HEALTH DATA ANALYTICS ASSIGNMENT

Assignment 1 - Practical

The assignment objective is to clean and standardize the Health Facility Assessment data to a standard that will enable a Macro-Eye machine learning scientist to start working with the preprocessed data.

Data Analytics Process

We will use the Google Analysis Process to guide us through the analysis:

1. **Ask** - Business Challenge/Objective/Question
2. **Prepare** - Data generation, collection, storage and management
3. **Process** - Data cleaning/data integrity
4. **Analyze** - Data exploration, visualization and analysis
5. **Share** - Communicating and interpreting results
6. **Act** - Putting insights to work

Packages

We will install and load required libraries

```
if(!require(rmarkdown)) install.packages("rmarkdown")
if(!require(tinytex)) install.packages("tinytex")
if(!require(skimr)) install.packages("naniar")
if(!require(tidyverse)) install.packages("tidyverse")
if(!require(janitor)) install.packages("janitor")
if(!require(stringr)) install.packages("stringr")
if(!require(skimr)) install.packages("skimr")
if(!require(DataExplorer)) install.packages("DataExplorer")



library(rmarkdown)
library(tinytex)
library(tidyverse)
library(janitor)
library(DataExplorer)
library(naniar)
library(stringr)
```

Data Loading

Loading the dataset

```r
#function to read and clean column names
read_data <- function(path){
  #setting the data path
df_path <- path
#reading the dataset and cleaning the names
df <- read_csv(df_path) %>% clean_names()
}

#applying read function to dataset
health_facility_df = read_data("./www/Health Facility Assessment.csv")
```

Data Processing

Understanding dataset structure

```r
#creating function to understand the data structure
df_structure <- function(df){
  head(df)
  skim(df)
  str(df)
  summary(df)
}

#applying the function to the data
df_structure(health_facility_df)
```

```
## spec_tbl_df [145 x 205] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
##  $ x1
##  $ number
##  $ form_health_centre_information_facility_name
##  $ form_facility_gps
##  $ form_health_centre_information_location_information_region_province
##  $ form_health_centre_information_location_information_district
##  $ form_health_centre_information_location_information_chiefdom
##  $ form_health_centre_information_location_information_facility_location
##  $ form_health_centre_information_facility_type
##  $ form_health_centre_information_facility_type_other
##  $ form_health_centre_information_managing_authority
##  $ form_health_centre_information_managing_authority_other
##  $ form_health_centre_information_setting
##  $ form_health_centre_information_outpatient_only
##  $ form_health_centre_information_capacity_number_consultation_rooms
##  $ form_health_centre_information_capacity_number_inpatient_beds
##  $ form_health_centre_information_capacity_number_maternity_beds
##  $ form_health_centre_information_group_number_employed_list_community_health_officer_cho_number_in_p
##  $ form_health_centre_information_group_number_employed_list_community_health_officer_cho_number_pres
```

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##  $ form_health_centre_information_group_number_employed_list_community_health_technician_cht_number_
##  $ form_health_centre_information_group_number_employed_list_community_health_technician_cht_number_
##  $ form_health_centre_information_group_number_employed_list_community_health_assistant_cha_number_i
##  $ form_health_centre_information_group_number_employed_list_community_health_assistant_cha_number_p
##  $ form_health_centre_information_group_number_employed_list_community_midwives_cm_number_in_post
##  $ form_health_centre_information_group_number_employed_list_community_midwives_cm_number_present_at_
##  $ form_health_centre_information_group_number_employed_list_sechn_sechn_number_in_post
##  $ form_health_centre_information_group_number_employed_list_sechn_sechn_number_present_at_visit
##  $ form_health_centre_information_group_number_employed_list_laboratory_technicians_lab_tech_number_
##  $ form_health_centre_information_group_number_employed_list_laboratory_technicians_lab_tech_number_p
##  $ form_health_centre_information_group_number_employed_list_mch_aides_mch_aides_number_in_post
##  $ form_health_centre_information_group_number_employed_list_mch_aides_mch_aides_number_present_at_v
##  $ form_health_centre_information_group_number_employed_list_cleaner_porter_cleaner_porter_number_in_
##  $ form_health_centre_information_group_number_employed_list_cleaner_porter_cleaner_porter_number_pr
##  $ form_health_centre_information_group_number_employed_list_other_other_number_in_post
##  $ form_health_centre_information_group_number_employed_list_other_other_number_present_at_visit
##  $ form_health_centre_information_group_number_employed_list_other_other_staff_cadre
##  $ form_sections_to_review
##  $ form_consultations_head_count_month_1
##  $ form_consultations_head_count_month_2
##  $ form_consultations_head_count_month_3
##  $ form_consultations_head_count_month_4
##  $ form_consultations_general_outpatient_month_1
##  $ form_consultations_general_outpatient_month_2
##  $ form_consultations_general_outpatient_month_3
##  $ form_consultations_general_outpatient_month_4
##  $ form_consultations_deliveries_month_1
##  $ form_consultations_deliveries_month_2
##  $ form_consultations_deliveries_month_3
##  $ form_consultations_deliveries_month_4
##  $ form_consultations_pent_vaccines_month_1
##  $ form_consultations_pent_vaccines_month_2
##  $ form_consultations_pent_vaccines_month_3
##  $ form_consultations_pent_vaccines_month_4
##  $ form_ql_human_resources_choice_labels
##  $ form_ql_human_resources_hr_focal_point
##  $ form_ql_human_resources_hr_staff_received_info
##  $ form_ql_human_resources_hr_healthcare_provider_training
##  $ form_ql_human_resources_hr_healthcare_provider_revised_training
##  $ form_ql_human_resources_hr_daily_staff_list
##  $ form_ql_information_education_communication_choice_labels
##  $ form_ql_information_education_communication_iec_handwashing_procedure
##  $ form_ql_information_education_communication_iec_physical_distancing
##  $ form_ql_information_education_communication_iec_covering_nose_mouth
##  $ form_ql_information_education_communication_iec_early_symptom_recognition
##  $ form_ql_information_education_communication_iec_when_facility_vs_home
##  $ form_ql_information_education_communication_iec_rational_ppe_use
##  $ form_ql_information_education_communication_iec_helpline_number
##  $ form_ql_surveillance_choice_labels
##  $ form_ql_surveillance_surv_procedure_for_notification
##  $ form_ql_surveillance_surv_official_case_definition
##  $ form_ql_surveillance_surv_hotline_number
##  $ form_ql_surveillance_surv_timely_data_reported_to_district
##  $ form_ql_triage_and_early_recognition_choice_labels
```

```
##  $ form_ql_triage_and_early_recognition_ter_screening_area_set_up
##  $ form_ql_triage_and_early_recognition_ter_symptom_screening_questionnaires
##  $ form_ql_triage_and_early_recognition_ter_temperature_measurement_at_triage
##  $ form_ql_triage_and_early_recognition_ter_physical_distancing_in_waiting
##  $ form_ql_triage_and_early_recognition_ter_separate_waiting_for_symptomatic
##  $ form_ql_chw_choice_labels
##  $ form_ql_chw_chw_trained_precautions
##  $ form_ql_chw_chw_trained_community_service
##  $ form_ql_chw_chw_drugs
##  $ form_ql_chw_chw_gloves
##  $ form_ql_chw_chw_masks
##  $ form_ql_chw_chw_iec_materials
##  $ form_ql_isolation_physical_distancing_choice_labels
##  $ form_ql_isolation_physical_distancing_iso_designated_isolation_for_suspected
##  $ form_ql_isolation_physical_distancing_iso_distance_between_patients_in_waiting
##  $ form_ql_isolation_physical_distancing_iso_distance_between_patient_beds
##  $ form_ql_isolation_physical_distancing_iso_transfer_referral_protocol
##  $ form_grp_infection_prevention_and_control_ql_ppe_choice_labels
##  $ form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_medical_masks
##  $ form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_disp_surgical_masks
##  $ form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_eye_protection
##  $ form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_examination_gloves
##  $ form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_surgical_gloves
##  $ form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_long_cuffed_gloves
##  $ form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_heavy_duty_gloves
##  $ form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_long_sleeved_gown
##   [list output truncated]
## - attr(*, "spec")=
##  .. cols(
##  ..   ...1 = col_double(),
##  ..   number = col_double(),
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##  ..   form.facility_gps = col_character(),
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##  ..   form.health_centre_information.managing_authority = col_character(),
##  ..   form.health_centre_information.managing_authority_other = col_character(),
##  ..   form.health_centre_information.setting = col_character(),
##  ..   form.health_centre_information.outpatient_only = col_character(),
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##  ..   form.health_centre_information.capacity.number_inpatient_beds = col_character(),
##  ..   form.health_centre_information.capacity.number_maternity_beds = col_character(),
##  ..   form.health_centre_information.group_number_employed.list_community_health_officer.cho_number_
##  ..   form.health_centre_information.group_number_employed.list_community_health_officer.cho_number_
##  ..   form.health_centre_information.group_number_employed.list_community_health_technician.cht_num
##  ..   form.health_centre_information.group_number_employed.list_community_health_technician.cht_num
##  ..   form.health_centre_information.group_number_employed.list_community_health_assistant.cha_numb
##  ..   form.health_centre_information.group_number_employed.list_community_health_assistant.cha_numb
##  ..   form.health_centre_information.group_number_employed.list_community_midwives.cm_number_in_pos
##  ..   form.health_centre_information.group_number_employed.list_community_midwives.cm_number_presen
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##    ..    form.health_centre_information.group_number_employed.list_sechn.sechn_number_in_post = col_cha
##    ..    form.health_centre_information.group_number_employed.list_sechn.sechn_number_present_at_visit
##    ..    form.health_centre_information.group_number_employed.list_laboratory_technicians.lab_tech_num
##    ..    form.health_centre_information.group_number_employed.list_laboratory_technicians.lab_tech_num
##    ..    form.health_centre_information.group_number_employed.list_mch_aides.mch_aides_number_in_post =
##    ..    form.health_centre_information.group_number_employed.list_mch_aides.mch_aides_number_present_
##    ..    form.health_centre_information.group_number_employed.list_cleaner_porter.cleaner_porter_numbe
##    ..    form.health_centre_information.group_number_employed.list_cleaner_porter.cleaner_porter_numbe
##    ..    form.health_centre_information.group_number_employed.list_other.other_number_in_post = col_cha
##    ..    form.health_centre_information.group_number_employed.list_other.other_number_present_at_visit
##    ..    form.health_centre_information.group_number_employed.list_other.other_staff_cadre = col_chara
##    ..    form.sections_to_review = col_character(),
##    ..    form.consultations.head_count.month_1 = col_character(),
##    ..    form.consultations.head_count.month_2 = col_character(),
##    ..    form.consultations.head_count.month_3 = col_character(),
##    ..    form.consultations.head_count.month_4 = col_character(),
##    ..    form.consultations.general_outpatient.month_1 = col_character(),
##    ..    form.consultations.general_outpatient.month_2 = col_character(),
##    ..    form.consultations.general_outpatient.month_3 = col_character(),
##    ..    form.consultations.general_outpatient.month_4 = col_character(),
##    ..    form.consultations.deliveries.month_1 = col_character(),
##    ..    form.consultations.deliveries.month_2 = col_character(),
##    ..    form.consultations.deliveries.month_3 = col_character(),
##    ..    form.consultations.deliveries.month_4 = col_character(),
##    ..    form.consultations.pent_vaccines.month_1 = col_character(),
##    ..    form.consultations.pent_vaccines.month_2 = col_character(),
##    ..    form.consultations.pent_vaccines.month_3 = col_character(),
##    ..    form.consultations.pent_vaccines.month_4 = col_character(),
##    ..    form.ql_human_resources.choice_labels = col_character(),
##    ..    form.ql_human_resources.hr_focal_point = col_character(),
##    ..    form.ql_human_resources.hr_staff_received_info = col_character(),
##    ..    form.ql_human_resources.hr_healthcare_provider_training = col_character(),
##    ..    form.ql_human_resources.hr_healthcare_provider_revised_training = col_character(),
##    ..    form.ql_human_resources.hr_daily_staff_list = col_character(),
##    ..    form.ql_information_education_communication.choice_labels = col_character(),
##    ..    form.ql_information_education_communication.iec_handwashing_procedure = col_character(),
##    ..    form.ql_information_education_communication.iec_physical_distancing = col_character(),
##    ..    form.ql_information_education_communication.iec_covering_nose_mouth = col_character(),
##    ..    form.ql_information_education_communication.iec_early_symptom_recognition = col_character(),
##    ..    form.ql_information_education_communication.iec_when_facility_vs_home = col_character(),
##    ..    form.ql_information_education_communication.iec_rational_ppe_use = col_character(),
##    ..    form.ql_information_education_communication.iec_helpline_number = col_character(),
##    ..    form.ql_surveillance.choice_labels = col_character(),
##    ..    form.ql_surveillance.surv_procedure_for_notification = col_character(),
##    ..    form.ql_surveillance.surv_official_case_definition = col_character(),
##    ..    form.ql_surveillance.surv_hotline_number = col_character(),
##    ..    form.ql_surveillance.surv_timely_data_reported_to_district = col_character(),
##    ..    form.ql_triage_and_early_recognition.choice_labels = col_character(),
##    ..    form.ql_triage_and_early_recognition.ter_screening_area_set_up = col_character(),
##    ..    form.ql_triage_and_early_recognition.ter_symptom_screening_questionnaires = col_character(),
##    ..    form.ql_triage_and_early_recognition.ter_temperature_measurement_at_triage = col_character(),
##    ..    form.ql_triage_and_early_recognition.ter_physical_distancing_in_waiting = col_character(),
##    ..    form.ql_triage_and_early_recognition.ter_separate_waiting_for_symptomatic = col_character(),
##    ..    form.ql_chw.choice_labels = col_character(),
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##   ..   form.ql_chw.chw_trained_precautions = col_character(),
##   ..   form.ql_chw.chw_trained_community_service = col_character(),
##   ..   form.ql_chw.chw_drugs = col_character(),
##   ..   form.ql_chw.chw_gloves = col_character(),
##   ..   form.ql_chw.chw_masks = col_character(),
##   ..   form.ql_chw.chw_iec_materials = col_character(),
##   ..   form.ql_isolation_physical_distancing.choice_labels = col_character(),
##   ..   form.ql_isolation_physical_distancing.iso_designated_isolation_for_suspected = col_character(),
##   ..   form.ql_isolation_physical_distancing.iso_distance_between_patients_in_waiting = col_character(),
##   ..   form.ql_isolation_physical_distancing.iso_distance_between_patient_beds = col_character(),
##   ..   form.ql_isolation_physical_distancing.iso_transfer_referral_protocol = col_character(),
##   ..   form.grp_infection_prevention_and_control.ql_ppe.choice_labels = col_character(),
##   ..   form.grp_infection_prevention_and_control.ql_ppe.ipc_ppe_medical_masks = col_character(),
##   ..   form.grp_infection_prevention_and_control.ql_ppe.ipc_ppe_disp_surgical_masks = col_character(),
##   ..   form.grp_infection_prevention_and_control.ql_ppe.ipc_ppe_eye_protection = col_character(),
##   ..   form.grp_infection_prevention_and_control.ql_ppe.ipc_ppe_examination_gloves = col_character(),
##   ..   form.grp_infection_prevention_and_control.ql_ppe.ipc_ppe_surgical_gloves = col_character(),
##   ..   form.grp_infection_prevention_and_control.ql_ppe.ipc_ppe_long_cuffed_gloves = col_character(),
##   ..   form.grp_infection_prevention_and_control.ql_ppe.ipc_ppe_heavy_duty_gloves = col_character(),
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##   ..   form.grp_infection_prevention_and_control.ql_ppe.ipc_ppe_waterproof_aprons = col_character(),
##   ..   form.grp_infection_prevention_and_control.ql_ppe_plan.choice_labels = col_character(),
##   ..   form.grp_infection_prevention_and_control.ql_ppe_plan.ipc_ppe_plan_staff_trained_on_ppe = col_
##   ..   form.grp_infection_prevention_and_control.ql_ppe_plan.ipc_ppe_plan_ppe_poster_displayed = col_
##   ..   form.grp_infection_prevention_and_control.ql_ppe_plan.ipc_ppe_plan_fit_test_kit = col_characte
##   ..   form.grp_infection_prevention_and_control.ql_ppe_plan.ipc_ppe_plan_contingency_for_shortages =
##   ..   form.grp_infection_prevention_and_control.ql_waste_collection_and_disposal.choice_labels = col
##   ..   form.grp_infection_prevention_and_control.ql_waste_collection_and_disposal.ipc_wcd_colour_code
##   ..   form.grp_infection_prevention_and_control.ql_waste_collection_and_disposal.ipc_wcd_clinical_wa
##   ..   form.grp_infection_prevention_and_control.ql_waste_collection_and_disposal.ipc_wcd_laundry_re
##   ..   form.grp_infection_prevention_and_control.ql_waste_collection_and_disposal.ipc_wcd_incinerato
##   ..   form.grp_infection_prevention_and_control.ql_water_sanitation_and_hygiene.choice_labels = col_
##   ..   form.grp_infection_prevention_and_control.ql_water_sanitation_and_hygiene.ipc_wash_clean_runni
##   ..   form.grp_infection_prevention_and_control.ql_water_sanitation_and_hygiene.ipc_wash_hand_soap =
##   ..   form.grp_infection_prevention_and_control.ql_water_sanitation_and_hygiene.ipc_wash_liquid_soap
##   ..   form.grp_infection_prevention_and_control.ql_water_sanitation_and_hygiene.ipc_wash_disp_hand_t
##   ..   form.grp_infection_prevention_and_control.ql_water_sanitation_and_hygiene.ipc_wash_alcohol_bas
##   ..   form.grp_infection_prevention_and_control.ql_disinfection_and_sterilization.choice_labels = co
##   ..   form.grp_infection_prevention_and_control.ql_disinfection_and_sterilization.ipc_ds_protocol_fa
##   ..   form.grp_infection_prevention_and_control.ql_disinfection_and_sterilization.ipc_ds_protocol_ed
##   ..   form.grp_infection_prevention_and_control.ql_disinfection_and_sterilization.ipc_ds_environment
##   ..   form.grp_infection_prevention_and_control.ql_disinfection_and_sterilization.ipc_ds_cleaning_sc
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##   ..   form.ql_logistics_patient_and_sample_transfer.log_tracer_drugs = col_character(),
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##   ..   form.question10.log_chlorhexidine_7 = col_character(),
##   ..   form.question10.choice_labels = col_character(),
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##    ..     form.question10.log_ferrous_and_folic = col_character(),
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##    ..     form.question6.log_metronidazole_250 = col_character(),
##    ..     form.question6.log_metronidazole_200 = col_character(),
##    ..     form.question6.log_methyldopa = col_character(),
##    ..     form.question6.log_magnesium_sulphate = col_character(),
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##    ..     form.question2.log_ors = col_character(),
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##    ..     form.question1.log_misoprostol = col_character(),
##    ..     form.question1.log_glucose = col_character(),
##    ..     form.consultations.head_count.monthly_average_head_counts = col_character(),
##    ..     form.consultations.general_outpatient.monthly_average_general_outpatient = col_character(),
##    ..     form.consultations.deliveries.monthly_average_deliveries = col_character(),
##    ..     form.consultations.pent_vaccines.monthly_average_pent_vaccines = col_character(),
##    ..     form.ql_human_resources.score_human_resources = col_character(),
##    ..     form.ql_human_resources.score_max_human_resources = col_character(),
##    ..     form.ql_information_education_communication.score_information_education_communication = col_cl
##    ..     form.ql_information_education_communication.score_max_information_education_communication = co
##    ..     form.ql_surveillance.score_surveillance = col_character(),
##    ..     form.ql_surveillance.score_max_surveillance = col_character(),
##    ..     form.ql_triage_and_early_recognition.score_triage_and_early_recognition = col_character(),
##    ..     form.ql_triage_and_early_recognition.score_max_triage_and_early_recognition = col_character()
##    ..     form.ql_chw.score_chw = col_character(),
##    ..     form.ql_chw.score_max_chw = col_character(),
```

```
##   ..    form.ql_isolation_physical_distancing.score_isolation = col_character(),
##   ..    form.ql_isolation_physical_distancing.score_max_isolation = col_character(),
##   ..    form.grp_infection_prevention_and_control.ql_ppe.score_infection_prevention_and_control_ppe =
##   ..    form.grp_infection_prevention_and_control.ql_ppe.score_max_infection_prevention_and_control_pp
##   ..    form.grp_infection_prevention_and_control.ql_ppe_plan.score_infection_prevention_and_control_
##   ..    form.grp_infection_prevention_and_control.ql_ppe_plan.score_max_infection_prevention_and_cont
##   ..    form.grp_infection_prevention_and_control.ql_waste_collection_and_disposal.score_infection_pr
##   ..    form.grp_infection_prevention_and_control.ql_waste_collection_and_disposal.score_max_infectio
##   ..    form.grp_infection_prevention_and_control.ql_water_sanitation_and_hygiene.score_infection_pre
##   ..    form.grp_infection_prevention_and_control.ql_water_sanitation_and_hygiene.score_max_infection_
##   ..    form.grp_infection_prevention_and_control.ql_disinfection_and_sterilization.score_infection_p
##   ..    form.grp_infection_prevention_and_control.ql_disinfection_and_sterilization.score_max_infecti
##   ..    form.grp_infection_prevention_and_control.score_infection_prevention_and_control = col_charac
##   ..    form.grp_infection_prevention_and_control.score_max_infection_prevention_and_control = col_ch
##   ..    form.question1.score_logistics_patient_and_sample_transfer = col_character(),
##   ..    form.question1.score_max_logistics_patient_and_sample_transfer = col_character(),
##   ..    form.score_total = col_double(),
##   ..    form.score_max_total = col_double()
##   .. )
## - attr(*, "problems")=<externalptr>


##        x1          number     form_health_centre_information_facility_name
## Min.   :  0   Min.   :  0   Length:145
## 1st Qu.: 36   1st Qu.: 36   Class :character
## Median : 72   Median : 72   Mode  :character
## Mean   : 72   Mean   : 72
## 3rd Qu.:108   3rd Qu.:108
## Max.   :144   Max.   :144
##
## form_facility_gps
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_health_centre_information_location_information_region_province
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_health_centre_information_location_information_district
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_health_centre_information_location_information_chiefdom
```

8

```
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_location_information_facility_location
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_facility_type
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_facility_type_other
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_managing_authority
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_managing_authority_other
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_setting
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
```

```
##
##   form_health_centre_information_outpatient_only
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_capacity_number_consultation_rooms
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_capacity_number_inpatient_beds
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_capacity_number_maternity_beds
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_group_number_employed_list_community_health_officer_cho_number_in_pos
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_group_number_employed_list_community_health_officer_cho_number_presen
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_group_number_employed_list_community_health_technician_cht_number_in_
##   Length:145
##   Class :character
##   Mode  :character
##
```

```
##
##
##
## form_health_centre_information_group_number_employed_list_community_health_technician_cht_number_pro
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_health_centre_information_group_number_employed_list_community_health_assistant_cha_number_in_p
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_health_centre_information_group_number_employed_list_community_health_assistant_cha_number_pres
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_health_centre_information_group_number_employed_list_community_midwives_cm_number_in_post
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_health_centre_information_group_number_employed_list_community_midwives_cm_number_present_at_vi
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_health_centre_information_group_number_employed_list_sechn_sechn_number_in_post
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_health_centre_information_group_number_employed_list_sechn_sechn_number_present_at_visit
## Length:145
## Class :character
```

```
##   Mode   :character
##
##
##
##
##   form_health_centre_information_group_number_employed_list_laboratory_technicians_lab_tech_number_in
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_health_centre_information_group_number_employed_list_laboratory_technicians_lab_tech_number_pre
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_health_centre_information_group_number_employed_list_mch_aides_mch_aides_number_in_post
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_health_centre_information_group_number_employed_list_mch_aides_mch_aides_number_present_at_vis
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_health_centre_information_group_number_employed_list_cleaner_porter_cleaner_porter_number_in_p
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_health_centre_information_group_number_employed_list_cleaner_porter_cleaner_porter_number_pres
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_health_centre_information_group_number_employed_list_other_other_number_in_post
```

```
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_group_number_employed_list_other_other_number_present_at_visit
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_health_centre_information_group_number_employed_list_other_other_staff_cadre
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_sections_to_review form_consultations_head_count_month_1
##   Length:145              Length:145
##   Class :character        Class :character
##   Mode  :character        Mode  :character
##
##
##
##
##   form_consultations_head_count_month_2 form_consultations_head_count_month_3
##   Length:145                            Length:145
##   Class :character                      Class :character
##   Mode  :character                      Mode  :character
##
##
##
##
##   form_consultations_head_count_month_4
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_consultations_general_outpatient_month_1
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
```

```
##
##   form_consultations_general_outpatient_month_2
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_consultations_general_outpatient_month_3
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_consultations_general_outpatient_month_4
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_consultations_deliveries_month_1 form_consultations_deliveries_month_2
##   Length:145                            Length:145
##   Class :character                      Class :character
##   Mode  :character                      Mode  :character
##
##
##
##
##   form_consultations_deliveries_month_3 form_consultations_deliveries_month_4
##   Length:145                            Length:145
##   Class :character                      Class :character
##   Mode  :character                      Mode  :character
##
##
##
##
##   form_consultations_pent_vaccines_month_1
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_consultations_pent_vaccines_month_2
##   Length:145
##   Class :character
##   Mode  :character
##
```

```
##
##
##
##  form_consultations_pent_vaccines_month_3
##  Length:145
##  Class :character
##  Mode  :character
##
##
##
##
##  form_consultations_pent_vaccines_month_4 form_ql_human_resources_choice_labels
##  Length:145                               Length:145
##  Class :character                         Class :character
##  Mode  :character                         Mode  :character
##
##
##
##
##  form_ql_human_resources_hr_focal_point
##  Length:145
##  Class :character
##  Mode  :character
##
##
##
##
##  form_ql_human_resources_hr_staff_received_info
##  Length:145
##  Class :character
##  Mode  :character
##
##
##
##
##  form_ql_human_resources_hr_healthcare_provider_training
##  Length:145
##  Class :character
##  Mode  :character
##
##
##
##
##  form_ql_human_resources_hr_healthcare_provider_revised_training
##  Length:145
##  Class :character
##  Mode  :character
##
##
##
##
##  form_ql_human_resources_hr_daily_staff_list
##  Length:145
##  Class :character
```

```
##   Mode   :character
##
##
##
##
##   form_ql_information_education_communication_choice_labels
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_ql_information_education_communication_iec_handwashing_procedure
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_ql_information_education_communication_iec_physical_distancing
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_ql_information_education_communication_iec_covering_nose_mouth
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_ql_information_education_communication_iec_early_symptom_recognition
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_ql_information_education_communication_iec_when_facility_vs_home
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_ql_information_education_communication_iec_rational_ppe_use
```

```
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_information_education_communication_iec_helpline_number
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_surveillance_choice_labels
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_surveillance_surv_procedure_for_notification
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_surveillance_surv_official_case_definition
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_surveillance_surv_hotline_number
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_surveillance_surv_timely_data_reported_to_district
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
```

```
##
##   form_ql_triage_and_early_recognition_choice_labels
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_triage_and_early_recognition_ter_screening_area_set_up
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_triage_and_early_recognition_ter_symptom_screening_questionnaires
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_triage_and_early_recognition_ter_temperature_measurement_at_triage
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_triage_and_early_recognition_ter_physical_distancing_in_waiting
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_triage_and_early_recognition_ter_separate_waiting_for_symptomatic
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_chw_choice_labels form_ql_chw_chw_trained_precautions
##   Length:145                Length:145
##   Class :character          Class :character
##   Mode  :character          Mode  :character
##
```

```
## 
## 
## 
##  form_ql_chw_chw_trained_community_service form_ql_chw_chw_drugs
##  Length:145                                Length:145
##  Class :character                          Class :character
##  Mode  :character                          Mode  :character
## 
## 
## 
## 
##  form_ql_chw_chw_gloves form_ql_chw_chw_masks form_ql_chw_chw_iec_materials
##  Length:145             Length:145            Length:145
##  Class :character        Class :character      Class :character
##  Mode  :character        Mode  :character      Mode  :character
## 
## 
## 
## 
##  form_ql_isolation_physical_distancing_choice_labels
##  Length:145
##  Class :character
##  Mode  :character
## 
## 
## 
## 
##  form_ql_isolation_physical_distancing_iso_designated_isolation_for_suspected
##  Length:145
##  Class :character
##  Mode  :character
## 
## 
## 
## 
##  form_ql_isolation_physical_distancing_iso_distance_between_patients_in_waiting
##  Length:145
##  Class :character
##  Mode  :character
## 
## 
## 
## 
##  form_ql_isolation_physical_distancing_iso_distance_between_patient_beds
##  Length:145
##  Class :character
##  Mode  :character
## 
## 
## 
## 
##  form_ql_isolation_physical_distancing_iso_transfer_referral_protocol
##  Length:145
##  Class :character
```

```
##   Mode   :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_choice_labels
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_medical_masks
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_disp_surgical_masks
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_eye_protection
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_examination_gloves
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_surgical_gloves
##   Length:145
##   Class :character
##   Mode   :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_long_cuffed_gloves
```

```
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_heavy_duty_gloves
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_long_sleeved_gown
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_ipc_ppe_waterproof_aprons
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_plan_choice_labels
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_plan_ipc_ppe_plan_staff_trained_on_ppe
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_ppe_plan_ipc_ppe_plan_ppe_poster_displayed
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
```

```
## 
##  form_grp_infection_prevention_and_control_ql_ppe_plan_ipc_ppe_plan_fit_test_kit
##  Length:145
##  Class :character
##  Mode  :character
## 
## 
## 
## 
##  form_grp_infection_prevention_and_control_ql_ppe_plan_ipc_ppe_plan_contingency_for_shortages
##  Length:145
##  Class :character
##  Mode  :character
## 
## 
## 
## 
##  form_grp_infection_prevention_and_control_ql_waste_collection_and_disposal_choice_labels
##  Length:145
##  Class :character
##  Mode  :character
## 
## 
## 
## 
##  form_grp_infection_prevention_and_control_ql_waste_collection_and_disposal_ipc_wcd_colour_coded_bins
##  Length:145
##  Class :character
##  Mode  :character
## 
## 
## 
## 
##  form_grp_infection_prevention_and_control_ql_waste_collection_and_disposal_ipc_wcd_clinical_waste_ba
##  Length:145
##  Class :character
##  Mode  :character
## 
## 
## 
## 
##  form_grp_infection_prevention_and_control_ql_waste_collection_and_disposal_ipc_wcd_laundry_receptacl
##  Length:145
##  Class :character
##  Mode  :character
## 
## 
## 
## 
##  form_grp_infection_prevention_and_control_ql_waste_collection_and_disposal_ipc_wcd_incinerator
##  Length:145
##  Class :character
##  Mode  :character
## 
```

```
##
##
##
##   form_grp_infection_prevention_and_control_ql_water_sanitation_and_hygiene_choice_labels
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_water_sanitation_and_hygiene_ipc_wash_clean_running_wa
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_water_sanitation_and_hygiene_ipc_wash_hand_soap
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_water_sanitation_and_hygiene_ipc_wash_liquid_soap
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_water_sanitation_and_hygiene_ipc_wash_disp_hand_towels
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_water_sanitation_and_hygiene_ipc_wash_alcohol_based_ha
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_disinfection_and_sterilization_choice_labels
##   Length:145
##   Class :character
```

```
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_disinfection_and_sterilization_ipc_ds_protocol_facility
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_disinfection_and_sterilization_ipc_ds_protocol_equipmen
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_disinfection_and_sterilization_ipc_ds_environmental_dis
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_disinfection_and_sterilization_ipc_ds_cleaning_schedule
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_disinfection_and_sterilization_ipc_ds_protocol_corpse_
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_logistics_patient_and_sample_transfer_choice_labels
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_logistics_patient_and_sample_transfer_log_referral_plan
```

```
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_logistics_patient_and_sample_transfer_log_cellphone_landline_swradio
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_logistics_patient_and_sample_transfer_log_tracer_drugs
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_logistics_patient_and_sample_transfer_log_albendazole
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_logistics_patient_and_sample_transfer_log_amoxicillin
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_logistics_patient_and_sample_transfer_log_ampicillin
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_logistics_patient_and_sample_transfer_log_chlorhexidine_5
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
```

```
##
##   form_question10_log_chlorhexidine_7 form_question10_choice_labels
##   Length:145                          Length:145
##   Class :character                    Class :character
##   Mode  :character                    Mode  :character
##
##
##
##
##   form_question10_log_gentamicin form_question10_log_folic
##   Length:145                     Length:145
##   Class :character               Class :character
##   Mode  :character               Mode  :character
##
##
##
##
##   form_question10_log_ferrous_and_folic form_question10_log_compound_sodium
##   Length:145                            Length:145
##   Class :character                      Class :character
##   Mode  :character                      Mode  :character
##
##
##
##
##   form_question10_log_co_trimoxazole_400 form_question10_log_co_trimoxazole_200
##   Length:145                             Length:145
##   Class :character                       Class :character
##   Mode  :character                       Mode  :character
##
##
##
##
##   form_question6_choice_labels form_question6_log_metronidazole_250
##   Length:145                   Length:145
##   Class :character             Class :character
##   Mode  :character             Mode  :character
##
##
##
##
##   form_question6_log_metronidazole_200 form_question6_log_methyldopa
##   Length:145                           Length:145
##   Class :character                     Class :character
##   Mode  :character                     Mode  :character
##
##
##
##
##   form_question6_log_magnesium_sulphate form_question6_log_lidocaine
##   Length:145                            Length:145
##   Class :character                      Class :character
##   Mode  :character                      Mode  :character
##
```

```
##
##
##
##   form_question6_log_ibuprofen form_question2_choice_labels
##   Length:145                    Length:145
##   Class :character              Class :character
##   Mode  :character              Mode  :character
##
##
##
##
##   form_question2_log_surgical_spirit form_question2_log_sodium_chloride
##   Length:145                         Length:145
##   Class :character                   Class :character
##   Mode  :character                   Mode  :character
##
##
##
##
##   form_question2_log_povidone form_question2_log_paracetamol_500
##   Length:145                  Length:145
##   Class :character            Class :character
##   Mode  :character            Mode  :character
##
##
##
##
##   form_question2_log_paracetamol_250 form_question2_log_ors
##   Length:145                         Length:145
##   Class :character                   Class :character
##   Mode  :character                   Mode  :character
##
##
##
##
##   form_question7_choice_labels form_question7_log_gauze
##   Length:145                   Length:145
##   Class :character             Class :character
##   Mode  :character             Mode  :character
##
##
##
##
##   form_question7_log_cotton_wool form_question7_log_cannula_iv_20
##   Length:145                     Length:145
##   Class :character               Class :character
##   Mode  :character               Mode  :character
##
##
##
##
##   form_question7_log_cannula_iv_24 form_question7_log_zinc_sulphate
##   Length:145                       Length:145
##   Class :character                 Class :character
```

```
##   Mode  :character                    Mode  :character
##
##
##
##
##   form_question7_log_water form_question4_choice_labels
##   Length:145              Length:145
##   Class :character        Class :character
##   Mode  :character        Mode  :character
##
##
##
##
##   form_question4_log_needle_23 form_question4_log_needle_21
##   Length:145                  Length:145
##   Class :character            Class :character
##   Mode  :character            Mode  :character
##
##
##
##
##   form_question4_log_glove_giving form_question4_log_glove_surgical
##   Length:145                      Length:145
##   Class :character                Class :character
##   Mode  :character                Mode  :character
##
##
##
##
##   form_question4_log_glove_gyn form_question4_log_glove_exam
##   Length:145                  Length:145
##   Class :character            Class :character
##   Mode  :character            Mode  :character
##
##
##
##
##   form_question1_choice_labels form_question1_log_tape
##   Length:145                  Length:145
##   Class :character            Class :character
##   Mode  :character            Mode  :character
##
##
##
##
##   form_question1_log_syringe form_question1_log_oxytocin
##   Length:145                 Length:145
##   Class :character           Class :character
##   Mode  :character           Mode  :character
##
##
##
##
##   form_question1_log_diazepam form_question1_log_misoprostol
```

```
##   Length:145                 Length:145
##   Class :character           Class :character
##   Mode  :character           Mode  :character
##
##
##
##
##   form_question1_log_glucose
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_consultations_head_count_monthly_average_head_counts
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_consultations_general_outpatient_monthly_average_general_outpatient
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_consultations_deliveries_monthly_average_deliveries
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_consultations_pent_vaccines_monthly_average_pent_vaccines
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_human_resources_score_human_resources
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
```

```
##
##   form_ql_human_resources_score_max_human_resources
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_information_education_communication_score_information_education_communication
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_information_education_communication_score_max_information_education_communication
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_surveillance_score_surveillance
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_surveillance_score_max_surveillance
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_triage_and_early_recognition_score_triage_and_early_recognition
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_ql_triage_and_early_recognition_score_max_triage_and_early_recognition
##   Length:145
##   Class :character
##   Mode  :character
##
```

```
##
##
##
## form_ql_chw_score_chw form_ql_chw_score_max_chw
## Length:145          Length:145
## Class :character     Class :character
## Mode  :character     Mode  :character
##
##
##
##
## form_ql_isolation_physical_distancing_score_isolation
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_ql_isolation_physical_distancing_score_max_isolation
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_grp_infection_prevention_and_control_ql_ppe_score_infection_prevention_and_control_ppe
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_grp_infection_prevention_and_control_ql_ppe_score_max_infection_prevention_and_control_ppe
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_grp_infection_prevention_and_control_ql_ppe_plan_score_infection_prevention_and_control_ppe_pla
## Length:145
## Class :character
## Mode  :character
##
##
##
##
## form_grp_infection_prevention_and_control_ql_ppe_plan_score_max_infection_prevention_and_control_ppe
## Length:145
## Class :character
```

```
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_waste_collection_and_disposal_score_infection_preventi
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_waste_collection_and_disposal_score_max_infection_preve
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_water_sanitation_and_hygiene_score_infection_preventior
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_water_sanitation_and_hygiene_score_max_infection_prever
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_disinfection_and_sterilization_score_infection_preventi
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_ql_disinfection_and_sterilization_score_max_infection_prev
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_score_infection_prevention_and_control
```

```
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_grp_infection_prevention_and_control_score_max_infection_prevention_and_control
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_question1_score_logistics_patient_and_sample_transfer
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_question1_score_max_logistics_patient_and_sample_transfer
##   Length:145
##   Class :character
##   Mode  :character
##
##
##
##
##   form_score_total form_score_max_total
##   Min.   : 0.00    Min.    :  0.00
##   1st Qu.:35.12    1st Qu.:102.00
##   Median :47.25    Median :102.00
##   Mean   :43.88    Mean    : 90.44
##   3rd Qu.:57.50    3rd Qu.:102.00
##   Max.   :89.50    Max.    :102.00
##   NA's   :3        NA's    :3
```

Renaming dataset columns

```r
#function to rename/drop the column characters
df_rename_columns <- function(df,character1,character2,character3){
  #drops character 1 from column names
  names(df)=gsub(character1,"",names(df))
  #drops character 2 from column names
  names(df)=gsub(character2,"",names(df))
  #drops character 3 from column names
  names(df)=gsub(character3,"",names(df))

  return(data.frame(df))
```

```
}

#applying function to dataset
health_facility_df <- df_rename_columns(health_facility_df,                    "form_
        "grp_infection_prevention_and_control_")
```

Creating a quick summary report of the data

```
#report output gives us a quick summary on basic statistics, data structure
create_report(health_facility_df)
```

```
##    |                                                        |
##     inline R code fragments
##
##    |                                                        |...
## label: global_options (with options)
## List of 1
##  $ include: logi FALSE
##
##    |                                                        |.....
##    ordinary text without R code
##
##    |                                                        |.......
## label: introduce
##    |                                                        |........
##    ordinary text without R code
##
##    |                                                        |..........
## label: plot_intro

##    |                                                        |............
##    ordinary text without R code
##
##    |                                                        |.............
## label: data_structure
##    |                                                        |..............
##    ordinary text without R code
##
##    |                                                        |................
## label: missing_profile

##    |                                                        |.................
##    ordinary text without R code
##
##    |                                                        |..................
## label: univariate_distribution_header
##    |                                                        |..................
##    ordinary text without R code
##
##    |                                                        |..................
## label: plot_histogram
```

34

```
##   |                                                         |.................
##   ordinary text without R code
## 
##   |                                                         |.................
## label: plot_density
##   |                                                         |.................
##   ordinary text without R code
## 
##   |                                                         |.................
## label: plot_frequency_bar


##   |                                                         |.................
##   ordinary text without R code
## 
##   |                                                         |.................
## label: plot_response_bar
##   |                                                         |.................
##   ordinary text without R code
## 
##   |                                                         |.................
## label: plot_with_bar
##   |                                                         |.................
##   ordinary text without R code
## 
##   |                                                         |.................
## label: plot_normal_qq


##   |                                                         |.................
##   ordinary text without R code
## 
##   |                                                         |.................
## label: plot_response_qq
##   |                                                         |.................
##   ordinary text without R code
## 
##   |                                                         |.................
## label: plot_by_qq
##   |                                                         |.................
##   ordinary text without R code
## 
##   |                                                         |.................
## label: correlation_analysis


##   |                                                         |.................
##   ordinary text without R code
## 
##   |                                                         |.................
## label: principal_component_analysis


##   |                                                         |.................
##   ordinary text without R code
## 
##   |                                                         |.................
```

```
## label: bivariate_distribution_header
##   |                                                          |..................
##   ordinary text without R code
##
##   |                                                          |..................
## label: plot_response_boxplot
##   |                                                          |..................
##   ordinary text without R code
##
##   |                                                          |..................
## label: plot_by_boxplot
##   |                                                          |..................
##   ordinary text without R code
##
##   |                                                          |..................
## label: plot_response_scatterplot
##   |                                                          |..................
##   ordinary text without R code
##
##   |                                                          |..................
## label: plot_by_scatterplot
##
## "C:/Program Files/RStudio/bin/pandoc/pandoc" +RTS -K512m -RTS "C:/Users/User/OneDrive/Macro - Eyes/He
```

Checking and dealing with missing values

Replacing "—" with NA

```
makeNA <- function(x) str_replace(x,"---",NA_character_)
health_facility_df = mutate_all(health_facility_df, funs(makeNA))
```

```
#replacing __ with NAs
#health_facility_df[health_facility_df == "---"] <- NA

df_missing_values <- function(df){

  #table output with the missing values summary per feature
  print(miss_var_summary(df))

 #Plotting percentage of missing values per feature
  print(gg_miss_var(df, show_pct = TRUE))

}


#applying function to dataset
df_missing_values(health_facility_df)
```

```
## # A tibble: 205 x 3
##    variable                                       n_miss pct_miss
##    <chr>                                           <int>    <dbl>
##  1 facility_type_other                               145      100
```

```
##  2 ql_human_resources_choice_labels                          145      100
##  3 ql_information_education_communication_choice_labels       145      100
##  4 ql_surveillance_choice_labels                              145      100
##  5 ql_triage_and_early_recognition_choice_labels              145      100
##  6 ql_chw_choice_labels                                       145      100
##  7 ql_isolation_physical_distancing_choice_labels             145      100
##  8 ql_ppe_choice_labels                                       145      100
##  9 ql_ppe_plan_choice_labels                                  145      100
## 10 ql_waste_collection_and_disposal_choice_labels             145      100
## # ... with 195 more rows
```
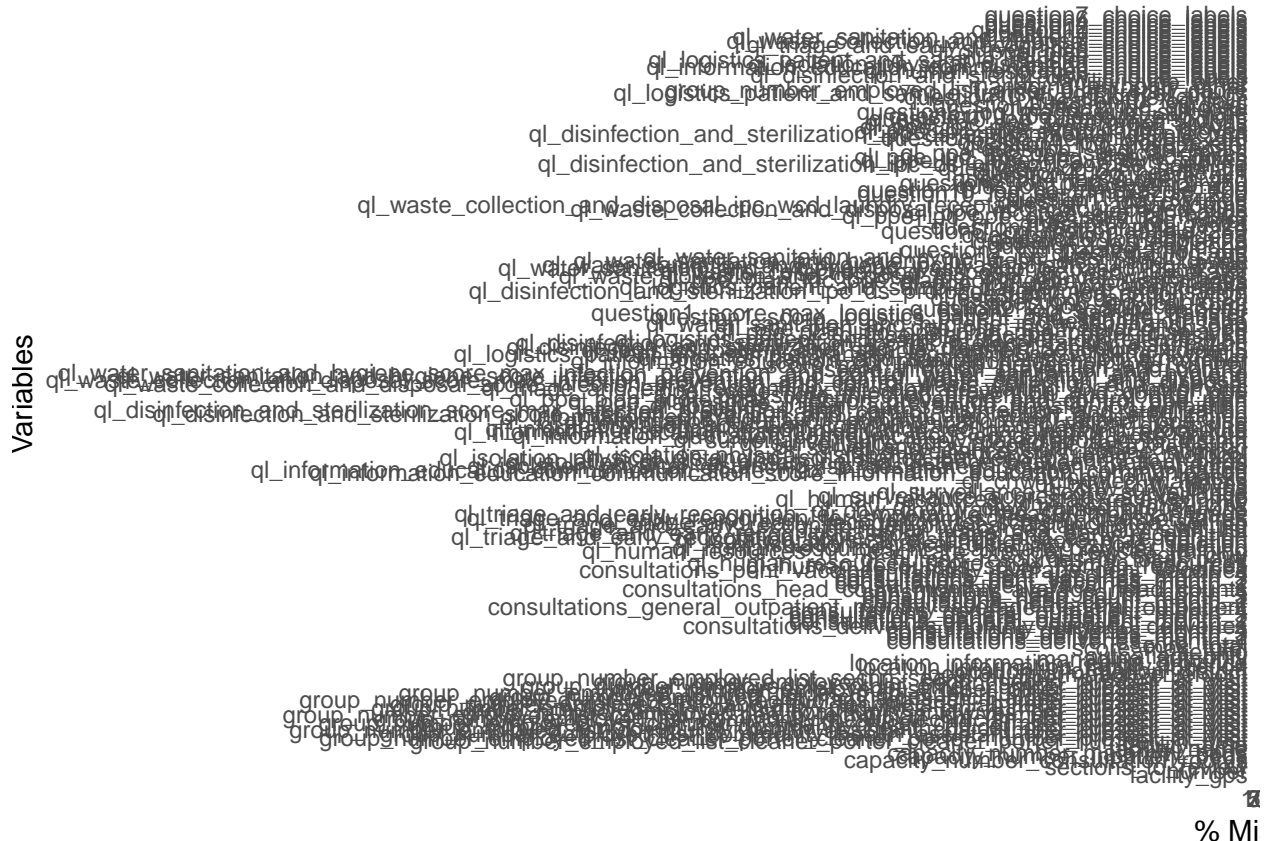

Dropping columns and rows with more than 50% missing values

```r
#function to drop rows and columns with missing values
df_drop_rowcol_missingvalues <- function(df,perc){
  df_dropNA<-df[which(rowMeans(!is.na(df)) > perc), which(colMeans(!is.na(df)) > perc)]
  return(data.frame(df_dropNA))
}

#applying function to dataset
health_facility_dropNA_df <-df_drop_rowcol_missingvalues(health_facility_df,0.5)
```

Filtering relevant columns for future analysis

```r
#dropping irrelevant columns
health_facility_dropcol_df <- health_facility_dropNA_df %>% select(-c(1,2,34,35))
names(health_facility_dropcol_df)
```

```
##   [1] "facility_name"
##   [2] "facility_gps"
##   [3] "location_information_region_province"
##   [4] "location_information_district"
##   [5] "location_information_chiefdom"
##   [6] "location_information_facility_location"
##   [7] "facility_type"
##   [8] "managing_authority"
##   [9] "setting"
##  [10] "outpatient_only"
##  [11] "capacity_number_consultation_rooms"
##  [12] "capacity_number_inpatient_beds"
##  [13] "capacity_number_maternity_beds"
##  [14] "group_number_employed_list_community_health_officer_cho_number_in_post"
##  [15] "group_number_employed_list_community_health_officer_cho_number_present_at_visit"
##  [16] "group_number_employed_list_community_health_technician_cht_number_in_post"
##  [17] "group_number_employed_list_community_health_technician_cht_number_present_at_visit"
##  [18] "group_number_employed_list_community_health_assistant_cha_number_in_post"
##  [19] "group_number_employed_list_community_health_assistant_cha_number_present_at_visit"
##  [20] "group_number_employed_list_community_midwives_cm_number_in_post"
##  [21] "group_number_employed_list_community_midwives_cm_number_present_at_visit"
##  [22] "group_number_employed_list_sechn_sechn_number_in_post"
##  [23] "group_number_employed_list_sechn_sechn_number_present_at_visit"
##  [24] "group_number_employed_list_laboratory_technicians_lab_tech_number_in_post"
##  [25] "group_number_employed_list_laboratory_technicians_lab_tech_number_present_at_visit"
##  [26] "group_number_employed_list_mch_aides_mch_aides_number_in_post"
##  [27] "group_number_employed_list_mch_aides_mch_aides_number_present_at_visit"
##  [28] "group_number_employed_list_cleaner_porter_cleaner_porter_number_in_post"
##  [29] "group_number_employed_list_cleaner_porter_cleaner_porter_number_present_at_visit"
##  [30] "group_number_employed_list_other_other_number_in_post"
##  [31] "group_number_employed_list_other_other_number_present_at_visit"
##  [32] "consultations_head_count_month_1"
##  [33] "consultations_head_count_month_2"
##  [34] "consultations_head_count_month_3"
##  [35] "consultations_head_count_month_4"
##  [36] "consultations_general_outpatient_month_1"
##  [37] "consultations_general_outpatient_month_2"
##  [38] "consultations_general_outpatient_month_3"
##  [39] "consultations_general_outpatient_month_4"
##  [40] "consultations_deliveries_month_1"
##  [41] "consultations_deliveries_month_2"
##  [42] "consultations_deliveries_month_3"
##  [43] "consultations_deliveries_month_4"
##  [44] "consultations_pent_vaccines_month_1"
##  [45] "consultations_pent_vaccines_month_2"
##  [46] "consultations_pent_vaccines_month_3"
##  [47] "consultations_pent_vaccines_month_4"
```

```
##  [48] "ql_human_resources_hr_focal_point"
##  [49] "ql_human_resources_hr_staff_received_info"
##  [50] "ql_human_resources_hr_healthcare_provider_training"
##  [51] "ql_human_resources_hr_healthcare_provider_revised_training"
##  [52] "ql_human_resources_hr_daily_staff_list"
##  [53] "ql_information_education_communication_iec_handwashing_procedure"
##  [54] "ql_information_education_communication_iec_physical_distancing"
##  [55] "ql_information_education_communication_iec_covering_nose_mouth"
##  [56] "ql_information_education_communication_iec_early_symptom_recognition"
##  [57] "ql_information_education_communication_iec_when_facility_vs_home"
##  [58] "ql_information_education_communication_iec_rational_ppe_use"
##  [59] "ql_information_education_communication_iec_helpline_number"
##  [60] "ql_surveillance_surv_procedure_for_notification"
##  [61] "ql_surveillance_surv_official_case_definition"
##  [62] "ql_surveillance_surv_hotline_number"
##  [63] "ql_surveillance_surv_timely_data_reported_to_district"
##  [64] "ql_triage_and_early_recognition_ter_screening_area_set_up"
##  [65] "ql_triage_and_early_recognition_ter_symptom_screening_questionnaires"
##  [66] "ql_triage_and_early_recognition_ter_temperature_measurement_at_triage"
##  [67] "ql_triage_and_early_recognition_ter_physical_distancing_in_waiting"
##  [68] "ql_triage_and_early_recognition_ter_separate_waiting_for_symptomatic"
##  [69] "ql_chw_chw_trained_precautions"
##  [70] "ql_chw_chw_trained_community_service"
##  [71] "ql_chw_chw_drugs"
##  [72] "ql_chw_chw_gloves"
##  [73] "ql_chw_chw_masks"
##  [74] "ql_chw_chw_iec_materials"
##  [75] "ql_isolation_physical_distancing_iso_designated_isolation_for_suspected"
##  [76] "ql_isolation_physical_distancing_iso_distance_between_patients_in_waiting"
##  [77] "ql_isolation_physical_distancing_iso_distance_between_patient_beds"
##  [78] "ql_isolation_physical_distancing_iso_transfer_referral_protocol"
##  [79] "ql_ppe_ipc_ppe_medical_masks"
##  [80] "ql_ppe_ipc_ppe_disp_surgical_masks"
##  [81] "ql_ppe_ipc_ppe_eye_protection"
##  [82] "ql_ppe_ipc_ppe_examination_gloves"
##  [83] "ql_ppe_ipc_ppe_surgical_gloves"
##  [84] "ql_ppe_ipc_ppe_long_cuffed_gloves"
##  [85] "ql_ppe_ipc_ppe_heavy_duty_gloves"
##  [86] "ql_ppe_ipc_ppe_long_sleeved_gown"
##  [87] "ql_ppe_ipc_ppe_waterproof_aprons"
##  [88] "ql_ppe_plan_ipc_ppe_plan_staff_trained_on_ppe"
##  [89] "ql_ppe_plan_ipc_ppe_plan_ppe_poster_displayed"
##  [90] "ql_ppe_plan_ipc_ppe_plan_fit_test_kit"
##  [91] "ql_ppe_plan_ipc_ppe_plan_contingency_for_shortages"
##  [92] "ql_waste_collection_and_disposal_ipc_wcd_colour_coded_bins"
##  [93] "ql_waste_collection_and_disposal_ipc_wcd_clinical_waste_bags"
##  [94] "ql_waste_collection_and_disposal_ipc_wcd_laundry_receptacles_at_patient_rooms"
##  [95] "ql_waste_collection_and_disposal_ipc_wcd_incinerator"
##  [96] "ql_water_sanitation_and_hygiene_ipc_wash_clean_running_water"
##  [97] "ql_water_sanitation_and_hygiene_ipc_wash_hand_soap"
##  [98] "ql_water_sanitation_and_hygiene_ipc_wash_liquid_soap"
##  [99] "ql_water_sanitation_and_hygiene_ipc_wash_disp_hand_towels"
## [100] "ql_water_sanitation_and_hygiene_ipc_wash_alcohol_based_hand_gel"
## [101] "ql_disinfection_and_sterilization_ipc_ds_protocol_facility_disinfection"
```

```
## [102] "ql_disinfection_and_sterilization_ipc_ds_protocol_equipment_sterilisation"
## [103] "ql_disinfection_and_sterilization_ipc_ds_environmental_disinfectant"
## [104] "ql_disinfection_and_sterilization_ipc_ds_cleaning_schedule_in_toilets"
## [105] "ql_disinfection_and_sterilization_ipc_ds_protocol_corpse_handling"
## [106] "ql_logistics_patient_and_sample_transfer_log_referral_plan"
## [107] "ql_logistics_patient_and_sample_transfer_log_cellphone_landline_swradio"
## [108] "ql_logistics_patient_and_sample_transfer_log_tracer_drugs"
## [109] "ql_logistics_patient_and_sample_transfer_log_albendazole"
## [110] "ql_logistics_patient_and_sample_transfer_log_amoxicillin"
## [111] "ql_logistics_patient_and_sample_transfer_log_ampicillin"
## [112] "ql_logistics_patient_and_sample_transfer_log_chlorhexidine_5"
## [113] "question10_log_chlorhexidine_7"
## [114] "question10_log_gentamicin"
## [115] "question10_log_folic"
## [116] "question10_log_ferrous_and_folic"
## [117] "question10_log_compound_sodium"
## [118] "question10_log_co_trimoxazole_400"
## [119] "question10_log_co_trimoxazole_200"
## [120] "question6_log_metronidazole_250"
## [121] "question6_log_metronidazole_200"
## [122] "question6_log_methyldopa"
## [123] "question6_log_magnesium_sulphate"
## [124] "question6_log_lidocaine"
## [125] "question6_log_ibuprofen"
## [126] "question2_log_surgical_spirit"
## [127] "question2_log_sodium_chloride"
## [128] "question2_log_povidone"
## [129] "question2_log_paracetamol_500"
## [130] "question2_log_paracetamol_250"
## [131] "question2_log_ors"
## [132] "question7_log_gauze"
## [133] "question7_log_cotton_wool"
## [134] "question7_log_cannula_iv_20"
## [135] "question7_log_cannula_iv_24"
## [136] "question7_log_zinc_sulphate"
## [137] "question7_log_water"
## [138] "question4_log_needle_23"
## [139] "question4_log_needle_21"
## [140] "question4_log_glove_giving"
## [141] "question4_log_glove_surgical"
## [142] "question4_log_glove_gyn"
## [143] "question4_log_glove_exam"
## [144] "question1_log_tape"
## [145] "question1_log_syringe"
## [146] "question1_log_oxytocin"
## [147] "question1_log_diazepam"
## [148] "question1_log_misoprostol"
## [149] "question1_log_glucose"
## [150] "consultations_head_count_monthly_average_head_counts"
## [151] "consultations_general_outpatient_monthly_average_general_outpatient"
## [152] "consultations_deliveries_monthly_average_deliveries"
## [153] "consultations_pent_vaccines_monthly_average_pent_vaccines"
## [154] "ql_human_resources_score_human_resources"
## [155] "ql_human_resources_score_max_human_resources"
```

```
## [156] "ql_information_education_communication_score_information_education_communication"
## [157] "ql_information_education_communication_score_max_information_education_communication"
## [158] "ql_surveillance_score_surveillance"
## [159] "ql_surveillance_score_max_surveillance"
## [160] "ql_triage_and_early_recognition_score_triage_and_early_recognition"
## [161] "ql_triage_and_early_recognition_score_max_triage_and_early_recognition"
## [162] "ql_chw_score_chw"
## [163] "ql_chw_score_max_chw"
## [164] "ql_isolation_physical_distancing_score_isolation"
## [165] "ql_isolation_physical_distancing_score_max_isolation"
## [166] "ql_ppe_score_infection_prevention_and_control_ppe"
## [167] "ql_ppe_score_max_infection_prevention_and_control_ppe"
## [168] "ql_ppe_plan_score_infection_prevention_and_control_ppe_plan"
## [169] "ql_ppe_plan_score_max_infection_prevention_and_control_ppe_plan"
## [170] "ql_waste_collection_and_disposal_score_infection_prevention_and_control_waste_collection_and_c
## [171] "ql_waste_collection_and_disposal_score_max_infection_prevention_and_control_waste_collection_a
## [172] "ql_water_sanitation_and_hygiene_score_infection_prevention_and_control_water_sanitation_and_hy
## [173] "ql_water_sanitation_and_hygiene_score_max_infection_prevention_and_control_water_sanitation_a
## [174] "ql_disinfection_and_sterilization_score_infection_prevention_and_control_disinfection_and_ster
## [175] "ql_disinfection_and_sterilization_score_max_infection_prevention_and_control_disinfection_and_
## [176] "score_infection_prevention_and_control"
## [177] "score_max_infection_prevention_and_control"
## [178] "question1_score_logistics_patient_and_sample_transfer"
## [179] "question1_score_max_logistics_patient_and_sample_transfer"
## [180] "score_total"
## [181] "score_max_total"
```

Creating lat, lon columns from facility gps

```r
health_facility_clean_df <- health_facility_dropcol_df %>%
  separate(facility_gps, c("lat","lon"),sep = ",")
```

Filtering columns for imputation

```r
#columns to be imputed
impute_cols <- c(33:48,151:154,161,162,179:182)

#df not to be imputed
nonimpute_df <- health_facility_clean_df %>%
  select(-impute_cols)
```

```
## Note: Using an external vector in selections is ambiguous.
## i Use `all_of(impute_cols)` instead of `impute_cols` to silence this message.
## i See <https://tidyselect.r-lib.org/reference/faq-external-vector.html>.
## This message is displayed once per session.
```

```r
#df to be imputed
impute_df <- health_facility_clean_df %>%
  select(impute_cols)
```

```
impute_df <- data.frame(lapply(impute_df, as.integer))
```

Exploring missing values in the impute data

```
#applying missing values function to dataset
df_missing_values(impute_df)
```

```
## # A tibble: 26 x 3
##    variable                                  n_miss pct_miss
##    <chr>                                      <int>    <dbl>
##  1 consultations_head_count_month_1               1      0.8
##  2 consultations_head_count_month_2               1      0.8
##  3 consultations_head_count_month_3               1      0.8
##  4 consultations_head_count_month_4               1      0.8
##  5 consultations_general_outpatient_month_1       1      0.8
##  6 consultations_general_outpatient_month_2       1      0.8
##  7 consultations_general_outpatient_month_3       1      0.8
##  8 consultations_general_outpatient_month_4       1      0.8
##  9 consultations_deliveries_month_1               1      0.8
## 10 consultations_deliveries_month_2               1      0.8
## # ... with 16 more rows
```

```
## Warning: It is deprecated to specify 'guide = FALSE' to remove a guide. Please use
## 'guide = "none"' instead.
```
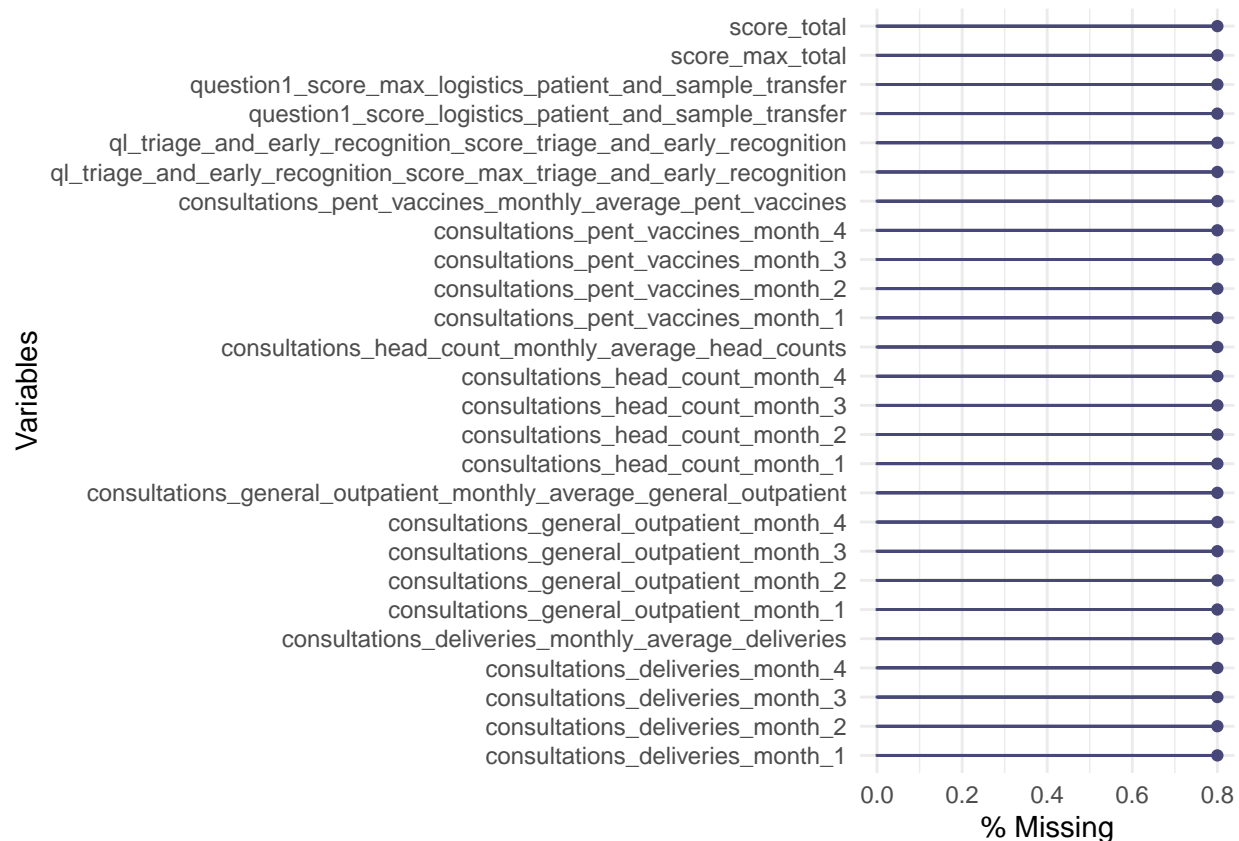
Imputing the missing values

```
#function to impute missing values per column

for(i in 1:ncol(impute_df)) {
  impute_df[ , i][is.na(impute_df[ , i])] <- mean(impute_df[ , i], na.rm=TRUE)
  }

summary(impute_df)
```

```
##  consultations_head_count_month_1 consultations_head_count_month_2
##  Min.   :   0.0                    Min.   :   0.0
##  1st Qu.: 289.0                    1st Qu.: 260.0
##  Median : 414.0                    Median : 397.0
##  Mean   : 500.8                    Mean   : 478.2
##  3rd Qu.: 599.0                    3rd Qu.: 604.0
##  Max.   :2261.0                    Max.   :2330.0
##  consultations_head_count_month_3 consultations_head_count_month_4
##  Min.   :   0.0                    Min.   :   0.0
##  1st Qu.: 245.0                    1st Qu.: 219.0
##  Median : 380.0                    Median : 345.0
##  Mean   : 460.8                    Mean   : 424.6
##  3rd Qu.: 599.0                    3rd Qu.: 511.0
##  Max.   :2309.0                    Max.   :1942.0
##  consultations_general_outpatient_month_1
##  Min.   :   0
##  1st Qu.: 144
```

```
##    Median : 224
##    Mean   : 274
##    3rd Qu.: 353
##    Max.   :1257
##    consultations_general_outpatient_month_2
##    Min.   :    0
##    1st Qu.: 120
##    Median : 200
##    Mean   : 257
##    3rd Qu.: 335
##    Max.   :1197
##    consultations_general_outpatient_month_3
##    Min.   :   0.0
##    1st Qu.: 127.0
##    Median : 192.0
##    Mean   : 259.6
##    3rd Qu.: 332.0
##    Max.   :1182.0
##    consultations_general_outpatient_month_4 consultations_deliveries_month_1
##    Min.   :   0.0                           Min.   : 0.00
##    1st Qu.:128.0                            1st Qu.: 8.00
##    Median :198.0                            Median :12.00
##    Mean   :230.9                            Mean   :13.15
##    3rd Qu.:291.0                            3rd Qu.:18.00
##    Max.   :913.0                            Max.   :40.00
##    consultations_deliveries_month_2 consultations_deliveries_month_3
##    Min.   : 0.00                    Min.   : 0.00
##    1st Qu.: 8.00                    1st Qu.: 8.00
##    Median :12.00                    Median :13.00
##    Mean   :12.72                    Mean   :13.73
##    3rd Qu.:16.00                    3rd Qu.:17.00
##    Max.   :41.00                    Max.   :96.00
##    consultations_deliveries_month_4 consultations_pent_vaccines_month_1
##    Min.   : 0.00                    Min.   : 0.00
##    1st Qu.: 8.00                    1st Qu.:10.00
##    Median :11.00                    Median :14.00
##    Mean   :11.92                    Mean   :16.38
##    3rd Qu.:15.00                    3rd Qu.:20.00
##    Max.   :30.00                    Max.   :61.00
##    consultations_pent_vaccines_month_2 consultations_pent_vaccines_month_3
##    Min.   : 0.00                       Min.   : 0.00
##    1st Qu.: 9.00                       1st Qu.:10.00
##    Median :15.00                       Median :15.00
##    Mean   :16.45                       Mean   :16.37
##    3rd Qu.:19.00                       3rd Qu.:21.00
##    Max.   :70.00                       Max.   :61.00
##    consultations_pent_vaccines_month_4
##    Min.   : 0.00
##    1st Qu.: 8.00
##    Median :13.00
##    Mean   :14.28
##    3rd Qu.:18.00
##    Max.   :65.00
##    consultations_head_count_monthly_average_head_counts
```

```
##  Min.   :    0.0
##  1st Qu.: 257.0
##  Median : 390.0
##  Mean   : 465.7
##  3rd Qu.: 599.0
##  Max.   :2040.0
##  consultations_general_outpatient_monthly_average_general_outpatient
##  Min.   :    0
##  1st Qu.: 134
##  Median : 209
##  Mean   : 255
##  3rd Qu.: 322
##  Max.   :1109
##  consultations_deliveries_monthly_average_deliveries
##  Min.   : 0.00
##  1st Qu.: 8.00
##  Median :12.00
##  Mean   :12.51
##  3rd Qu.:16.00
##  Max.   :51.00
##  consultations_pent_vaccines_monthly_average_pent_vaccines
##  Min.   : 0.00
##  1st Qu.: 9.00
##  Median :14.00
##  Mean   :15.47
##  3rd Qu.:19.00
##  Max.   :56.00
##  ql_triage_and_early_recognition_score_triage_and_early_recognition
##  Min.   :0.000
##  1st Qu.:1.000
##  Median :2.000
##  Mean   :2.048
##  3rd Qu.:3.000
##  Max.   :5.000
##  ql_triage_and_early_recognition_score_max_triage_and_early_recognition
##  Min.   :5
##  1st Qu.:5
##  Median :5
##  Mean   :5
##  3rd Qu.:5
##  Max.   :5
##  question1_score_logistics_patient_and_sample_transfer
##  Min.   : 0.00
##  1st Qu.:17.00
##  Median :21.99
##  Mean   :21.99
##  3rd Qu.:29.00
##  Max.   :38.00
##  question1_score_max_logistics_patient_and_sample_transfer  score_total
##  Min.   :44                                                 Min.   : 9.00
##  1st Qu.:44                                                 1st Qu.:41.00
##  Median :44                                                 Median :50.00
##  Mean   :44                                                 Mean   :49.63
##  3rd Qu.:44                                                 3rd Qu.:58.00
```

```
## Max.   :44                                         Max.   :89.00
## score_max_total
## Min.   :102
## 1st Qu.:102
## Median :102
## Mean   :102
## 3rd Qu.:102
## Max.   :102
```

Merging imputed data with non imputed data and dropping any NA values

```r
#merging process
health_facility_final_df <- cbind(nonimpute_df,impute_df)

head(health_facility_final_df)
```

```
##            facility_name        lat          lon
## 1       William hospital  60.234598   -90.157892
## 2 Kathryn Hospital/CHC 21.2454855  -107.509120
## 3       Jessica Hospital  -0.178657    -9.190029
## 4            Lauren CHC  35.856989   -87.512790
## 5             Tammy CHC  54.7148835   150.744813
## 7          Bryan Clinic  61.8040035    28.191714
##   location_information_region_province location_information_district
## 1                             Southern                       Pujehun
## 2                             Southern                            Bo
## 3                             Southern                            Bo
## 4                             Southern                        Bonthe
## 5                             Southern                        Bonthe
## 7                             Southern                       Pujehun
##   location_information_chiefdom location_information_facility_location
## 1                      New York                              Jasonfort
## 2                       Arizona                        West Jamesshire
## 3                    New Mexico                             Robertsside
## 4                      Missouri                         Port Christopher
## 5                      Virginia                               Reneeton
## 7                      Michigan                               Adammouth
##           facility_type managing_authority    setting outpatient_only
## 1 community_health_post  government_public peri_urban             yes
## 2 community_health_post  government_public      rural             yes
## 3 community_health_post  government_public      rural             yes
## 4            mch_post  government_public peri_urban              no
## 5 community_health_post  government_public peri_urban              no
## 7 community_health_post  government_public peri_urban             yes
##   capacity_number_consultation_rooms capacity_number_inpatient_beds
## 1                                  1                              0
## 2                                  1                              1
## 3                                  2                              1
## 4                                  1                              2
## 5                                  3                              1
## 7                                  1                              0
##   capacity_number_maternity_beds
```

```
## 1                                  1
## 2                                  2
## 3                                  1
## 4                                  3
## 5                                  1
## 7                                  1
##   group_number_employed_list_community_health_officer_cho_number_in_post
## 1                                                                      1
## 2                                                                      0
## 3                                                                      1
## 4                                                                      0
## 5                                                                      0
## 7                                                                      0
##   group_number_employed_list_community_health_officer_cho_number_present_at_visit
## 1                                                                               0
## 2                                                                               0
## 3                                                                               0
## 4                                                                               0
## 5                                                                               0
## 7                                                                               0
##   group_number_employed_list_community_health_technician_cht_number_in_post
## 1                                                                         0
## 2                                                                         0
## 3                                                                         0
## 4                                                                         0
## 5                                                                         0
## 7                                                                         0
##   group_number_employed_list_community_health_technician_cht_number_present_at_visit
## 1                                                                                  0
## 2                                                                                  0
## 3                                                                                  0
## 4                                                                                  0
## 5                                                                                  0
## 7                                                                                  0
##   group_number_employed_list_community_health_assistant_cha_number_in_post
## 1                                                                        0
## 2                                                                        1
## 3                                                                        0
## 4                                                                        0
## 5                                                                        0
## 7                                                                        1
##   group_number_employed_list_community_health_assistant_cha_number_present_at_visit
## 1                                                                                 0
## 2                                                                                 0
## 3                                                                                 0
## 4                                                                                 0
## 5                                                                                 0
## 7                                                                                 1
##   group_number_employed_list_community_midwives_cm_number_in_post
## 1                                                               0
## 2                                                               0
## 3                                                               1
## 4                                                               0
## 5                                                               0
```

```
## 7                                                                   0
##   group_number_employed_list_community_midwives_cm_number_present_at_visit
## 1                                                                   0
## 2                                                                   0
## 3                                                                   0
## 4                                                                   0
## 5                                                                   0
## 7                                                                   0
##   group_number_employed_list_sechn_sechn_number_in_post
## 1                                                   0
## 2                                                   2
## 3                                                   2
## 4                                                   0
## 5                                                   3
## 7                                                   0
##   group_number_employed_list_sechn_sechn_number_present_at_visit
## 1                                                       0
## 2                                                       2
## 3                                                       0
## 4                                                       0
## 5                                                       2
## 7                                                       0
##   group_number_employed_list_laboratory_technicians_lab_tech_number_in_post
## 1                                                                     0
## 2                                                                     0
## 3                                                                     0
## 4                                                                     0
## 5                                                                     0
## 7                                                                     0
##   group_number_employed_list_laboratory_technicians_lab_tech_number_present_at_visit
## 1                                                                             0
## 2                                                                             0
## 3                                                                             0
## 4                                                                             0
## 5                                                                             0
## 7                                                                             0
##   group_number_employed_list_mch_aides_mch_aides_number_in_post
## 1                                                         2
## 2                                                         2
## 3                                                         2
## 4                                                         3
## 5                                                         1
## 7                                                         2
##   group_number_employed_list_mch_aides_mch_aides_number_present_at_visit
## 1                                                              1
## 2                                                              2
## 3                                                              2
## 4                                                              3
## 5                                                              1
## 7                                                              0
##   group_number_employed_list_cleaner_porter_cleaner_porter_number_in_post
## 1                                                               1
## 2                                                               0
## 3                                                               2
```

```
## 4                                                                                0
## 5                                                                                1
## 7                                                                                1
##   group_number_employed_list_cleaner_porter_cleaner_porter_number_present_at_visit
## 1                                                                                0
## 2                                                                                0
## 3                                                                                1
## 4                                                                                0
## 5                                                                                1
## 7                                                                                0
##   group_number_employed_list_other_other_number_in_post
## 1                                                      4
## 2                                                     13
## 3                                                     18
## 4                                                      0
## 5                                                      0
## 7                                                      2
##   group_number_employed_list_other_other_number_present_at_visit
## 1                                                              0
## 2                                                              5
## 3                                                              3
## 4                                                              0
## 5                                                              0
## 7                                                              1
##   ql_human_resources_hr_focal_point ql_human_resources_hr_staff_received_info
## 1                     not_completed                                 completed
## 2                     not_completed                       partially_completed
## 3                     not_completed                                 completed
## 4                     not_completed                       partially_completed
## 5                     not_completed                                 completed
## 7                         completed                       partially_completed
##   ql_human_resources_hr_healthcare_provider_training
## 1                                      not_completed
## 2                                      not_completed
## 3                                partially_completed
## 4                                partially_completed
## 5                                      not_completed
## 7                                partially_completed
##   ql_human_resources_hr_healthcare_provider_revised_training
## 1                                              not_completed
## 2                                              not_completed
## 3                                        partially_completed
## 4                                              not_completed
## 5                                        partially_completed
## 7                                        partially_completed
##   ql_human_resources_hr_daily_staff_list
## 1                              completed
## 2                              completed
## 3                              completed
## 4                          not_completed
## 5                              completed
## 7                              completed
##   ql_information_education_communication_iec_handwashing_procedure
## 1                                                    not_displayed
```

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```
## 2                                                         not_displayed
## 3                                                             displayed
## 4                                                             displayed
## 5                                                         not_displayed
## 7                                                             displayed
##   ql_information_education_communication_iec_physical_distancing
## 1                                                         displayed
## 2                                                         displayed
## 3                                                     not_displayed
## 4                                                     not_displayed
## 5                                                     not_displayed
## 7                                                         displayed
##   ql_information_education_communication_iec_covering_nose_mouth
## 1                                                         displayed
## 2                                                         displayed
## 3                                                         displayed
## 4                                                     not_displayed
## 5                                                     not_displayed
## 7                                                         displayed
##   ql_information_education_communication_iec_early_symptom_recognition
## 1                                                             displayed
## 2                                                         not_displayed
## 3                                                         not_displayed
## 4                                                         not_displayed
## 5                                                         not_displayed
## 7                                                             displayed
##   ql_information_education_communication_iec_when_facility_vs_home
## 1                                                           displayed
## 2                                                       not_displayed
## 3                                                       not_displayed
## 4                                                       not_displayed
## 5                                                       not_displayed
## 7                                                           displayed
##   ql_information_education_communication_iec_rational_ppe_use
## 1                                                      displayed
## 2                                                  not_displayed
## 3                                                      displayed
## 4                                                  not_displayed
## 5                                                  not_displayed
## 7                                                      displayed
##   ql_information_education_communication_iec_helpline_number
## 1                                                     displayed
## 2                                                     displayed
## 3                                                     displayed
## 4                                                 not_displayed
## 5                                                 not_displayed
## 7                                                     displayed
##   ql_surveillance_surv_procedure_for_notification
## 1                           fully_operational
## 2                       partially_operational
## 3                       partially_operational
## 4                           fully_operational
## 5                           fully_operational
## 7                           fully_operational
```

```
##   ql_surveillance_surv_official_case_definition
## 1                             fully_operational
## 2                                   not_in_place
## 3                                   not_in_place
## 4                                   not_in_place
## 5                                   not_in_place
## 7                             fully_operational
##   ql_surveillance_surv_hotline_number
## 1                   fully_operational
## 2                   fully_operational
## 3                   fully_operational
## 4                   fully_operational
## 5                   fully_operational
## 7                   fully_operational
##   ql_surveillance_surv_timely_data_reported_to_district
## 1                                     fully_operational
## 2                                     fully_operational
## 3                                     fully_operational
## 4                                     fully_operational
## 5                                     fully_operational
## 7                                     fully_operational
##   ql_triage_and_early_recognition_ter_screening_area_set_up
## 1                                         fully_operational
## 2                                               not_in_place
## 3                                               not_in_place
## 4                                               not_in_place
## 5                                               not_in_place
## 7                                     partially_operational
##   ql_triage_and_early_recognition_ter_symptom_screening_questionnaires
## 1                                                         not_in_place
## 2                                                         not_in_place
## 3                                                         not_in_place
## 4                                                         not_in_place
## 5                                                         not_in_place
## 7                                                         not_in_place
##   ql_triage_and_early_recognition_ter_temperature_measurement_at_triage
## 1                                                     fully_operational
## 2                                                           not_in_place
## 3                                                           not_in_place
## 4                                                     fully_operational
## 5                                                           not_in_place
## 7                                                     fully_operational
##   ql_triage_and_early_recognition_ter_physical_distancing_in_waiting
## 1                                                   fully_operational
## 2                                               partially_operational
## 3                                               partially_operational
## 4                                                   fully_operational
## 5                                                   fully_operational
## 7                                                   fully_operational
##   ql_triage_and_early_recognition_ter_separate_waiting_for_symptomatic
## 1                                                         not_in_place
## 2                                                         not_in_place
## 3                                                         not_in_place
## 4                                                         not_in_place
```

```
## 5                                                         fully_operational
## 7                                                            not_in_place
##   ql_chw_chw_trained_precautions ql_chw_chw_trained_community_service
## 1                  not_in_place                         not_in_place
## 2                  not_in_place                         not_in_place
## 3                  not_in_place                         not_in_place
## 4                       partial                              partial
## 5                       partial                              partial
## 7                       partial                              partial
##   ql_chw_chw_drugs ql_chw_chw_gloves ql_chw_chw_masks ql_chw_chw_iec_materials
## 1          partial          adequate     not_in_place             not_in_place
## 2          partial      not_in_place          partial             not_in_place
## 3             <NA>           partial          partial             not_in_place
## 4          partial           partial          partial             not_in_place
## 5         adequate      not_in_place         adequate                  partial
## 7         adequate          adequate         adequate             not_in_place
##   ql_isolation_physical_distancing_iso_designated_isolation_for_suspected
## 1                                                          not_in_place
## 2                                                          not_in_place
## 3                                                          not_in_place
## 4                                                          not_in_place
## 5                                                     fully_operational
## 7                                                          not_in_place
##   ql_isolation_physical_distancing_iso_distance_between_patients_in_waiting
## 1                                                       fully_operational
## 2                                                            not_in_place
## 3                                                            not_in_place
## 4                                                       fully_operational
## 5                                                       fully_operational
## 7                                                       fully_operational
##   ql_isolation_physical_distancing_iso_distance_between_patient_beds
## 1                                                  fully_operational
## 2                                                       not_in_place
## 3                                               partially_operational
## 4                                                       not_in_place
## 5                                                       not_in_place
## 7                                                  fully_operational
##   ql_isolation_physical_distancing_iso_transfer_referral_protocol
## 1                                                    not_in_place
## 2                                           partially_operational
## 3                                           partially_operational
## 4                                               fully_operational
## 5                                               fully_operational
## 7                                               fully_operational
##   ql_ppe_ipc_ppe_medical_masks ql_ppe_ipc_ppe_disp_surgical_masks
## 1                not_available                      not_available
## 2              risk_of_shortage                   risk_of_shortage
## 3              risk_of_shortage                sufficient_supplies
## 4           sufficient_supplies                      not_available
## 5              risk_of_shortage                   risk_of_shortage
## 7                not_available                sufficient_supplies
##   ql_ppe_ipc_ppe_eye_protection ql_ppe_ipc_ppe_examination_gloves
## 1                 not_available                   risk_of_shortage
## 2              risk_of_shortage                   risk_of_shortage
```

```
## 3           sufficient_supplies              sufficient_supplies
## 4           sufficient_supplies              sufficient_supplies
## 5             risk_of_shortage                risk_of_shortage
## 7           sufficient_supplies              sufficient_supplies
##    ql_ppe_ipc_ppe_surgical_gloves ql_ppe_ipc_ppe_long_cuffed_gloves
## 1               risk_of_shortage                  risk_of_shortage
## 2                  not_available                     not_available
## 3               risk_of_shortage               sufficient_supplies
## 4                  not_available               sufficient_supplies
## 5               risk_of_shortage                     not_available
## 7                  not_available                  risk_of_shortage
##    ql_ppe_ipc_ppe_heavy_duty_gloves ql_ppe_ipc_ppe_long_sleeved_gown
## 1                    not_available                 risk_of_shortage
## 2                    not_available                    not_available
## 3                    not_available                 risk_of_shortage
## 4                    not_available                 risk_of_shortage
## 5                    not_available                    not_available
## 7                    not_available                 risk_of_shortage
##    ql_ppe_ipc_ppe_waterproof_aprons
## 1               sufficient_supplies
## 2               sufficient_supplies
## 3                     not_available
## 4               sufficient_supplies
## 5                  risk_of_shortage
## 7                  risk_of_shortage
##    ql_ppe_plan_ipc_ppe_plan_staff_trained_on_ppe
## 1                        available_fully_achieved
## 2                                   not_available
## 3                        available_fully_achieved
## 4                              partially_achieved
## 5                              partially_achieved
## 7                        available_fully_achieved
##    ql_ppe_plan_ipc_ppe_plan_ppe_poster_displayed
## 1                                   not_available
## 2                                   not_available
## 3                                   not_available
## 4                                   not_available
## 5                                   not_available
## 7                                   not_available
##    ql_ppe_plan_ipc_ppe_plan_fit_test_kit
## 1                           not_available
## 2                           not_available
## 3                           not_available
## 4                           not_available
## 5                           not_available
## 7                           not_available
##    ql_ppe_plan_ipc_ppe_plan_contingency_for_shortages
## 1                                        not_available
## 2                                        not_available
## 3                                        not_available
## 4                                        not_available
## 5                                        not_available
## 7                                        not_available
##    ql_waste_collection_and_disposal_ipc_wcd_colour_coded_bins
```

```
## 1                                               not_available
## 2                                               not_available
## 3                                                       <NA>
## 4                                               not_available
## 5                                             risk_of_shortage
## 7                                               not_available
##   ql_waste_collection_and_disposal_ipc_wcd_clinical_waste_bags
## 1                                             risk_of_shortage
## 2                                           sufficient_supplies
## 3                                           sufficient_supplies
## 4                                               not_available
## 5                                             risk_of_shortage
## 7                                               not_available
##   ql_waste_collection_and_disposal_ipc_wcd_laundry_receptacles_at_patient_rooms
## 1                                                                 not_available
## 2                                                                 not_available
## 3                                                                 not_available
## 4                                                                 not_available
## 5                                                                 not_available
## 7                                                                 not_available
##   ql_waste_collection_and_disposal_ipc_wcd_incinerator
## 1                                   sufficient_supplies
## 2                                         not_available
## 3                                       risk_of_shortage
## 4                                         not_available
## 5                                       risk_of_shortage
## 7                                         not_available
##   ql_water_sanitation_and_hygiene_ipc_wash_clean_running_water
## 1                                           sufficient_supplies
## 2                                           sufficient_supplies
## 3                                           sufficient_supplies
## 4                                           sufficient_supplies
## 5                                           sufficient_supplies
## 7                                                 not_available
##   ql_water_sanitation_and_hygiene_ipc_wash_hand_soap
## 1                                 sufficient_supplies
## 2                                       not_available
## 3                                       not_available
## 4                                 sufficient_supplies
## 5                                 sufficient_supplies
## 7                                       not_available
##   ql_water_sanitation_and_hygiene_ipc_wash_liquid_soap
## 1                                   sufficient_supplies
## 2                                       risk_of_shortage
## 3                                   sufficient_supplies
## 4                                   sufficient_supplies
## 5                                   sufficient_supplies
## 7                                   sufficient_supplies
##   ql_water_sanitation_and_hygiene_ipc_wash_disp_hand_towels
## 1                                             not_available
## 2                                             not_available
## 3                                             not_available
## 4                                             not_available
## 5                                             not_available
```

```
## 7                                                            not_available
##   ql_water_sanitation_and_hygiene_ipc_wash_alcohol_based_hand_gel
## 1                                                      sufficient_supplies
## 2                                                            not_available
## 3                                                            not_available
## 4                                                      sufficient_supplies
## 5                                                      sufficient_supplies
## 7                                                            not_available
##   ql_disinfection_and_sterilization_ipc_ds_protocol_facility_disinfection
## 1                                                             not_available
## 2                                                             not_available
## 3                                                             not_available
## 4                                                             not_available
## 5                                                       sufficient_supplies
## 7                                                             not_available
##   ql_disinfection_and_sterilization_ipc_ds_protocol_equipment_sterilisation
## 1                                                              not_available
## 2                                                              not_available
## 3                                                              not_available
## 4                                                        sufficient_supplies
## 5                                                        sufficient_supplies
## 7                                                        sufficient_supplies
##   ql_disinfection_and_sterilization_ipc_ds_environmental_disinfectant
## 1                                                        sufficient_supplies
## 2                                                              not_available
## 3                                                              not_available
## 4                                                        sufficient_supplies
## 5                                                        sufficient_supplies
## 7                                                        sufficient_supplies
##   ql_disinfection_and_sterilization_ipc_ds_cleaning_schedule_in_toilets
## 1                                                               not_available
## 2                                                               not_available
## 3                                                               not_available
## 4                                                               not_available
## 5                                                             risk_of_shortage
## 7                                                               not_available
##   ql_disinfection_and_sterilization_ipc_ds_protocol_corpse_handling
## 1                                                               not_available
## 2                                                               not_available
## 3                                                               not_available
## 4                                                               not_available
## 5                                                               not_available
## 7                                                               not_available
##   ql_logistics_patient_and_sample_transfer_log_referral_plan
## 1                                                            not_available
## 2                                                      partially_available
## 3                                                      partially_available
## 4                                                                available
## 5                                                                available
## 7                                                                available
##   ql_logistics_patient_and_sample_transfer_log_cellphone_landline_swradio
## 1                                                              not_available
## 2                                                              not_available
## 3                                                              not_available
```

```
## 4                                                             available
## 5                                                             available
## 7                                                         not_available
##   ql_logistics_patient_and_sample_transfer_log_tracer_drugs
## 1                                        partially_available
## 2                                                  available
## 3                                        partially_available
## 4                                                  available
## 5                                                  available
## 7                                        partially_available
##   ql_logistics_patient_and_sample_transfer_log_albendazole
## 1                                            not_available
## 2                                            not_available
## 3                                                available
## 4                                                available
## 5                                                available
## 7                                                available
##   ql_logistics_patient_and_sample_transfer_log_amoxicillin
## 1                                                available
## 2                                      partially_available
## 3                                            not_available
## 4                                                available
## 5                                                available
## 7                                                available
##   ql_logistics_patient_and_sample_transfer_log_ampicillin
## 1                                           not_available
## 2                                     partially_available
## 3                                               available
## 4                                           not_available
## 5                                               available
## 7                                           not_available
##   ql_logistics_patient_and_sample_transfer_log_chlorhexidine_5
## 1                                              not_available
## 2                                                  available
## 3                                                  available
## 4                                                  available
## 5                                              not_available
## 7                                              not_available
##   question10_log_chlorhexidine_7 question10_log_gentamicin question10_log_folic
## 1                  not_available       partially_available            available
## 2                  not_available       partially_available        not_available
## 3                      available                 available            available
## 4                      available                 available        not_available
## 5                  not_available                 available        not_available
## 7                  not_available                 available        not_available
##   question10_log_ferrous_and_folic question10_log_compound_sodium
## 1                        available                 not_available
## 2                    not_available           partially_available
## 3                    not_available                     available
## 4                    not_available                     available
## 5                    not_available                     available
## 7                    not_available                     available
##   question10_log_co_trimoxazole_400 question10_log_co_trimoxazole_200
## 1                         available                         available
```

```
## 2                        available                          not_available
## 3                        available                              available
## 4                        available                          not_available
## 5                    not_available                          not_available
## 7                    not_available                          not_available
##   question6_log_metronidazole_250 question6_log_metronidazole_200
## 1                        available                          not_available
## 2              partially_available                          not_available
## 3                        available                          not_available
## 4                        available                          not_available
## 5                        available                          not_available
## 7                        available                          not_available
##   question6_log_methyldopa question6_log_magnesium_sulphate
## 1      partially_available              partially_available
## 2                available                        available
## 3                available                        available
## 4                available                        available
## 5            not_available                    not_available
## 7                available                        available
##   question6_log_lidocaine question6_log_ibuprofen question2_log_surgical_spirit
## 1           not_available               available                not_available
## 2               available     partially_available                not_available
## 3               available               available                    available
## 4               available               available                    available
## 5               available               available                    available
## 7           not_available               available                not_available
##   question2_log_sodium_chloride question2_log_povidone
## 1                 not_available    partially_available
## 2           partially_available              available
## 3                     available              available
## 4                     available              available
## 5                     available              available
## 7                     available              available
##   question2_log_paracetamol_500 question2_log_paracetamol_250 question2_log_ors
## 1                     available                 not_available         available
## 2                 not_available                 not_available         available
## 3                 not_available                 not_available         available
## 4                     available                 not_available         available
## 5                     available                     available         available
## 7                     available                 not_available         available
##   question7_log_gauze question7_log_cotton_wool question7_log_cannula_iv_20
## 1 partially_available                 available               not_available
## 2 partially_available                 available               not_available
## 3           available                 available                   available
## 4           available                 available                   available
## 5           available                 available         partially_available
## 7       not_available       partially_available                   available
##   question7_log_cannula_iv_24 question7_log_zinc_sulphate question7_log_water
## 1               not_available               not_available           available
## 2               not_available         partially_available           available
## 3         partially_available                   available           available
## 4                   available                   available           available
## 5         partially_available                   available           available
## 7               not_available               not_available       not_available
```

```
##    question4_log_needle_23 question4_log_needle_21 question4_log_glove_giving
## 1             available           not_available                available
## 2         not_available               available                available
## 3             available               available                available
## 4             available               available                available
## 5             available               available                available
## 7         not_available           not_available                available
##    question4_log_glove_surgical question4_log_glove_gyn question4_log_glove_exam
## 1                    available     partially_available                available
## 2                not_available           not_available                available
## 3                    available               available                available
## 4                    available               available                available
## 5          partially_available           not_available      partially_available
## 7                not_available               available                available
##     question1_log_tape question1_log_syringe question1_log_oxytocin
## 1      not_available               available              available
## 2          available               available              available
## 3          available               available              available
## 4 partially_available               available              available
## 5          available               available              available
## 7          available               available              available
##    question1_log_diazepam question1_log_misoprostol question1_log_glucose
## 1          not_available             not_available         not_available
## 2              available             not_available         not_available
## 3              available                 available         not_available
## 4          not_available                 available         not_available
## 5              available       partially_available             available
## 7          not_available             not_available         not_available
##   ql_human_resources_score_human_resources
## 1                                         2
## 2                                       1.5
## 3                                         3
## 4                                         1
## 5                                       2.5
## 7                                       3.5
##   ql_human_resources_score_max_human_resources
## 1                                             5
## 2                                             5
## 3                                             5
## 4                                             5
## 5                                             5
## 7                                             5
##   ql_information_education_communication_score_information_education_communication
## 1                                                                                6
## 2                                                                                3
## 3                                                                                4
## 4                                                                                1
## 5                                                                                0
## 7                                                                                7
##   ql_information_education_communication_score_max_information_education_communication
## 1                                                                                    7
## 2                                                                                    7
## 3                                                                                    7
## 4                                                                                    7
```

```
## 5                                                                                  7
## 7                                                                                  7
##   ql_surveillance_score_surveillance ql_surveillance_score_max_surveillance
## 1                                   4                                       4
## 2                                 2.5                                       4
## 3                                 2.5                                       4
## 4                                   3                                       4
## 5                                   3                                       4
## 7                                   4                                       4
##   ql_chw_score_chw ql_chw_score_max_chw
## 1              1.5                    6
## 2                1                    6
## 3                1                    6
## 4                2                    6
## 5                3                    6
## 7              3.5                    6
##   ql_isolation_physical_distancing_score_isolation
## 1                                                2
## 2                                              0.5
## 3                                                1
## 4                                                2
## 5                                                3
## 7                                                3
##   ql_isolation_physical_distancing_score_max_isolation
## 1                                                    4
## 2                                                    4
## 3                                                    4
## 4                                                    4
## 5                                                    4
## 7                                                    4
##   ql_ppe_score_infection_prevention_and_control_ppe
## 1                                                 3
## 2                                                 3
## 3                                               5.5
## 4                                               5.5
## 5                                                 3
## 7                                               4.5
##   ql_ppe_score_max_infection_prevention_and_control_ppe
## 1                                                     9
## 2                                                     9
## 3                                                     9
## 4                                                     9
## 5                                                     9
## 7                                                     9
##   ql_ppe_plan_score_infection_prevention_and_control_ppe_plan
## 1                                                           1
## 2                                                           0
## 3                                                           1
## 4                                                         0.5
## 5                                                         0.5
## 7                                                           1
##   ql_ppe_plan_score_max_infection_prevention_and_control_ppe_plan
## 1                                                               4
## 2                                                               4
```

```
## 3                                                                        4
## 4                                                                        4
## 5                                                                        4
## 7                                                                        4
##   ql_waste_collection_and_disposal_score_infection_prevention_and_control_waste_collection_and_dispo
## 1
## 2
## 3
## 4
## 5
## 7
##   ql_waste_collection_and_disposal_score_max_infection_prevention_and_control_waste_collection_and_d
## 1
## 2
## 3
## 4
## 5
## 7
##   ql_water_sanitation_and_hygiene_score_infection_prevention_and_control_water_sanitation_and_hygien
## 1
## 2                                                                      1.5
## 3
## 4
## 5
## 7
##   ql_water_sanitation_and_hygiene_score_max_infection_prevention_and_control_water_sanitation_and_hy
## 1
## 2
## 3
## 4
## 5
## 7
##   ql_disinfection_and_sterilization_score_infection_prevention_and_control_disinfection_and_steriliz
## 1
## 2
## 3
## 4
## 5
## 7
##   ql_disinfection_and_sterilization_score_max_infection_prevention_and_control_disinfection_and_ster
## 1
## 2
## 3
## 4
## 5
## 7
##   score_infection_prevention_and_control
## 1                                    10.5
## 2                                     5.5
## 3                                      10
## 4                                      12
## 5                                      12
## 7                                     8.5
##   score_max_infection_prevention_and_control consultations_head_count_month_1
```

```
## 1                                    27                          221
## 2                                    27                          270
## 3                                    27                          748
## 4                                    27                           79
## 5                                    27                          928
## 7                                    27                          358
##   consultations_head_count_month_2 consultations_head_count_month_3
## 1                              225                              304
## 2                              238                              245
## 3                              604                              405
## 4                               93                              101
## 5                              900                              467
## 7                              308                              452
##   consultations_head_count_month_4 consultations_general_outpatient_month_1
## 1                              217                                      144
## 2                              269                                      178
## 3                              576                                      466
## 4                               21                                      144
## 5                              177                                      165
## 7                              267                                      128
##   consultations_general_outpatient_month_2
## 1                                      151
## 2                                      155
## 3                                      474
## 4                                       88
## 5                                      399
## 7                                      144
##   consultations_general_outpatient_month_3
## 1                                      158
## 2                                      171
## 3                                      338
## 4                                      101
## 5                                      408
## 7                                      124
##   consultations_general_outpatient_month_4 consultations_deliveries_month_1
## 1                                      145                               19
## 2                                      182                               15
## 3                                      418                                9
## 4                                      121                                7
## 5                                      198                                4
## 7                                      137                               15
##   consultations_deliveries_month_2 consultations_deliveries_month_3
## 1                               20                               21
## 2                               15                               17
## 3                               13                                7
## 4                                5                               11
## 5                                5                                4
## 7                               13                               13
##   consultations_deliveries_month_4 consultations_pent_vaccines_month_1
## 1                               18                                  12
## 2                               16                                  18
## 3                                7                                  18
## 4                                3                                   5
## 5                                5                                   3
```

```
## 7                                    17                                    20
##   consultations_pent_vaccines_month_2 consultations_pent_vaccines_month_3
## 1                                   10                                   18
## 2                                   16                                   19
## 3                                   22                                   24
## 4                                    5                                    6
## 5                                    5                                    4
## 7                                   19                                   20
##   consultations_pent_vaccines_month_4
## 1                                   20
## 2                                   16
## 3                                   15
## 4                                    7
## 5                                    1
## 7                                   19
##   consultations_head_count_monthly_average_head_counts
## 1                                                   241
## 2                                                   255
## 3                                                   583
## 4                                                    73
## 5                                                   618
## 7                                                   346
##   consultations_general_outpatient_monthly_average_general_outpatient
## 1                                                                 149
## 2                                                                 171
## 3                                                                 424
## 4                                                                 113
## 5                                                                 292
## 7                                                                 133
##   consultations_deliveries_monthly_average_deliveries
## 1                                                   19
## 2                                                   15
## 3                                                    9
## 4                                                    6
## 5                                                    4
## 7                                                   14
##   consultations_pent_vaccines_monthly_average_pent_vaccines
## 1                                                         15
## 2                                                         17
## 3                                                         19
## 4                                                          5
## 5                                                          3
## 7                                                         19
##   ql_triage_and_early_recognition_score_triage_and_early_recognition
## 1                                                                  3
## 2                                                                  0
## 3                                                                  0
## 4                                                                  2
## 5                                                                  2
## 7                                                                  2
##   ql_triage_and_early_recognition_score_max_triage_and_early_recognition
## 1                                                                      5
## 2                                                                      5
## 3                                                                      5
```

```
## 4                                                                    5
## 5                                                                    5
## 7                                                                    5
##    question1_score_logistics_patient_and_sample_transfer
## 1                                                      19
## 2                                                      21
## 3                                                      33
## 4                                                      34
## 5                                                      29
## 7                                                      21
##    question1_score_max_logistics_patient_and_sample_transfer score_total
## 1                                                          44          48
## 2                                                          44          35
## 3                                                          44          55
## 4                                                          44          57
## 5                                                          44          55
## 7                                                          44          53
##    score_max_total
## 1              102
## 2              102
## 3              102
## 4              102
## 5              102
## 7              102
```

Saving cleaned dataset

```r
#function to save cleaned dataset
save_data <- function(df,path){
#saving data
 write.csv(df,path,row.names = FALSE)
}

#applying save function to dataset
save_data(health_facility_final_df,"./www/Health Facility Assessment_cleaned.csv")
```

Assignment 2 - Theory

**The task is to describe the steps, tools and extra datasets you would use to match the master
facility list with the health facility assessment file. Include a short paragraph explaining how
you would approach this problem and the tools you would use.**

Solution

First of all, we need to determine which columns are common between the Master Health Facility and the
Health Facility Assessment datasets. Using the dplyr package, I will use the inner_join function to find an
intersection of the facility name in both datasets and merge the two datasets. A shapefile with the province,
district, chiefdom, and location boundaries would be helpful in conducting geospatial analysis of the dataset.
R packages such as leaflet, sf, rgdal would be helpful in the geospatial analysis.