0.8%  Sensitivity HCS 33%, specificity 87% anemia severe 14% specificity 100%  Palmar anemia sensitivity 58% (p<0.001) specificity 55% HCS is not significantly better to dx anemia vs clinical assessment	Need to improve the training for HCS

Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Asweto et al. (2016)	Explore the available opportunities and challenges of incorporating community health workers into healthcare systems of developing nations	None stated	Literature review Level V	33 studies	Developing countries.  Qualitative, quantitative, and mixed methods studies on CHWs working in preventive, promotional and curative primary care	Thematic coding	CHWs excluded from healthcare system due to reimbursement and funding issues  CHW performance improves when they receive financial and non-financial incentives  Supervision improves motivation and performance  Government commitment is required to address health needs in developing countries  A supportive environment is vital for CHWs to be productive	Pay attention to factors impacting CHW productivity in design phase and throughout program  Government to anchor CHW programs to ensure their sustainability  Emphasize on high-performing health systems to reinforce CHW
Callister et al. (2020)	Evaluate typical diets in Ghana to Hgb level		Cross sectional sample Level III	Ghana 140 adults	Food questionnaire Finger sticks 95 CI Regression analysis	R studio program OR testing	Prevalence 47% anemia  Distinct variation of location/access to game meat to Hgb level	Access to plant proteins is likely to be of benefit to this population
Chandyo (2015)	Determine the prevalence of iron deficiency anemia	None Stated	Two-stage cluster sampling Level III	500 lactating women 15-44yr of age 474 infants under 1y of age  Bhaktapur Nepal No concurrent infection	Blood samples Sent to Norway TIBC, Hgb, transferrin, ferritin	Regression analysis of WHO definition of anemia  Independent t-tests  P<0.05 Stata version 10	72% >6m of age  49% <6m of age  20% of women  Each month of age co-correlated with decrease in ferritin (95%CI) Maternal levels helped for 1 <sup>st</sup> 6mo of life	Identify causes of anemia  Determine if findings consistent with other countries

Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Cherrington et al (2010)	Explore the role of CHWs and difference between paid and non-paid	None stated	Literature review Level V	25 studies	Not indicated how data was obtained	Commentary review	Volunteer CHWs: motivate/mobilize community, advocate, episodic outreach, choose what to do  Paid: more connection with health facility, educate health centers on community, long-term outreach, assigned tasks	If possible, offering paid incentives can help
Detzel & Wieser (2015)	Benefits and cost-effectiveness of food fortification for addressing an iron deficiency	None stated	Level V	1800 households Philippines	National nutrition survey	Literature review	Powdered milk was a good vehicle in helping with iron fortified foods and hgb levels	Iron fortified foods can be a cost effective method to help in IDA
Golden et al. (2011)	To show how increased consumption of wildlife is related to reduced anemia incidence	None stated	Longitudinal cohort study Level IV	Rural northeastern Madagascar 77 children under 12 years  Yearlong observation and monitoring	Systematic random sampling  Hemocue  Diet journal  Stata 10.0  Generalized linear mixed model	Lack of wildlife consumption result in increase in anemia prevalence from 42% to 52%  Hgb levels increase avg by 0.69 g/dl eating wildlife	Correlation between hgb levels and wildlife consumption Consuming more wildlife have increased hgb  Children in low-income families are 3x more likely to have anemia than those from high and middle income families	Animal meat helps with prevention of anemia  Need to balance conservation, economic development and human health



Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Javanparast et al. (2018)	Scope and value of CHPs in Australia	None stated	Literature review Interviews Level V	11 stakeholders 47 documents	Semi-structured interview via telephone of 11 stakeholders NVivo 11 for coding  Databases: Scopus, Web of Science, ProQuest, Informit	Interviews: audio recorded, transcribed and coded for themes 2 policy makers, 6 program managers, 3 practitioners Documents: 29/47 on role of CHPs, 13/47 looked at non-English speaking patients, 2/47 on IV drug users, 1/47 on dementia and 2/47 undefined	Multiple roles and terms used for CHPs: facilitate relationship building between community and health care services, support cultural competence, increase health literacy, help with research, seek community input in programs and services Much on origin of Australia CHPs	There is a place for CHPs and they add value to the community
Jeet et al. (2017)	Evaluated effectiveness of CHW on non-communicable disease primary prevention interventions in low-income and middle-income regions	None stated	Systematic review Level I	16 articles published (2000-2015)	Primary reviewer  Instrument adapted from The Cochrane Public Health Group: Data Extraction and Assessment Template. Hamilton Effective Public Health Practice Project Checklist	Meta-analysis using Review Manager	Tobacco – helped with quitting ETOH – no change Physical activity – increased  Vegetable/fruit intake – no change  BP control - decrease (MD: -4.80, 95% CI: -8.12, -1.49 and MD:-2.88, 95% CI: -5.65, -0.10)  BMI – no change (MD: -0.75, 95% CI: -1.63, 0.13)  A1c – improvement (MD: -0.83%, 95% CI: -1.25,-0.41)  Lipids – improved (MD: -0.1, 95% CI: -0.26, 0.00)	Economic implications- cost effectiveness of offering group education-based intervention  Guide resource allocation towards promotive and preventive services

Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Khan (2015)	Assess accuracy HCS, compared with clinical signs assessment technique of health care providers	None stated	Patients presenting at antenatal clinics Level II	Karachi, Pakistan Pregnant women 18 - 45 years, gestational age >12 wks	Cross-sectional validation Structured questionnaire	HCS Clinical Signs Anemia Assessment  Hemoglobin levels <11 g/dL	Sensitivity/ specificity of HCS: 70.9% (95% CI= 62.7-78.3) and 49.1% (95% CI = 35.1-63.2)  CSAT: 95.7% (95% CI = 1.0-98.4)and 5.7% (95% CI = 1.2-15.7)	Accuracy of Hemoglobin Color Scale is superior to CSAT for evaluating clinical anemia by healthcare providers
Loy et al (2019)	To identify the iron status and risk factors of iron deficiency among pregnant women in Singapore	None stated	Cross-sectional study Level II	Singapore 985 women Asian ladies 26-28 weeks gestation	Plasma ferritin and transferrin receptor measurements (ELISA)	Multi-variable ordinal logistic regression	Applicable for POC use in resource-limited and resource-rich institutions  Up-to 88% accuracy 25-75 <sup>th</sup> percentile 24.2 ug/L 660 (67%) significant anemia	Widespread screening & supplementation might be assessed as a preventive system
Lu et al. (2017)	Propose a quick diagnostic test to diagnose iron and vitamin A deficiency	None stated	Convenient sampling Level III	43 blood samples from donors with no illness	Diagnostic testing of blood samples	TIDBIT (their machine)	Testing technique was reliable and was able to provide information on multiple nutritional deficient  Sensitivity: 88%, 100%, 80%  Specificity: 97%, 100%, 97%	Useful for testing iron and vitamin A deficiency since it is cheap and easy to use

Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Martial (2021)	Assess factors that contribute to anemia outcomes in children 6 to 59 months after administration of Timo Anemia-Prevention Program	None stated	Mixed method design consisting of simultaneous quantitative phase and two qualitative phases  Level III	Rural Haiti Children 6 - 59 months presenting at bi-annual outreach clinics between 2011 and 2018	Prospective interviews and questionnaires for caretakers and clinicians	Multilevel/multivariate modelling: quantitative data  Content analysis/focused ethnography, integration of core findings: qualitative (interview) data	Decreased anemia prevalence by 21.2%  Predictors of anemia included number of clinical visit and age at first visit After improvement children remained in normal state	Socioeconomic factors undermined recommended behaviors  Need for attention to intra-and inter-personal, and community social determinants is critical for management of pediatric anemia
McGann (2015)	Test accuracy color-based assay in a point-of-care (POC) in detecting severe anemia  Children living in limited resources regions	None stated	Convenience sampling:  Only children  Employed pilot study technique  Level II	Angola Kids with sickle cell anemia  Hospital Pediatrico David Bernardino  Collected samples from sickle cell anemia patients visiting the hospital	Blood samples examined: hemoglobin level  Sysmex KX-21N hematology used as reference point  The leftover blood sample (capillary/venous blood) collected at the point-of-care analyzed	Capillary blood analyzed using spectrophotometric hemoglobin  Stata 13.1 Linear regression prediction limits, person correlation approach	86 samples measured Avg hgb: $6.6 \pm 1.3$ g/dL  Positive correlation between reference value and color-based essay value of $r=0.88$ , $P<0.000$  51 patients hgb $<7.0$ g/dl, (severe anemia)  POC 95% accuracy	Further study on the financial impact of color-based POC use is needed

Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Moor et al. (2016)	Identify prevalence of anemia in women and children in rural farming community in Baja California	None stated	Cross-sectional data collection Level III	2004-2005 (wave1) 2011-2012 (wave2) 201 Women 15-49 99 Children 6-59m	Survey and blood testing following nutritional education and PE	Anemia decreased from 42.3 to 23.3 % between Waves 1 and 2 in women ( $p < 0.001$ ), from 46.5 to 30.2 % in children 24 to 59m ( $p = 0.066$ ), and from 71.4 to 45.8 % in children 6–23 m ( $p = 0.061$ )	Eating iron rich foods is protective against anemia. Eating >4 servings a week	Encourage eating green veggies and add fruits high in Vit C
Najafizada et al. (2009).	Analysis of how CHWs function as human resources for health in rural Afghanistan. evaluate how CHWs interact with formal and informal healthcare employees in Afghan	None stated	Descriptive qualitative analysis Level V	Rural Afghanistan. 98 participants: policy makers, health managers, community health worker trainers and community members 54 male/ 44 female	Stratified, purposive sampling to select participants  In-depth interviews  Eight focus groups	Interviews audio-taped and field notes documenting observations  Thematic analysis	Most CHWs are voluntary Religious beliefs/rewards are motivating factors Monetary/non-financial incentives are important recruitment, retention, deployment CHWS develop additional practical skills besides assigned tasks to accomplish positive health outcomes Roles: detecting s/s of diseases, dispense drugs, offer first-aid, care for the sick, tract health status within the community, monitor pregnant women and administer injections CHWs undertake tasks that other health practitioners ignore, including health education for individual behavior and hygiene and mobilization for overall wellbeing CHWs in Afghanistan are situated between traditional and professional health workers	CHWs in rural Afghanistan are a viable option to meet population basic health needs.  Their full potential and integration into the health system in most regions as human resources for health is limited.  CHWs can extend services to marginalized populations.  Attention to career progress for CHWs is required

Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
O'Donovan et al. (2018).	Map current implementation, delivery and assessment of ongoing training provision for CHWs in low-income and middle-income countries	None stated	Systematic scoping review Level V	Developing countries (studies of most of the reviewed articles took place in East Africa, (n=16) or South Asia (n=7)) 35 articles	Review articles relating to CHW training	Systematically extracting data from studies  Data charting form in Excel spreadsheet  Thematic analysis	Variation in terms of structure, duration and content focus in training Training range from a 1 day refresher focusing on acute respiratory illness in children to monthly refresher trainings focusing on behavior change. Outcome measures are knowledge pretesting and post testing and behavior change. Co-designing training programs with CHWs is vital to ensure relevance to experiences and practices. Training is delivered in person or through mobile technologies Evaluation and assessment done through pre/post tests CHWs who receive supportive supervision foster improved behavior hygiene among community members	ongoing training in management and prevention of NCDs at community levels Need to expand CHW towards NCDs further exploration of mHealth as a potential tool to manage HR shortages consider how mobile phones can transition successfully

Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Olupot-Olupot et al. (2019)	Evaluate different methods to assess anemia in resource- limited communities	None stated	Prospective descriptive study	322 children 2m to 12y Uganda hospital	Hemocue, HCS, Sahli's method vs clinical assessment	Observation findings confirmed and compared to finger stick hemocue	<p>Clinicians over estimated severe anemia</p> <p>Agreement between the clinicians and the nurse were good</p> <p>Colorimetric performed poorly in identifying severe anemia Hemocue was most accurate followed by Sahli's</p> <p>RN: severe 51%, moderate 30.7%, mild 17.7%</p> <p>Hemocue: mild 2.7%, moderate 45.2%, severe 52.1%</p>	<p>Clinical assessment of severe pallor results has a low specificity for the diagnosis of severe anaemia. To target blood transfusion Hb measurement by either Hemocue or Sahli's method for the cost of USD 4 or and USD 0.25 per test, respectively would be more cost-effective</p>
Perry et al. (2014)	Review history of CHW globally and significance in achieving health and wellbeing for every individual	None stated	Literature review Level VII Defining who CHWs are, history, evolution and effectiveness	Not applicable	Report	158 studies evaluated to summarize and condense information about CHPs	<p>CHWs have formal but limited training and work in communities</p> <p>do not receive paraprofessional or formal professional certificate Originate from Ding Xian, China in 1920s</p> <p>CHWs are integral in HIV/AIDS fight in high prevalence nations, malaria and tuberculosis control contribute towards reduction of under-nutrition, help reduce mortality in children younger than 5 years</p> <p>CHWs help in community case management of challenging childhood diseases</p>	<p>CHWs should be integrated in health system to improve population health in low-income, middle-income and even high income nations</p>

Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Pratt (2015)	Review strategies used to reduce IDA in 6-12 month olds	None stated	Meta-analysis Level II	8 studies prior to 2014	RCTs, quasi-randomized and non-randomized studies reviewed	Meta-analysis	Micronutrients improved anemia 20% then iron-fortified milk. Iron supplements were mixed and least successful were the food based	Need longer term studies to investigate
Rosado et al. (2010).	Assess the efficacy and children's acceptance of different recognized approaches to treat anemia	None stated	Randomized control trials Level II	Rural communities within 50 kilometers of the city of Queretaro in Mexico: La Fuente, Los Cerritos, El Tejocote and Fuentezuelas  Mothers of 577 children aged 6 to 42 months	Treatment Groups SAS version 8.1 program. Electronic scale to evaluate Anthropometry Questionnaires	Statistical analyses using SPSS v.10.0.  The Least Significant Difference test.  A Chi square test	267/577 children were anemic  Changes in Hgb with IS, MMS and IFS were more than FCF  Decrease in anemia prevalence in the treatment groups were MMS -72%; IFS -69%; IS -58%; FW -52% and FCF -45% All were effective in increasing iron  Effect is greater when supplements are used Adding micronutrients (multivitamins) to iron supplements improve Hb outcomes than supplements alone	Consider multivitamins and other micronutrients in supplements than providing iron doses alone.  Give attention to other deficiencies caused by lack of micronutrients to improve iron intervention techniques effectiveness
Salah et al. (2018)	Evaluate recurrence of IDA  Provincial zones of Nablus Governorate	None stated	Cross-sectional descriptive  Level III	Bank, Jerusalem  Jan to March 2015 654 children between 9-12m	CBC Questionnaire	Bloodwork (venous) and interviews of diary history: type of feeding, time of food introduction, taking iron?  Logistic regression model	Dietary and non-dietary elements were related to increased risk of IDA complication Anemia:34.6%, 36.2% OR=1.19 95% CI maternal anemia 3 <sup>rd</sup> trimester OR=2.39 95% CI birth to 3y OR=2.86 95% CI Breastfeed 1 <sup>st</sup> 6m OR=2.40 95% CI	Clinicians should recommend iron supplement  Offer iron at no charge  Provide information to mothers

Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Stoltzfus (2011)	Global methods to help with IDA	None stated	Cross- sectional descriptive study Level II	Nepal and Zanzibar  CHWs participants  1994-1996  5760 pts examined	Observation and compared with Hemocue	Specificity:82 % sensitivity of pallor severe anemia highest in Nepal postpartum 81%, intermediate in Nepal pregnant 63%, Zanzibari schoolchildre n 65%, Zanzibar— preschoolers 61%	Trainings lasted 1-2 days  Clinical assessment adequate for severe anemia, insensitive for mild anemia  Best to train on using 3 anatomical sites (vs just 1 or 2)	Teaching CHWs on clinical assessment is a cost effective and good method to help get people with severe anemia treated
Tata et al. (2019)	Test if a relationship between anemia & forest proximity	None stated	Comparative cross- sectional design Level VI	Takamanda rainforest region in Southwest, Cameroon.  247 women	Questionnaire and 24 hour recall.  Anthropometric measurements.  Biochemical measurements	Microsoft excel 2010 SPSS version 20.0 and Statistical Analysis System (SAS) Regression analysis using Stata 15	living in forest areas more likely to eat vitamin rich vegetables and fruits than those in grasslands (98% vs. 92%; p = 0.04), meat and fish (84% vs. 68%; p<0.01), and nuts and seeds (88% vs. 46%; p<0.01).  Mean hgb: 10.89 ± 1.54 g/dL.  Grassland participants had lower Hgb (11.10 ± 1.53 g/dL vs. 10.68 ± 1.55 g/dL; p = 0.03). Forest foods can be protective against anemia	Conservation, agricultural and development intervention resulting in forest loss and accessibility affects health negatively



Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Van Phu et al (2010)	Research whether a program including food sources can improve iron status	None found	Randomized control study Level III	Vietnamese 246 children under 6months	Cyanomethemoglobin method  Sigma diagnostic kit	Statistical analysis	Hgb 6 SD higher in fortified flour (112.5 6 8.0 g/L) P = 0.006) [95% CI  Fortified flour helped with anemia but vit A and zinc did not have any significant changes	Large-scale distribution of such food products in developing countries could reduce the level of anemia
Vasan (2013)	Adult-care in outpatient department in rural Rwanda Purpose: establish standard of care determine areas that require improvement suggest improvement measures that can be adopted	None stated	Systematic sampling Level II	Age >13 Seeking treatment in 8 hospitals in Kanyonza District (Rwanda) Between February and March 2011 Hospital staff	Observation (routine nurse care) Patient diagnostic and complaints examined	Analyzed if correct diagnosis established  Appropriate treatment  Continuous variables used to categorize sample  Correlation between nurse experience and correct diagnosis	470 cases Median time taken for nurse consultation=6 minutes 68.4% of the patients were women  > ½ nurses experience >4y 75% patients suffered from one health issue, 21.7% had two, 1.9% > 2 health complaints  1.5% examined and triaged as emergency  Nurses had correct diagnosis 50.1% of patients  44.9% had correct treatment	Additional study required to understand the impact of misdiagnosis and improvement plans to prevent such cases in limited resources health system

Table A1 Continued

Author (year)	Purpose	Theory/ Framework	Design & evidence level	Setting & sample	Survey/ instruments	Analysis	Findings	Implication
Yilma et al. (2020).	To investigate the capability of a norms-based behavior change intervention to decrease anemia among females of reproductive age in Odisha, India.	normative social behavior  Posits that social norms influence behavior and the influence is increased when moderators support the behavior	A cluster randomized controlled trial (RCT) design. Level II	Odisha, India. 4000 women	Hemoglobin measurements using a Hemo-Cue photometer  Interviews  The Queens College Step Test.  The Simon Task and a Simple Reaction Time test to measure attention  ActivPAL (PAL Technologies, LTD; Glasgow, UK)	Statistical analysis	Significance of shifting social norms among women of reproductive age and their primary referent groups was determined  The evaluation of reduction in anemia through normative innovations (RANI) T4 approach can evaluate norms-based intervention to increase iron-rich food and IFA uptake	Encourage input from stakeholders throughout the implementation and assessment of the Rani project.  Support social norms-based intervention as it increased uptake of iron rich foods and iron folic acid supplements to reduce anemia

**APPENDIX B**  
**INSTITUTIONAL REVIEW BOARD APPROVAL**



UNIVERSITY OF  
NORTHERN COLORADO

**Institutional Review Board**

Date: 08/16/2021

Principal Investigator: Julie Hirman

Committee Action: **IRB EXEMPT DETERMINATION – New Protocol**

Action Date: 08/16/2021

Protocol Number: [2108028142](#)

Protocol Title: Development of a Culturally Adaptable Educational Program on Iron-Deficiency Anemia For Use In Resource-Limited Communities

Expiration Date:

The University of Northern Colorado Institutional Review Board has reviewed your protocol and determined your project to be exempt under 45 CFR 46.104(d)(702) for research involving Category 2 (2018): EDUCATIONAL TESTS, SURVEYS, INTERVIEWS, OR OBSERVATIONS OF PUBLIC BEHAVIOR. Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met: (i) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects; (ii) Any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, educational advancement, or reputation; or (iii) The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by 45 CFR 46.111(a)(7).

You may begin conducting your research as outlined in your protocol. Your study does not require further review from the IRB, unless changes need to be made to your approved protocol.

**As the Principal Investigator (PI), you are still responsible for contacting the UNC IRB office if and when:**

- You wish to deviate from the described protocol and would like to formally submit a modification
- At the end of the study or before you leave The University of Northern Colorado and are no longer a student or employee, to request your protocol be closed. \*You cannot continue to reference UNC on any documents (including the informed consent form) or conduct the study under the auspices of UNC if you are no longer a student/employee of this university.

- You have received or have been made aware of any complaints, problems, or adverse events that are related or possibly related to participation in the research.

If you have any questions, please contact the Research Compliance Manager, Nicole Morse or via e-mail at [nicole.morse@unco.edu](mailto:nicole.morse@unco.edu) Additional information concerning the requirements for the protection of human subjects may be found at the Office of Human Research Protection website: <http://hhs.gov/ohrp/www.unco.edu/research/research-integrity-and-compliance/institutional-review-board>

Sincerely,

A handwritten signature in black ink that reads "Nicole Morse". The signature is written in a cursive style.

Nicole Morse  
Research Compliance Manager

2108028142

**APPENDIX C**  
**OUTLINE FOR ROUND ONE EDUCATIONAL**  
**PROGRAM**

## OUTLINE FOR EDUCATIONAL PROGRAM

### Overview

**Purpose:** To develop an educational program designed to be presented to community health promoters in resource-limited communities on iron deficiency anemia (IDA).

**Background:** IDA is a global health problem that affects a quarter of the world's population and has an even greater impact on those living in resource-limited communities where up to 70% of those populations suffer from IDA. Identification of individuals with severe anemia and preventing anemia can save lives. Unfortunately, many resource-limited communities have inadequate health care services and there are significant barriers for the individual to seek health care services. One potential approach to reduce the burden in these regions is to utilize Community Health Promoters (CHPs) to prevent, intervene, and initiate referrals for IDA among community members. CHPs are members of the community who work either for pay or volunteer to work in association with the health care system or another organization in providing basic health services to their communities. They usually have some educational (primary or secondary school), have completed some supervised training, and can engage in basic community health intervention such as health screenings, maternal health/delivery, vaccinations, and record keeping. CHPs offer a unique benefit in that they are often a trusted member of the community and can offer insight into the social and cultural nuances of health issues such as IDA.

**Delivery:** Educational program will entail 2 sections: a lecture and a hands-on skills training section.

**Estimated time to deliver program:** One 8.5 hour day or two 4 hour days

**Suggested location:** Local community center, health clinic, school, or other appropriate location identified by the community

**Preparation:** Prior to delivering program, partner with local health facility/organization and seek to get local clinicians/providers to attend\*. Whenever possible, local terms should be identified and used or the program can be fully translated by a trained interpreter.

**Suggested supplies/materials:** 2 clear bottles partially filled with water, pink/red juice or cocoa powder (to add to bottles), markers/pens, masking tape, picture of social norms, figures in this educational program, check off form for each participant (appendix A), certificate of completion for each participant, iron-rich food sources for provided lunch

\*Alternative: If unable to arrange for partnership with local health care organization, work with CHPs to arrange a few hours in the community going house to house and/or arrange for training during market days, church, or other community events.

Time Allotted	Topic	Key Points	Content	Materials Needed
15min (time may be modified depending on # of participants)	Introduction	Icebreaker Introductions Purpose of Program	Purpose: purpose of the program is to provide knowledge and skills to local CHPs to reduce anemia in their communities and provide resources to help them educate and refer members of their communities to more advanced care.  There will be two parts to the training: lecture and a hands on skill based section.	
10min	Ground rules	Ground Rules	Local context discussion: Ask the participants to either describe or select a picture of group norms. If participants are willing, ask them to describe to the group what the picture represents and then tape to the wall. When everyone has completed this, ask the group if there are other cultural or social norms that they would like to see honored during this training. Keep the written ground rules or pictures posted on the wall throughout the entire program.	Tape  Pictures displaying examples of ground rules or group norms
20min	What is anemia	Definitions: Anemia, Hemoglobin, Iron  Prevalence	Discussion/ask: What is anemia? Show anemia bottles 1 and 2 and pass them around Ask: Which one of the bottles is the healthier one? Discuss: both bottles represent human blood, bottle 1 which is less in concentration (lighter) is anemic blood. And bottle 2 which is more concentrated (thicker) is normal or healthy blood. Explain that the beet/cocoa powder represents the hemoglobin which gives blood it's red color just as the beet/cocoa powder gives the water in the bottle it's brown color. The more hemoglobin you have the thicker and healthier your blood will be just like bottle 2 which has more cocoa powder in it. Definitions: Anemia – reduced amount of hemoglobin in the blood. Hemoglobin – is the substance in the blood that carries oxygen from the lungs to the organs, tissues and all parts of the body. To make hemoglobin, you need a substance call iron. Iron is found in foods such as meats and dark green leafy	Prepared bottles representing anemia (figure 1)  Picture of Blood Cell (figure 2)  WHO picture of anemia prevalence from website  Picture of people/prevalence (figure 3)



			<p>vegetables. We will discuss the foods in more details later.</p> <p>Prior to lecture, determine prevalence rates in area this is being conducted at:  <a href="https://www.who.int/health-topics/anaemia#tab=tab_1">https://www.who.int/health-topics/anaemia#tab=tab_1</a></p>	
15min	Consequence of anemia	Economic Cognitive	<p>Economic – anemia causes fatigue. If you are feeling fatigued, it is harder to work and if you can't work, then you cannot earn money needed</p> <p>Cognitive – anemia in children less than 2y of age leads to permanent cognitive delays</p>	
		Pre-term Delivery Mortality	<p>Pre-term delivery – anemia in pregnant women can result in pre-term delivery (prior to 37w gestation). This leads to higher complications for both the fetus and the mother.</p> <p>Mortality – higher rates of death for those with anemia</p>	
15min	Types of anemia Causes of IDA	IDA	<p>Main focus on IDA and greatest impact</p> <p>Causes (risk factors): Lack of adequate or iron-rich foods, malaria, intestinal disorders (including parasites), pregnancy, menstruation, age (&gt;65 years or &lt;5 years), premature birth or low birth weight, family history</p>	Picture of causes (figure 4)
10min	BREAK			
30min	Signs and symptoms	Define Symptoms of Anemia Signs of Anemia	<p>Define 1: Symptoms: what an individual affected by disease experiences</p> <p>2: Sign: what is seen/observed</p> <p>Symptoms: Mild – fatigue/tiredness, headache, feeling cold Moderate – above and weakness, dizziness, pica (strange cravings esp. in pregnant women), hair loss, tingling sensation in feet/legs, SOB</p>	<p>Picture of symptoms (figure 6)</p> <p>Picture of signs (figure 7)</p>

			<p>Severe – above and brittle nails, irregular heart rate (palpitations), syncope, chest pain, dyspnea</p> <p>Signs: pallor – hands, nailbeds, tongue, conjunctivae</p> <p>Additional signs: Thinning hair, Irregular heart rate, cracked nails</p>	
25min	Identification of anemia	Assessment Techniques: Client Interview Clinical Assessment	<p>Client interview: confidentiality, ask about symptoms and dietary habits (including food security and quality issues)</p> <p>Local context discussion: Ask CHPs what types of culturally appropriate questions they feel they should ask their clients. Create a list of interview questions that the group and facilitator agree upon.</p> <p>1:1 Role Play: Practice CHP/client brief interviews in pairs with facilitator feedback. Discuss how to create a confidential environment for interviewing clients.</p> <p>Clinical assessment: signs (as listed above); emphasize that the more signs the client displays, the more likely and potentially severe the anemia. [Physical assessment will be practiced later in the training]</p>	Picture of interview/exam (figure 5)
25min	Referral	When to Refer	<p>Local context discussion: What is the available healthcare? How do they currently refer? Do they know how to refer and who to contact? What are the logistics and barriers to accessing care in this community?</p> <p>When to refer:</p> <ul style="list-style-type: none"> <li>• clients presenting with at least 3 pallor signs and/or 1 additional sign</li> <li>• 2 mild/moderate symptoms or any one symptom from the severe list.</li> </ul> <p>s/s needing emergent higher level of care: dyspnea, chest pain, syncope, palpitations (regardless of any presenting signs)</p>	

10min	BREAK			
15min	Perspectives/ Beliefs	Perspectives/ Belief  Cultural Aspects  Myths or misconceptions	Local context discussion: What do the CHPs currently know about anemia? What methods are currently employed now to help with anemia? (i.e. iron pots, special foods, etc.) Do woman and children need as much iron as men? Do people in the community have access to iron replacement pills and if so, are they utilized and why or why not? Are there any beliefs or stigma associated with anemia?  Discuss local populations potentially vulnerable to IDA: menstruating and pregnant girls/women; children and babies; those with food insecurity, etc.	
20min	Interventions /Prevention	Iron-Rich Foods  Other Methods	Local context discussion: Review the poster and ask the participants to circle or indicate which of the listed foods are readily available in the community Discussion: What other foods are available that are not listed on the poster? Are iron supplements, cast iron pots, or other resources locally available?	Poster
15min	Physical Assessment	Physical Assessment	Hands, nailbeds, tongue, conjunctivae	Instructor lead demonstration  Poster  Printed pictures of clinical signs of anemia
45min	LUNCH	Provide lunch to participants that is high in iron and have displays of iron content of foods		
HANDS ON PRACTICUM				
20min	Practice	Practice Complete Assessment	Facilitator will role play a complete client interview and demonstrate the technique for assessing for anemia: palms, conjunctivae, tongue, nailbeds. Pair up the participants and have them practice the interview and technique on each other. This session is designed for the practical use of the assessment of anemia	Appendix A

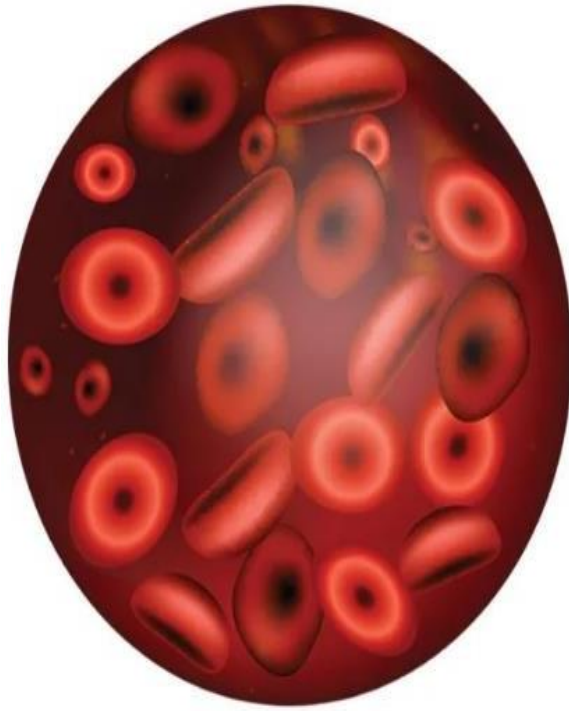
3.5hours	Assess Clients in Pairs	In pairs, assess 3 to 5 clients, come to consensus, report to facilitator	As you have partnered with local health care facility partners, assessments will be accomplished on clients waiting for appointments. Clients will be verbally asked to participate in this training. If consenting, the CHPs will assess the client in pairs and come up with a consensus of their findings (symptoms and physical assessment). They will then present their findings to the facilitator who will then perform their own evaluation and provide feedback. The CHPs are expected to assess symptoms, dietary practices/food security, and pallor in palms, conjunctivae, nailbeds, and tongue. If the client is determined to be anemic, they will provide education on following an iron-rich diet and report to the partnering health care provider (immediate referral is essential if the client is displaying signs and symptoms of severe anemia). If the CHPs are unable to have a consistent and accurate assessment, or if there are no anemic clients, then continue to assess in supervised pairs until accuracy improves.	Appendix A
	Assess Clients Independently	Independently assess 3 clients, report to facilitator	CHPs will individually assess 3 clients and then present their findings to facilitator as in the prior step. If there is good consensus amongst the CHPs and facilitator in assessment findings and there have been at least three anemic clients identified, the CHP will be permitted to independently assess clients in the facility, community, or wherever they practice.	Appendix A
20min	Completion		Conclusions/Questions/Celebration	Certificates of completion and IDA signs/symptoms and iron sources posters for each participant

**Figure 1***Anemia***Bottle 1 (Anemic Blood)****Bottle 2 ( Healthy Blood)**

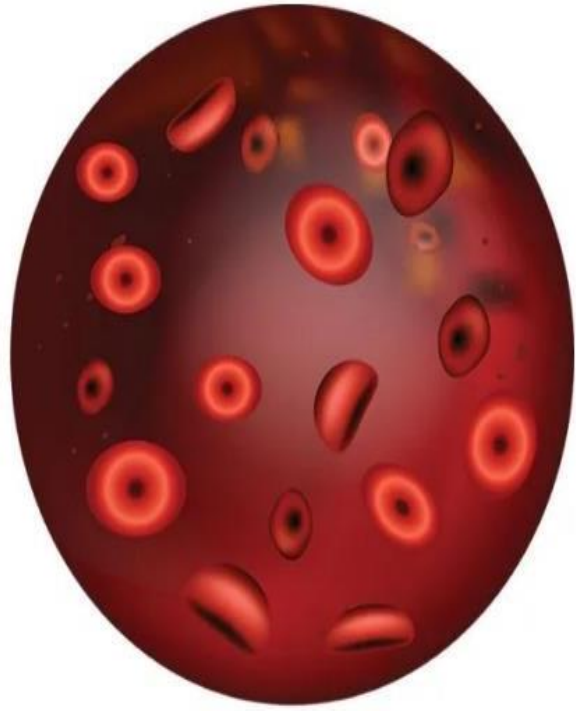
How to prepare: Fill 2 clear bottles with clear water (about 2/3 full). Label the bottles 1 and 2. Put a small amount of juice or cocoa powder in to bottle 1 to get a light coloration. Put more quantity of juice or cocoa powder in to bottle 2 to get a dark coloration .

**Figure 2**

*Picture of Anemia*



Normal



Anemia

**Figure 3***Prevalence*

**Figure 4**

*Causes of Iron-Deficiency Anemia*





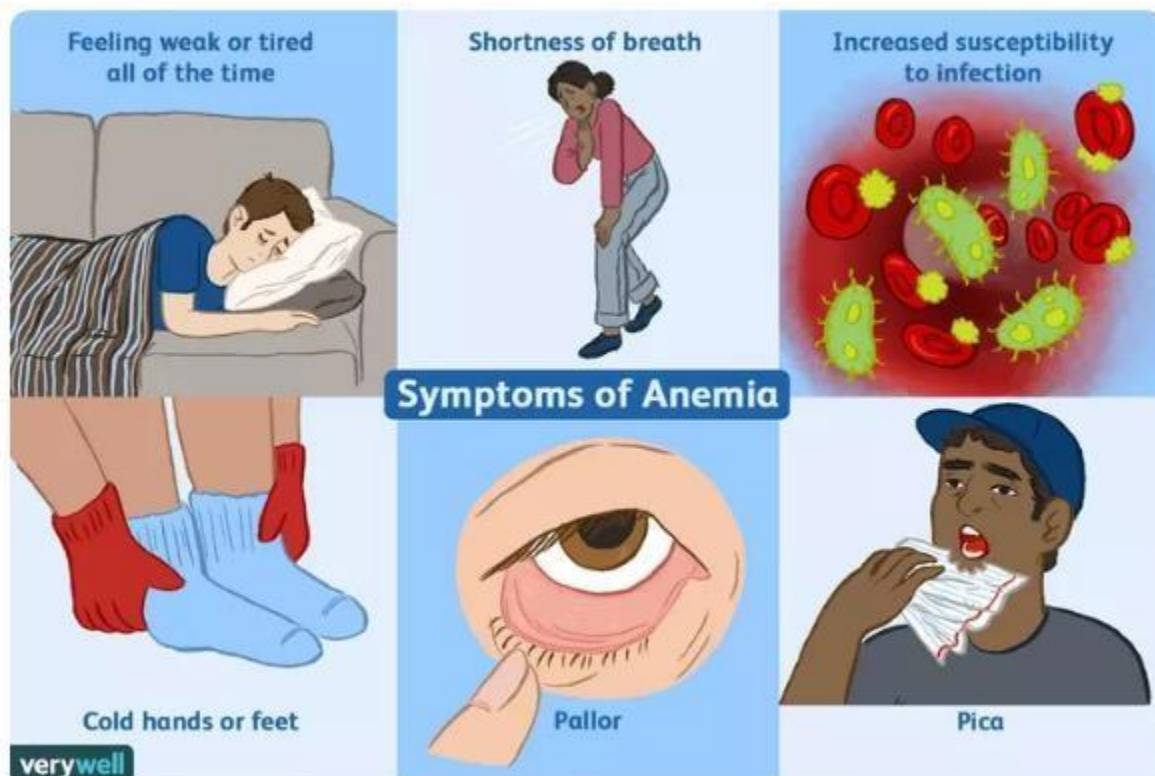
**Figure 5**

*Client Interview/Exam*



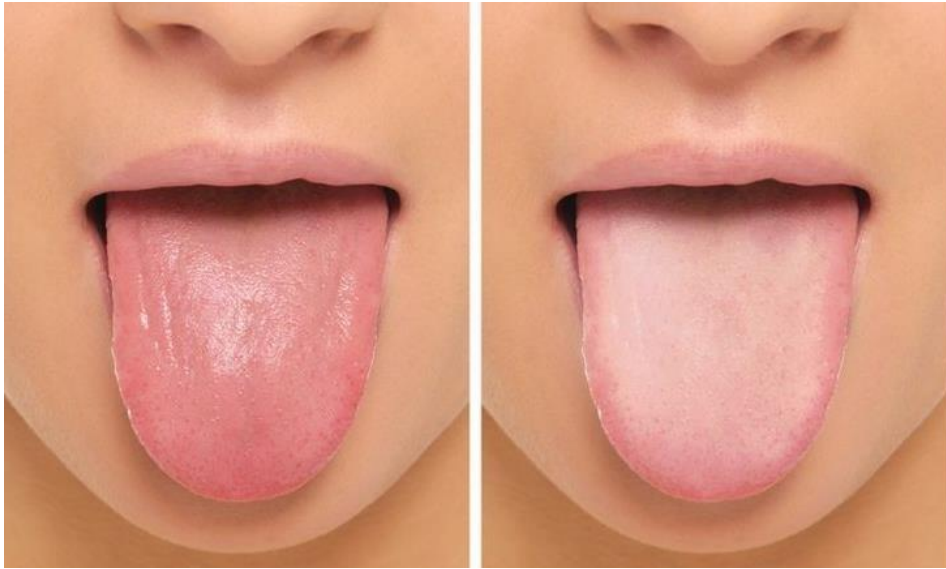
**Figure 6**

*Symptoms of Anemia*



**Figure 7**

*Signs of Anemia*





**Appendix A**  
Skills Check Off

Topic	Skill	Met	Not Met	Comments
Interview	Provide confidentiality			
	Follows social/cultural norms, respectful communication			
	Risk factors: menstruation, pregnancy, age (>65 or infant/child <5), intestinal disorders (including parasites), malaria, family history*			*Must assess for at least 50% of the risk factors
Assesses for the following	Dietary habits, quality of and access to food			
	Signs/symptoms: fatigue/tiredness, headache, feeling cold, weakness, dizziness, pica (strange cravings), hair loss, tingling sensation in feet/legs, SOB, brittle nails, irregular heart rate (palpitations), syncope, chest pain, dyspnea*			*Must assess for at least 50% of the symptoms
Physical Assessment**	Conjunctivae, tongue, nail beds, palm, Nails (brittle), scalp (thinning)			
Education/Referral**	Verbalizes findings and assessment			
	Provides education and recommendations to client			
	Verbalizes need for referral (if appropriate)			
	Able to state how to refer (if appropriate)			
Total met out of 10 possible		_/10		**Required components to successfully complete check-off

## Appendix B

## Questionnaire – Round One (Including Participation Agreement)

**Purpose and Procedures:** The purpose of this questionnaire is to gather your thoughts and opinions on the usability, feasibility, and applicability of the accompanying draft of an educational program on iron deficiency anemia (IDA) designed to be implemented with community health promoters (CHP) in resource limited communities. You have been presented with an educational program related to IDA and asked to review its contents. You are now asked to provide basic demographic information and to answer questions about the educational program after agreeing to participate in this study. Your responses will be kept completely confidential and only utilized to inform further development of the educational program. The de-identified data collected from this and all future questionnaires will be stored according to UNC's data security procedures. This research project has received approval from the UNC Institutional Review Board in the Office of Research and Sponsored Programs.

**Note:** Questionnaires for this scholarly project will be conducted using Qualtrics Survey Software. Before you begin, please note that the data you provide may be collected and used by Amazon as per its privacy agreement. Additionally, this research is for residents of the United States over the age of 18; if you are not a resident of the United States and/or under the age of 18, please do not complete this survey. Qualtrics may have specific privacy policies. You should be aware that these web services may be able to link your responses to your ID in ways that are not bound by this consent form and the data confidentiality procedures used in this study. If you have concerns you should consult these services directly.

**Questions or Concerns:** If you have questions about this project, please contact the student researcher, Julie Hirman, at hirm8798@bears.unco.edu or by phone at 303-918-2433. You may also contact the project Chair, Dr. Natalie Pool, PhD, RN, CNE at natalie.pool@unco.edu or 480-370-4477 at any time. If you have any concerns about your selection or treatment as a research participant, please contact Nicole Morse, Research Compliance Manager, University of Northern Colorado at nicole.morse@unco.edu or 970-351-1910.

**Voluntary Participation:** Please understand that your participation in this project is voluntary. You may decide not to participate in this project and if you begin participation, you may still decide to stop and withdraw at any time. Your decision will be respected and will not result in loss of benefits to which you are otherwise entitled.

1. Please select one of the following:
  - a. Yes, I agree to participate in this project
  - b. No, I wish to decline participation in this project (if no is clicked, the participant is thanked and the survey does not continue)

**Demographic Information:** Please answer the following questions to ensure that you met the inclusion criteria to participate in this project and so that we may better understand the composition of the expert panel. All responses will be kept completely confidential and will be aggregated for analysis.

2. What is your current professional title?
  - a. Advanced Practice Health care clinician: e.g. Nurse Practitioner, Physician Assistant, Medical Doctor, Doctor of Osteopathy, Pharmacist, etc.
  - b. Health Educator
  - c. Licensed clinical worker: e.g. nurse, medical/nursing assistant, social worker/counselor, Physical Therapist/Occupational Therapist
  - d. Public or Global Health Professional
  - e. Other [free text limit 50 characters]
3. Number of years working in your current profession
  - a. 0-1
  - b. 2-5
  - c. 5-10
  - d. 10+
4. Do you have experience in working with resource limited communities or populations? Resource limited populations are in areas where access to basic health care is limited by economics, geography, sociopolitical factors, and/or infrastructure.
  - a. Yes
  - b. No
5. What is your age?
  - a. 18-25y
  - b. 26-35y
  - c. 36-45y
  - d. 46y-55y
  - e. 56y+
6. What is your gender?
  - a. Female
  - b. Male
  - c. Non-binary
  - d. other
  - e. Choose not to disclose

Educational Program – do the following sections of the provided educational program have sufficient information and appropriate delivery methods? If ‘no’ is selected, please briefly explain your response to inform subsequent development of the educational program.

7. Introduction
  - a. Yes
  - b. No\_[open text response, 140 character limit]\_\_\_\_\_
8. Ground Rules
  - a. Yes
  - b. No\_[open text response, 140 character limit]\_\_\_\_\_
9. What is anemia
  - a. Yes
  - b. No\_[open text response, 140 character limit]\_\_\_\_\_
10. Consequences of anemia
  - a. Yes
  - b. No\_[open text response, 140 character limit]\_\_\_\_\_

11. Types of anemia/Causes of IDA
  - a. Yes
  - b. No \_[open text response, 140 character limit \_\_\_\_\_
12. Signs and symptoms
  - a. Yes
  - b. No \_[open text response, 140 character limit \_\_\_\_\_
13. Identification of anemia
  - a. Yes
  - b. No \_[open text response, 140 character limit \_\_\_\_\_
14. Referrals
  - a. Yes
  - b. No \_[open text response, 140 character limit \_\_\_\_\_
15. Perspectives/beliefs
  - a. Yes
  - b. No \_\_\_\_\_
16. Interventions/prevention
  - a. Yes
  - b. No \_[open text response, 140 character limit \_\_\_\_\_
17. Clinical assessment
  - a. Yes
  - b. No \_[open text response, 140 character limit \_\_\_\_\_
18. Hands on/skills practicum
  - a. Yes
  - b. No \_[open text response, 140 character limit \_\_\_\_\_

#### Overall Usability, Feasibility, and Applicability

19. Is the educational program and associated materials (e.g. pictures, posters, etc.) at an appropriate literacy level for the intended target audience? (Community health promoters and community members in resources limited areas)
  - a. Yes
  - b. No \_\_\_\_\_
20. Does the educational program allow for adequate time and break periods for learning?
  - a. Yes
  - b. No \_\_\_\_\_
21. Does the educational program allow for variability and/or modifications for local and/or cultural adaptations?
  - a. Yes
  - b. No \_\_\_\_\_
22. Should the program include a pre and post-test?
  - a. Yes
  - b. No
23. Does the educational program need more visual aids?
  - a. Yes \_\_\_\_\_
  - b. No



24. Is it reasonable to plan to have a hands-on session the same day as the lecture?
- a. Yes
  - b. No \_\_\_\_\_
25. Other important information you feel is missing from the proposed educational program [open text response, limit 300 characters]:

Thank you for reviewing the proposed educational program and providing your feedback. Your responses will be analyzed along with those of the other panelists. A revised educational program will be created and submitted to you for further review within the next 3-4 weeks.

**APPENDIX D**  
**RECRUITMENT LETTER**

Dear Healthcare Provider/Educator,

Thank you again for your interest in participating in my Doctor of Nursing Practice scholarly project. This project is aimed at developing an educational program on iron deficiency anemia (IDA). You are asked to critically review the attached IDA educational program and answer questions about the program via on-line questionnaire. The questionnaire is focused on the feasibility, usability, and applicability of the program. It includes basic demographic information about you but primarily consists of yes/no questions with free text areas for your suggestions when 'no' is selected. Your participation is voluntary, confidential, and anonymous and your responses will be aggregated with those from the rest of the participants.

At the conclusion of this round, your feedback will be analyzed and used to inform subsequent drafts of the educational program. Review of the educational program and online questionnaire accompanying this email today should take approximately 30 minutes. After you have had a chance to review the attached IDA educational program, please complete the following questionnaire:

[https://unco.co1.qualtrics.com/jfe/form/SV\\_1Mm79mpDrSjOc3c](https://unco.co1.qualtrics.com/jfe/form/SV_1Mm79mpDrSjOc3c)

Please complete your review of the educational program draft and the questionnaire by Thursday, September 2, 2021 (5pm MST). The second round of the educational program and questionnaire will be sent out the week of September 20, 2021.

If you have any questions about this project you may contact me via email at [hirm8798@bears.unco.edu](mailto:hirm8798@bears.unco.edu) or by phone at 303-918-2433. Thank you for your support of this scholarly project.

Sincerely,

Julie Hirman, DNP Candidate, BSN, MSN, FNP-C

**APPENDIX E**  
**IRON-DEFICIENCY ANEMIA EDUCATIONAL**  
**PROGRAM: ROUND TWO**

Dear Healthcare Provider/Educator

Thank you very much for your time and valuable feedback on the first draft of my Iron Deficiency Anemia (IDA) educational program as part of my Doctor of Nursing Practice project. Your responses were carefully evaluated and generated new ideas and provided clarification for several sections of the program.

The revised educational program is attached for your review. Major modifications to the program are recorded in red font. You will note that the format/look of the program has changed as I continue to make improvements with the project advisor.

After you have had a chance to review the revised educational program (time estimate: 20 minutes), please complete the following short questionnaire by clicking on the link below:

[https://unco.co1.qualtrics.com/jfe/form/SV\\_aY4f8nkCaPRoqsS](https://unco.co1.qualtrics.com/jfe/form/SV_aY4f8nkCaPRoqsS)

Please review the program and complete the questionnaire by Friday, September 24. If you have any questions, I can be reached at [hirm8798@bears.unco.edu](mailto:hirm8798@bears.unco.edu) or by phone at 303-918-2433.

Respectfully,

Julie P Hirman, DNP candidate, RN, FNPc

## Outline for Educational Program

### Overview

**Purpose:** To develop an educational program designed to be presented to community health promoters in resource-limited communities on iron deficiency anemia (IDA).

**Background:** IDA is a global health problem that affects a quarter of the world's population and has an even greater impact on those living in resource-limited communities where up to 70% of those populations suffer from IDA. Identification of individuals with severe anemia and preventing anemia can save lives. Unfortunately, many resource-limited communities have inadequate health care services and there are significant barriers for the individual to seek health care services. One potential approach to reduce the burden in these regions is to utilize Community Health Promoters (CHPs) to prevent, intervene, and initiate referrals for IDA among community members. CHPs are members of the community who work either for pay or volunteer to work in association with the health care system or another organization in providing basic health services to their communities. They usually have some educational (primary or secondary school), have completed some supervised training, and can engage in basic community health intervention such as health screenings, maternal health/delivery, vaccinations, and record keeping. CHPs offer a unique benefit in that they are often a trusted member of the community and can offer insight into the social and cultural nuances of health issues such as IDA.

**Delivery, Audience, and Cultural/Community-Specific Tailoring:** This program is intended to be implemented in a community where IDA has been identified as a health problem through surveillance, epidemiological, or other forms of data. The program is designed to be adapted by the facilitator and tailored for use with CHPs with a wide variety of cultures within resource-limited communities. It is also designed to be extremely 'low-tech' so that it can be implemented in settings that lack internet capability, electricity, or other amenities. The educational program will entail 2 sections: a question and answer educational session and a hands-on skills training section.

**Estimated time to deliver program:** One 8.5 hour day or two 4 hour days

**Suggested location:** Local community center, health clinic, school, or other appropriate location identified by the community.

**Preparation:** Prior to delivering program, partner with local health facility/organization and seek to get local clinicians/providers to attend\*. Whenever possible, local terms should be identified and used or the program can be fully translated by a trained interpreter.

**Suggested supplies/materials:** 2 clear bottles partially filled with water, pink/red juice or cocoa powder (to add to bottles), markers/pens, masking tape, picture of social norms, figures in this educational program, laminated food sources and signs and symptoms reference guide (Figures 25-27), check off form for each participant (Appendix A), certificate of completion for each participant, iron-rich food sources for provided lunch.

\*Alternative: If unable to arrange for partnership with local health care organization, work with CHPs to arrange a few hours in the community going house to house and/or arrange for training during market days, church, or other community events.

## Course Outline

### Introductory Session

- 1.1 Ice Breaker ..... p. 3
- 1.2 Purpose of Program..... p. 4
- 1.3 Community Agreements ..... p. 5

### Blood and Anemia Session

- 2.0 What is Blood ..... p. 6
- 2.1 What is Anemia..... p. 7
- 2.2 What is IDA ..... p. 8
- 2.3 Consequences of Anemia..... p. 9
- 2.4 Signs and Symptoms..... p. 11
- 2.5 Assessment Techniques ..... p. 12
- 2.6 Making Referrals ..... p. 13
- 2.7 Interventions/Preventions ..... p. 14
- 2.8 Physical Assessment ..... p. 15

### Hands-On/Practicum Session

- 3.0 Hands on Practice ..... p. 16
- 3.1 Client Session..... p. 17
- 3.2 Independent Session..... p. 18

### Completion Session

- 4.0 Celebration, Certificates ..... p. 19



## **Session 1: Introduction**

### **1.1 Icebreaker**

*Duration: 10min but may vary based on number of participants*

#### **Purpose:**

To help the participants to get to know each other and feel more comfortable in sharing and learning **Materials Needed:**

None

#### **Activity:**

Culturally Appropriate Introductory Ice breaker

#### **Example:**

- Have everyone stand or sit in a circle (including the facilitator(s))
- The facilitator will explain this is an activity to get to know each other
- The facilitator will then start by stating “My name is \_\_\_\_\_ and I would like to introduce you to \_\_\_\_\_” Choose an object on the body that everyone has. The object can be a shoe, shirt, head covering and so on, as long as it is present on each participant (some may not be wearing shoes). Example: “I would like to introduce you to my left shoe” and then explain about your shoe. Example; “I met my left shoe at the Sunday market in town 5 years ago. We go everywhere together but lately I have noticed my shoe is starting to get old and bald. As you can see here, there is a hole at the big toe area indicating it is balding.”
- Then state what community you work in
- Each participant will then follow in turn
- When everyone has completed their introductions, thank them for sharing

## **1.2 Purpose of Program**

*Duration: 10min*

### **Purpose:**

To lay the foundation of what the purpose of the program is. Explain expectations and outline the educational program curriculum.

### **Materials Needed:**

None

### **Activities:**

Discussion

### **Explain:**

The purpose of the program is to enable the participants to update and strengthen their knowledge and skills in regard to anemia in their communities with the goal to prevent IDA and reduce the overall rate. They will be provided resources and education and will learn when to refer members of their communities to more advanced medical care.

There will be two parts: group discussions and a hands-on skill based section.

Hours of the program (either full-day or 2 half days)

Questions and discussion are welcomed

### **Evaluation:**

Address any questions or concerns

### **1.3 Community Agreements**

*Duration: 15min*

**Purpose:**

Discuss agreed upon behaviors of the participants during the program

**Materials Needed:**

Laminated Figures 1-9, tape, marker

**Activities:**

Matching game, brainstorming, and group discussion

**Explain:**

There are different manners in which people like to learn and interact and you want to understand what the group's expectations are and what are the acceptable behaviors.

**Procedure:**

- Have everyone randomly take a picture of social norm
- Ask the participants to find the matching picture
- Discuss the picture and what it represents
- Once everyone has had the chance to discuss the pictures, ask the pairs to describe the behavior that the picture represents to the group
- Ask the group if they feel this should be something that the group agrees to adhere to during the program. If 'yes', post the picture on the wall. If 'no', set the picture aside
- Once the entire group has had a chance to present their pictures, ask them what other things they would like to agree upon
- Record any additional recommendations

**Evaluation:**

Confirm that the participants agree about the group norms. Address any disagreement or questions.

## Session 2: Blood and Anemia

### 2.0 What is Blood?

*Duration: 20min*

#### **Purpose:**

To understand basic knowledge, cultural beliefs, and local perspectives regarding blood

#### **Materials Needed:**

Laminated Figures 10-13, tape

#### **Activities:**

Group discussion

#### **Discussion Points:**

- What is blood?
- Why is blood important?
- What are the local beliefs about blood?

Blood is a fluid in the body that delivers necessary nutrients and oxygen to the cells of the body. Without adequate and healthy blood, the body cannot function well and you can suffer from illnesses and even die.

Blood is made up of 4 components:

1. Plasma: mostly water but with important nutrients necessary for the body
2. Red blood cells: contain hemoglobin, iron, and oxygen. These are the cells that carry oxygen to the tissues and organs in the body.
3. White blood cells: fight diseases and infections
4. Platelets: form clots and help to stop bleeding

There are 3 main functions of blood:

1. Transport oxygen and nutrients throughout the body
2. Protection: WBCs fight diseases and infections
3. Regulation: Maintains temperature and balance in the body

#### **Evaluation:**

Ask the participants to describe blood, it's main functions in the body, and why it is important. Address questions and misconceptions.

## 2.1 What is Anemia?

*Duration: 40min*

### **Purpose:**

Explain anemia

### **Materials Needed:**

Laminated Figures 14-16, 18, tape, prepared bottles

### **Activities:**

Group discussion, illustrate anemia

### **Review:**

Anemia is a decrease in blood cells. Blood contains plasma, red blood cells, white blood cells and platelets. We are going to discuss the red blood cells because these are the ones most impacted by all forms of anemia. Red blood cells contain hemoglobin, iron and oxygen. If you do not have all these components, you cannot make RBCs (figures 15-16).

### **Anemia Illustration Procedure:**

- Show anemia bottles 1 and 2
- Inform the participants that these bottles do not contain real blood but represent blood
- Pass the bottles around
- Show figure 14

### **Discussion Points:**

- What are their observations of both the bottles and the blood picture?
- Which of the bottles is the healthier one?
- Both bottles represent human blood
- Bottle 1 which is lighter is anemic blood – it has less RBCs and less iron
- Bottle 2 is normal or healthy blood – this bottle has more iron and RBCs
- To be healthy, you need to have normal amounts of RBCs
- There are many types of anemia and the most common and greatest impact is iron deficiency anemia.
- IDA is the lack of iron – recall the RBC need hemoglobin, iron and oxygen
- Causes (risk factors): Lack of adequate or iron-rich foods, malaria, intestinal disorders (including parasites), pregnancy, menstruation, age (>65 years or <5 years), premature birth or low birth weight, family history

### **Evaluation:**

Ask the participants to describe anemia and the main components of RBCs. Address any questions or concerns.

## 2.2 What is IDA?

*Duration: 15min*

### **Purpose:**

To understand basic knowledge, cultural beliefs, and perspectives regarding IDA specifically. Explain what IDA is and describe the prevalence rates in their communities.

### **Materials Needed:**

Laminated Figure 17, tape

Prior to discussion, determine prevalence rates in the area that the program is being conducted at: [https://www.who.int/health-topics/anaemia#tab=tab\\_1](https://www.who.int/health-topics/anaemia#tab=tab_1)

### **Activities:**

Group discussion

### **Discussion Points:**

- What do you know about anemia?
- How do you become anemic?
- What are the local beliefs about anemia?
- How do you currently treat anemia? (e.g. iron pots, special foods, etc.)
- Do women and children need as much iron as men?
- Do people in the community have access to iron replacement pills and if so, are they utilized? Why or why not?
- Are there any beliefs or stigma associated with blood/anemia? Discuss the local prevalence rates of IDA
- Discuss local populations potentially vulnerable to IDA: menstruating and pregnant women/girls, children/babies, those with food insecurity, etc.

### **Evaluation:**

Ask participants to share the local prevalence rates of IDA and to identify the populations most at risk. Address any questions, potentially harmful beliefs, or concerns.

## 2.3 Consequences of Anemia

*Duration: 20min*

### **Purpose:**

To describe the consequences of untreated anemia

### **Materials Needed:**

None

**Activities:**

Group discussion

**Discussion points:**

- Why do we care about anemia?
- Economic – anemia causes fatigue. If you are feeling fatigued, it is harder to work and if you can't work, then you cannot earn money needed
- Cognitive – anemia in children less than 2 years of age leads to permanent cognitive delays
- Pre-term delivery – anemia in pregnant women can result in pre-term delivery (prior to 37 weeks gestation). This leads to higher complications for both the fetus and the mother.
- Mortality – higher rates of death for those with anemia

**Evaluation:**

Ask participants to describe the consequences of anemia. Address any questions or concerns.

## 2.4 Signs and Symptoms of IDA

*Duration: 25min*

### **Purpose:**

Define the terms 'signs' and 'symptoms'. Discuss common signs and symptoms of anemia

### **Materials Needed:**

Laminated Figures 21-25, tape

### **Activities:**

Group discussion

### **Discussion points:**

- Symptoms: what an individual affected by disease experiences
- Sign: what is seen/observed
- Symptoms of anemia: Mild – fatigue/tiredness, headache, feeling cold Moderate – above and weakness, dizziness, pica (strange cravings esp. in pregnant women), hair loss, tingling sensation in feet/legs, SOB Severe – above and brittle nails, irregular heart rate (palpitations), syncope, chest pain, dyspnea
- Signs: pallor – hands, nailbeds, tongue, conjunctivae
- Additional signs: Thinning hair, Irregular heart rate, cracked nails
- Special populations: Signs and symptoms may be more difficult to assess in infants and young children (those under age 10) as they are not always able to verbalize their symptoms. The caregiver may notice the child not playing or eating as much, sleeping more, or experiencing pale stools, rapid breathing, or an increased heart rate

### **Evaluation:**

Ask participants to identify at least one symptom in each of the 3 categories of anemia and to identify the 4 observable signs. Address any questions or inaccuracies.



## 2.5 Assessment Techniques

*Duration: 25min*

### **Purpose:**

Describe the client interview process and clinical assessment techniques

### **Materials Needed:**

Laminated Figure 19-20, tape

### **Activities:**

Group discussion, role play

### **Discussion points:**

- Ask CHPs what types of culturally appropriate questions they feel they should ask their clients.
- Create a list of interview questions that the group and facilitator agree upon.
- Client interview: maintain confidentiality; assess symptoms, dietary habits (including food security and quality issues), and risk factors
- Clinical assessment: signs (from previous session); emphasize that the more signs the client displays, the more likely and potentially severe the anemia. [Physical assessment will be practiced later in the program]

### **Role Play Activity:**

Practice CHP/client brief interviews in pairs with facilitator observation and feedback.

### **Evaluation:**

Ask participants to identify any additional client interview/assessment questions. Discuss strategies for creating a confidential environment for interviewing clients. Address any questions or concerns.

## 2.6 Making Referrals

*Duration: 20min*

### **Purpose:**

Identify local resources and clinical locations to refer clients suspected of having IDA. Identify when to refer.

### **Materials Needed:**

None

### **Activities:**

Group discussion

### **Discussion points:**

- What is the available healthcare?
- How do they currently refer clients for medical services?
- Do they know how to refer and who to contact?
- What are the logistics and barriers to accessing care in this community?
- When to refer: Clients presenting with at least 3 pallor signs and/or 1 additional sign OR 2 mild/moderate symptoms or any one symptom from the severe list

### **Evaluation:**

Ask participants to describe when a referral for IDA would be warranted and how that would occur (logistically) in the community. Address any questions or concerns.

## 2.7 Interventions/Prevention

*Duration: 25min*

### **Purpose:**

To teach participants how to partner with clients to treat and prevent IDA

### **Materials Needed:**

Laminated Figures 26-27, tape, dry erase markers

### **Activities:**

Group discussion, small group activity

### **Identifying Local Iron Rich Food Sources Small Group Activity:**

- Arrange participants in groups of 2-4 and provide large laminate posters with pictures of local foods (e.g. beans, meat, eggs, leafy greens, etc.)
- Ask groups to circle the most accessible foods in their communities and to add any that are missing
- Ask groups to put an X over foods not readily available
- Ask groups to put a check mark on foods that are available but may be either expensive or difficult to obtain
- Discuss each group's findings

### **Discussion Points:**

- Discuss geographical or seasonal food trends
- Are there foods that are culturally unacceptable? Are there gender, age, cultural group, race/ethnicity, or class considerations?
- Are iron supplements, cast iron pots, or other non-food sources of iron locally available?
- Emphasize that clients may be prescribed a medication (iron supplements in liquid, capsules, or tablet form) by a professional health care provider but these medications should never be administered or distributed by a CHP without additional training
- Share that breastfeeding for a minimum of 6 months may help prevent anemia in infants

**Evaluation:** Ask participants to identify 3 recommendations they can make to a client to increase their iron intake. Address any questions or concerns.

## 2.8 Physical Assessment

*Duration: 15min*

### **Purpose:**

To illustrate the physical assessment of IDA

### **Materials Needed:**

Laminated Figures 23-28, tape

### **Activities:**

Group discussion

### **Discussion Points:**

Discuss physical assessment for anemia: Palms, nailbeds, tongue, conjunctivae

Palms: Look at the palmar crease which is the line across the middle of the palm. Does the palm look pale or even almost white?

Nailbeds: Do the nails beds look pale? Are they brittle/cracked? Are there lines on the nails? Is there spooning (nails curved so that it looks like a spoon)?

Tongue: Is it smooth? Enlarged? Shiny?

Conjunctivae: Pull down lower eye lid and look on the inside of the lid for paleness

Discuss variations in physical assessment based on client race/ethnicity

### **Evaluation:**

Address any questions or concerns.

**Session 3: Hands-On Practicum****3.0 Hands-On Practicum (Practice Session)**

*Duration: 15min*

**Purpose:**

To demonstrate and practice the complete physical assessment for IDA on a peer.

**Materials Needed:**

Laminated Figures 23-27, tape, evaluation form

**Activities:**

Role play, small group demonstration

**Discussion Points:**

- This session is designed to practice the assessment of anemia
- Describe the evaluation form (Appendix A)

**Role Play Procedure:**

Facilitator will role play a complete client interview and demonstrate the technique for assessing for anemia using the palms, conjunctivae, tongue, and nailbeds.

Pair up the participants and have them practice the interview and physical assessment techniques on each other.

**Evaluation:**

Once each participant is able to successfully demonstrate an accurate IDA interview and physical assessment of a peer according to the evaluation form (Appendix A), they can proceed to the next session.

### **3.1 Hands-On Practicum (Client Session)**

*Duration: remainder of session time*

#### **Purpose:**

To practice the complete IDA interview and assessment on a client while working as a pair

#### **Materials Needed:**

Laminated Figures 22-27, tape, evaluation form

#### **Activities:**

Assess clients in pairs

#### **Discussion Points:**

- This session is designed to practice the assessment of anemia
- Review the evaluation form (Appendix A)

#### **Procedure:**

As you have partnered with local healthcare facility partners, assessments will be accomplished on clients waiting for appointments or otherwise present at the clinical site. Clients will be verbally asked to participate in this training. If consenting, the CHPs will interview and assess the client in pairs and come up with a consensus of their findings (risk factors, symptoms, and physical assessment). They will then present their findings to the facilitator who will then perform their own evaluation and provide feedback. The CHPs are expected to assess symptoms, dietary practices/food security and other risk factors, and pallor in palms, conjunctivae, nailbeds, and tongue. If anemia is suspected, the CHPs will provide education on following an iron-rich diet and report to the partnering health care provider (immediate referral is essential if the client is displaying one or more signs/symptoms of severe anemia). If the CHPs are unable to have a consistent and accurate assessment, or if there are no anemic clients detected, then continue to assess in supervised pairs until accuracy improves.

#### **Evaluation:**

Once the pair of participants can successfully pass the evaluation form (Appendix A), they can proceed to the next session.

### **3.2 Hands-On Practicum (Independent Session)**

*Duration: Remainder of session time*

#### **Purpose:**

To demonstrate a complete IDA interview and assessment independently

#### **Materials Needed:**

Laminated Figures 23-28, tape, evaluation form

#### **Activities:**

Assess clients

#### **Discussion Points:**

- This session is designed for independent demonstration of the assessment of anemia

#### **Procedure:**

Each CHP will individually assess clients and then present their findings to the facilitator as in the prior session. If there is good consensus amongst the CHP and facilitator in assessment findings and at least three anemic clients have been correctly identified, the CHP will be permitted to independently assess clients in the facility, community, or wherever they practice.

#### **Evaluation:**

Once the participant can successfully pass the evaluation form (Appendix A), they can proceed to completing the program.

**Session 4: Completion Session****4.0 Completion**

*Duration: 20min*

**Purpose:**

To close out the session and provide resources

**Materials****Needed:**

Certificates of  
completion

**Discussion Points:**

- Conclusions, questions, celebrations



**Figure 1**

*Community Agreements – Raise Hands*



[Untitled illustration of raising hands]. Vectorstock. <https://www.vectorstock.com/royalty-free-vectors/cartoon-school-kids-raising-hand-in-the-classroom-vectors>

**Figure 2**

*Community Agreements – Respectful Communication*



[Untitled illustration of community meeting]. Government of India.  
<https://panchayatcharter.nic.in/#/>

**Figure 3**

*Community Agreements—Participate and Pay Attention*



Untitled illustration of meeting] Clip-art. <http://clipart-library.com/free-meeting->

**Figure 4***Community Agreements—Participate and Pay Attention*

[Untitled illustration of meeting] Clip-art. <http://clipart-library.com/free-meeting-cliparts.html>

**Figure 5**

*Community Agreements—Participate and Pay Attention*



[Untitled illustration of meeting] Clip-art. <http://clipart-library.com/free-meeting-cliparts.html>

**Figure 6**

*Community Agreements—Talking Over Each Other/Not Listening*



[Untitled illustration of conflict] [https://www.google.com/search?sa=G&hl=en&tbs=simg:CAQSgQIJCrpjOzqA0Q0a9QELELCMpwgaOgo4CAQSFM0\\_1-CWdAcoW\\_1gf2BIOq9zXIHOYQGhqSlaPMKdBddyXRBE6FdHMN9o4APSQOFtujiAFMAQMCxCOrv4IGgoKCAgBEgQlmELPDAsQne3BCRqVAQofCgxjb252ZXJzY](https://www.google.com/search?sa=G&hl=en&tbs=simg:CAQSgQIJCrpjOzqA0Q0a9QELELCMpwgaOgo4CAQSFM0_1-CWdAcoW_1gf2BIOq9zXIHOYQGhqSlaPMKdBddyXRBE6FdHMN9o4APSQOFtujiAFMAQMCxCOrv4IGgoKCAgBEgQlmELPDAsQne3BCRqVAQofCgxjb252ZXJzY)

**Figure 7**

*Community Agreements—Talking Over Each Other/Not Listening*



[Untitled illustration of fighting at meeting]. Flaticon. <https://www.flaticon.com/free-icons/brainstorming>

**Figure 8**

*Community Agreements—Be On Time*



[Illustration of meeting]. The Conversation. <https://theconversation.com/us>

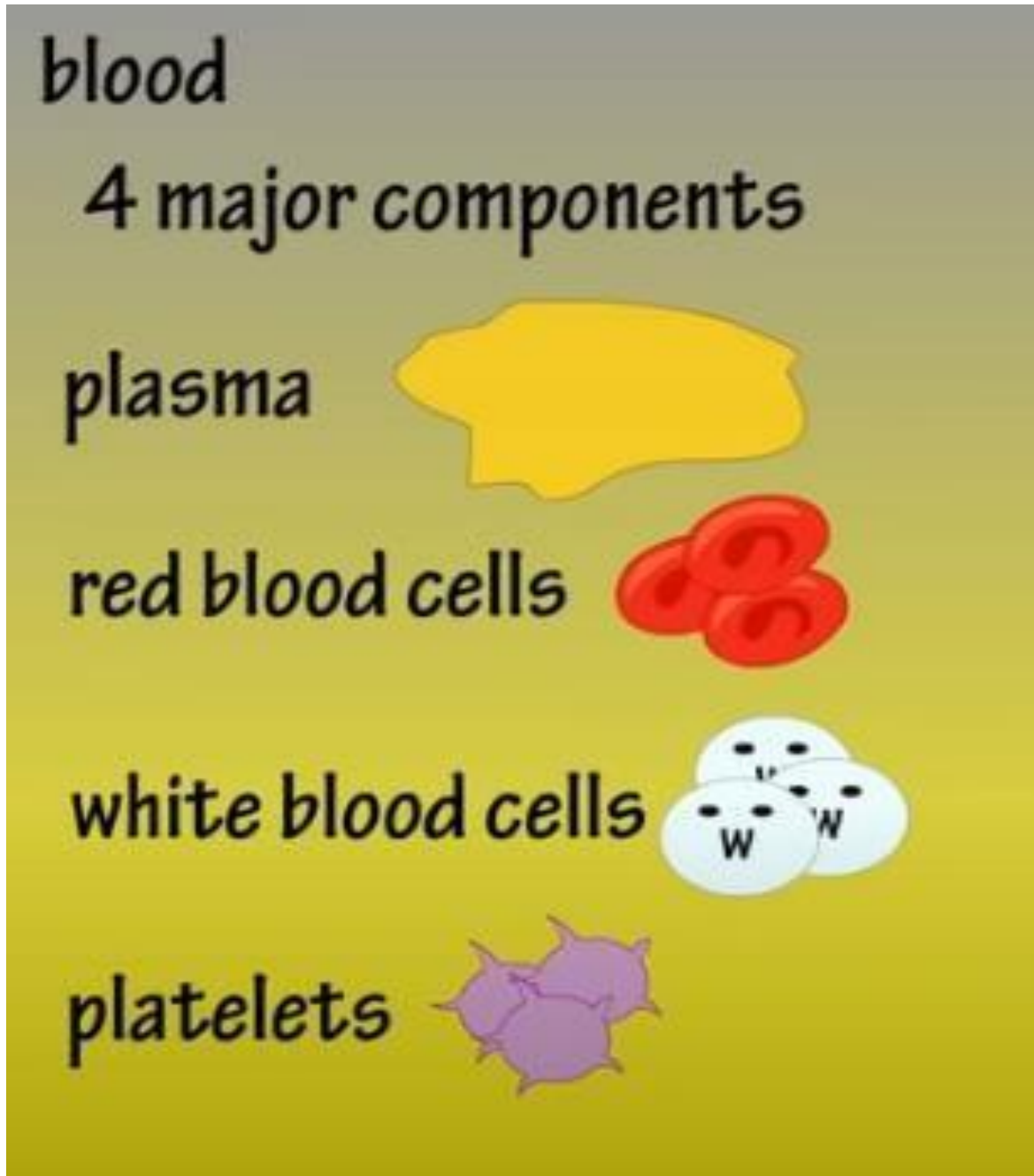


**Figure 9**

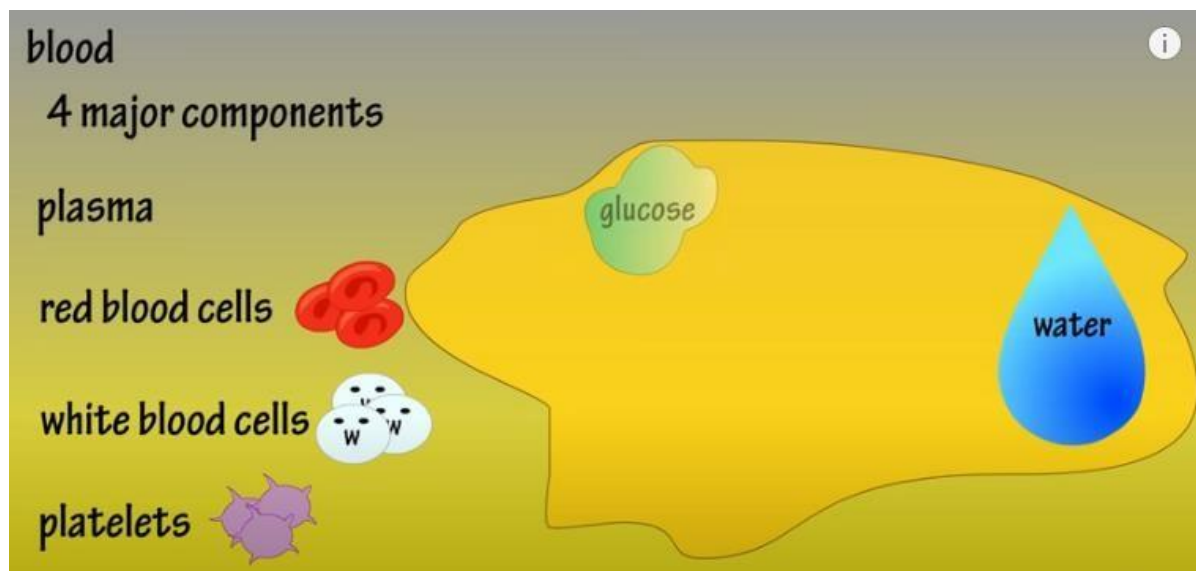
*Community Agreements—Using Cell Phones*



I am not texting I am taking notes [Online image]. New York Times. <https://www.nytimes.com/2017/04/07/jobs/texting-work-meetings-social-media.html?smid=pin-share>

**Figure 10***Four Components of Blood*

What is blood? [Online image]. 2016. <https://www.youtube.com/watch?v=68HyQPx-kso>

**Figure 11***Plasma*

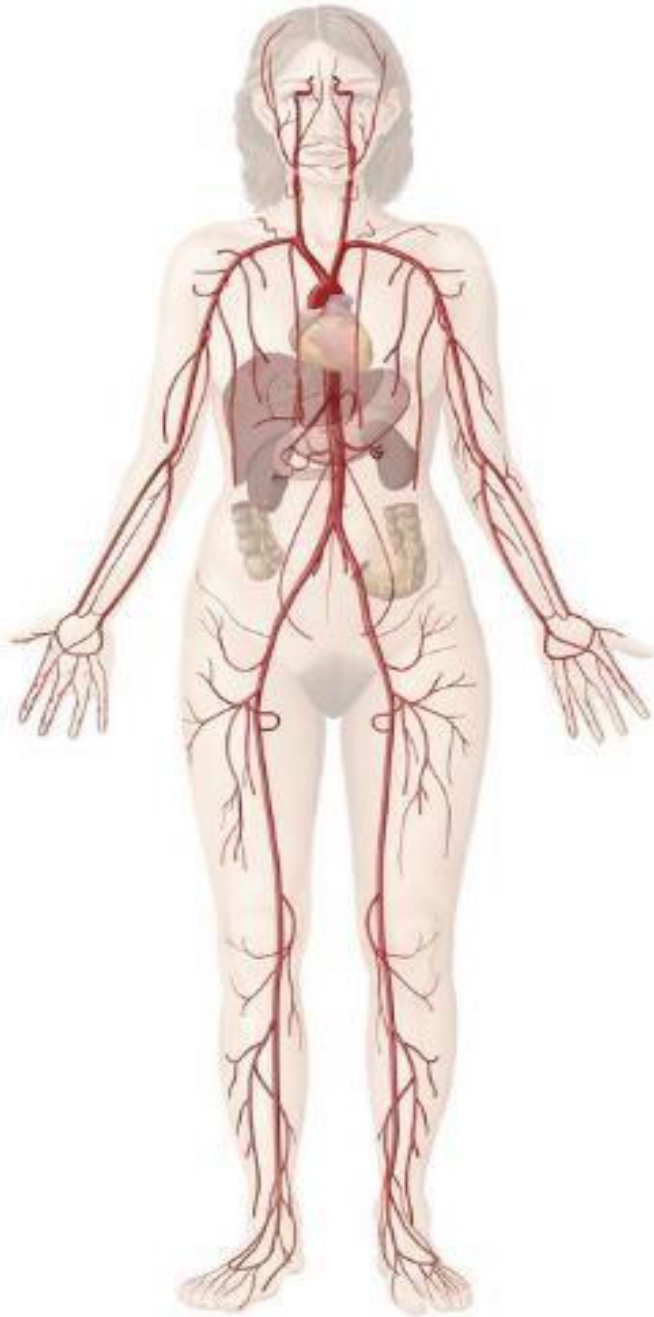
What is blood? [Online image]. 2016. <https://www.youtube.com/watch?v=68HyQPx-kso>

**Figure 12**

*Red and White Blood Cells, Platelets*



What is blood? [Online image]. 2016. <https://www.youtube.com/watch?v=68HyQPx-kso>

**Figure 13***Circulatory System*

Gorman, N. (2021). Circulatory (cardiovascular) system [Online image]. Kenhub.  
<https://www.kenhub.com/en/library/anatomy/circulatory-system>

**Figure 14***Anemia***Bottle 1 (Anemic Blood)****Bottle 2 ( Healthy Blood)**

How to prepare:

Fill 2 clear bottles with clear water (about 2/3 full)

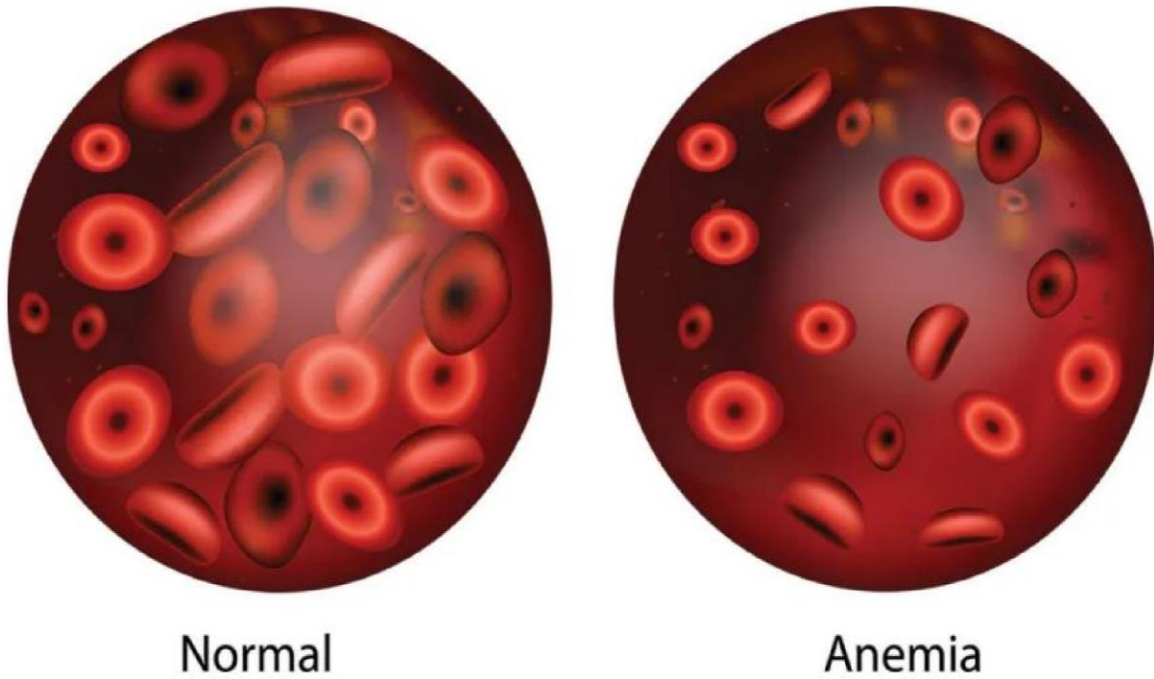
Label the bottles 1 and 2

Put a small amount of juice or cocoa powder in to bottle 1 to get a light coloration

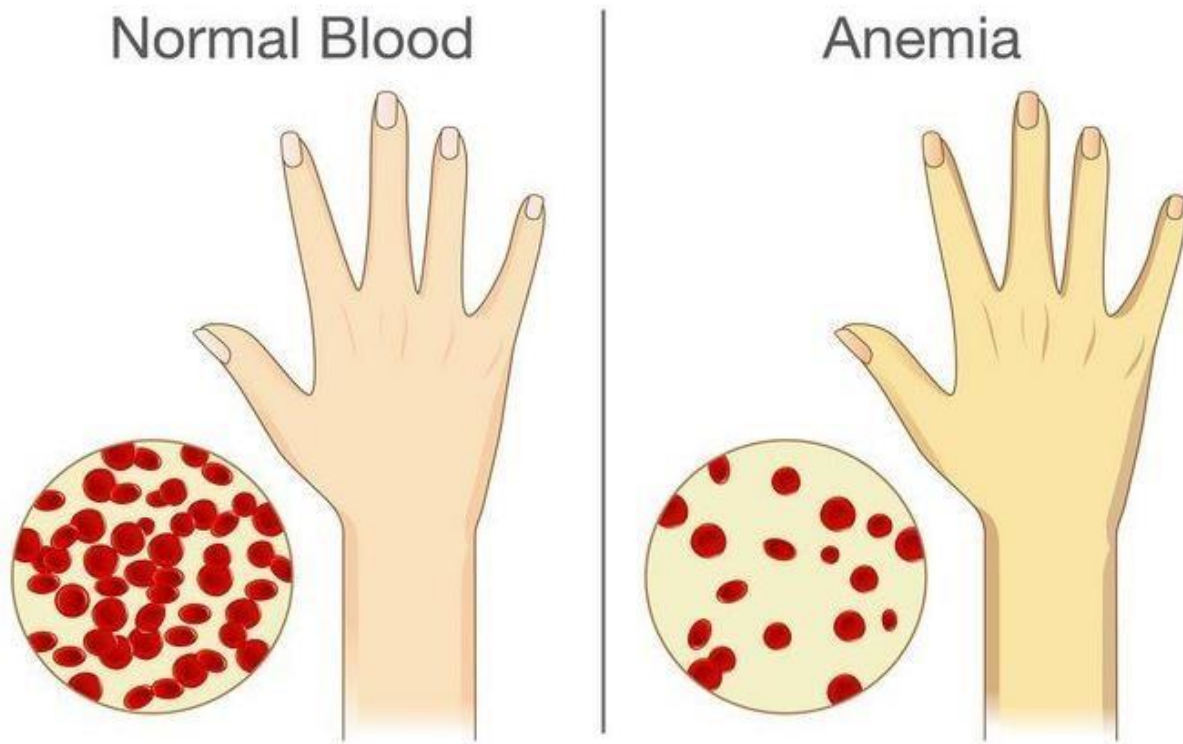
Put more quantity of juice or cocoa powder in to bottle 2 to get a dark coloration.

**Figure 15**

*Picture of Anemia*



Robertson, S. (N.D.). Fanconi anemia prognosis [Online image]. NewsMedical  
<https://www.news-medical.net/health/FanconiAnemia-Prognosis.aspx>

**Figure 16***Anemia*

Anemia: overview, symptoms, causes, types, and dietary guidelines [Online image].  
<https://betahealthy.com/anemia-overviewsymptoms-causes-types-and-dietary-guidelines/>



**Figure 17***Prevalence*

**Figure 18**

*Causes of IDA*



**Figure 19**

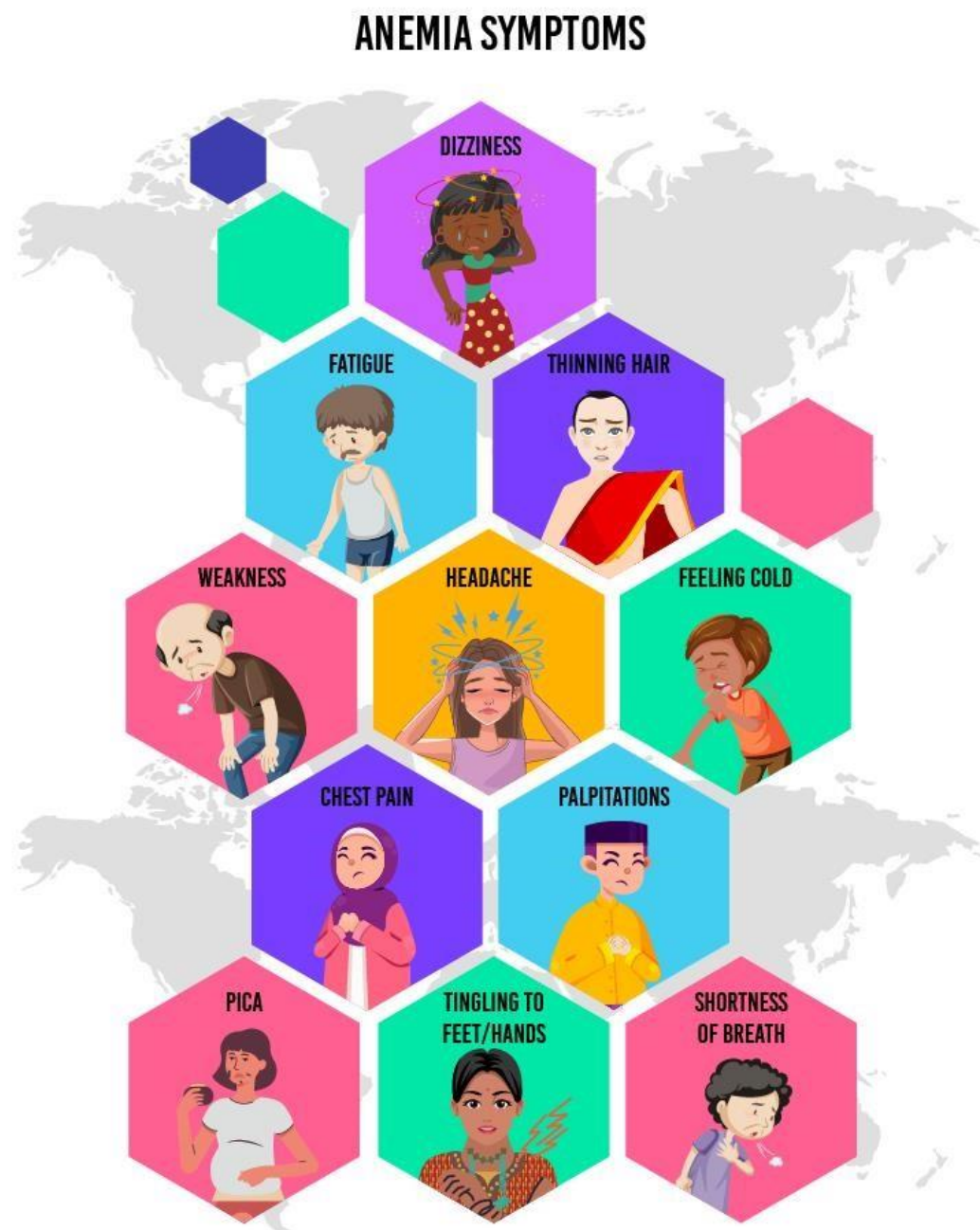
*Client Interview/Exam: Counseling*



[Untitled illustration of counseling]. [https://iycf.advancingnutrition.org/explore?keys=&country=All&field\\_nutrition\\_topic=All&field\\_collection=1472&page=5](https://iycf.advancingnutrition.org/explore?keys=&country=All&field_nutrition_topic=All&field_collection=1472&page=5)

**Figure 20***Client Interview and Exam*

[Untitled illustration of client interview]. [https://iycf.advancingnutrition.org/explore?keys=&country=All&field\\_nutrition\\_topic=All&field\\_collection=1472&page=5](https://iycf.advancingnutrition.org/explore?keys=&country=All&field_nutrition_topic=All&field_collection=1472&page=5)

**Figure 21***Symptoms of Anemia*

**Figure 22***Signs of Anemia*

10 signs your body is lacking iron [Online image]. (2021). <https://brightside.me/inspiration-health/10-disturbing-signs-your-body-is-lacking-iron-513660/>



Motswaledi, M & Mayayise, M. [Online image]. 2010 <http://www.tandfonline.com/loi/ojfp20>.

**Figure 23**

*Signs of Anemia: Palmar Pallor in a Patient with Severe Anemia*



Taylor, T. (2021) Palmar pallor in a patient with severe anemia [Online image]. Uptodate. [www.uptodate.com](http://www.uptodate.com)

**Figure 24***Signs of Anemia: Hand Pallor and Conjunctivae Anemia*

Pallor. [Online image]. (2021). <https://www.shutterstock.com/image-photo/image-hands-comparing-severe-anaemia-normal-759943144>



Digital photos of conjunctivae anemia [Online image]. (2021). <https://www.grepmed.com/images/4197/conjunctivalcomparison-pallor-comparison-physicalexam>



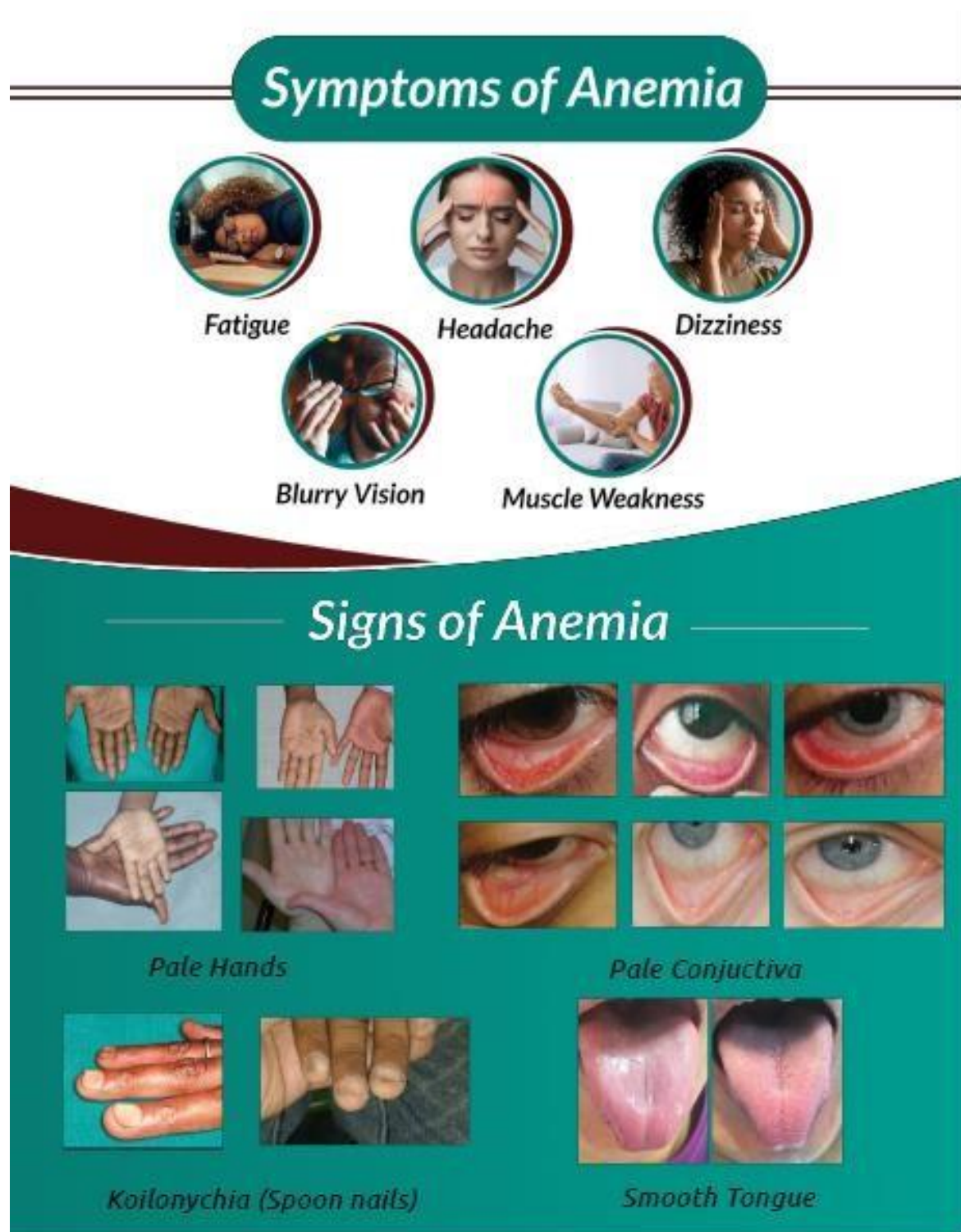
Figure 25

*Iron Deficiency Anemia Foods Poster: Front*



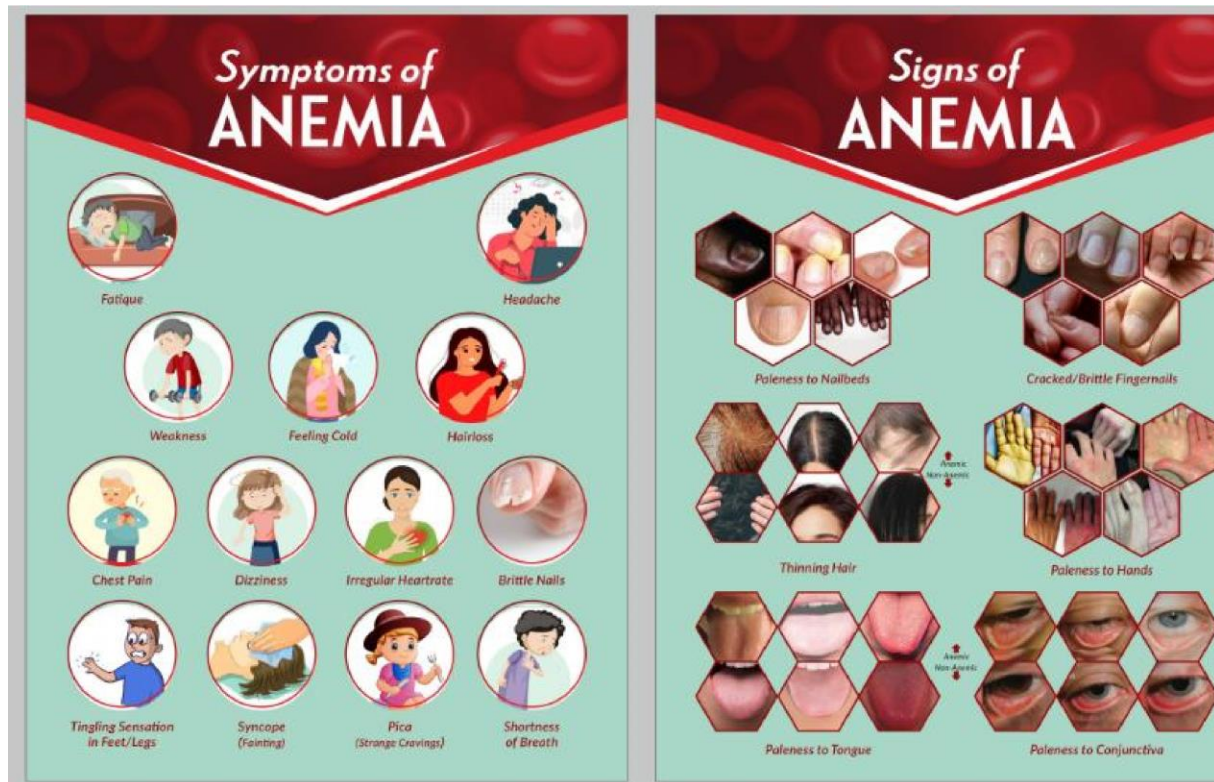
Figure 26

*Iron Deficiency Anemia Foods Poster: Back Side*



**Figure 27**

*Signs and Symptoms Resource Guide*



Appendix A  
Skills Check

Topic	Skill	Met	Not Met	Comments
Interview	• Provide confidentiality			
	• Follows social/cultural norms, respectful communication			
	• Risk factors: menstruation, pregnancy, age (>65 or infant/child <5), intestinal disorders (including parasites), malaria, family history*			*Must assess for at least 50% of the risk factors
Assesses for the following	• Dietary habits, quality of and access to food			
	• Signs/symptoms: fatigue/tiredness, headache, feeling cold, weakness, dizziness, pica (strange cravings), hair loss, tingling sensation in feet/legs, SOB, brittle nails, irregular heart rate (palpitations), syncope, chest pain, dyspnea*			*Must assess for at least 50% of the symptoms
Physical Assessment**	Conjunctivae, tongue, nail beds, palm, Nails (brittle), scalp (thinning)			
Education/Referral**	• Verbalizes findings and assessment			
	• Provides education and recommendations to client			
	• Verbalizes need for referral (if appropriate)			
	• Able to state how to refer (if appropriate)			
Total met out of 10 possible		_/10		

**APPENDIX F**

**GUIDELINE FOR AN EDUCATIONAL PROGRAM ON  
IRON DEFICIENCY ANEMIA: FINAL DRAFT**

## Guideline for an Educational Program on Iron Deficiency Anemia

### **Overview**

**Purpose:** To develop an educational program designed to be presented to community health promoters in resource limited communities on iron deficiency anemia (IDA).

**Background:** IDA is a global health problem that affects a quarter of the world's population and has an even greater impact on those living in resource limited communities where up to 70% of those populations suffer from IDA. Identification of individuals with severe anemia and preventing anemia can save lives. Unfortunately, many resource limited communities have inadequate health care services and there are significant barriers for the individual to seek health care services. One potential approach to reduce the burden in these regions is to utilize Community Health Promoters (CHPs) to prevent, intervene, and initiate referrals for IDA among community members. CHPs are members of the community who work either for pay or volunteer to work in association with the health care system or another organization in providing basic health services to their communities. They usually have some educational (primary or secondary school), have completed some supervised training, and can engage in basic community health intervention such as health screenings, maternal health/delivery, vaccinations, and record keeping. CHPs offer a unique benefit in that they are often a trusted member of the community and can offer insight into the social and cultural nuances of health issues such as IDA.

**Delivery, Audience, and Cultural/Community-Specific Tailoring:** This program is intended to be implemented in-person in a community where IDA has been identified as a health problem through surveillance, epidemiological, or other forms of data. This program can be implemented by one or more people with training in a healthcare field (nursing, medicine, public health, nutrition) who have also been trained in facilitating training or educational sessions among under-resourced or vulnerable communities. The facilitators can be local person or a non-local partner both of who has some knowledge of local cultural customs, beliefs and traditions in order to have the ability to adapt and/or modify the program during implementation. The program is designed to be adapted by the facilitator and tailored for use with CHPs with a wide variety of cultures within resource limited communities. It is also designed to be extremely 'low-tech' so that it can be implemented in settings that lack internet capability, electricity, or other amenities. The educational program will entail 2 sections: a question and answer educational session and a hands-on skills training section.

**Estimated time to deliver program:** One 8.5 hour day or two 4 hour days

**Suggested location:** Local community center, health clinic, school, or other appropriate location identified by the community.

**Preparation:** Prior to delivering program, partner with local health facility/organization and seek to get local clinicians/providers to attend\*. Whenever possible, local terms should be identified and used or the program can be fully translated by a trained interpreter.

**Suggested supplies/materials:** 2 clear bottles partially filled with water, pink/red juice or cocoa powder (to add to bottles), markers/pens, flipchart, and note-taking material, masking tape, picture of social norms, figures in this educational program, laminated food sources and signs and symptoms reference guide (Figures 26-28), check off form for each participant (appendix A), certificate of completion for each participant, iron-rich food sources for provided lunch.

\*Alternative: If unable to arrange for partnership with local health care organization, work with CHPs to arrange a few hours in the community going house to house and/or arrange for training during market days, church, or other community events.

## Course Outline

### **Introductory Session**

- 1.1 Ice Breaker ..... p. 4
- 1.2 Purpose of Program..... p. 5
- 1.3 Community Agreements ..... p. 6

### **Blood and Anemia Session**

- 2.0 What is Blood ..... p. 7
- 2.1 What is Anemia..... p. 8
- 2.2 What is IDA ..... p. 9
- 2.3 Consequences of Anemia..... p. 10
- 2.4 Signs and Symptoms..... p. 11
- 2.5 Assessment Techniques ..... p. 12
- 2.6 Referral ..... p. 13
- 2.7 Interventions/Preventions ..... p. 14
- 2.8 Physical Assessment ..... p. 15

### **Hands-On/Practicum Session**

- 3.0 Hands on Practice ..... p. 16
- 3.1 Client Session..... p. 17
- 3.2 Independent Session..... p. 18

### **Completion Session**

- 4.0 Celebration, Certificates ..... p. 19



## Session 1: Introduction

### **1.1 Icebreaker**

*Duration: 10min but may vary based on number of participants*

#### **Purpose:**

To help the participants to get to know each other and feel more comfortable in sharing and learning

#### **Materials Needed:**

None

#### **Activity:**

Culturally appropriate introductory ice breaker

#### **Example (may be modified as needed by facilitator[s]):**

- Have everyone stand or sit in a circle (including the facilitator[s])
- The facilitator will explain this is an activity to get to know each other
- The facilitator will then start by stating “My name is \_\_\_\_\_ and I would like to introduce you to \_\_\_\_\_” Choose an object on the body that everyone has. The object can be a shoe, shirt, head covering and so on, as long as it is present on each participant (some may not be wearing shoes). Example: “I would like to introduce you to my left shoe” and then explain about your shoe. Example; “I met my left shoe at the Sunday market in town 5 years ago. We go everywhere together but lately I have noticed my shoe is starting to get old and bald. As you can see here, there is a hole at the big toe area indicating it is balding.”
- Then state what community you work in
- Each participant will then follow in turn
- When everyone has completed their introductions, thank them for sharing

## **1.2 Purpose of Program**

*Duration: 10min*

### **Purpose:**

To lay the foundation of what the purpose of the program is. Explain expectations and outline the educational program curriculum.

### **Materials Needed:**

None

### **Activities:**

Discussion

### **Explain:**

The purpose of the program is to enable the participants to update and strengthen their knowledge and skills regarding anemia in their communities with the goal to prevent IDA and reduce the overall rate. They will be provided resources and education and will learn when to refer members of their communities to more advanced medical care.

There will be two parts: group discussions and a hands-on skill-based section.

Hours of the program (either full-day or 2 half days)

Questions and discussion are welcomed

### **Evaluation:**

Address any questions or concerns

### **1.3 Community Agreements**

*Duration: 15min*

**Purpose:**

Discuss and agreed on behaviors of the participants during the program

**Materials Needed:**

Laminated Figures 1-9, tape, marker, flipchart

**Activities:**

Matching game, brainstorming, and group discussion

**Explain:**

There are different manners in which people like to learn and interact and you want to understand what the group's expectations are and what are the acceptable behaviors.

**Procedure:**

- Have everyone randomly take a picture of social norm
- Ask the participants to find the matching picture
- Discuss the picture and what it represents
- Once everyone has had the chance to discuss the pictures, ask the pairs to describe the behavior that the picture represents to the group
- Ask the group if they feel this should be something that the group agrees to adhere to during the program. If 'yes', post the picture on the wall. If 'no', set the picture aside
- Once the entire group has had a chance to present their pictures, ask them what other things they would like to agree upon
- Record any additional recommendations

**Evaluation:**

Confirm that the participants agree about the group norms. Address any disagreement or questions.

## Session 2: Blood and Anemia

### **2.0 What is Blood?**

*Duration: 20min*

#### **Purpose:**

To understand basic knowledge, cultural beliefs, and perspectives regarding blood

#### **Materials Needed:**

Laminated Figures 10-13, tape

#### **Activities:**

Group discussion

#### **Local Context Discussion:**

- What is blood?
- Why is blood important?
- What are the local beliefs about blood?

#### **Discussion Points:**

Blood is a fluid in the body that delivers necessary nutrients and oxygen to the cells of the body. Without adequate and healthy blood, the body cannot function well and you can suffer from illnesses and even die.

Blood is made up of 4 components:

1. Plasma: mostly water but with important nutrients necessary for the body
2. Red blood cells: contain hemoglobin, iron, and oxygen. These are the cells that carry oxygen to the tissues and organs in the body.
3. White blood cells: fight diseases and infections
4. Platelets: form clots and help to stop bleeding

There are 3 main functions of blood:

1. Transport oxygen and nutrients throughout the body
2. Protection: WBCs fight diseases and infections
3. Regulation: Maintains temperature and balance in the body

#### **Evaluation:**

Ask the participants to describe blood, its main functions in the body, and why it is important. Address questions and misconceptions.

## 2.1 What is Anemia?

*Duration: 40min*

### **Purpose:**

Explain anemia

### **Materials Needed:**

Laminated Figures 14-16, 18, tape, prepared bottles

### **Activities:**

Group discussion, illustrate anemia

### **Review:**

Anemia is a decrease in blood cells. Blood contains plasma, red blood cells, white blood cells and platelets. We are going to discuss the red blood cells because these are the ones most impacted by all forms of anemia. Red blood cells contain hemoglobin, iron, and oxygen. If you do not have all these components, you cannot make RBCs (figures 15-16)

### **Anemia Illustration Procedure:**

- Show anemia bottles 1 and 2
- Inform the participants that these bottles do not contain real blood but represent blood
- Pass the bottles around
- Show figure 14

### **Discussion Points:**

- What are their observations of both the bottles and the blood picture?
- Which of the bottles is the healthier one?
- Both bottles represent human blood
- Bottle 1 which is lighter is anemic blood – it has less RBCs and less iron
- Bottle 2 is normal or healthy blood – this bottle has more iron and RBCs
- To be healthy, you need to have normal amounts of RBCs
- There are many types of anemia and the most common and greatest impact is iron deficiency anemia.
- IDA is the lack of iron – recall the RBC need hemoglobin, iron, and oxygen
- Causes (risk factors): Lack of adequate or iron-rich foods, malaria, intestinal disorders (including parasites), pregnancy, menstruation, age (>65 years or <5 years), premature birth or low birth weight, family history

### **Evaluation:**

Ask the participants to describe anemia and the main components of RBCs. Address any questions or concerns.

## 2.2 What is IDA?

*Duration: 15min*

### **Purpose:**

To understand basic knowledge, cultural beliefs, and perspectives regarding IDA specifically. Explain what IDA is and describe the prevalence rates in their communities.

### **Materials Needed:**

Laminated Figure 17, tape

Prior to discussion, determine prevalence rates in the area that the program is being conducted at: [https://www.who.int/health-topics/anaemia#tab=tab\\_1](https://www.who.int/health-topics/anaemia#tab=tab_1)

### **Activities:**

Group discussion

### **Local Contest Discussion:**

Determine cultural and local beliefs and methods of IDA

### **Discussion Points:**

- What do you know about anemia?
- How do you become anemic?
- What are the local beliefs about anemia?
- How do you currently treat anemia? (e.g. iron pots, special foods, etc.)
- Do women and children need as much iron as men?
- Do people in the community have access to iron replacement pills and if so, are they utilized? Why or why not?
- Are there any beliefs or stigma associated with blood/anemia? Discuss the local prevalence rates of IDA
- Discuss local populations potentially vulnerable to IDA: menstruating and pregnant women/girls, children/babies, those with food insecurity, etc.

### **Evaluation:**

Ask participants to share the local prevalence rates of IDA and to identify the populations most at risk. Address any questions, potentially harmful beliefs, or concerns.

## 2.3 Consequences of Anemia

*Duration: 20min*

### **Purpose:**

To describe the consequences of untreated anemia

### **Materials Needed:**

None

### **Activities:**

Group discussion

### **Discussion points:**

- Why do we care about anemia?
- Economic – anemia causes fatigue. If you are feeling fatigued, it is harder to work and if you can't work, then you cannot earn money needed
- Cognitive – anemia in children less than 2y of age leads to permanent cognitive delays
- Pre-term delivery – anemia in pregnant women can result in pre-term delivery (prior to 37w gestation). This leads to higher complications for both the fetus and the mother.
- Mortality – higher rates of death for those with anemia

### **Evaluation:**

Ask participants to describe the consequences of anemia. Address any questions or concerns.

## 2.4 Signs and Symptoms of IDA

*Duration: 25min*

### **Purpose:**

Define the terms 'signs' and 'symptoms'. Discuss common signs and symptoms of anemia

### **Materials Needed:**

Laminated Figures 21-25, tape

### **Activities:**

Group discussion

### **Discussion points:**

- Symptoms: what an individual affected by disease experiences
- Sign: what is seen/observed
- Symptoms of anemia: Mild – fatigue/tiredness, headache, feeling cold; Moderate – above and weakness, dizziness, pica (strange cravings esp. in pregnant women), hair loss, tingling sensation in feet/legs, SOB; Severe – above and brittle nails, irregular heart rate (palpitations), syncope, chest pain, dyspnea
- Signs: pallor – hands, nailbeds, tongue, conjunctivae
- Additional signs: Thinning hair, Irregular heart rate, cracked nails
- Special populations: Signs and symptoms may be more difficult to assess in infants and young children (those under age 10) as they are not always able to verbalize their symptoms. The caregiver may notice the child not playing or eating as much, sleeping more, or experiencing pale stools, rapid breathing, or an increased heart rate

### **Evaluation:**

Ask participants to identify at least one symptom in each of the 3 categories of anemia and to identify 4 observable signs. Address any questions or inaccuracies.



## 2.6 Assessment Techniques

*Duration: 25min*

### **Purpose:**

Describe the client interview process and clinical assessment techniques

### **Materials Needed:**

Laminated Figure 19-20, tape

### **Activities:**

Group discussion, role play

### **Discussion points:**

- Ask CHPs what types of culturally appropriate questions they feel they should ask their clients.
- Create a list of interview questions that the group and facilitator agree upon.
- Client interview: maintain confidentiality; assess symptoms, dietary habits (including food security and quality issues), and risk factors
- Clinical assessment: signs (as listed above); emphasize that the more signs the client displays, the more likely and potentially severe the anemia. [Physical assessment will be practiced later in the program]

### **Role Play:**

Practice CHP/client brief interviews in pairs with facilitator observation and feedback.

### **Evaluation:**

Ask participants to identify any additional client interview/assessment questions that are locally or culturally appropriate. Discuss strategies for creating a confidential environment for interviewing clients. Address any questions or concerns.

## 2.6 Making Referrals

*Duration: 20min*

### **Purpose:**

Identify local resources and clinical locations to refer clients suspected of having IDA. Identify when to refer.

### **Materials Needed:**

None

### **Activities:**

Group discussion

### **Discussion points:**

- What is the available healthcare?
- How do they currently refer clients for medical services?
- Do they know how to refer and who to contact?
- What are the logistics and barriers to accessing care in this community?
- When to refer: Clients presenting with at least 3 pallor signs and/or 1 additional sign OR 2 mild/moderate symptoms or any one symptom from the severe list

### **Evaluation:**

Ask participants to describe when a referral for IDA would be warranted and how that would occur (logistically) in the community. Address any questions or concerns.

## **2.7 Interventions/Prevention**

*Duration: 25min*

### **Purpose:**

To teach participants how to partner with clients to treat and prevent IDA

### **Materials Needed:**

Laminated Figures 26-27, tape, dry erase markers

### **Activities:**

Group discussion, small group activity

### **Identifying Local Iron Rich Food Sources Small Group Activity:**

- Arrange participants in groups of 2-4 and provide large laminate posters with pictures of local foods (e.g. beans, meat, eggs, leafy greens, etc.)
- Ask groups to circle the most accessible foods in their communities and to add any that are missing
- Ask groups to put an X over foods not readily available
- Ask groups to put a check mark on foods that are available but may be either expensive or difficult to obtain
- Discuss each group's findings

### **Discussion Points:**

- Discuss geographical or seasonal food trends
- Are there foods that are culturally unacceptable? Are there gender, age, race/ethnicity, or class considerations?
- Are iron supplements, cast iron pots, or other non-food sources of iron locally available?
- Emphasize that clients may be prescribed a medication (iron supplements in liquid, capsules, or tablet form) by a professional health care provider but these medications should never be administered or distributed by a CHP
- Share that breastfeeding for a minimum of 6 months may help prevent anemia in infants

### **Evaluation:**

Ask participants to identify 3 feasible recommendations they can make to a client to increase their iron intake. Address any questions or concerns.

## 2.8 Physical Assessment

*Duration: 15min*

### **Purpose:**

To illustrate the physical assessment of IDA

### **Materials Needed:**

Laminated Figures 23-28, tape

### **Activities:**

Group discussion

### **Discussion Points:**

- Assessing 4 areas of the body for anemia: Hands, nailbeds, tongue, conjunctivae
  - Hand: Look at the palmar crease which is the line across the middle of the palm. Does the palm look pale or even almost white?
  - Nailbeds: Do the nails beds look pale? Are they brittle/cracked? Are there lines on the nails? Is there spooning (nails curved so that it looks like a spoon)?
  - Tongue: Is it smooth? Enlarged? Shiny?
  - Conjunctivae: Pull down lower eye lid and look on the inside of the lid for paleness
- Discuss variations in physical assessment based on client race/ethnicity as relevant to the local population

### **Evaluation:**

Address any questions or concerns.

### Session 3: Hands-On Practicum

#### **3.0 Hands-On Practicum (Practice Session)**

*Duration: 15min*

#### **Purpose:**

To demonstrate and practice the complete physical assessment for IDA on a peer.

#### **Materials Needed:**

Laminated Figures 23-28, tape, evaluation form

#### **Activities:**

Role play, small group demonstration

#### **Discussion Points:**

- This session is designed for the practical use of the assessment of anemia
- Describe the evaluation form (Appendix A)

#### **Role Play Procedure:**

Facilitator will role play a complete client interview and demonstrate the technique for assessing for anemia using the palms, conjunctivae, tongue, and nailbeds.

Pair up the participants and have them practice the interview and technique on each other.

#### **Evaluation:**

Once each participant successfully demonstrates an accurate IDA interview and physical assessment of a peer according to the evaluation form (Appendix A), they can proceed to the next session

### **3.1 Hands-On Practicum (Client Session)**

*Duration: remainder of session time*

#### **Purpose:**

To practice the complete IDA interview and assessment on a client while working as a pair

#### **Materials Needed:**

Laminated Figures 23-28, tape, evaluation form

#### **Activities:**

Assess clients in pairs

#### **Discussion Points:**

- This session is designed for the practical use of the assessment of anemia
- Describe the evaluation form (Appendix A)

#### **Procedure:**

As you have partnered with local healthcare facility partners, assessments will be accomplished on clients waiting for appointments or otherwise present at the clinical site. Clients will be verbally asked to participate in this training. If consenting, the CHPs will interview and assess the client in pairs and come up with a consensus of their findings (risk factors, symptoms, and physical assessment). They will then present their findings to the facilitator who will then perform their own evaluation and provide feedback. The CHPs are expected to assess symptoms, dietary practices/food security, and pallor in palms, conjunctivae, nailbeds, and tongue. If the client is determined to be anemic, the CHPs will provide education on following an iron-rich diet and report to the partnering health care provider (immediate referral is essential if the client is displaying signs and symptoms of severe anemia). If the CHPs are unable to have a consistent and accurate assessment, or if there are no anemic clients, then continue to assess in supervised pairs until accuracy improves.

#### **Evaluation:**

Once the pair of participants can successfully pass the evaluation form (Appendix A), they can proceed to the next session

### **3.2 Hands-On Practicum (Independent Session)**

*Duration: Remainder of session time*

**Purpose:**

To demonstrate a complete IDA interview and assessment independently

**Materials Needed:**

Laminated Figures 23-28, tape, evaluation form

**Activities:**

Assess clients

**Discussion Points:**

- This session is designed for the practical use of the assessment of anemia

**Procedure:**

CHPs will individually assess clients and then present their findings to the facilitator as in the prior session. If there is good consensus amongst the CHP and facilitator in assessment findings and at least three anemic clients have been correctly identified, the CHP will be permitted to independently assess clients in the facility, community, or wherever they practice.

**Evaluation:**

Once the participant can successfully pass the evaluation form (Appendix A), then they can proceed to completing the program.

## Session 4: Completion Session

### **4.0 Completion**

*Duration: 20min*

#### **Purpose:**

To close out the session and provide resources

#### **Materials Needed:**

Certificates of completion

#### **Discussion Points:**

- Conclusions, questions, celebrations



**Figure 1**

*Community Agreements – Raise Hands*



[Untitled illustration of raising hands]. Vectorstock. <https://www.vectorstock.com/royalty-free-vectors/cartoon-school-kids-raising-hand-in-the-classroom-vectors>

**Figure 2***Community Agreements – Respectful Communication*

[Untitled illustration of community meeting]. Government of India.  
<https://panchayatcharter.nic.in/#/>

**Figure 3**

*Community Agreements—Participate and Pay Attention*



Untitled illustration of meeting] Clip-art. <http://clipart-library.com/free-meeting->

**Figure 4**

*Community Agreements—Participate and Pay Attention*



[Untitled illustration of meeting] Clip-art. <http://clipart-library.com/free-meeting-cliparts.html>

**Figure 5**

*Community Agreements—Participate and Pay Attention*



[Untitled illustration of meeting] Clip-art. <http://clipart-library.com/free-meeting-cliparts>.

**Figure 6**

*Community Agreements—Talking Over Each Other/Not Listening*



[Untitled illustration of conflict] [https://www.google.com/search?sa=G&hl=en&tbs=simg:CAQSgQIJCrpjOzqA0Q0a9QELELCMpwaOgo4CAQSFM0\\_1-CWdAcoW\\_1gf2BIOq9zXIHOYQGhqpSlaPMKdBddyXRBE6FdHMN9o4APSQOFtujiAFMAQMCxCOrv4IGgoKCAgBEgQlmELPDAsQne3BCRqVAQofCgxjb252ZXJzY](https://www.google.com/search?sa=G&hl=en&tbs=simg:CAQSgQIJCrpjOzqA0Q0a9QELELCMpwaOgo4CAQSFM0_1-CWdAcoW_1gf2BIOq9zXIHOYQGhqpSlaPMKdBddyXRBE6FdHMN9o4APSQOFtujiAFMAQMCxCOrv4IGgoKCAgBEgQlmELPDAsQne3BCRqVAQofCgxjb252ZXJzY)

**Figure 7**

*Community Agreements—Talking Over Each Other/Not Listening*



[Untitled illustration of fighting at meeting]. Flaticon. <https://www.flaticon.com/free-icons/brainstorming>

**Figure 8**

*Community Agreements—Be On Time*



[Illustration of meeting]. The Conversation. <https://theconversation.com/us>

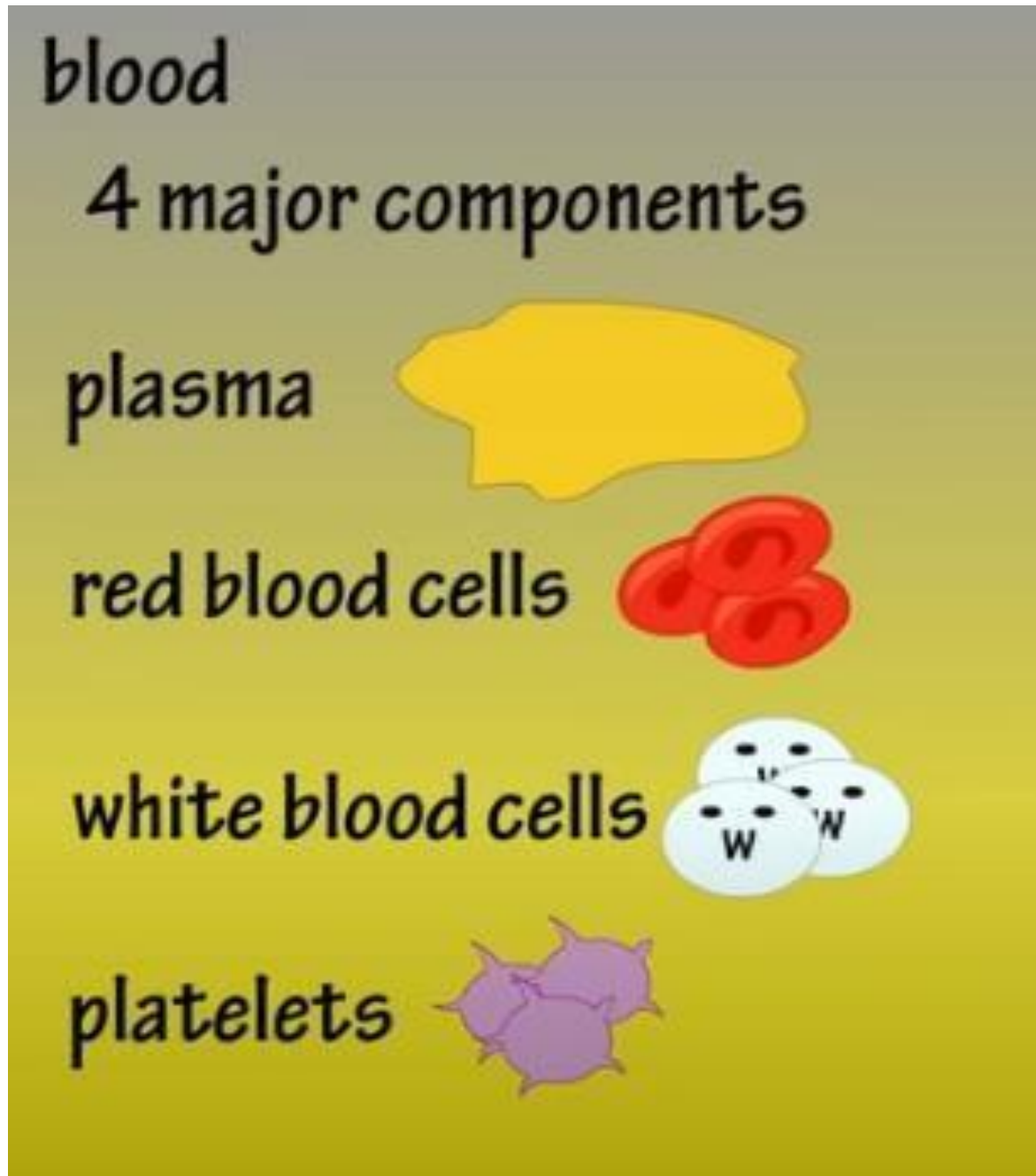


**Figure 9**

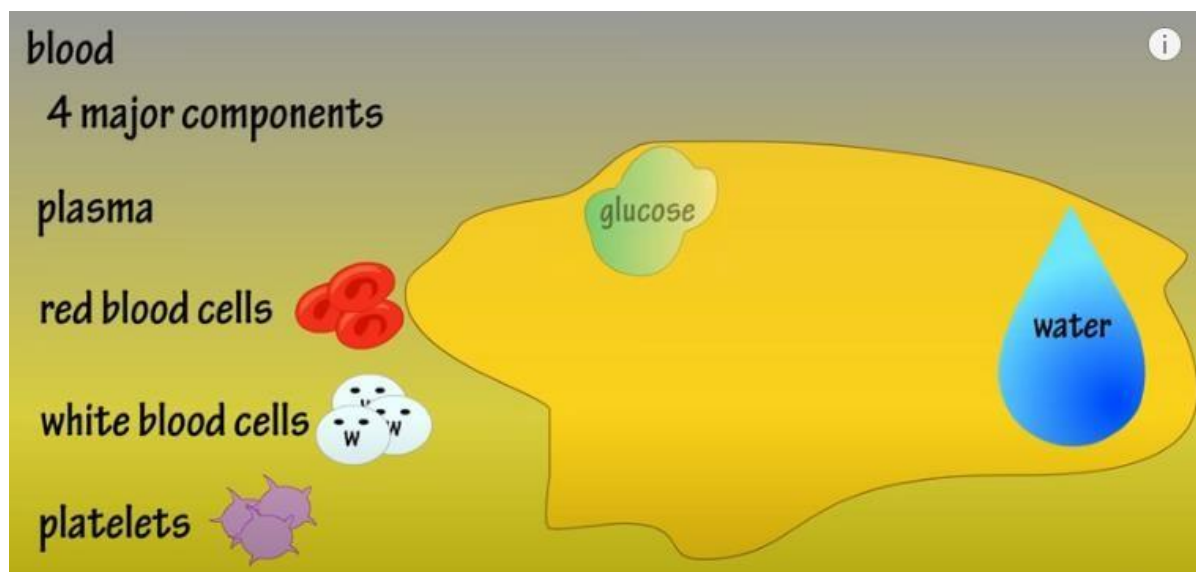
*Community Agreements—Using Cell Phones*



I am not texting I am taking notes [Online image]. *New York Times*. <https://www.nytimes.com/2017/04/07/jobs/texting-work-meetings-social-media.html?smid=pin-share>

**Figure 10***Four Components of Blood*

What is blood? [Online image]. 2016. <https://www.youtube.com/watch?v=68HyQPx-kso>

**Figure 11***Plasma*

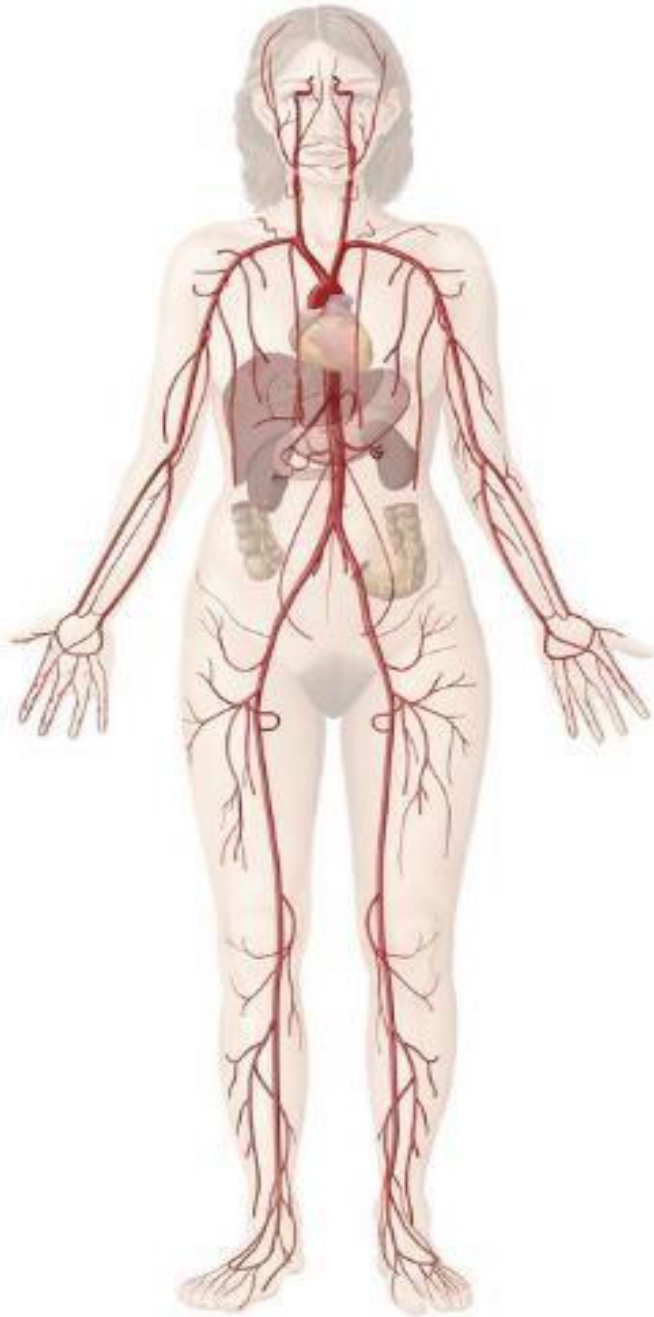
What is blood? [Online image]. 2016. <https://www.youtube.com/watch?v=68HyQPX-kso>

**Figure 12**

*Red and White Blood Cells, Platelets*



What is blood? [Online image]. 2016. <https://www.youtube.com/watch?v=68HyQPx-kso>

**Figure 13***Circulatory System*

Gorman, N. (2021). Circulatory (cardiovascular) system [Online image]. Kenhub. <https://www.kenhub.com/en/library/anatomy/circulatory-system>

**Figure 14***Anemia***Bottle 1 (Anemic Blood)****Bottle 2 ( Healthy Blood)**

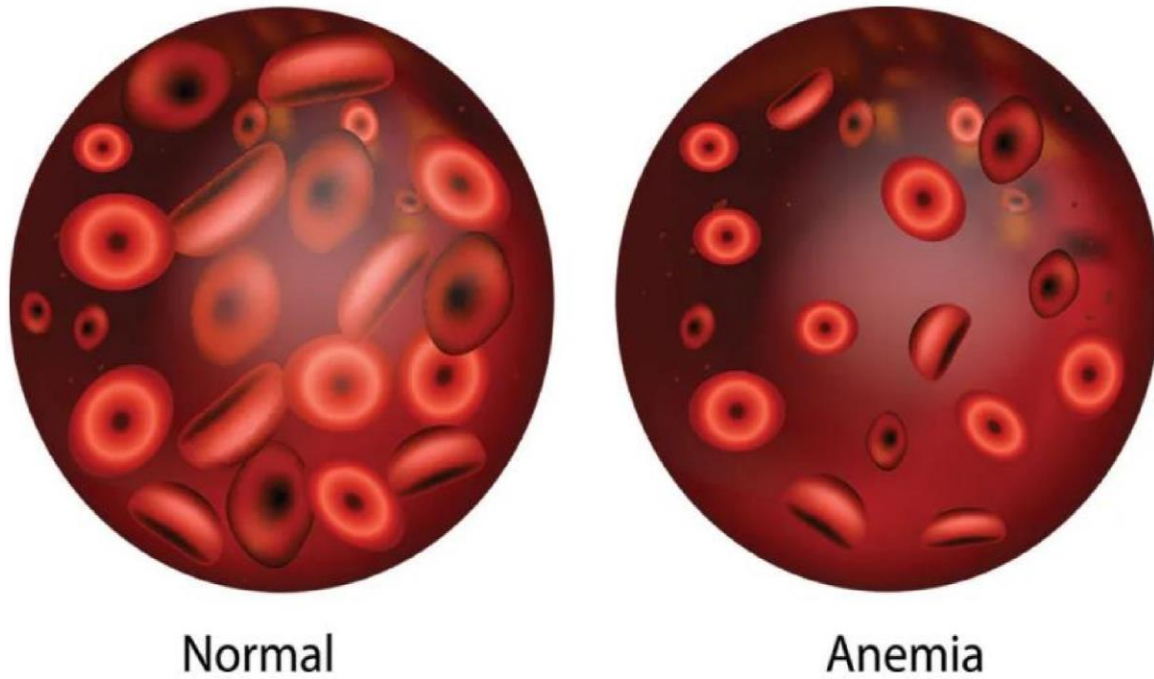
How to prepare:

Fill 2 clear bottles with clear water (about 2/3 full)

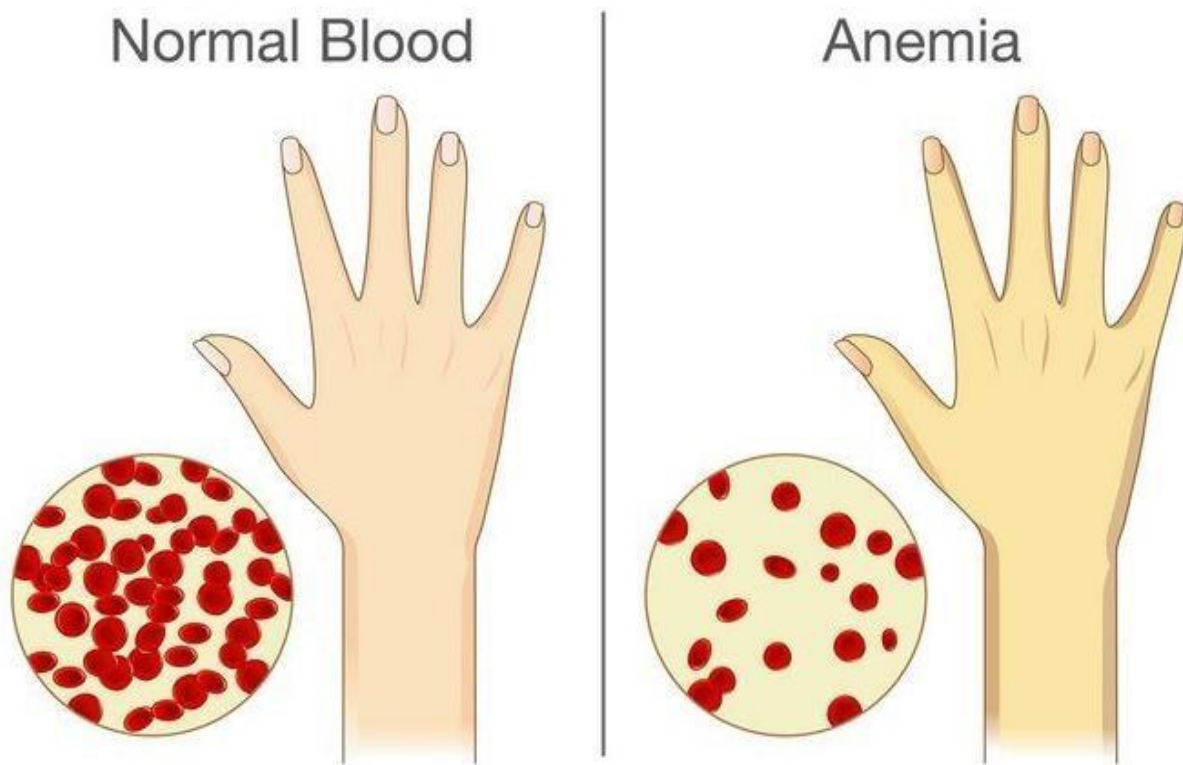
Label the bottles 1 and 2

Put a small amount of juice or cocoa powder in to bottle 1 to get a light coloration

Put more quantity of juice or cocoa powder in to bottle 2 to get a dark coloration.

**Figure 15***Picture of Anemia*

Robertson, S. (N.D.). Fanconi anemia prognosis [Online image]. NewsMedical  
<https://www.news-medical.net/health/FanconiAnemia-Prognosis.aspx>

**Figure 16***Anemia*

Anemia: overview, symptoms, causes, types, and dietary guidelines [Online image].  
<https://betahealthy.com/anemia-overviewsymptoms-causes-types-and-dietary-guidelines/>



**Figure 17***Prevalence*

**Figure 18**

*Causes of Iron Deficiency Anemia*



**Figure 19**

*Client Interview/Exam: Counseling*

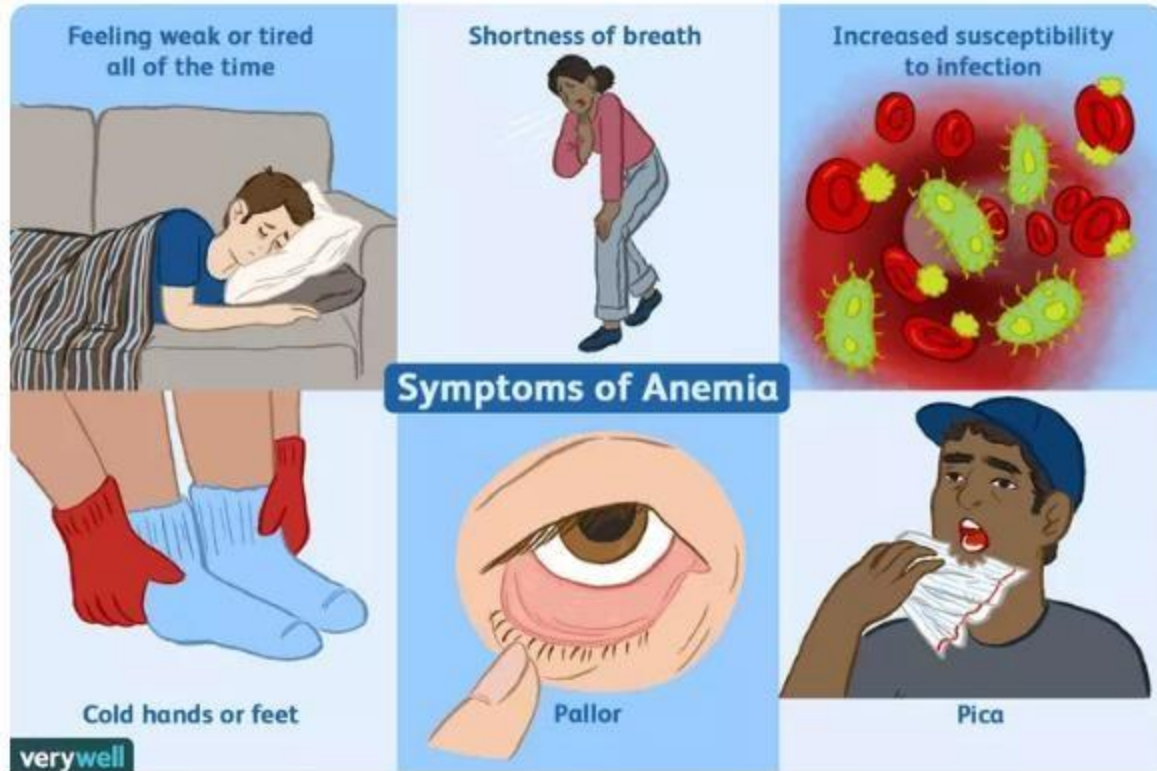


[Untitled illustration of counseling]. [https://iycf.advancingnutrition.org/explore?keys=&country=All&field\\_nutrition\\_topic=All&field\\_collection=1472&page=5](https://iycf.advancingnutrition.org/explore?keys=&country=All&field_nutrition_topic=All&field_collection=1472&page=5)

**Figure 20***Client Interview and Exam*

[Untitled illustration of client interview]. [https://iycf.advancingnutrition.org/explore?keys=&country=All&field\\_nutrition\\_topic=All&field\\_collection=1472&page=5](https://iycf.advancingnutrition.org/explore?keys=&country=All&field_nutrition_topic=All&field_collection=1472&page=5)

**Figure 21***Symptoms of Anemia*



Gilmartin, B. (2021). The link between cancer and anemia [Online image]. VeryWell. <https://www.verywellhealth.com/anemiaand-cancer-797397>

**Figure 22***Signs of Anemia*

10 signs your body is lacking iron [Online image]. (2021). <https://brightside.me/inspiration-health/10-disturbing-signs-your-body-is-lacking-iron-513660/>



Motswaledi, M & Mayayise, M. [Online image]. 2010 <http://www.tandfonline.com/loi/ojfp20>.

**Figure 23**

*Signs of Anemia: Palmar Pallor in a Patient with Severe Anemia*



Taylor, T. (2021). *Palmar pallor in a patient with severe anemia* [Online image].  
[www.uptodate.com](http://www.uptodate.com)



## Figure 24

### *Signs of Anemia: Hand Pallor and Conjunctivae Anemia*



Pallor. [Online image]. (2021). <https://www.shutterstock.com/image-photo/image-hands-comparing-severe-anaemia-normal-759943144>



Digital photos of conjunctivae anemia [Online image]. (2021). <https://www.grepmed.com/images/4197/conjunctivalcomparison-pallor-comparison-physicalexam>

Figure 25

Iron Deficiency Anemia Foods Poster: Front

## Iron Deficiency Anemia

# COMMON FOODS IN YOUR COMMUNITY

	Sheep/lamb		Goose		Whale		Winged bean
	Rice bran		White bean		Pig/pork		Kidney bean
	Cowpea		Black bean		Mung bean		Natto
	Teff		Amaranth		Yardlong Bean		Chili/pink Bean
	Lentil		Yellow bean		Duck		Lima bean
	Chicken		Clams		Pumpkin Seed		Squab
	Pigeon Pea		Fava Bean		Sesame Seed		Adzuki bean
	Cranberry bean		Masa		Split Peas		Cuttlefish
	Sunflower Seed		Bagel		Sardines		Chickpeas
	Shrimp		Spinach		Beet		Brussel sprout
	Egg		Collard greens		Mushroom		Nuts
	Potato		Tortilla		Turkey		Blackberry
	Broccoli		Carrot		Califlower		Tomato
	Cow		Bear		Halibut		Fish

Figure 26

*Iron Deficiency Anemia Foods Poster: Back Side*

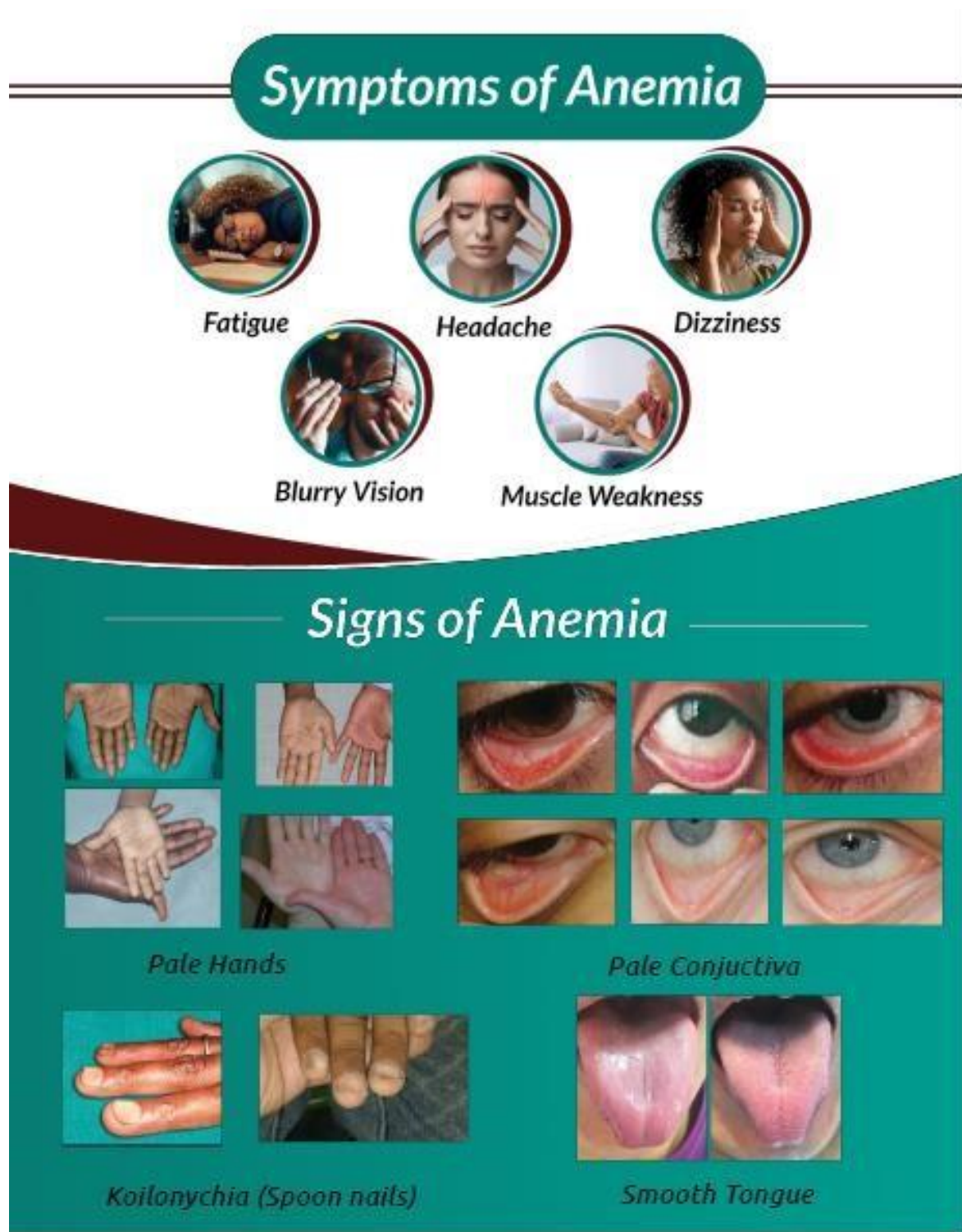
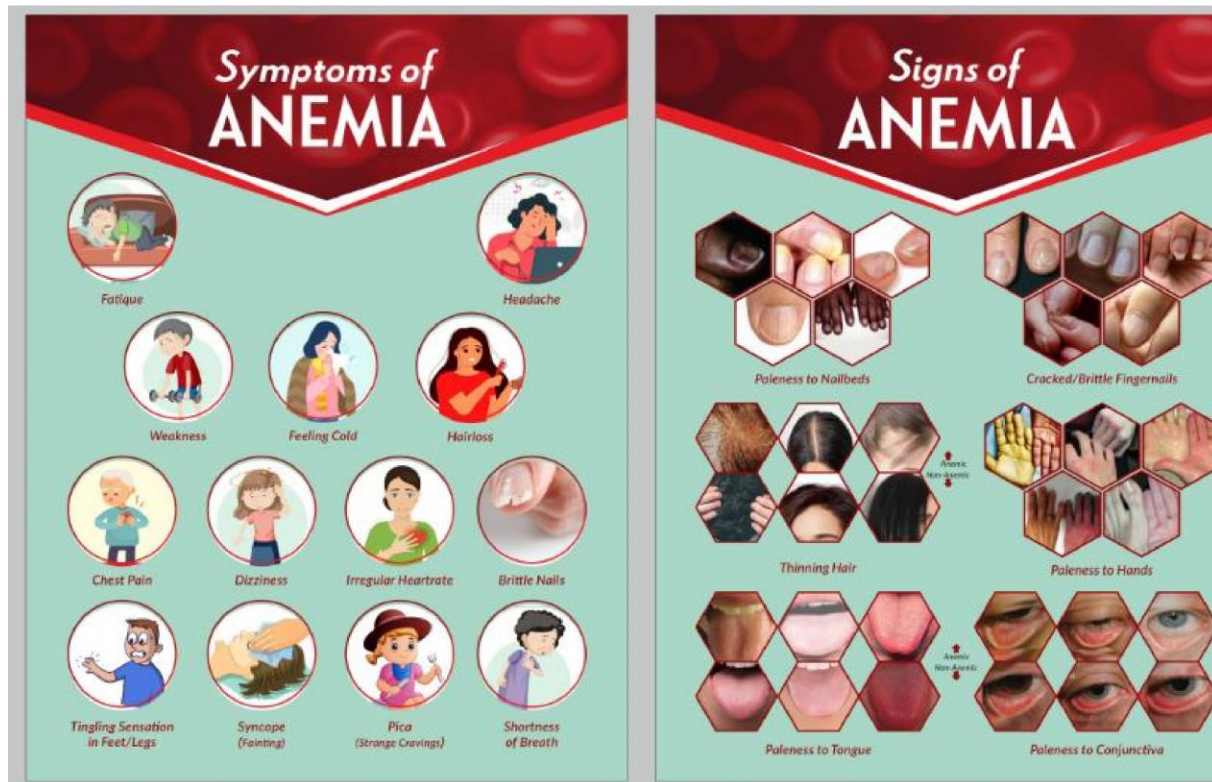


Figure 27

## Signs and Symptoms Resource Guide



Appendix A  
Skills Check

Topic	Skill	Met	Not Met	Comments
Interview	• Provide confidentiality			
	• Follows social/cultural norms, respectful communication			
	• Risk factors: menstruation, pregnancy, age (>65 or infant/child <5), intestinal disorders (including parasites), malaria, family history*			*Must assess for at least 50% of the risk factors
Assesses for the following	• Dietary habits, quality of and access to food			
	• Signs/symptoms: fatigue/tiredness, headache, feeling cold, weakness, dizziness, pica (strange cravings), hair loss, tingling sensation in feet/legs, SOB, brittle nails, irregular heart rate (palpitations), syncope, chest pain, dyspnea*			*Must assess for at least 50% of the symptoms
Physical Assessment**	Conjunctivae, tongue, nail beds, palm, Nails (brittle), scalp (thinning)			
Education/Referral**	• Verbalizes findings and assessment			
	• Provides education and recommendations to client			
	• Verbalizes need for referral (if appropriate)			
	• Able to state how to refer (if appropriate)			
	Total met out of 10 possible	_/10		

*Note.* \*\*Required components to successfully complete check-off