Data Support Materials
CLSA DXA Image Characteristics

The CLSA collects images using Hologic QDR-4500 dual energy X-ray (DXA) scanners of those participants who are part of the comprehensive cohort and who do not contraindicate. Scans performed during a data collection site (DCS) interview include: preferred left or alternatively right hip, AP lumbar spine, lateral IVA spine, whole body and forearm under certain contraindication conditions. With the exception of lateral IVA spine images, scans are given a preliminary analysis on the Hologic computer with Apex software. All images are exported in dicom format and archived in a CLSA hosted and maintained central data repository. With the exception of lateral IVA scans, all dicom files are comprised of two primary components identified by dicom tags: a jpeg report image and a proprietary data set containing information required to reconstitute a scan within Hologic Apex software. The lateral IVA dicom files are grayscale images intended for vertebral morphometry assessment and, as such, do not contain density information or a report image and are the only scan type with pixel dimensions (mm). All DXA scan types, with the exception of lateral IVA scans, have alphanumeric data (e.g., BMD) that can be requested where listed as available. For further information on availability consult documentation through the data access portal (https://www.clsa-elcv.ca/data-access/data-and-biospecimens).

Table 1 presents the sizes and other characteristics of the available images. Primary refers to the entire image size (e.g., report jpeg) while secondary refers to the size of inset anatomical images where applicable. Image sizes (e.g., row x column = height x width) can vary between participants depending on whether the operator was required to increase the scan length beyond the default value.

Type	Primary (row x column)	Bit Depth	Color Space	Secondary (row x column)	Overlays	Dicom Size (~ Mb)
lateral IVA spine	1248 x 402	16	MONOCHROME	NA	no	1
forearm	1420 x 1200	8	RGB	304 x 252	yes	5.3
hip	1830 x 1200	8	RGB	252 x 276 (BMD) 252 x 276 (HSA)	yes yes	6.7
wbody (BMD)	1585 x 1440	8	RGB	746 x 327	yes	18
wbody (BCA)	1670 x 1440	8	RGB	295 x 861 (mono) 295 x 861 (color)	yes no	7
AP lumbar spine[†]	1609 x 1200	8	RGB	404 x 252	yes	5.7

Table 1: DXA image characteristics.
[†]*AP lumber spine images acquired starting follow-up 1*

Image samples are provided in Figs 1-6. Dicom files are provided for lateral IVA spine scans only. For all other scan types, redacted report images (i.e., primary) are available in jpeg format. It is on the onus of the data applicant to extract inset (i.e., secondary) images for further analysis. Note that inset images have line overlays which are an artifact of the analysis process in Hologic Apex software and no density or pixel spacing attributes are available. Direct access to the raw Hologic image files can be obtained under special agreement with CLSA.

Figure 1: lateral IVA spine sample

Figure 2: left hip report image sample

The figure contains the following report content:

CLSA (NCC)
175 Longwood Rd. S. 309A
Hamilton, ON L8P 0A1

Patient Information:

Name:	
Patient ID:	
Identifier 2:	
Postal Code:	
Sex:	
Ethnicity:	
Height:	179.2 cm
Weight:	81.6 kg
DOB:	
Age:	
Menopause Age:	
Referring Physician:	
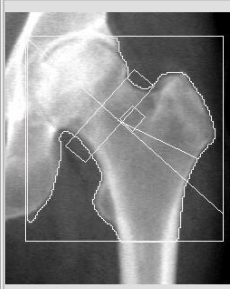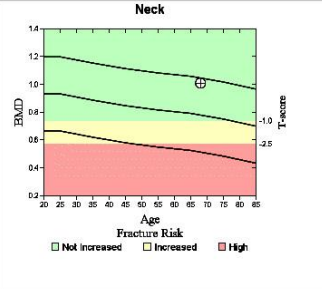
Scan Information:

Scan Date:	
Scan Type:	a Left Hip
Analysis Date:	30.01.2017 13:06
Analysis Protocol:	Hip
Report Date:	18.09.2018 16:07
Institution:	CLSA (NCC)
Operator:	
Model:	Discovery A (S/N85921)
Comment:	
Software version:	13.6.0.5

Comment:

Image not for diagnostic use
110 x 114
NECK: 58 x 15
HAL: 117 mm
k = 1.134, d0 = 48.3
DAP: 3.5 cGy*cm^2

Neck

T-score vs. White Female. Source:2012 BMDCS/NHANES White Female.
Z-score vs. White Male. Source:2012 BMDCS/NHANES White Male.

Fracture Risk
Not Increased   Increased   High

Results Summary:

Region	Area[cm^2]	BMC[(g)]	BMD[g/cm^2]	T-score	PR (Peak Reference)	Z-score	AM (Age Matched)
Neck	6.90	6.95	1.007	1.4	119	1.7	130
Troch	15.58	14.36	0.922	2.2	131	1.5	127
Inter	26.91	33.55	1.247	0.9	113	0.8	113
Total	49.39	54.86	1.111	1.4	118	1.1	118
Ward's	1.15	0.79	0.684	-0.4	93	1.1	130

Total BMD CV 1.0%, ACF = 1.042, BCF = 1.008, TH = 5.776

Fracture Risk: Not Increased; WHO Classification: Normal
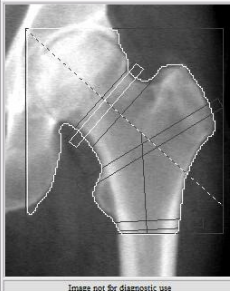
Image not for diagnostic use

HSA™ Results Summary:

Region	Sub Peri.Width [cm]	Endo Cort.Width [cm]	CSA [cm^2]	CSMI [cm^4]	Z [cm^3]	Cort.Thick [cm]	BR
NN	4.28	3.80	5.07	7.50	3.42	0.24	9.2
IT	7.18	6.08	7.68	36.78	9.38	0.55	7.1
FS	3.37	1.84	6.28	6.65	3.93	0.77	2.2
Neck Shaft Angle:	135°						

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Figure 3: whole body (BMD) report image sample

CLSA (NCC)
175 Longwood Rd. S. 309A
Hamilton, ON L8P 0A1

Patient Information:

Name:	
Patient ID:	
Identifier 2:	
Postal Code:	
Sex:	
Ethnicity:	
Height:	160.2 cm
Weight:	63.3 kg
DOB:	
Age:	
Menopause Age:	
Referring Physician:	

Scan Information:

Scan Date:	
Scan Type:	a Whole Body
Analysis Date:	25.01.2019 10:12
Analysis Protocol:	Whole Body Fan Beam
Report Date:	27.08.2020 14:20
Institution:	CLSA (NCC)
Operator:	
Model:	Discovery A (S/N86204)
Comment:	
Software version:	13.6.0.5

Comment:

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Image not for diagnostic use
327 x 150
k = 1.171, d0 = 49.1
DAP: 13.1 cGy*cm²

T-score vs. White Female. Source:2012 BMDCS/NHANES.
Z-score vs. White Female. Source:2012 BMDCS/NHANES.

Results Summary:

Region	Area [cm²]	BMC [(g)]	BMD [g/cm²]	Fat[(g)]	Lean [(g)]	Lean + BMC[(g)]	Total [(g)]	% Fat [(%)]	T-score	PR (Peak Reference)	Z-score	AM (Age Matched)
L Arm	183.65	121.40	0.661	1273.6	1889.8	2011.2	3284.8	38.8				
R Arm	200.20	140.90	0.704	1543.6	1901.8	2042.7	3586.2	43.0				
Trunk				10743.2	21383.7	21905.8	32649.1	32.9				
L Leg	347.12	355.53	1.024	3686.3	5521.8	5877.3	9563.6	38.5				
R Leg	349.14	368.96	1.057	4008.5	5462.2	5831.2	9839.7	40.7				
Subtotal	1707.76	1508.92	0.884	21255.2	36159.3	37668.2	58923.4	36.1				
Head	229.67	409.52	1.783	1010.6	2759.6	3169.1	4179.7	24.2				
Total	1937.42	1918.44	0.990	22265.8	38918.9	40837.3	63103.1	35.3	-1.5	90	0.4	105

Total BMD CV 1.0%, ACF = 1.037, BCF = 1.010
TBAR1209 - NHANES BCA calibration

CLSA (NCC)
175 Longwood Rd. S. 309A
Hamilton, ON L8P 0A1

Patient Information:

Name:	
Patient ID:	
Identifier 2:	
Postal Code:	
Sex:	
Ethnicity:	
Height:	160.2 cm
Weight:	63.3 kg
DOB:	
Age:	
Menopause Age:	
Referring Physician:	

Scan Information::

Scan Date:	
Scan Type:	a Whole Body
Analysis Date:	25.01.2019 10:12
Analysis Protocol:	Whole Body Fan Beam
Report Date:	27.08.2020 14:21
Institution:	CLSA (NCC)
Operator:	
Model:	Discovery A (S/N86204)
Comment:	
Software version:	13.6.0.5

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Image not for diagnostic use

Fat — Lean — Bone

Total Body % Fat

Source: 2008 NHANES White Female

World Health Organization Body Mass Index Classification
BMI = 24.7 WHO Classification Normal

Underweight | Normal | Overweight | Obesity I | Obesity II | Obesity III

BMI has some limitations and an actual diagnosis of overweight or obesity should be made by a health professional. Obesity is associated with heart disease, certain types of cancer, type 2 diabetes, and other health risks. The higher a person's BMI is above 25, the greater their weight-related risks.

Results Summary:

Region	Fat[(g)]	Lean + BMC[(g)]	Total[(g)]	% Fat	% Fat T-score	% Fat Z-score
L Arm	1274	2011	3285	38.8	-0.1	-1.2
R Arm	1544	2043	3586	43.0	0.5	-0.7
Trunk	10743	21906	32649	32.9	0.0	-1.1
L Leg	3686	5877	9564	38.5	-0.4	-1.1
R Leg	4009	5831	9840	40.7	-0.2	-0.9
Subtotal	21255	37668	58923	36.1	-0.1	-1.2
Head	1011	3169	4180	24.2		
Total	22266	40837	63103	35.3	-0.1	-1.2
Android (A)	1431	3608	5039	28.4		
Gynoid (G)	4037	6265	10303	39.2		

Total BMD CV 1.0%, ACF = 1.037, BCF = 1.010
TBAR1209 - NHANES BCA calibration

Adipose Indices:

Measure	Result	T-score	Z-score
Total Body % Fat	35.3	-0.1	-1.2
Fat Mass/Height² (kg/m²)	8.68	-0.1	-0.8
Android/Gynoid Ratio	0.72		
% Fat Trunk/% Fat Legs	0.83	0.3	-0.4
Trunk/Limb Fat Mass Ratio	1.02	1.0	0.2
Est. VAT Mass (g)	470		
Est. VAT Volume (cm³)	508		
Est. VAT Area (cm²)	97.4		

Lean Indices:

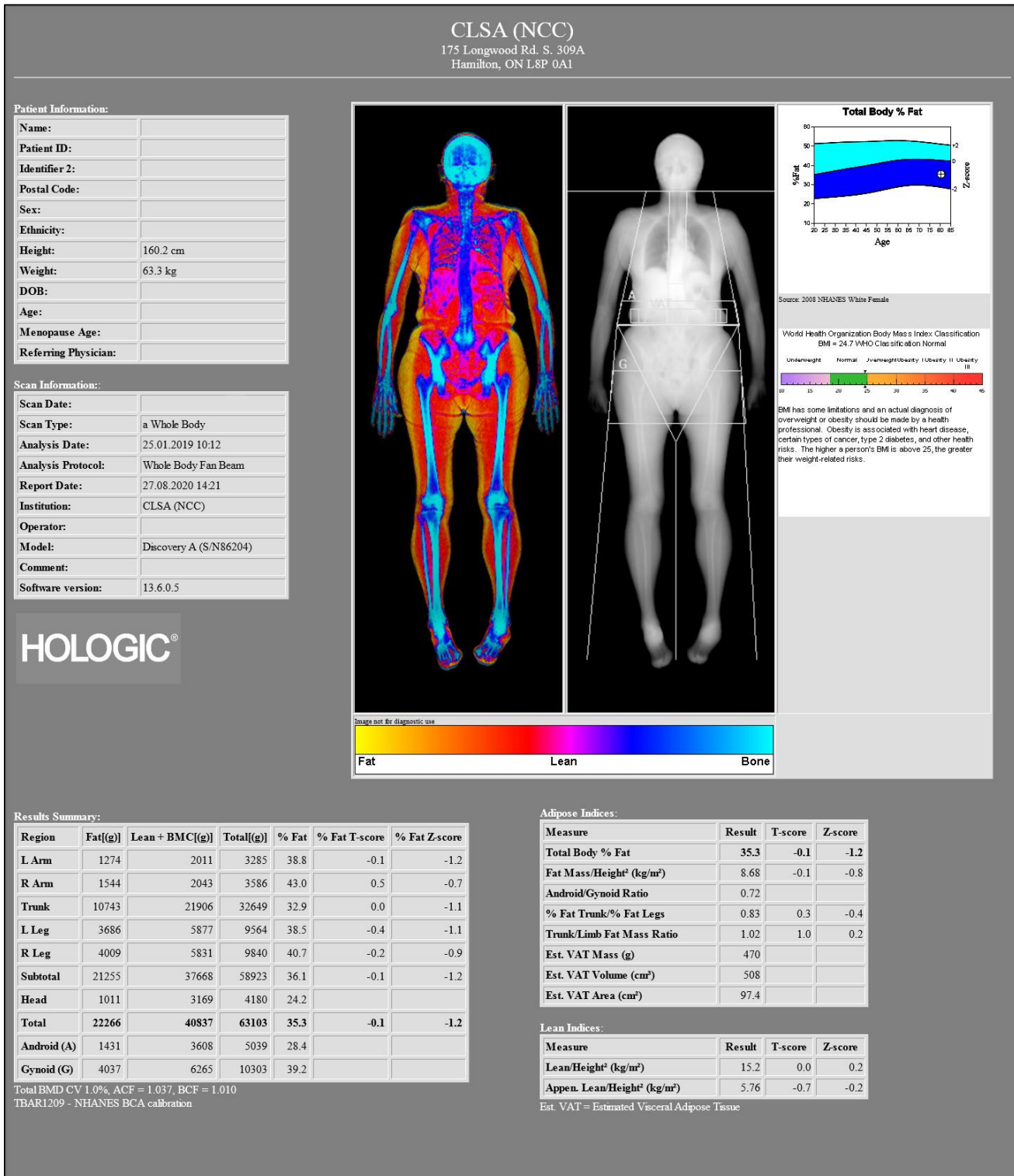| Measure	Result	T-score	Z-score
Lean/Height² (kg/m²)	15.2	0.0	0.2
Appen. Lean/Height² (kg/m²)	5.76	-0.7	-0.2

Est. VAT = Estimated Visceral Adipose Tissue

Figure 4: whole body (BCA) report image sample

CLSA (NCC)
175 Longwood Rd. S. 309A
Hamilton, ON L8P 0A1

Patient Information:

Name:	
Identifier 2:	
Patient ID:	
Postal Code:	
Sex:	
Ethnicity:	
Height:	162.0 cm
Weight:	71.9 kg
DOB:	
Age:	
Menopause Age:	
Referring Physician:	

Scan Information:

Scan Date:	
Scan Type:	a Lumbar Spine
Analysis Date:	30.03.2019 22:16
Analysis Protocol:	Spine
Report Date:	10.12.2020 15:02
Institution:	CLSA (NCC)
Operator:	
Model:	Discovery A (S/N85968)
Comment:	
Software version:	13.6.0.5

Comment:

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Image not for diagnostic use
116 x 130
k = 1.121, d0 = 45.5
DAP: 4.6 cGy*cm²

L1-L4

T-score vs. White Female. Source:Hologic
Z-score vs. White Female. Source:Hologic

sBMD Reuslts Summary (L2 - L4)

Region	sBMD[mg/cm²]	T-score	Z-score
Total	1369	1.8	4.0

Total BMD CV 1.0%

Fracture Risk: Not Increased; WHO Classification: Normal

Extended Results Summary

Region	Area[cm²]	BMC[(g)]	BMD[g/cm²]	T-score	PR (Peak Reference)	Z-score	AM (Age Matched)
L1	13.49	18.40	1.364	3.4	138	5.3	174
L2	13.82	18.11	1.311	2.6	127	4.7	164
L3	17.61	21.81	1.238	1.4	114	3.6	147
L4	19.28	24.63	1.277	2.0	120	4.2	157
L1-L2	27.31	36.51	1.337	3.3	137	5.2	176
L1,L3	31.10	40.20	1.293	2.5	128	4.6	164
L1,L4	32.77	43.03	1.313	2.5	127	4.6	163
L2-L3	31.43	39.92	1.270	1.9	120	4.1	155
L2,L4	33.10	42.74	1.291	1.9	120	4.1	154
L3-L4	36.89	46.44	1.259	1.4	114	3.7	147
L1-L3	44.92	58.32	1.298	2.5	128	4.6	164
L1-L2,L4	46.59	61.14	1.312	2.5	127	4.6	164
L1,L3-L4	50.38	64.84	1.287	2.1	122	4.3	158
L2-L4	50.71	64.55	1.273	1.8	118	4.0	152
L1-L4	64.20	82.95	1.292	2.2	123	4.4	159

Total BMD CV 1.0%, ACF = 1.041, BCF = 1.015, TH = 7.870

Figure 5: AP lumbar spine report image sample

CLSA (NCC)
175 Longwood Rd. S. 309A
Hamilton, ON L8P 0A1

Patient Information:

Name:	
Patient ID:	
Identifier 2:	
Postal Code:	
Sex:	
Ethnicity:	
Height:	182.0 cm
Weight:	104.0 kg
DOB:	
Age:	
Menopause Age:	
Referring Physician:	

1/3 (Radius + Ulna)

Image not for diagnostic use
191 x 95
k = 1.184, d0 = 67.1
DAP: 0.8 cGy*cm²

T-score vs. White Female. Source:Hologic
Z-score vs. White Male. Source:Hologic

Fracture Risk
☐ Not Increased   ☐ Increased   ☐ High

Scan Information:

Scan Date:	
Scan Type:	a L.Forearm
Analysis Date:	22.02.2019 13:45
Analysis Protocol:	Left Forearm
Report Date:	03.12.2019 09:17
Institution:	CLSA (NCC)
Operator:	
Model:	Discovery A (S/N86147)
Comment:	
Software version:	13.6.0.5

Results Summary:

Region	Area[cm²]	BMC[(g)]	BMD[g/cm²]	T-score	PR (Peak Reference)	Z-score	AM (Age Matched)
UD	6.24	2.93	0.469	1.1	114	0.1	101
MID	13.11	8.77	0.668	1.5	114	0.1	101
1/3	**6.13**	**5.25**	**0.856**	**3.0**	**125**	**1.3**	**110**
Total	25.49	16.94	0.665	2.0	118	0.5	104

Total BMD CV 1.0%, ACF = 1.033, BCF = 0.999
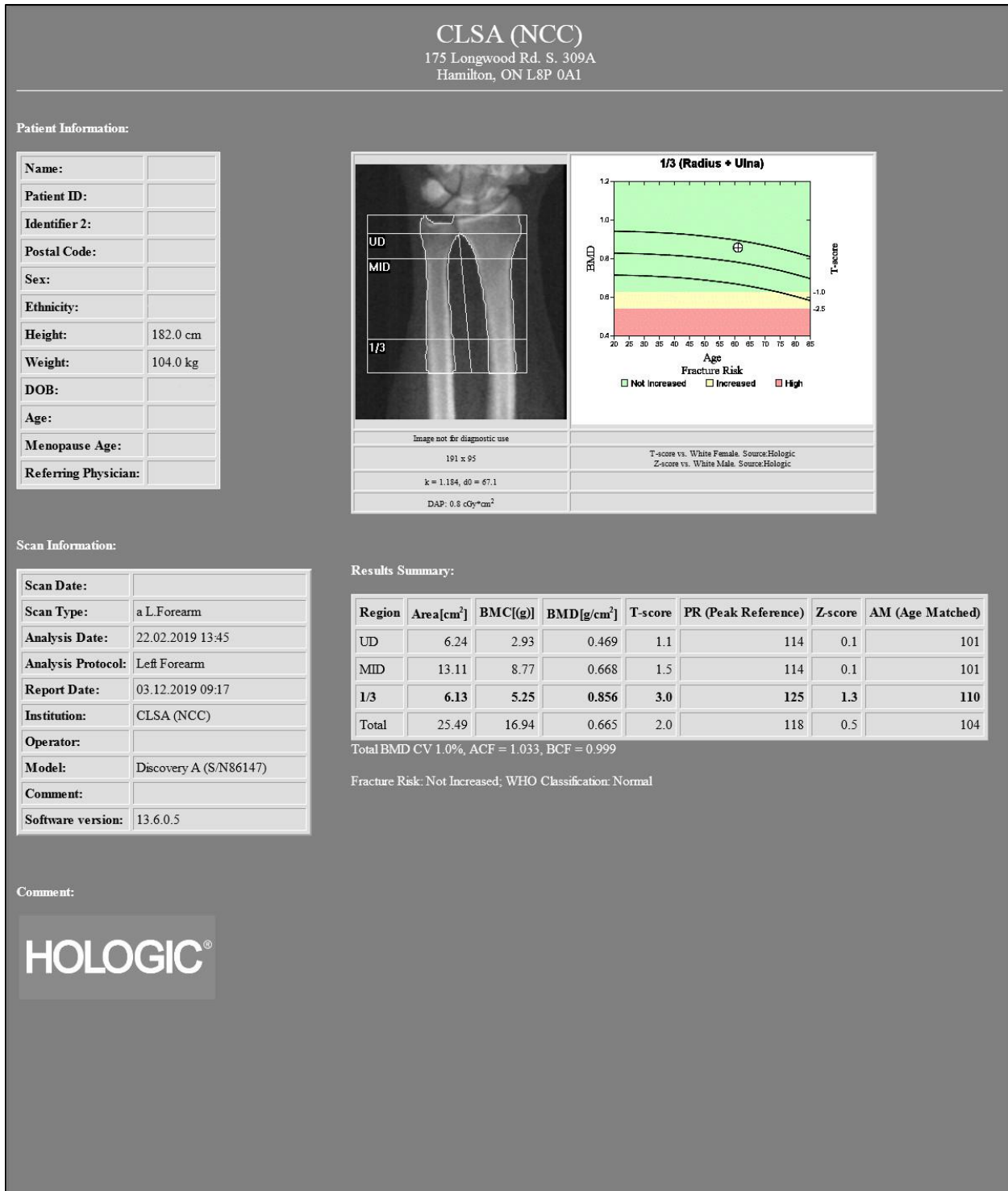
Fracture Risk: Not Increased; WHO Classification: Normal

Comment:

HOLOGIC®

Figure 6: left forearm report image sample