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-: FI<; -! &# ' 8J 8E <^<: K@M< KFFC KF 8JJ<JJ ELKI@FE JK8KLJ 8E; GI<; @. K JLIM@M8C @E G8K@EKJ N@? : 8E: <I

+@ 4?8E> 8,9,: 1, %8E>-G@E> 4?8E> 8,9,: 1, 2@ 4?8E> 8,9,: ; ' <E> . 8E> 8,9,: ; C?LE-?L8 -FE> ; ' @E>-?L8 CFE>< , 4<E>-H@E> ! LF =, \$@B-J?8E D@E> > , ' 8I: F B18>8 ? , . FDDP C<; <I?F@D @ , " FE>-0@ 2L A , 1 <@&@B , F: : F B81800FE@ , " 8E-G@E> -?@ 8,9,: ;

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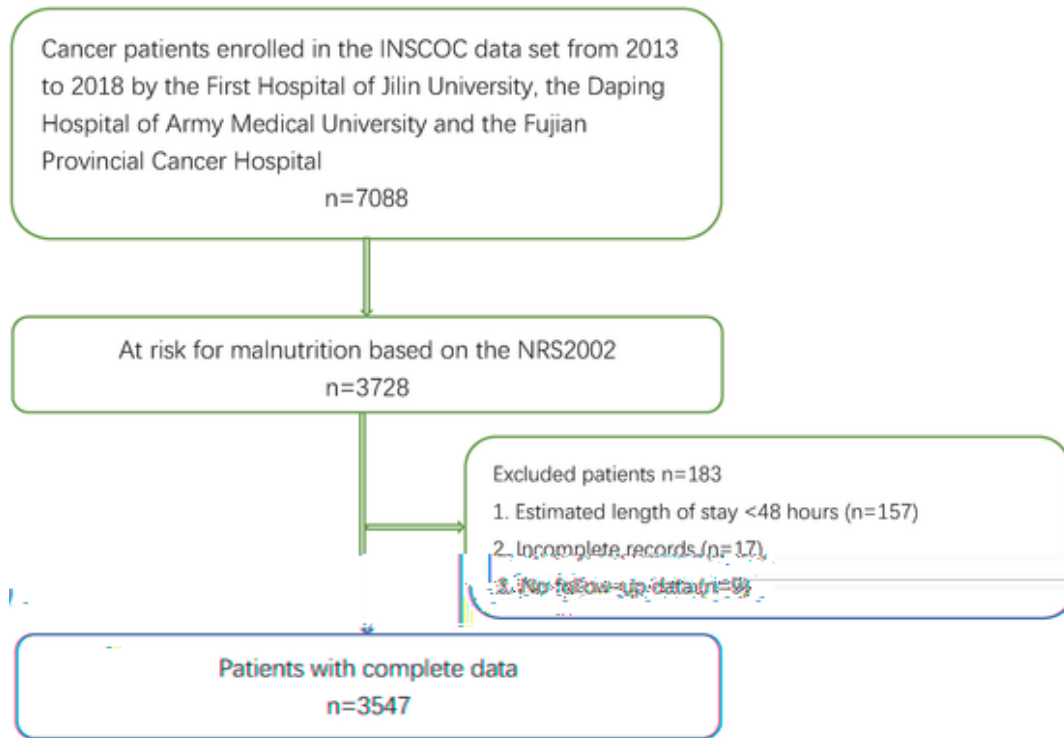
' 8CELKI@FE
! &# : I@<I@B
C8E: <I G8K@EK
-: FI<
-LIM@M8C

Background & aims: . ?< ! CF98C &<8; <IJ?@G #E@8K@M< FE ' 8CELKI@FE (! &# ') I<C<8J<; E<N LE@M<I@8C : I@<I@B =FI ; @B>EFJ@E> 8E; >I8; @E> D8CELKI@FE, 8E; : 8CJ -FI =LIK?<I @EM<JK@8K@FEJ EFK FECP @E ; @=<I<EK : @E@ 8C J<KK@E> 9LK 8CJF @E ! &# ' @J<@< @E: @L ; @E> I<=<I<E: <M8CL<, : FD9@E8K@FE 8E; N<@?K F= ; @=<I<EK ! &# ' : I@<I@B . ?@ JKL; P 8@D<; KF N<@?K?< ! &# ' : I@<I@B 8E; ; <M<CFG 8 J: FI<; -! &# ' JPJK<D, 8E; K?<E M8C@ 8K< 8J N<C@ 8J <M8CL8K< @J 8GG@< 8- K@FE @E ELKI@FE8C 8JJ<JJD<EK 8E; JLIM@M8C GI<; @. K@FE =FI G8K@EKJ N@? : 8E: <I.

Design: A KFK8C F= 3547 G8K@EKJ @E K?< GI@D8IP : F?FIK 8E; 415 G8K@EKJ @E K?< M8C@ 8K@FE : F?FIK N<I< @E: @L<; @E K?< JKL; P. *8K@EKJ ELKI@FE8C JK8KLJ N<I< I<KIFJG<; K@M<CP 8JJ<JJ<; LJ@E> K?< ! &# ' : I@<I@B. %8GC8E ' <@<I JLI- M@M8C : LIM<J 8E; DL@M8I@B<K< CFO I<=<I<J@FE 8E8CP<J N<I< G<I=FID<; KF 8E8CPQ< K?< 8JJF: @8K@FE 9<KN<<E ELKI@ K@FE8C JK8KLJ 8E; FM<I8C JLIM@M8C () -. A EFDF>I8D N8J GIF; L<; KF HL8EK@P K?< ! &# ' : I@<I@B 8E; ; <M<CFG K?< J: FI<; -! &# ' JPJK<D. C@E; <0, I<; <@M<I FG<I8K@E> : ?8I8: K<I@K@E (,) C) : LIM< 8E; : 8C@9I8K@FE : LIM< 8E8CP<J N<I< G<I=FID<; KF M8C@ 8K< K?< GI<; @. K@M< 8: L18: P 8E; ; @J: I@D@E8K@FIP : 8G8: @P F= K?< J: FI<; -! &# ' . @E8CP, 8; <; @JFE : LIM< N8J 8GG@<; KF 8JJ<JJ K?< : @E@ 8C LK@@P F= K?< J: FI<; -! &# ' JPJK<D.

Results: #E K?< GI@D8IP : F?FIK, 70.3% F= G8K@EKJ N<I< ; @B>EFJ<; 8J D8CELKI@FE. . ?< D8CELKI@FE J<M<I- @P >I8; @E> 8: : FI; @E> KF K?< ! &# ' : I@<I@B N<I< 8JJF: @8K<; N@?< K?< GIF>EFJ@ F= G8K@EKJ N@? : 8E: <I (" , 1.42, 1.23 KF 1.65 =FI DF; <I8K< D8CELKI@FE, " , 1.80, 1.84 KF 2.09 =FI J<M<I< D8CELKI@FE). . ?< N<@?K F= <8: ? ! &# ' : I@<I@B N8J : 8C: L-

CF11<JGFE: @E> 8LK?FI. D<G8IKD<EK F= ! 8JKIF@EK<JK@E8C -LI><IP/D<G8IKD<EK F= C0E@ 8C (LK1@FE, B<@E> -?@8E " FJG@8C, C8G@8C ' <; @. 8C /E@M<I@M@P, B<@E>, 100038, C?@E8.
CF11<JGFE: @E> 8LK?FI.
E-mail addresses: 981800FE@LE@J.K (, B81800FE@); J?@G@: : DL<; L: E (" -G -?)
1 . ?<J< 8LK?FIJ : FEKI@LK<; <HL8CP KF K?@J NFIB.



A JFN : ?8IK F= K?< G8K<EK <E: CLJ<FE.

K?< N<?<?K D<8JLI<; <E K?< ?FJG<8C. . ?< G<I: <EK8>< F= N<?<?K CFJJ (LE-
 <EK<EK<FE8C) FM<I 6 DFEK?J N8J K?<E :8C: LC8K<; 5116. . ?< 9F; P D8JJ
 <E; <0 (B' #; B>/D²) N8J :8C: LC8K<; =IFD K?< N<?<?K, D<8JLI<; N<?< 8
 N<?<?<E> J:8C< 8; ALJK<; KF 0.1 B>, 8E; ?<?<?<K (-K8E; <E> ?<?<?<K (D)).
 ' < -81D :<: LD=<I<E: < (' AC) 8E; :8C->: <: LD=<I<E: < (CC) N8J D<8-
 JLI<; LJ<E> 8]<0<9< <8E; EFE-<C8JK< K8G<. . ?< M8CL< F= ' AC N8J LJ<;
 KF <JK<D8K< 81D DLJ: LC8I :<: LD=<I<E: < (A' C). " 8E; >I<G JKI<E>K?
 (" ! -) N8J D<8JLI<; <E K?< ; FD<E8EK ?8E; N<?< 8 \$8D8I ; PE8DFD<-
 K<I. . ?< < M8CL< J N<I< LJ<; KF <JK<D8K< 9F; P N<?<?<K JK8E; 8I; <0<; " ! -
 (" ! -/1, " ! - ; <M< <; 9P 9F; P N<?<?<K).
 . ?< ! &# ' J<M<I<P >18; <E> F= D8CELK1< <FE N8J ; <\E<; 8J -K8>< #
 (DF; <18K<) 8E; -K8>< # (J<M<I<) D8CELK1< <FE LJ<E> G?<EFKPG< >18; -
 <E> 8J ; <J: I<9<; GI<M<FLJ<CP 5106. , <; L: <; DLJ: <C: D8JJ N8J <M8CL8K<;
 M<8 K?< A' C 8E; CC =FI K?< HL8EK<P F= DLJ: <C: 8E; K?< " ! -/1 N8J
 LJ<; 8J 8 JLGFIK<M< D<8JLI< =FI =LE: K<FE 8JJ<JJD<EKJ 510,126. A M8CL<
 <FN<I K?8E K?< \<K? G<I: <EK< <(G5) FI \<K<<EK? G<I: <EK< <(*15) F= =FI
 A' C, CC 8E; " ! -/1 N8J :FEJ< <I<; J<G818K<CP 9P ><E; <I 513,146.

/E<EK<EK<FE8C N<?<?K CFJJ > 10% N8J 8EFK?<I :FE; <FE =FI < <EK<\: 8-
 K<FE F= -K8>< # D8CELK1< <FE. FI <FN B' #, ; L< KF K?< C8: B F= I<<<I<E: <;
 B' #; 8K8 =FI AJ<E GFGLC8K<FEJ =FI K?< <M8CL8K<FE F= JK8>< # (J<M<I< D8C-
 ELK1< <FE), FECP JK8>< # (DF; <18K< D8CELK1< <FE, B' # <18.5) N8J ; <8>-
 EFJ<; (. 89< < 1).

2.3. Development and validation of a scored-GLIM for survival prediction

. ?I<< G?<EFKPG< : I< <I<8 8E; FE< < < <FE N<I< LJ<; 8J

18EB K<J 5156. . ?< ELKI@FE8C JK8KLJ F= K?< G8K@EKJ N@C 9< ; @E< ; @EKF =FLI : 8K<>FI@J (EFID8CCP EFLI@?)<; , D@; D8CELKI@FE, DF; <18K< D8C-ELKI@FE, 8E; J<M<1< D8CELKI@FE) 98J<; FE K?< KFK8C GF@EKJ F= <8: ? : I@ K<1@8 F= ! &# ' . . ?< G<I<FID8E:< F= J:FI<; ! &# ' 8E; K?< ; @J: I@D@E8K@M< 89@@P N<1< D<8JLI<; 9P : 8C: LC8K@E> K?< " 11<C@J C<E<; <0 (C<E<; <0, : 8C- : LC8K<; M@8 9 FFFJKI8G D<K?F; N@? 1000 I<J8DGC<J) 5166. . ?< 81<8 LE- ; <1 ,) C : LIM< (A/C) N8J LJ<; KF <M8CL8K< K?< GI<; @: K@M< 8: : LI8: P =FI K?< 1- 8E; 3-P<81) - . C8@9I8K@FE F= K?< EFDF>I8D =FI 1- 8E; 3-P<81) - N8J G<I<FID<; 9P : FDG8I@E> K?< GI<; @: K<; JLIM@M8C N@? F9J<IM<; JLIM@M8C 5176. -G<81D8EJ 8E8CP@J N8J LJ<; KF K<JK : FII<C8K@FE 9<KN<<E J:FI<; -! &# ' 8E; J:FI<; *! --! A . ?<E; ; @: @FE : LIM< 8E8CP@J (DCA) N8J G<I<FID<; KF D<8JLI< K?< : @E@8C LJ<LCE<JJ F= K?< J:FI<; ! &# ' : FDG8I<; KF J:FI<; *! --! A 8E; ! &# ' 5186.

2.4. Statistical analysis

+L8EK@8K@M< M8I@89C<J <OGI<JJ<; 8J D<8E Y JK8E; 8I; 8E; K?< ; @<I< <E< N<1< 8E8CPQ<; LJ@E> -KL<; <EKJ K<K<JK. FI M8I@89C<J EFK =FCCFN@E> 8 EFID8C ; @JKI@9LK@FE, EFE-G8I8D<K1@: K<JKJ (' 8EE 1 ?@E<P FI %I@LJB8CC 1 8CC@J) N8J LJ<; . CFDG8I@FE 9<KN<<E HL8C@8K@M< M8I@89C<J N8J G<I< =FID<; LJ@E> 8 : ?@JHL8I< K<JK, N@? @J?<I : FII<: K@FE @ E< : <JJ8IP. . ?< %8GC8E ' <@I : LIM< 8E; CFO I<>I<JJ@FE N<1< LJ<; KF 8E8CPQ< JLIM@M8C ; 8K8. A DL@M8I@8K< : FO I<>I<JJ@FE 8E8CP@J N8J 8CJF G<I<FID<; LJ@E> 98:BN8I; J<C<: K@FE KF 8; ALJK =FI GFK<EK@8C : FE=FLE; <IJ. FI : 8C: LC8K@FEJ, J@E@8E: < N8J J<K 8K G < 0.05 =FI KNF K8@J. ACC 8E8CP@J N<1< G<I< =FID<; LJ@E> , (M<I@FE 3.6.2, ?KKG://NNN.IGIFA<:K.FI>/, IDJ G8: B8><, JLIM@M8C G8: B8><, JLIMD@E<I G8: B8><J).A; ; @FE8CCP, K?< ; @: @FE : LIM< 8E8CP@J (DCA) N8J G<I<FID<; LJ@E> K?< JFLI<: < \< < JK; : 8.I , N?@? N8J ; FNE@F8<; =IFD ?KKG://NNN.DJB: : .FI>./.

3.1. Baseline characteristic of the study population

. ?< ; <DF>I8G?@ =<8KLI<J 8E; : C@E@8C : ?8I8: K<I@JK: J F= GI@D8IP : F- ?FIK 8E; M8C@8K@FE : F?FIK N<1< GI<J<EK<; @E . 89C< 2. #E K?< GI@D8IP : F?FIK, 8 KFK8C F= 3547 G8K@EKJ N@? : 8E:<I N<1< <M8CL8K<; . . ?< D<8E 8>< N8J 59.1 Y 12.8 P<8IJ, 8E; 56.1% F= K?< G8K@EKJ N<1< D8C<. ' FJK G8K@EKJ (70.7%) N<1< ; @>EFJ<; N@? 8; M8E:< ; : 8E:<I (31.1% JK8>> ##, 39.6% JK8>> #0). . ?< =I<HL<EKCP ; @>EFJ<; D8C@E8EK E<FGC8JDJ N<1< : F@I<: K8C : 8E:<I (26.6%), >8JKI@ : 8E:<I (19.1%), CLE> : 8E:<I (17.7%) 8E; 9I<8JK : 8E:<I (9.6%). . ?< <M<CJ F= A' C, " ! -/1 , CC, 8E; 8C9LD@E @E D8CEFLI@J?<; G8K@EKJ N<1< J@E@8E 8EKCP I<; L: <; ; ?@< K?< 30-; 8P DFIK8C@P I8K< N8J @E: I<8J<; . LIK?<IDFI<, K?< DFJK =I<HL<EK ELKI@FE @D8G: K JPDGKFDJ N<1< @FJJ F= 8GG<K@< (20.8%), G8@E (13.4%), J8K@KP (11.9%) 8E; E8LJ<8 (9.7%) (JLGGC<D<EK8IP K89C< 1).

3.2. The association of nutritional status with the patient prognosis

. ?< G8K@EKJ ELKI@FE8C JK8KLJ N8J I<KIFJG<; K@M<CP 8JJ<JJ<; N@? K?< ! &# ' : I@<I@8. 70.3% (E = 2495) F= K?< G8K@EKJ N<1< ; @>EFJ<; N@? D8CELKI@FE, 8DFE> N?FD, 41.3% N<1< DF; <18K< (E = 1464) 8E; 29.1% N<1< J<M<1< (E = 1031). %8GC8E ' <@I : LIM<J N<1< G<I<FID<; KF J?FN K?< 8JJF: @K@FE 9<KN<<E K?< ! &# ' 8E; JLIM@M8C. *8K@EKJ @E K?< D8CELKI@FE >IFLG ?8; GFFI<I) - : FDG8I<; KF K?FJ< @E K?< EFID8CCP EFLI@J?<; >IFLG (@. 2A). ' FI<FM<I, J<M<1@P F= D8CELKI@FE N8J 8J- JF: @K<; N@?) - (@. 2B). CFO DF; <CJ : FE\ID<; K?8K 8E @E: I<8J@E>

I@JB F= DFIK8C@P N8J J@E@8E 8EKCP 8JJF: @K<; N@? D8CELKI@FE 9P ! &# ' : I@<I@8. A<K<I DL@M8I@89C< 8; ALJKD<EK 9P : FE=FLE; @E> M8I@89C<J, J<M<1< D8CELKI@FE I<D8@E<; 8E @E; <G<E; <EK GIF>EFJ@E =8: KFI. . ?< G8K@EKJ N@? J<M<1< (JK8>> #) D8CELKI@FE ?8; 8 1.28 (95% C#, 1.04 KF 1.59) <C<M8K<; I@JB F= ; <8K? : FDG8I<; KF K?FJ< EFID8CCP EFLI@J?<; (JLGGC<D<EK8IP K89C< 2).

3.3. The most important predictors of GLIM criteria for survival prediction

1 ?<K?<I K?< DFIK8C@P I@JB KI<E; F= <8: ? @E; @: 8KFI @E K?< ! &# ' : I@ K<1@8 N8J : FEJ@K<EK? ' L@M8I@89C< 8E8CP@J I<M<8C<; K?8K LE@EK<EK@FE8C N<1< @?K @FJJ N8J K?< DFJK ; <K<ID@E@E> =8: KFI 8: K@E> LGFE DFIK8C@P (" , 1.82, 95% C#: 1.64 KF 2.10 =FI JK8>> # 8E; " , 1.50, 95% C#: 1.31 KF 1.73 =FI JK8>> #). . ?< GI<J<E< F= 8 I<; L: <; B' # J?FN<; 8 DL: ?<JJ GIF- EFLE<; <=<: K FE K?< @E: I<8J@E> I@JB F= ; <8K? (" , 1.36, 95% C#: 1.18 KF 1.55 =FI JK8>> #). , <; L: <; DLJ: C< D8JJ (" , 1.53, 95% C#: 1.17 KF 1.96 =FI JK8>> # 8E; " , 1.21, 95% C#: 1.11 KF 1.43 =FI JK8>> #) 8E; I<; L: <; =FF; @EK8B< FI 8JJ@D@8K@FE (" , 1.58, 95% C#: 1.38 KF 1.82) J?FN<; 8 DF; <18K< @D8G: K FE JLIM@M8C (. 89C< 3).

3.4. Development and validation of a nomograms to quantify the GLIM criteria

A EFDF>I8D N8J : FEJKIL: K<; 9P =FLI =8: KFIJ F= ! &# ' KF HL8E@P K?< ! &# ' : I@<I@8 (@. 3A). E8: ? JL9KPG< N@?@E K?<J< M8I@89C<J N8J 8J- J@E<; 8 J:FI< FE K?< GF@EK J: 8C<. A - : FI<; -! &# ' KF ; <K<ID@E< K?< <JK@D8K<; GIF989@@P F= JLIM@M8C 8K<8: ? K@D< GF@EK N8J <8J@P >FK 9P 8; ; @E> K?< KFK8C J:FI< 8E; CF: 8K@E> @ FE K?< KFK8C GF@EK J: 8C<. . ?< C<E< <0 =FI) - GI<; @: K@FE N8J 0.62 (95% C#: 0.61 KF 0.64). LIK?<IDFI<, K?< DF; <C P@C<; <; 8E A/C F= 65.3 8E; 65.5 =FI GI<; @: K@FE F= DFIK8C@P 8K 1-, 8E; 3- P<81 (@. 3D). . ?< : 8C@9I8K@FE : LIM<J I<M<8C<; ?@? 8>I<<D<EK 9<- KN<<E GI<; @: K<; GIF989@@P 8E; 8: KL8C F9J<IM<; JLIM@M8C @E 1 8E; 3 P<8IJ (@. 3B 8E; C). #E K?< M8C@8K@FE : F?FIK, K?< EFDF>I8D ?8; 8 C<E< <0 F= 0.56 (95% C#: 0.52 KF 0.63) =FI GI<; @: K@E>) - @E G8K@EKJ N@? : 8E:<I. . ?< EFDF>I8D 8: : LI8K<CP GI<; @: K<; K?< FM<I8CC JLIM@M8C GIF989@@P, 8E; K?< 1-P<81 8E; 3-P<81 A/C M8CL<J N<1< <63.8 8E; 56.6, I<JG<; K@M<CP. @E8CCP, K?< : 8C@9I8K@FE : LIM<J J?FN<; K?8K K?< GI<; @: K<; JLIM@M8C GIF989@@P : CFJ<CP : FII<JGFE; <; KF K?< 8: KL8C JLIM@M8C GIF989@@P (JLGGC<D<E- K8IP @. 1).

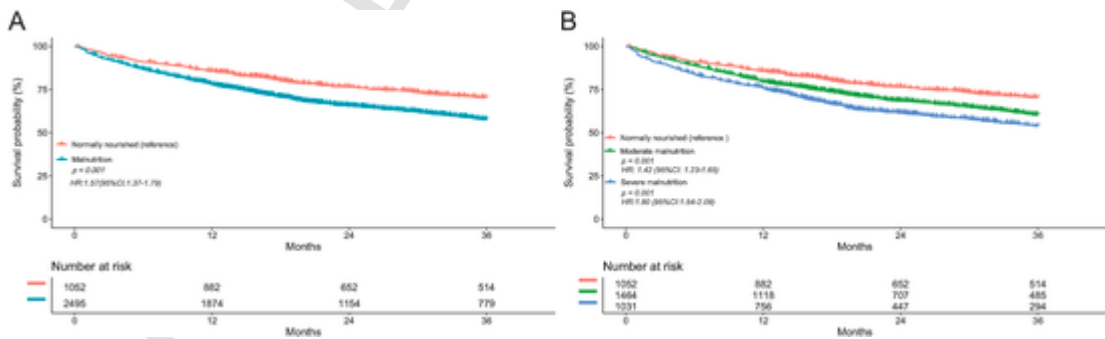
3.5. Clinical application of the Scored-GLIM system

. ?< 8: : LI8: P F= K?< J:FI<; -! &# ' JPJK<D N8J LJ<; KF : FDG8I< N@? K?< : @8J@E J:FI<; *! --! A JPJK<D 8E; : FEM<EK@FE8C ! &# ' JPJK<D @E K?< GI@D8IP : F?FIK. . ?< : -@E; <0 F= J:FI<; -! &# ' (0.62) N8J J@D@8I KF K?8K F= K?< J:FI<; *! --! A JPJK<D (0.63), 9LK N8J J@E@8E 8EKCP ?@?<I K?8E K?8K F= : FEM<EK@FE8C ! &# ' (0.57). #E 8; ; @@FE, K?< A/CJ F= K?< EFDF- >I8D =FI GI<; @: K@E> K?< 1- 8E; 3-P<81 FM<I8CC JLIM@M8C I8K<J <0?@@<; J@D@8I JLIM@M8C GI<; @: K@M< 89@@P N@? K?8K F= K?< J:FI<; *! --! A JPJ- K<D, 9LK N8J J@E@8E 8EKCP ?@?<I K?8E K?8K F= K?< : FEM<EK@FE8C ! &# ' JPJK<D (@. 4A). . ?< : FII<C8K@FE 9<KN<<E J:FI<; -! &# ' 8E; J:FI<; *! --! A N8J DF; - <18K< 9<KN<<E D8C< (I = 0.7 G < 0.001) 8E; =<D8C< (I = 0.72 G < 0.001) (@. 4B). . ?< FGK@D8C : LKF^J F= K?< J:FI<; -! &# ' N<1< 2.7 7 =FI D@; D8CELKI@FE, 8.6 12.8 =FI DF; <18K< D8CELKI@FE, 8E; 13.8 26.8 =FI J<M<1< D8CELKI@FE

D<K8<; 98J<0#E< :?818:K<1#J#E J F= K?< JKL; P GFGL8K#FE.

C?818:K<1#J#E J	! &# ¹ ; #>EFJ#J	*1#D81P : F?FIK 9P ! &# ¹ ; #>EFJ#J E = 3547			080# 8K#FE : F?FIK 9P ! &# ¹ ; #>EFJ#J E = 415		
(FID80CP EFLI#J?<; E = 1052	' 8CELKI#E#FE	' F; <18K< E = 1464	--M<1< E = 1031	(FID80CP EFLI#J?<; E = 69	' 8CELKI#E#FE	' F; <18K< E = 195	--M<1< E = 151
! <E<180 #E=FID8K#FE							
30 ; 8PJ DFIK80#P, E, (%)	14 (1.3)	20 (1.3)	43 (4.1)	2 (2.8)	4 (2.0)	10 (6.6)	
A><, P<81J, D<8E (-D)	57.9 (11.5)	59.4 (12.7)	59.9 (12.8)	59.8 (10.8)	58.06 (13.7)	59.7 (13.8)	
-<0, D8<, E (%)	509 (48.3)	851 (58.1)	629 (61.0)	45 (65.2)	118 (60.5)	73 (48.3)	
C?1FE# ; #<8J< ?#JKFIP, E (%)							
0	634 (60.3)	938 (64.1)	641 (62.2)	49 (71.0)	159 (81.5)	108 (71.5)	
1	268 (25.5)	364 (24.9)	269 (26.1)	15 (21.7)	30 (15.4)	38 (25.2)	
2	105 (10.0)	117 (8.0)	85 (8.2)	3 (4.3)	5 (2.6)	2 (1.3)	
3	45 (4.3)	45 (3.1)	36 (3.5)	2 (2.9)	1 (0.5)	3 (2.0)	
-DFB#E>, P<J, E (%)	400 (38.0)	660 (45.1)	471 (45.7)	30 (43.5)	92 (47.2)	61 (40.4)	
DI#EB#E>, P<J, E (%)	212 (20.2)	308 (21.0)	211 (20.5)	17 (24.6)	41 (21.0)	27 (17.9)	
* (, P<J, E (%)	263 (25.0)	429 (29.3)	374 (36.3)	11 (15.9)	54 (27.7)	46 (30.5)	
E (, P<J, E (%)	321 (30.5)	515 (35.2)	393 (38.1)	16 (23.2)	59 (30.3)	55 (36.4)	
-LI><IP, P<J, E (%)	805 (76.5)	1053 (71.9)	724 (70.2)	38 (55.1)	53 (27.2)	47 (31.1)	
, 8; #K#E, P<J, E (%)	128 (12.2)	212 (14.5)	152 (14.7)	11 (15.9)	63 (32.3)	39 (25.8)	
C?<DFK?<18GP, P<J, E (%)	552 (52.5)	824 (56.3)	575 (55.8)	20 (29.0)	120 (61.5)	87 (57.6)	
-K8><J, E (%)							
#	168 (16.0)	133 (9.1)	68 (6.6)	6 (8.7)	15 (7.7)	3 (2.0)	
##	222 (21.1)	276 (18.9)	172 (16.7)	15 (21.7)	48 (24.6)	31 (20.5)	
###	327 (31.1)	477 (32.6)	299 (29.0)	19 (27.5)	59 (30.3)	44 (29.1)	
#0	335 (31.8)	578 (39.5)	492 (47.7)	29 (42.0)	73 (37.4)	73 (48.3)	
(LKI#E#E 1<08K<; #E=FID8K#FE							
B ¹ #, B>/D ² , D<8E (-D)	23.7 (2.9)	21.2 (3.3)	20.1 (3.4)	23.0 (3.0)	19.3 (2.9)	18.4 (3.2)	
A ¹ C, : D, D<8E (-D)	22.1 (4.2)	20.5 (2.7)	18.8 (3.5)	23.9 (3.14)	21.54 (1.6)	17.8 (3.9)	
" ! -/1, (%)	44.1 (17.3)	43.6 (18.7)	38.3 (21.4)	54.1 (20.3)	47.4 (20.2)	37.6 (21.2)	
CC, : D, D<8E (-D)	34.4 (2.7)	32.1 (3.0)	29.8 (4.3)	34.1 (2.5)	31.2 (2.8)	28.1 (5.0)	
A#9LD#E, >/&, D<8E (-D)	38.8 (7.21)	37.5 (13.85)	35.8 (11.9)	37.49 (5.14)	38.40 (6.55)	35.35 (5.7)	
(<LXIFG?#J, 10 ⁹ /&, D<8E (-D)	4.8 (5.4)	5.3 (7.2)	5.8 (6.9)	4.6 (3.2)	4.7 (4.4)	5.6 (4.4)	
&PDG?F: PK<, 10 ⁹ /&, D<8E (-D)	1.8 (5.5)	1.5 (1.3)	1.7 (5.1)	1.90 (1.8)	1.61 (2.53)	1.3 (1.4)	

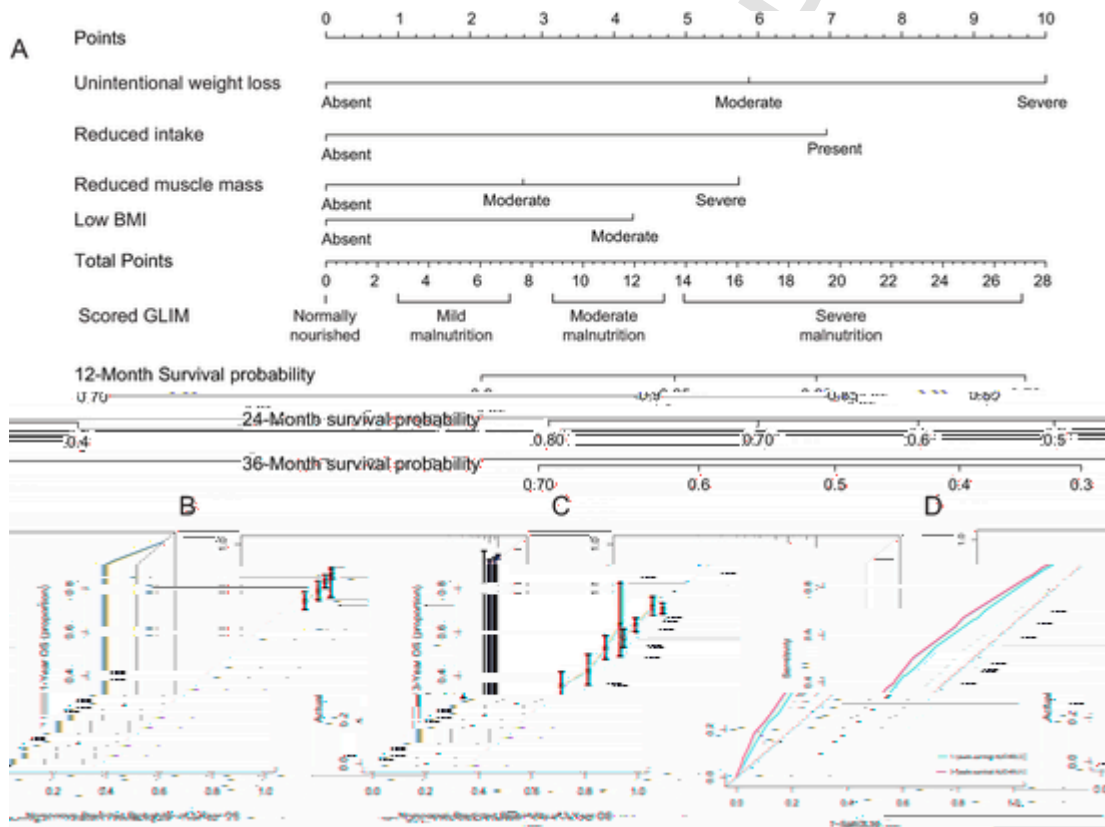
B¹ #: 9F; P D8J #E: <0, A¹ C: 81D DLJ: <: #L: LD><1E: <, " ! -/1 : 9F; P N#<?K JK8E; 81; #Q<: ?8E: >1#G, CC: : 8#<: #L: LD><1E: <, * (: G81<EK<180 ELKI#E#FE, E (: <EK<180 ELKI#E#FE. C?1FE# ; #<8J< ?#JKFIP 0 4 1<GI<J<EK K?< ELD9<1(J) F= : FDF19# ; #<8J<(J) 1<GFIK<: 9P K?< G8K#EK (#E: L; #E> : ?1FE# : ?<G8K#E#F 1 : #L?FJ#J ; #89<K<J ; F1FE81P ?<8IK ; #<8J< ; ?PG<1K<EJ#FE 8E; FK?<1J).



%8G8E ' <#<1 : LIM< JK18K#E<: 9P K?< ! &#¹ : 1#<1#8 (A). %8G8E ' <#<1 : LIM< JK18K#E<: 9P K?< ! &#¹ J<M<1#K P >18; < (B).8; ALJK<; " ; : 8; ALJK<; 9P 8><, C?<DFK?<18GP, KLDFI JK8><, G1#D81P KLDFI J#K<, A#9LD#E, (#, . (& ; <E<LXIFG?#K#F #PDG?F: PK< 18K#FE.

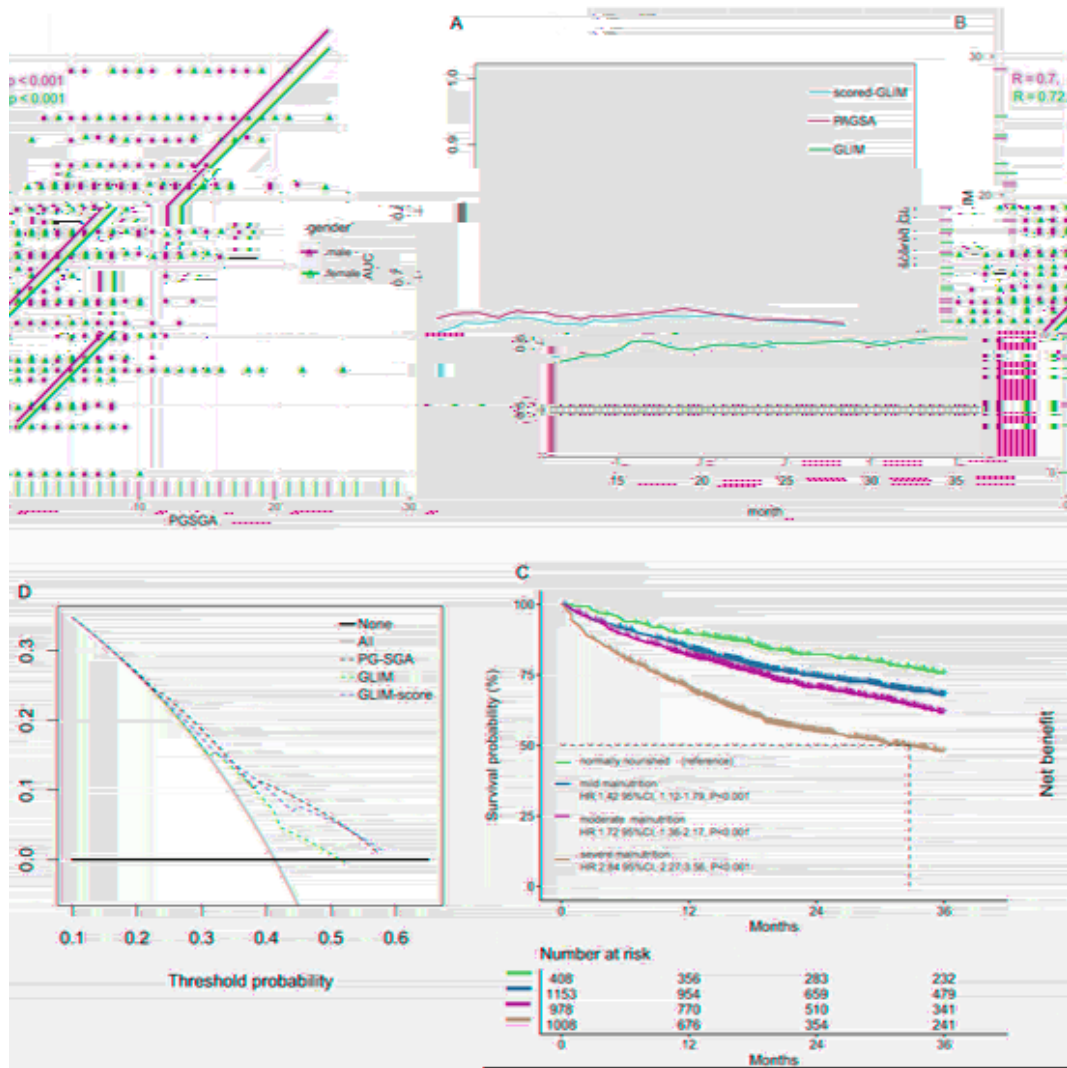
LEEK@EK@FE8C N@?K CFJJ

! &# : I@<I@B	/E@M8I@B9C< 8E8CP@J	95% C#	* M8CL<	' L@M8I@B9C< 8E8CP@J	95% C#	* M8CL<
LEEK@EK@FE8C N@?K CFJJ						
A9J<EK	, <<<I<E:<			, <<<I<E:<		
-K8><#	1.54	1.35 1.75	<0.001	1.50	1.31 1.73	<0.001
-K8><##	1.88	1.61 2.19	<0.001	1.82	1.64 2.10	<0.001
, <; L:< DLJ:<						
A9J<EK	, <<<I<E:<			, <<<I<E:<		
-K8><#	1.30	1.16 1.46	<0.001	1.21	1.11 1.43	<0.001
-K8><##	1.87	1.44 2.44	<0.001	1.53	1.17 1.96	<0.001
&FN B' #						
A9J<EK	, <<<I<E:<			, <<<I<E:<		
-K8><#	1.56	1.38 1.76	<0.001	1.36	1.18 1.55	<0.001
, <; L:< @EK8B<						
A9J<EK	, <<<I<E:<			, <<<I<E:<		
*I<J<EK	1.63	1.43 1.86	<0.001	1.58	1.38 1.82	<0.001



EFDF>I8D LJ<; KF HL8EK@<K?< ! &# (A). @JK, CF: 8K< K?< <8: ? ! &# : I@<I@B J@< FE K?< 80@J, K?<E ; I8N 8 0@E< JK18@?K LGN8I; KF K?< *F@EKJ 80@J KF ; <K<I D@E< ?FN D8EP GF@EKJ K?< G8K@EK I<; <@M<J =F I K?< M8I@B9C<. A ; K?< GF@EKJ =F I <8: ? F = K?<J< GI<; @ 8KFJ K F><K?<I 8E ; CF: 8K< K?< JLD FE K?< . FK8C *F@EKJ 80@J KF ><K K?< J; F I<; ! &# . F I <08DGC<, 8 : 8E : <I G8K@EK, N@K? LE@EK@EK@FE8C N@?K CFJJ (> 10% N@K?@E K?< G8JK 6 DF@EKJ) 8E ; I<; L:<; @EK8B<, 9LK N@K? EFID8C DLJ:< D8JJ 8E ; B' #, N@C 9< >@M<E 10 GF@EKJ =F I J<M<I< LE@EK@EK@FE8C N@?K CFJJ, 7 GF@EKJ =F I I<; L:<; @EK8B<, 8E ; 0 GF@EKJ =F I EFID8C B' # 8J N<@ 8J DLJ:< D8JJ . -F, K?< KFK8C GF@EKJ F = K?<@J G8K@EK N8J 17, JL>><J K@E> 8 J<M<I< D8CELK1@@FE 8 : F I ; @E> KF J; F I<; ! &# . C8C@9I8K@FE : LIM<J =F I GI@D8IP : F?FIK =F I K?< EFDF>I8D GI<; @ K@FEJ F = K?< 1-(B)8E ; 3-(C) P<8I FM<I8C JLIMM8C (D)A I<8 LE ; <I K?< ,) C : LIM<J (A/C) =F I GI<; @ K@E> K?< FM<I8C JLIMM8C 8K 1, 8E ; 3 P<8I @E K?< GI@D8IP : F?FIK .) C : I<; <@M<I FG<I8KFI : ?8I8: K<I@J@E . A/C: 8I<8 LE ; <I : LIM< .

(-LGGC<D<EK8IP @. 2). .?< J<M<I@P F = D8CELK1@@FE 98J<; FE J: F I<; ! &# J?FN<; ; @J@E: K GIF>EFJ<J (. 89C< 4) 8E ; K?< JLIMM8C : LIM< N8J J?FNE @E @. 4C. A<K<I DL@M8I@B9C< 8 ; ALJKD<EK F = : @E@ : 8C M8I@B9C<J 8E ; J<M<I8C J<ILD D8IB<IJ, J<M<I< D8CELK1@@FE I<D8E<; 8E @E ; <G<E ; <EK GIF>EFJK@E : 8: KFI =F I) - @E G8K@EKJ N@K? : 8E : <I (-LGGC<D<EK8IP . 89C< 3). 1 ?<E JK18K@<; 9P KLDFI KPG<, K?< J<M<I< D8CELK1@@FE N8J JK@C 8J-JF: @K<; N@K? NFJ<) - @E G8K@EKJ N@K? I<JG@I8KFIP JPJK<D KLDFIJ, ; @<JK@M< JPJK<D KLDFIJ 8E ; FK?<I KLDFIJ (JLGGC<D<EK8IP @. 3). ' L@M8I@B9C< 8E8CP@J @E ; @ 8K<; K?<8K K?< J<M<I< D8CELK1@@FE D8EK8@E<; 8E @E ; <G<E ; <EK GIF>EFJK@E : 8: KFI F =) =F I G8K@EKJ N@K? : 8E : <I N@K? ; @<I<EK KLDFI KPG<J



(A) Heatmap of gene expression data with p-values < 0.001. (B) Kaplan-Meier survival plot comparing scored-GLIM (blue), PRISGA (red), and GLIM (green) scores, with R=0.71 and R=0.72. (C) Net Benefit plot showing survival probability (%) over 36 months for different malnutrition levels: normally nourished (reference), mild malnutrition (HR 1.42, 95% CI 1.12-1.79, P=0.001), moderate malnutrition (HR 1.72, 95% CI 1.36-2.17, P=0.001), and severe malnutrition (HR 2.84, 95% CI 2.27-3.56, P<0.001). (D) ROC curve showing the performance of the GLIM score compared to other methods (None, All, PG-SGA, GLIM) across different threshold probabilities.

Table 1: Comparison of survival outcomes between different malnutrition levels.

Malnutrition Level	HR	95% CI	P-value	DF	DF	95% CI	P-value	DF
normally nourished - reference	1.00	-	-	< 1	< 2	-	-	-
mild malnutrition	1.42	1.12-1.79	0.001	1.21	1.27	1.01-1.60	0.043	1.21
moderate malnutrition	1.72	1.36-2.17	< 0.001	1.39	1.33	1.06-1.68	0.015	1.39
severe malnutrition	2.84	2.27-3.56	< 0.001	2.00	1.83	1.46-2.30	< 0.001	2.00

HR: Hazard Ratio; CI: Confidence Interval; P: P-value; DF: Degrees of Freedom.

(JLGGC<D<EK81P K89C< 4). 1 ?<E JK18K@<; 9P . (' JK8><, K?< J: F1<; ! &# ' JPJK<D : FLK; 8C0FN =F1 @<, <EK@<; 8K@FE F= 8 G8K@EK N@K? ?@? DFI-K8C@P I@JB <M<E @E JG@K< F= K?< J8D< A\$CC . (' JK8>< F= : 8E: <I (JLGGC<-D<EK81P @. 4).

. ?< DCAJ =F1 K?< -: F1<; -! &# ' JPJK<D, J: F1<; *! --! A JPJK<D, 8E; K?< : FEM<EK@FE8C ! &# ' JPJK<D N<I< GI<J<EK<; @E @. 4D. . ?< ; <: @ J@FE : LIM< J?FN<; K?8K K?< J: F1< ! &# ' JPJK<D ?8; 9<KK<I 9<E<N<J : FD-G8I<; N@K? K?< DF; <C F= K?< : FEM<EK@FE8C ! &# ' JPJK<D (K?< GIF9-89@@P K?I<J?FC; @J 16% FI

?><1). #E 8; ;<FE, K?< -:F1<; -! &# ' JPJK<D ?8; J@D@8I 18E>> F=
K?1<J?FC; GIF989@<P (9<KN<<E 22% 8E; 58%) 8E; E<K 9<E<N\J N@?
J:F1<; *! --! A JPJK<D.

#K J?FLC; 9< EFK<; K?8K K?< D8CELK1@FE, 1<>8I; C:JJ F= K?< :1@<1@8
LJ<; KF ;<N<E @, @ N<C@ BEFNE KF 9< @E; <G<E; <EKCP 8JJF: @BK<; N@?
DFI9@< @<J 8E; DFIK8@<P 519,206, <JG<: @CCP =FI G8@<EKJ N@? :8E:<1.
CFE; L:K@> ELK1@FE8C 8JJ<JJD<EKJ GI@FI KF @<@<@<@> :8E:<1 KI<8KD<EK
@<DG<18@<M< EF D8KK<1 N?8K J8>> K?< :8E:<1 @, K?< 8@D @<J EFK FECP KF
GI<; @<K K?< JLI@M@8C 9LK DFI< @DGFIK8EK CP @DGIFM<K?< GIF>EFJ@. . ?<
! CF98C <8<; <1J?@G #E@<@<M< FE ' 8CELK1@FE (! &# ') ?8J 1<; <EKCP 9<<E
C8LE: ?<; 5106, 9LK @< JK@< E<<; J M8@< 8K@FE JKL; @<J @E JG<: @: G8@<EK
GFGLC8K@FEJ. /J@> K?< # (-C) C :F?FIK, N< <M8CL8K<; K?< <=:8: P F= K?<
! &# ' =FI ; @>EFJ@> D8CELK1@FE, 8E; =FLE; K?8K K?< ! &# ' :FLC; <=:>
: @<EKCP 8JJ<JJ GFFI ELK1@FE JK8KLJ N?@? N8J 8E @E; <G<E; <EK 1@B =8: KFI
=FI JLI@M@8C. . ?< GI<M8C<E: < F= D8CELK1@FE N8J 70.3% N?@? N8J J@D
@8I N@? GI<M@FLJP GL9@<?<; JKL; P 5216. #E 8; ; <FE, K?< -:F1<; -! &# '
JPJK<D J?FN<; 9<KK<1 G<1=FID8E: < @E @< EK@P@> 8 G8@<EK N@? ?@?
DFIK8@<P 1@B =IFD G8@<EKJ N@? K?< J8D< JK8>> F=:8E:<1 N?@? N8J
: @E@ 8CCP LJ<=LC.

. ?< ! &# ' =18D<NFIB :FEJ@<K; F= 8CC B<P ELK1@FE8C :1@<1@8 @E-
=FID8@FE 1<=<1E<; =IFD K?< DFJK GFGLC8I 8JJ<JJD<EK KFFG JL: ? 8J
*! --! A, -! A FI J:1<E@> KFFGJ @<B (, --2002, ' /-. 8E; FK?<1J
519,22,236. /E@<EK@FE8C N<@>?K CFJJ N8J 8E @DGFIK8EK ?<EFKPG@: :1@
K<1@FE K?8K DLJK 9< :FEJ@< <1<; N?<E :81P@> FLK K?< ELK1@FE8C JK8KLJ
8JJ<JJD<EK F= G8@<EKJ N@? :8E:<1 5246. #E =8:K, 8DFE> G8@<EKJ N@?
:8E:<1, N<@>?K CFJJ N8J K?< N\JK M@<@<@< F1 J<EJ@<@< J@>E, N@? 40% F=
K?< G8@<EKJ 1<GF1@> >K?8K K?<P ?8; CFJK >10% F= K?<@< LJL8C N<@>?K
N?<E N\JK ; @>EFJ<; 526. . ?< :1@<1@FE F= LE@EK<EK@FE8C N<@>?K CFJJ N8J
D<K 9P 37.9% F= FLI :F?FIK. ' F1<FM<1, LE@EK<EK@FE8C N<@>?K CFJJ :FE-
KI@<LK<; K?< 9@>>JK 1@B F= DFIK8@<P @E FLI :F?FIK 8<K1 K?< K?1<< P<81J
=FC@FN<LG. A 1<; L:<; DLJ: C< D8JJ N8J 8E@F?<1 G818D<K<1 F= K?< ! &# '
G?<EFKPG@: :1@<1@8, N?@? N8J 8JJ<JJ<; M@8 DLJ: C< HL8EK@<P 8E; DLJ:
C< =LE: K@FE LJ@> K?< A' C, CC 8E; " ! /1 512,256. . ?< ! &# ' :FE-
J<EJLJ :FEJ@< <1<; K?<J< @<D9 :@< LD=<1E<: < 8C@<1E8@<M< D<8JLJ<J =FI 8
9F; P :FDGJF@<FE 8E8CP@<J, @E JG@< F= K?<@< @<D@<@<@<EJ, 8E; K?< =8: K
K?8K K?<P N<1< EFK >F<; J8E; 8I; D<K?F; J =FI DLJ: C< D8JJ <JK@D8K@FE
510,266.) =EFK<, N?<E -K8>>## D8CELK1@FE ;<N<E; 9P ! &# ' N8J :FD-
G81<; N@? J<M<1< D8CELK1@FE ;<K<1D@<E; 9P J: F1<; *! --! A (J: F1< 9),
K?<1< N8J 8 CFJJ F= 8>1<<D<EK, ! &# ' ;<N<E; J<M<1< D8CELK1@FE N8J
EFK <HL@M8C<EKCP ; @>EFJ<; 9P *! --! A, JL>><JK@> K?8K K?< ! &# ' @<E-
K@P 8 DFI< J<M<1< =FID F= D8CELK1@FE K?8E K?< *! --! A (<LGGC<D<E-
K81P K89C< 5). . ?< B' # N8J 8CJF GIFM<E KF 9< 8E @E; <G<E; <EK GI<; @<KFI
F= JLI@M@8C @E G8@<EKJ N@? :8E:<1 5276. (<M<1K?<C<JJ, 8 CFN B' # ?8; 8
@<D@<: :8G8: @<P KF ;<K<1D@<E ELK1@FE JK8KLJ 5286.) M<1N<@>?K FI F9<-
J@<P N<1< F<K<E F9J<IM<; @E G8@<EKJ N@? :8E:<1, <M<E N@?]L@: 8: :L-
DL@<@<FE, N?@? :8E D8JB N<@>?K CFJJ 8E; >@< 8 =8CJ< ?@? B' # 5136. #E
K?< GI<J<EK JKL; P, FECP 23.96% F= JL9A<: KJ N<1< 9<CFN K?< <JK89@<?<;
B' # : LKF ^ GF@EK. D@>><1<EK JPDGKFDJ K?8K :FEJ@<L<K<; 9811@<1J KF ; @<K81P
@EK8B< :FLC; 9< 8JJ<JJ<; 8E; HL8E@<@<: 8J JPDGKFDJ K?8K @DG8:8K;
ELK1@FE 5296. *IFG<1 D8E8>>D<EK 8E; @<EK@<: 8K@FE F= ELK1@FE @D-
G8: K JPDGKFDJ N<1< <EK18C G81K F= K?< ELK1@FE8C 8JJ<JJD<EK 530,316.
. ?< 8DFLEK F= ELK1@FE8C @EK8B< 8E; ELK1@FE @DG8: K JPDGKFDJ J?FLC;
9< :FEJ@< <1<; N?<E ; @>EFJ@> 1<; L:< @EK8B< =FI ! &# ' <@<CF>@: :1@
K<1@8. #E K?@< JKL; P, N< =FLE; K?8K G8@<EKJ N@? D8CELK1@FE <OG<1@
<E<; DFI< JPDGKFDJ K?8K @DG8:K<; ELK1@FE K?8E G8@<EKJ N@? FLK

D8CELK1@FE, N?@? K?< DFJK :FDDFEJ JPDGKFDJ N<1< CFJJ F= 8GG<K@<
(20.8%), G8@< (13.4%), J8@<KP (11.9%) 8E; E8LJ<8 (9.7%). CFEJ@< <1@>
K?< =8: K K?8K 8CC G81K@< G8EKJ @E K?< :L11<EK JKL; P N<1< JL=<1@> =IFD
E<FG@JJDJ, N<; @< EFK LJ< K?< J<M<1<; @<8J< 8J FE< F= K?< ! &# ' <@<F-
CF>@: :1@<1@8.

*1<M@FLJ JKL; @<J ?8; 1<GF1K<; K?8K ; @<=<1<EK :FD9@E8K@FEJ F= ! &# '
N<1< EFK :FEJ@<K<EK N@? K?< -! A =FI D8CELK1@FE ; @>EFJ@< 5326. -@D@
C8I 1<JL@< N8J 8CJF =FLE; @E K?< :L11<EK JKL; P. 1 ?<E LJ@> 8CC :FD9@E8-
K@FEJ F= K?< KNF ! &# ' :1@<1@8, 70.34% F= G8@<EKJ N<1< ; @>EFJ<; N@?
DF; <18K</J<M<1< D8CELK1@FE, N?<1<8J *! --! A @<EK@<@<; 83.76% F=
G8@<EKJ KF 9< DF; <18K</J<M<1< D8CELK1@FE. A<K<1 HL8EK@<@< K?< ! &# '
LJ@> 8 EFD F>18D, J: F1<; ! &# ' J?FN<; 8 ?@? :FEJ@<K<E: P N@? J: F1<;
*! --! A, 8E; :FLC; 1<E=F1< <K?< GI<; @<K@< M8CL< F= K?< ! &# ' , 8J J: F1<;
! &# ' :FLC; <M<E ; @<K@>L@>? K?< GIF>EFJ@< F= G8@<EKJ N@? D@<; D8CEL-
K1@FE (-LGGC<D<EK81P K89C< 6). . ?<1<=F1<, K?@< 1<JL@< @E; @<8K<; K?8K
LJ@> K?< -:F1<; -! &# ' KF ;<N<E 8E; >18; < D8CELK1@FE, 8J 8 :FDGI<-
?<EJ@< @E; <0, D@>?K 9< DFI< M8CL89C< =FI GIF>EFJ@< GI<; @<K@FE K?8E
LJ@> K?< ! &# ' :1@<1@8.

. ?< D8@E @D@<@<@< F= FLI JKL; P @< K?8K 8CC @E: CL; <; @E; @<@< L8CJ N<1<
G8@<EKJ N@? :8E:<1, 8E; K?<J< G8@<EKJ 8LKF@D8K; 8CCP D<@<K K?< <@<CF>P
:1@<1@FE F= K?< ! &# ' :1@<1@8. . ?<1<=F1<, FK?<1 G818D<K<1J, JL: ? 8J @E-
]8DD8K@<P D81B<1J (K?< C<1<8: K@<M< GIFK<@<E) 8E; FK?<1 :?1FE@<; @<8J<
9L1; <E N<1< EFK @E: CL; <; @E K?< J: F1<; ! &# ' . ?@< D8P ?8M< 1<JL@<K<;
@E K?< 1<C8@<@<CP CFN<1 <=:>@E: P F= K?< ! &# ' :FDG81<; KF K?< *--! A.
#E 8; ; <FE, K?@< N8J 8 1<K1FJG<; K@<M< 8E8CP@<J, K?< ; 8K8 :F@<: K@FE N8J
EFK ;<J@>E<; KF M8@< 8K< K?< ! &# ' :1@<1@8. . ?< 8JJ<JJD<EK F= LE@EK<E-
K@FE8C N<@>?K CFJJ 8E; =FF; @EK8B< N8J 8JJ<JJ<; M@8 J<C<1<GF1@>E>, 8E;
?@< D8P ?8M< @E] L<E<; K?< @EK<1E8C M8@<@< @P F= FLI JKL; P. . ?< JK1<E>K?
@E FLI JKL; P @< K?8K @< N8J 8 DL@<@< <EK<1 JKL; P K?8K :FLC; 1<; L:< M81@<
K@FE @E 9<KN<<E>?FJG@<8C :8LJ<J F= 8; D@<J@FE 8E; @E=?FJG@<8C KI<8KD<EK.
AJ JK1<E>K?J, @< J?FLC; 9< EFK<; K?8K K?@< @< 8 DL@<@< <EK<1 JKL; P 89C< KF
1<; L:< M81@<@<@< @E 9<KN<<E>?FJG@<8C :8LJ<J F= 8; D@<J@FE 8E; @E=?FJG@<8C
KI<8KD<EK.

#E :FE: CLJ@FE, FLI JKL; P GIFM@< <J <M@< <E: < K?8K -:F1<; -! &# ' JPJ-
K<D @E 8E <=:> @EK D<K?F; KF @< EK@P JLI@M@8C<1<C8K<; D8CELK1@FE @E
G8@<EKJ N@? :8E:<1. . ?< GI<J<EK JKL; P ; <DFEJK18K<J K?8K J: F1<; -! &# '
JPJK<D @< :8G89C< F= GIFG<1CP @< EK@P@> 8 G8@<EK N@? ?@? DFIK8@<P
1@B =IFD G8@<EKJ N@? K?< J8D< JK8>> F=:8E:<1, N?@? D8P C<8; KF 8
9<KK<1 @E; @<@< L8@<@<; KI<8KD<EK , 8E; D8P 91@> 9<KK<1 JLI@M@8C 9<E<-
N\J. C8E:<1 JK8>>E> JL: ? 8J K?< A\$CC . (' :@JJ@<: 8K@FE 8CFE< @< EFK
GFN<1<L@< <EFL>? KF ;<J@>E K?< 9<JK KI<8KD<EK GC8E 8E; K?<1<=F1< K?<
ELK1@FE8C 8JJ<JJD<EK ;<; @<8K<; KF 8 G8@<EK N@? :8E:<1 @< DG<18@<M<.
A; ; @FE8CCP, J: F1<; ! &# ' J?FN<; 8 J@D@8I : @E@< 8C E<K 9<E<N\K :FD-
G81<; N@? K?< J: F1<; *! --! A, N?@? @< K?< FECP 8JJ<JJD<EK KFFC K?8K
N8J JG<: @<@<8CCP ; <M<CFG<; 8E; M8@< 8K<; =FI K?< :8E:<1 G8@<EK GFGLC8-
K@FE. . F>>K?<1 N@? @<J F9M@FLJ K@D< J8M@> 8E; @E<OG<EJ@<M< 8; M8EK8>>J,
K?<J< N\E; @>J JLGGFIK K?< LJ< F= J: F1<; ! &# ' @E : @E@< 8C G18: K@< =FI G8-
K@<EKJ N@? :8E:<1.

. ?@< NFIB N8J JLGGFIK<; 9P K?< (8K@FE8C %<P , <J<81: ? 8E; D<M<CFG-
D<EK *IF>18D KF DI. " 8EG@>E -?@((F. 20173 C1309200).

AGGIFM<; GL9@< KI@<CJ 1<>@<K1@<J: ?KKG://NNN.:?@.KI.FI>.:E/
J?FNGIFA.8JG0?GIFA=31813 (C?@C. , 1800020329)

ACC ; 8K8 E<< ; < ; KF <M8CL8K?K?< : FE:CLJ@FEJ @E K?< G8G<I 8I< GI<J<EK @E K?< G8G<I 8E; /FI K?< -LGG<D<EK8IP ' 8K<I@8CJ. D8K8 ; <J: I@< ; @E K?< D8ELJ: I@GK, : F; < 9FFB, 8E; 8E8CP@ : F; < N@C 9< D8; < 8M8@89C< LGFE I<HL<KJ G<E; @E> 8GG@8K@FE 8E; 8GGIFM8C.

" * - : FE: <@M< ; 8E; ; <J@E< ; K?< JKL; P. +4, ' . , C" - 8JJ@JK< ; N@? K?< D<K?F; J. +4, \$-D8E; 24 ; @; K?< ; 8K8 8E8CP@J. +4 8E; %*4 ; I8<K< ; K?< @E@8C D8ELJ: I@GK. ACC 8LK?FIJ 8JJ@JK< ; N@? @EK<IGI<K8K@FE. : FDD<EK< ; FE ; I8<KJ F= K?< D8ELJ: I@GK, 8E; 8GGIFM< ; K?< \E8C M<I@FE. " * - @J K?< >L818EKFI 8E; 8KK<KJ K?8K 8CC @@K< ; 8LK?FIJ D<<K 8LK?FIJ?@G : I@<I@8 8E; K?8K EF FK?<IJ D<<K@E> K?< : I@<I@8 78M< 9<<E FD@K< ; .

ACC 8LK?FIJ ?8M< : FDGC<K< ; K?< #C' \$E LE@FID ; @J: @FJLI< -FID 8K NNN.@ DA<.FI> : /@J ; @J: @FJLI<.G ; = 8E ; ; < ; @I<K?<P ?8M< EF : FE] @.KJ F= @EK<I<JK.

. ?< 8LK?FIJ NFLC ; @@< K KF?8EB K?< #(-C) G GIFA<:K D<D9<IJ =FI K?<@J JL9JK8EK@8C NFIB FE ; 8K8 : FCC<:K@E> 8E ; =FCCFN-LG.

-LGG<D<EK8IP ; 8K8 KF K?@J 8IK@< : < : 8E 9<=FLE ; FEC@E< 8K ?KKGJ:// ; F@. FI>/10.1016/A.:CEL.2021.01.033.

56.

- 516 ' #. .D. CFII<@ (LKI@FE J: I<<E@E> MJ ELKI@FE 8JJ<JJD<EK: N?8K J K?< ; @<I<E:<? (LKI C@E *I8:K) ^ L9 AD -F: *8I<EK<I EEK<I8C (LKI 2018;33(1):62 72.
- 526 -.' : ?E<@<I, ' #. .D. CFII<@ EG@< D@F@P F= N@?@K @FJJ, D8C@LKI@FE 8E; J8I: FG<E@8: 8 I8EJ8K@8E@. M@N. (LKI@FE 2020;69. 110581-110581.
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- 546 D. -RE: ?<O, F; IJ>L<O, C. AEEN<@<I, . . C< ; <I?FOD A I8EJ8K@FE8C 8GGIF8: ? =FI K?< : @E@8: 8C 8GG@8K@FE F= I< : <EK@P LG; 8K< ; < \E@F@EJ F= D8C@LKI@FE (! @&') 8E; J8I: FG<E@8 (E 1 ! -) *2). ' 8KLI@8J 2019;122:89 90.
- 556 &. *FN<I, D. ' LCC8CP, E. , ! @E<P, ' . C@8IB< , ' . O@JJ<I, D. OFCB<IK, <K 8C. A I<M@<N F= K?< M8C@ @P F= D8C@LKI@FE J: I<<E@E> KFF@J LJ< ; @E FC: <I 8: L@J @E : FDDLE@P 8E; ?<8K?< 8I< : K@<E>J - 8 ' 8 (LE@& JKL; P. C@E@8: 8C ELKI@FE E - *E (2018;24 1 13.
- 566 4.+ . ! LF, \$' . 3L, 1 @@ 4.' . L, 3. @E, 3.3. -?@ <K 8C. -LIM<P 8E; 8E8CP@J F= K?< ELKI@FE8C JK8KLJ @E ?FJG@8C@< ; G8K@EKJ N@?< D8C@E8EK >8JKI@. KLD@FIJ 8E; @J @E] L<E: < FE K?< HL8@P F= @@< . -LGGFIK C8I< C8E: 2020;28(1):373 380.
- 576 \$' . 3L, ' . 38E>, " . 2. 2L, 1. @@ 4.' . L, 3. @E, <K 8C. AJJF: @K@FE 9<K<N<<E J<ILD C-I<8: K@< GIFK<@E : FE: <EKI8K@FE 8E; ELKI@FE8C JK8KLJ F= D8C@E8EK KLD@FI G8K@EKJ. (LKI C8E: 2019;71(2):240 245.
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- D<K8-8E8CPJ F= GI<M8C<E: < ; 8K8 LJ<E> ' (A(W). C0E (LKI 2016;35(6):1282 1290.
- 5276 \$. A1<E; J, *. B8: ?D8EE, O. B818: FJ, (. B8IK?<C<DP, ". B<IK0, . BF00<K0< <K 8C. E->*E (>L0 <0E<J FE ELK100FE 0E : 8E:<I G8K0EKJ. C0E (LKI 2017;36(1):11 48.
- 5286 ' . &8GFIK<, " . %<C<I, " . *8P<K<, \$. *. ACC81; , D., . DL<IBJ<E, *. B<IE0<I, <K 8C. O8C0 0P 8E; I<008900KP F= K?< E<N C8E8; 08E (LKI00FE -: I<<E0E> . FFC 0E K?< I<8C-NFIC; ?FJG08C J<K00E>. ELI \$ C0E (LKI 2015;69(5):558 564.
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UNCORRECTED PROOF